

Contracts Department

News of Special Interest to Contractors, Engineers, Manufacturers and Dealers in Building Supplies.

Information for insertion in these columns is invited from Architects, Contractors, Engineers, etc.

Waterworks, Sewerage and Roadways

Burnaby, B.C.

Tenders addressed to C. T. Saunders, C.M.C., will be received until January 9th for construction of waterworks system for D. L. 186. Tenders to quote lump sum of alternatively separate tenders as follows: (1) Price of valves and other fittings. (2) Supply of approximately 31,000 feet of 4, 6, 8 and 10-inch pipe; laying of pipe and fittings. Plans, etc., at engineer's office, Municipal Hall, Edmonds, and at Messrs. Kilmer & Holland's office, 524 Pender street, Vancouver.

Fergus, Ont.

The by-law to issue debentures for permanent sidewalks was carried.

Goderich, Ont.

The by-law to raise \$26,000 by debentures for the building of a storm sewer was carried.

Harriston, Ont.

The by-law for a municipal waterworks was carried.

Meaford, Ont.

The by-law to raise \$10,000 for street repairs was defeated.

North Vancouver, B.C.

It is stated that a sum of approximately \$40,000 will be expended by the city during the coming season in the purchase of cast iron pipe, this to be in future extension.

Pembroke, Ont.

The time for receiving tenders for supply of riveted or lapwelded steel piping for waterworks here has been extended to January 16th; also that for delivery of cast iron water main. A. E. Fortier, town clerk, this town; T. Aird Murray, consulting engineer, Toronto; A. E. Dunlop, chairman Water Committee.

St. Catharines, Ont.

The by-law to expend \$180,000 for a new water main to increase the pressure and supply was carried.

Toronto, Ont.

The storm overflow sewer by-law was carried; also the good roads by-law.

Vancouver, B.C.

Tenders will be received by the city clerk, Vancouver, B.C., for a road roller. For further particulars see advertisement in "Tenders and for Sale Department" of this issue.

Victoria, B.C.

In the by-law which provides an expenditure of 1,500,000 on the Sooke Lake project and which will be submitted to the ratepayers on January 12th, a clause was inserted making it compulsory to have the work done by contract.

AWARDED.

New Westminster, B.C.

The contract for paving and re-grading the Columbia street extension from Fourth

street to Leopold place, will be done by the Hassam Paving Company.

Ottawa, Ont.

The city council awarded the contract for the two lifts for the waterworks to D. Round & Sons, of Cleveland, Ohio. They are two ton lifts and the price is \$185 each. The tender to the General Supply Company was second lowest, \$204 each.

Victoria, B.C.

The contract with the Worswick Paving Company for the paving of Langley street, between Yates street and Bastion street, has been signed by the city and work will commence at once.

Railroads, Bridges and Wharves

Charlottetown, P.E.I.

Tenders are being called by department of public works until January 6th for rebuilding Sutherland's bridge at Montague; also Poole's mill dam bridge; also Paynter's bridge. L. B. McMillan secretary.

Edmonton, Alta.

One of the debenture by-laws to be voted on by the ratepayers on January 22nd includes \$167,000 for another bridge over the Saskatchewan.

Fredericton, N.B.

The Pinder mill bridge, in Southamton, York county, is to be rebuilt, and the provincial department of public works is calling for tenders for the work.

Montreal, Que.

Capitalized at thirty million dollars, the Montreal Central Terminal Company proposes to tunnel the St. Lawrence and erect a central terminal station for all the railway lines entering Montreal with the exception of the C.P.R. Their plan, which includes the abolition of all level crossings, has been laid before the Board of Control.

Owen Sound, Ont.

The by-laws to rebuild two bridges were carried.

Port Burwell, Ont.

Tenders addressed to R. C. Desrochers, Department of Public Works, Ottawa, will be received until January 30th for construction of breakwater here. Plans, etc., at above Department and at the offices of district engineers, Toronto, London, and on application to local postmaster.

Toronto, Ont.

The by-law to improve Ashbridge's Bay was carried.

Public Buildings, Churches Schools, etc.

Brantford, Ont.

By-laws to dispose of the fire hall and old Waterous property sites on Dalhousie street, on which the proposed new Gov-

ernment buildings were to be erected, were defeated.

Calgary, Alta.

The present site of Knox church, Seventh avenue and Centre street, has been sold. The congregation is now considering the erection of a church on Sixth avenue and Second street. Estimated expenditure, \$100,000.

The present site of the First Baptist church on First street west and Seventh avenue has been sold. Plans are to be prepared immediately for a new church for which a site on southwest corner of Thirteenth avenue and Fourth street west has been purchased. The deal was put through by J. K. Lee, of this city.

Collingwood, Ont.

The by-law for new west end public school and town fire hall with up-to-date equipment was carried.

Edmonton, Alta.

Debenture by-laws totalling \$456,000 will be voted by the ratepayers on January 22nd. They include \$175,000 for a stock pavilion at the exhibition grounds, and \$90,000 for the purchase of industrial sites.

Fergus, Ont.

Tenders addressed to R. C. Desrochers, secretary, will be received until January 18th for postoffice fittings. Plans, etc., on application to Wm. Mahoney, architect, Guelph, and at the Department of Public Works.

Foldens, Ont.

Tenders addressed to C. W. Budd, secretary, will be received until January 15th for erection of brick church here. Plans, etc., with Wm. Pullin, chairman, or with the above. Advertisement in "Contract Record."

Guelph, Ont.

At a joint meeting of the Winter Fair board and council it was decided to have an architect draw up plans regarding the additional accommodation required for the fair. Several proposals were submitted, but no action was taken. A meeting will be held on or about January 15th.

Goderich, Ont.

The referendum towards building new municipal buildings was carried.

Hamilton, Ont.

The by-law for hospital site and Children's Detention Home were carried.

Hillsboro, N.B.

Tenders addressed to Jordan Steeves, chairman of building committee, will be received until January 6th for construction of the First Hillsboro Baptist church. Plans, etc., at office of above and at office of H. Mott, architect, Germain street, St. John.

Kamloops, B.C.

Plans are being prepared for the erection of new hospital here by Mr. Birds,

architect. Noted in issue of December 21.

Kingsmill, Ont.

The by-law for a library was carried.

Montreal, Que.

Messrs. Bullen, Day, Evans and others, of Mount Royal Vale, were appointed a committee to report on the erection of a new Anglican church here.

Application is being made to the Quebec legislature by the churchwardens of St. Mathias' Church, Westmount, for an act authorizing them to borrow money upon the security of the church for the legislature by the erection of church and other buildings for the ecclesiastical and parochial uses of the parish.

Ottawa, Ont.

It is understood that negotiations are about completed whereby the English-speaking Lutheran church congregation in this city has purchased a site on Lisgar street near O'Connor on which it will erect a church in the very near future. Rev. Mr. Bieber is minister.

Owen Sound, Ont.

The by-law to erect a Carnegie library was carried.

Quebec, Que.

The Nickel Theatre on St. Ann street was damaged to the extent of about \$25,000 on the 25th ulto.

Sault Ste. Marie, Ont.

The by-law for schools was carried.

Sherbrooke, Que.

We are informed that the contracts for erection of monastery at Sherbrooke have not been awarded. Materials, stone and brick; estimated cost of building, \$75,000. Architect, P. Girard.

South Vancouver, B.C.

A new church will be erected shortly in St. Mary's parish.

Plans have been completed by Engineer Harvey for the Emergency Hospital on corner of Thirty-sixth avenue and Prince Edward street. Plans are yet to be approved by council.

St. John, N.B.

Mrs. J. C. Jordan has given to the province her summer home at River Glade as a sanitarium. It is understood that Mrs. Jordan proposes to build a large hall and library also.

Toronto, Ont.

The Western Hospital by-law was carried.

Building permits were issued to Board of Education for 2-storey brick addition to school on Avenue road, \$40,000; Methodist Church, 2-storey stone Sunday School on St. Clair avenue, \$30,000.

Vancouver, B.C.

Tenders addressed to Wm. McQueen, city clerk, were received until December 30th for construction of isolation hospital near Barnet, including heating. Plans, etc., at office of Messrs. Dalton & Eveleigh, architects, 615 Hastings street west. Tenders to furnish figures on cement foundation and stone foundation. Owing to the tenders called before being too high, new plans have been prepared.

Victoria, B.C.

The council finally decided to submit the theatre by-law to the ratepayers on January 12th.

Tenders are invited by the department of public works for the erection of a small one-room schoolhouse at Oyama, in the

Okanagan district, tenders to be received on or before the 20th January.

The ratepayers will vote on the erection of a new theatre here at an estimated expenditure of about \$100,000. A company headed by Mr. Simon Leiser represents the company interested, and Alderman Mabie is on the committee appointed by the city council to look after the city's interests.

Weston, Ont.

The high school by-law asking permission to purchase a site for a new high school was defeated. The by-law for an addition to the public school was carried.

Whitby, Ont.

The ratepayers voted down the proposal to expend \$25,000 on new collegiate.

Windsor, Ont.

The by-law to provide \$6,000 for new fire hall in west end of the city was defeated.

Winnipeg, Man.

The board of control decided to advertise the programme for competitive plans for an infectious disease hospital to cost \$200,000, despite the fact that only \$75,000 of the money is as yet available. The advertisement is to be conditional upon the procuring of the rest of the money needed. Special legislation to carry on the work will be asked from the government this winter, and it is probable that authority will be given to place the additional amount in next year's general tax levy.

AWARDED.

Brockville, Ont.

F. Clow was given the contract for the repairs to the Victoria building, necessitated by the recent explosion. Five bulk tenders were received.

Residences

Cobalt, Ont.

The residence formerly occupied by Mr. Robbins was destroyed by fire on the 27th ulto. Loss, about \$4,000.

Nelson, B.C.

Alex. Carrie is advertising for tenders for quarrying rock on the lots on Victoria street, where Edward Kerr proposes to build a modern apartment house.

Ottawa, Ont.

M. C. Edey is preparing plans for tenements for B. Barwick and Mrs. Barrett.

Business Buildings, and Industrial Plants

Aurora, Ont.

Tenders are being called until January 6th for erection of two-storey and basement factory for J. Fleury's Sons. O. E. Teneh, architect, Newmarket. For further information see "Tenders and For Sale Department," this issue.

Calgary, Alta.

Dr. Lindsay is reported to have purchased the Knox church site on Seventh avenue on which he will erect a large business block.

Chatham, Ont.

The by-law to grant the Western Bridge & Equipment Company a site for an enlarged factory was carried.

Dresden, Ont.

The heaviest losers in the fire which occurred here on the 25th ulto. were C. B.

Watson, owner of buildings, and R. Aiken. Estimated loss, about \$100,000.

Edmonds, B.C.

The B.C.E.R. Company will erect in the near future a new station similar to the one at Chilliwack. A Purvis, mgr., Mr. B. G. Walker, president of the Board of Trade.

Elora, Ont.

The by-law to exempt the Bissell foundry from taxation for ten years was defeated.

Fort Frances, Ont.

The by-law for the assessment of the Shevlin Clarke Lumber Company carried.

Glace Bay, N.S.

The building owned by the Harris Abattoir Co. was destroyed by fire.

Hamilton, Ton.

It is reported that 1,500 acres of land on the Grand river, between Dunnville and Port Maitland, are being purchased for the United States Steel Corporation.

Iberville, Que.

The Noreroos Bros.' stone-dressing plant was destroyed by fire on the 27th ulto. Loss, about \$30,000. Mr. Perry manager.

Latchford, Ont.

Loss by fire on the 24th ulto. to the extent of about \$100,000 was sustained by Latchford Hardware Company, A. Abdalah, P. Curtis, and others.

Masson, Que.

It is stated that Senator W. C. Edwards is rebuilding on a larger scale the large flour mill recently destroyed by fire. E. A. Barry, of Montreal, is in charge.

Moose Jaw, Sask.

The Western Manufacturing Company, of Regina, are stated to have purchased the plant of the Saskatchewan Sash & Door Company, here, which they will replace by a large and up-to-date plant.

Montreal, Que.

The building occupied by the Anglo-Canadian Leather Co. was damaged to the extent of about \$200,000 on the 27th ulto.

The building occupied by Freeman's Company has been purchased and it is understood that this will be replaced by a modern ten-storey office building.

North Battleford, Man.

C. B. Ramsay and J. Roberts have purchased the Grand Central Hotel, which they propose renovating at once. An addition will probably be built in the spring.

Orillia, Ont.

The by-law granting certain privileges to the Canada Refining & Smelting Co. was carried; that for loan of \$12,000 to the National Hardware Company, defeated.

Ottawa, Ont.

M. C. Edey is preparing plans for a three-storey commercial building on Gladstone avenue near Bank, for H. Levin.

A permit has been issued to the Ottawa Electric Railway Company for a concrete addition to its power house on Middle street, \$7,000.

Owen Sound, Ont.

The planing mill now operated in Chatsworth will be operated in the future in Owen Sound. Those interested are W. Bumstead, of Owen Sound; Wm. Arthur, Woodford; Dr. J. Airth, Chatsworth, and former Manager Galbraith, Chatsworth.

Peterborough, Ont.

Messrs. J. J. Turner & Sons will enlarge their factory here. John Belcher, C.E., has been instructed to prepare plans.

The by-law to authorize a loan of \$12,000 and exemption to the Bonner Worth Company was carried, but possibly not large enough to meet the requirements of the three-fifths.

Petrolea, Ont.

The by-law to give exemption to a canning factory was carried.

Princeton, B.C.

C. R. Briggs, is secretary for the British Columbia Portland Cement Company, Ltd., Vancouver, for whom a cement plant and storage house is being erected here. Size, ground floor, 50x450. Address of Secretary, Room 11, Davis Chambers, 615 Hastings West, Vancouver.

Strathcona, Alta.

The warehouses and workshops of the O'Brien Company, until recently the O'Brien-Dale Lumber Company, will be enlarged. The transfer of this business to the Pigeon Lake Lumber Co., of which P. J. Mullen, lately of Millet, will take place shortly.

Stettler, Alta.

Stettler iron works, owned and occupied by John Finchman, were badly damaged on the 26th ulto.

St. Catharines, Ont.

The by-law to make a fixed assessment on the Kinleith Paper Mills and Warren Bros. knitting factory was defeated.

St. John, N.B.

Joseph E. Clarkson, manager of the Edward Partington Pulp & Paper Company, has left for England. It is expected on his return an announcement will be made respecting the project for the erection of an up-to-date mill.

Toronto, Ont.

The St. Nicholas' Home for Boys on Lombard street has been sold. It is stated that a factory will be erected on the site.

Vancouver, B.C.

Permits were issued for six-storey business block, Seymour street, to T. A. Fee, \$115,000; also to Smith, Davidson & Wright, for 4-storey warehouse, \$75,000.

Plans have been submitted by Messrs. Smith, Davidson & Wright for the erection of a four-storey warehouse at the corner of Homer and Davie streets. It will be 80 by 100 feet and will cost \$80,000.

The Merchants Bank of Canada has purchased the corner of Granville and Pender streets, where a large business building of about eight storeys will be erected. Mr. Geo. S. Harrison, manager of the Vancouver branch.

W. M. Dodd & Co., Canadian Bank of Commerce Chambers, Hasting street, are the architects for the new 10 storey fire-proof hotel to be erected on the corner of Robson and Hornby streets for Passlin building syndicate, Dominion Trust building. The latter will erect at once, it is stated, at a cost of \$35,000, a four-storey brick and stone building on Richards street. Contractors, S. Hovick & Co., Vancouver; architects, W. M. Dodd & Co.

Victoria, B.C.

The Standard Laundry Company will erect an extensive addition to its View street building, \$9,000.

Tenders were called until December 27th for concrete foundation, etc., for a building by S. Maclure, 19 Green block.

Whitby, Ont.

The proposal to accept \$4,150 a year from the Bell Company for a 5-year extension of their franchise was defeated.

Winnipeg, Man.

It is rumored that options were secured on two Main street sites for the projected hotel by the Ritz-Carlton Syndicate of New York.

The Donald Fraser building, here, was destroyed by fire on the 26th ulto. Total loss, about \$150,000. Owner, Rt. Hon. A. J. Balfour. Damage to the extent of about \$20,000 was also done to the Overland Furniture Co.'s plant.

AWARDED.**Brantford, Ont.**

E. G. M. Cape, Montreal Que., has charge of the erection of the extension to Watrous Engine Works, here. Estimated cost, \$40,000.

Charlottetown, P.E.I.

The contract for erection of branch for Royal Bank of Canada has been awarded to H. & S. Lowe, this city, \$20,000. Kenneth G. Rea, architect, Montreal, Que.

Ottawa, Ont.

Pedlar People, of this city, have been awarded the contract for metal lath and furring for the Rosenthal building. C. E. Deakin, general contractor. A. L. Weeks, architect.

The Linden British Refrigeration Co. has been awarded the contract for the cork boarding and refrigeration installations for the George Matthews building. W. E. Noffke, architect.

Port Arthur, Ont.

R. Hamer has been awarded the contract by the Dominion government for the construction of a fish hatchery in the mouth of the Current river, here, \$5,000.

Power Plants, Electricity and Telephones**Bowmanville, Ont.**

The plebiscite in favor of the electric light being managed by commissioners carried.

The by-law to grant a franchise to the Seymour Power & Electric Company, Limited, was carried.

Brockville, Ont.

The by-law to amalgamate the Light and Water Commissioners carried.

Elko, B.C.

The B.C. Electric Company will apply for the right to use five hundred second feet of water from the Elk river near Elko. There is a head of 175 feet, and that volume of water will produce a large current for use in the near future.

Fergus, Ont.

The People's Railway by-law to invest \$20,000 in a preferred stock at 6 per cent. for the town carried. The by-law to grant the People's Railway a franchise carried.

Guelph, Ont.

Guelph voted for the by-law to extend the radial railway into St. Patrick's Ward.

Hesperia, Ont.

The by-law to raise \$4,000 for the extension of the electric light for street lighting was carried.

Kingston, Ont.

The by-laws for electric light improve-

ments and for the extension of Hesse St. were carried.

Listowel, Ont.

The by-law to raise \$5,000 to complete the electric light system was carried.

Niagara Falls, Ont.

Stamford Township ratepayers voted down the by-law to grant the Niagara Falls, Welland and Dunnville Railway right of way through the township.

Ottawa, Ont.

The Morrisburg & Ottawa Railway and the Ottawa Electric Railway are in negotiation to co-operate. The proposal is for the Morrisburg & Ottawa to enter the city in Ottawa East and the city street railway extend its line to meet it at a station there.

St. John, N.B.

The Maine & New Brunswick Electrical Power Company is making arrangements to build a power line from its plant at Aroonstock Falls to Limestone, Van Buren and St. Leonards, running near Grand Falls. The object is to sell electrical power for lights and motors in the towns reached, also to furnish electrical power for the construction work during the establishment of a power plant on the St. John river at Grand Falls, which, it is understood, will soon be built by a company which has recently gained control of it.

Toronto, Ont.

The street railway extension by-law was carried.

Waterloo, Ont.

Waterloo voted to raise \$40,000 for electric light purposes.

The by-law to raise \$40,000 for electric light purposes was carried.

Victoria, B.C.

The council have decided to ask the ratepayers to vote on the underground telephone and electric lighting by-laws on the 12th of January.

Winnipeg, Man.

Tenders addressed to chairman, board of control; will be received until January 12th for manufacture, delivery and erection of one stop log winch at Point du Bois. Specification, etc., with power engineers, Carnegie Library.

Miscellaneous**Bradwardine, Man.**

In the recent fire the Bank of Hamilton's branch here was burned.

Edmonton, Alta.

On First street, the buildings projected within the coming year are Adams Bros., wholesale saddlery building, five storeys, \$75,000, northwest corner First and Athabasca; K. Tegler, six-storey apartment store block, \$100,000, southeast corner First and Elizabeth; Crafts, Lee & Gallinger, northwest corner of First and Peace, five-storey block, about \$75,000; an Edmonton syndicate, ten-storey block opposite King Edward Hotel.

On Jasper avenue the blocks that are projected are the Masonic Temple, corner Sixth and Jasper, five storeys; Dr. McLean, reported building on the corner of Eighth and Jasper, six storeys; P. McNaughton, apartment block, southwest corner Ninth and Jasper, \$25,000; Hugh McDonald, business block, corner Fourth and

(Continued on page 31)

Tenders and For Sale Department

Tenders

Sealed tenders are asked (for all and part) for Brick Church, Foldens. Tenders open till JANUARY 14TH, 1911. For plans, etc., see Wm. Pullin (chairman), or O. W. Budd (secretary), Foldens, Ont. Bell phone service 49, ring 14, Ingersoll. Lowest tender not necessarily accepted.

WM. PULLIN,
Foldens, Ont.

52-2

Wanted

Wanted—Large American firm manufacturing waterproofing compounds, wants to secure Canadian representatives with good connection. Product is now widely used in United States and is an absolutely reliable and economical waterproof of concrete and cement mortar. For full information write Box 178, CONTRACT RECORD, Toronto.

52-1

To Machinery Users

For 15 years we have handled both new and second-hand Machinery and Contractors' Equipment, and the name, Willis Shaw, is familiar to users of Machinery all over the United States.

We issue a printed list of our offerings with prices, sizes, etc. This we will cheerfully mail on request. We submit it with the assurance that we have investigated, inspected, or have reliable reports on every item in it.

We know how, and do protect the interests of our customers. Confer with us and get prompt service. Large Chicago stock to select from.

WILLIS SHAW MACHINERY CO.,
171 La Salle St., Chicago Ill.

Time Extension

The Town of Pembroke, Ontario

Tenders for

Cast Iron Water Main

Tenders are required by the 16TH JANUARY for the delivery of Cast Iron Water Main.

Prices to include for 16-inch diameter cast iron hub and spigot joints. Approximate length 5,900 feet. At least in 12-foot lengths, exclusive of socket. Pipes to be in accordance with the Canadian Society of Civil Engineers standard specifications for cast iron pipe and special castings. Class D. Tenders to specify price per foot and include delivery f.o.b. cars Pembroke.

Tenders to be sent in to Mr. E. A. Dunlop (Chairman of Water Committee, Pembroke).

The right is reserved to reject any or all tenders. Any tender will only be accepted on condition of entrance into a bond as to specification of quality and time limit for delivery.

Tenders to specify earliest possible delivery with limit period for completion of delivery.

By Order,

A. E. FORTIER,

Town Clerk, Pembroke.

T. AIRD MURRAY,
Consulting Engineer, Toronto.

52-52

To Building Contractors

Tenders are invited for the erection in Aurora, Ont., of a large two-storey and basement factory building, for J. Fleury's Sons.

Tenders in bulk or separately for excavating, concrete work and brickwork; carpentry, painting, gravel roofing and galvanized iron work. Prompt tenders are required.

The plans and specifications will be ready Friday, December 30th, and may be seen at the offices of J. Fleury's Sons, Aurora, and also at the Architect's office, Queen Street, Newmarket.

O. E. TENCH,
Architect.

1-1

Extension of Time

City of Regina

Tenders for Power Plant

Tenders are asked for by the City of Regina for the supply and installation of any or all of the following, together with the necessary connections ready for operation:

- 1 1500 k.w. Steam Turbine Generating Unit.
- 1 500 k.w. D.C. Generating Unit.
- 2 500 Horse Power Boilers.
- 1 Economizer.
- 1 Hand Power Travelling Crane.
- 1 Coal and Ash Conveyer.

Tenders will be received for the above until noon, TUESDAY, JANUARY 31, 1911. Specifications and all information will be furnished on application to the undersigned or to E. W. Bull, City Electrician.

(Signed) A. J. McPHERSON,
City Commissioner.

51-2

Time Extension

The Town of Pembroke, Ontario

Tenders Required for Steel Tubes for Intake Pipe

Tenders are required by the 16TH JANUARY for either rivetted or lapwelded Steel Piping.

Prices to include for 18 inch diameter steel piping ¾ inch thick—approximate length 6,000 feet—cast Steel Flanges—Wood or other approved Gaskets—Approximate number fifteen Flexible Joints, Cast Iron Double Flanged Ball and Socket Joints.

Prices to include delivery f.o.b. cars Pembroke.

Tenders to specify price per foot for piping, including flanges, bolts and gaskets complete. For Flexible Joints, price per joint is to be specified. Tenders to specify earliest possible delivery with limit period for completion up to end of February, 1911.

Tenders to be sent in to Mr. E. A. Dunlop (Chairman of Water Committee, Pembroke).

The right is reserved to reject any or all tenders. Any tender will only be accepted on condition of entrance into a bond as to specification of quality and time limit for delivery.

By order,

T. AIRD MURRAY,
Consulting Engineer,
Toronto.

A. E. FORTIER,
Town Clerk,
Pembroke.

52-52

Miscellaneous

Advertisements under this heading one cent a word per insertion. Box No. ten cents extra

Agents Wanted

Agents wanted in all parts of Canada to handle wood preserving for Poles, Cross-Arms, Railroad Ties and Construction Timber. For particulars write W. D. Ward, Tribune Building, New York.

1-2

Wire cables for holding shaft timbers are used at the Fremont mine near Amador City, Cal. The shaft has two compartments, dips at an angle of 52 degrees, and is 650 feet deep with a 50-pound sump. In sinking this shaft some heavy ground that caved badly was encountered; the "Engineering and Mining Journal" states that it was impossible to get a bearing for the wall plates or caps, and the more the ground was trimmed away to secure a bearing for these timbers the worse it caved, until a large cavern was formed above the shaft. In order to timber the shaft through this ground, the expedient of securing the timbers in place with old hoisting cable was tried and proved quite successful. The sets in the caving zone were tied with the cable to those above which had firm bearings in the wall rock. This hanging of the timbers was continued until firm ground that would give sufficient bearing for the timbers was again encountered. Stringers were then placed over the suspended shaft sets and upon them a cribbing built up in the opening.

A concrete telegraph pole of the Siegart type was recently tested at the factory in Lucerne in order to determine its resistance to bending, the load being applied at a distance of 4 inches from the top in order to secure loading similar to that to which the pole is subjected in practice. The pole was 26.24 feet long and its lower end was embedded horizontally for 4 feet in a masonry wall. The pole was hollow, about 10 inches in external diameter at the lower end and about 7½ inches at the upper end. The annular wall was 1.2 inch thick, reinforced with 32 ¼-inch round rods at the base, and wrapped with steel wire of small size. The deflection was measured by a scale at the end. According to "Beton und Eisen," the pull required to stress the steel to the permissible 14,200 pounds per square inch was computed as 409 pounds. The load was applied in increments of either 110 or 220 pounds, until it reached 550 pounds, when the deflection at the end was 2.2 inches. The load was then released to 0 and the set found to be 0.16 inch. It was again applied and raised to 1320 pounds, at which the deflection was 9.5 inches. Upon release the set was 1.9 inch. After raising the load to 1694 lbs., where the deflection was 17.9, and again releasing; the set amounted to 8.3 inches. The pole was finally broken under a load of 1958 pounds, failure occurring at the base. The first small cracks were noted on the tension side under a load of 1210 lbs., when the stress in the concrete was computed as 1970 pounds per square inch and in the steel 43,700 pounds.

Miscellaneous

(Continued from page 31)

Jasper, \$55,000; Jackson Bros., three-storeys, on Wm. Sugarman property; Northern Investment agency, business block on Kelly and Moore property; J. B. Mercer, five-storey hotel, on Grand Central property, \$100,000. This list does not include the proposed drill hall at \$50,000, and the land titles office, which the provincial government will probably undertake within the next year.

Montreal, Que.

Tenders addressed to David Seath, secretary-treasurer Harbor Commissioners of Montreal, will be received until January 10th for supply of concrete and macadamizing stone. Specifications upon application to F. W. Cowie, chief engineer.

Port Hastings, N.S.

Tenders addressed to R. C. Desrochers, secretary, department of public works, Ottawa, will be received until January 11th for dredging here.

Prince Rupert, B.C.

Tenders will be received until March 2nd for \$40,000, 20 year, 4½ per cent. telephone debentures; also \$79,560 5 per cent. local improvement debentures. Ernest A. Woods, city clerk.

Regina, Sask.

The city council has decided to place an order with the Ottawa Car Company for four single and two double truck cars for the new municipal street railway under construction, to be delivered on or about July 5th, 1911.

Three Rivers, Que.

At a meeting between the promoters of the St. Maurice Valley Cotton Company and the city council of Three Rivers, it is expected that arrangements will be completed to build the new mills in Three Rivers. The organization involves a capital of three million dollars.

Toronto, Ont.

Permit was issued to Messrs. Ambrose Kent & Sons for addition to new 10-storey office building corner of Yonge & Richmond streets, \$50,000.

Recent building permits include: Robt. Fasken, 2 pair semi-detached brick dwellings, on Margueretta, \$10,000; Consumers' Gas Company, 1 storey brick governor house, on Eastern avenue, \$14,000; W. H. Wright, 3 pair semi-detached 2 storey brick dwellings, Symington, \$12,000; C. Coulter, 2 pair semi-detached, 2-storey brick dwellings, south-east corner Harbord and Jersey, \$8,000; H. Freeman, 1 pair semi-detached 2½-storey brick dwellings, on Perth, \$4,600; W. J. Bolus Co., 3-storey brick warehouse, on Victoria, \$14,000; C. Garfunkel, 4 attached 3-storey brick stores and dwellings, on Roncesvalles, \$14,000; T. Reid, 1 pair semi-detached 2-storey and attic brick dwellings, on Dufferin, \$6,000; Mrs. A. M. Baird, 4 attached 2-storey brick and rough cast dwellings on Margueretta, \$6,000; C. E. Lailey, 2-storey brick dwelling on Whitney avenue, \$8,000; Whalen & Manuel, 1 pair semi-detached, 2½-storey brick dwellings, on Edna, \$5,000; Jos. Yates, 2-storey brick dwelling on 12 Dalton, \$4,500; Harvey Printing Co., 2-storey brick factory, Richmond, \$8,000; A. Tate, 3 attached 2-storey roughcast dwellings, Westmoreland, \$5,000; G. Brady & Son, 2 detached 2-storey and attic brick dwellings, on Woodlawn, \$8,800; C. Banckham, 1 pair semi-detached 2-storey brick stores and dwellings, on Margueretta, \$5,000;

Walter Hudson, 2 detached 2-storey and attic brick dwellings, on Millicent, \$5,000; C. P. R. Co., 1-storey brick freight shed, on West Toronto station grounds, \$19,500; C. E. Walton, 1 pair semi-detached 2-storey and attic brick dwellings, on 118 126 Winchester, \$4,500; The Norcross Bros., 1-storey galvanized iron stone mill, on 355-367 Logan avenue, \$5,000; Frank Merrill, 3-storey brick addition to factory, on Lombard street, \$4,500; T. J. Allen, 3 attached 2-storey brick dwellings, on Ritchie avenue, \$6,000; Mary S. Thompson, 3 attached 2-storey brick dwellings, on Clinton, \$9,000; Lake Simcoe Ice Co., 1-storey galvanized iron ice house, on George street, \$3,500; Marg. Wright, 2-storey and attic brick dwelling, on Westminster avenue, \$3,500; J. Wanless & Son, 3-storey brick addition to office and apartments, corner Hayter and Yonge, \$5,000; S. S. Prusky, 3-storey brick apartments, on William St., \$9,000; S. J. Sharp, 1 pair semi-detached 2-storey brick dwellings, on Palmerston Gardens, \$4,000; C. A. Boone, 1-storey brick storage warehouse, on 165 Richmond St. west, \$4,500.

Vancouver, B.C.

Recent building permits include: A. Munn, 1330 Odium drive, \$2,500; A. E. Williams, 3026 Woodland drive, \$3,500; J. C. Laidlaw, 166 Eleventh avenue west, \$2,700; McColl & Saunders, 1957 Third avenue east, \$2,500; Sam Kee, Hastings St., \$4,500.

Victoria, B.C.

Following are the bids which have been received by the city for supplying the new equipment for the fire department authorized under the recent by-law: Two fire engines, Waterous Engine Company, \$9,000; Aherns, Fox Fire Engine Company, \$15,000. Motor hose wagons and motor combination chemical engine and hose wagon, Findlay, Durham & Brodie, \$5,925; Woods Motor & Taxicab Company, combination, \$6,700, hose wagons, \$6,550. Hose: Vancouver Rubber Company, 95c. to \$1.25 per foot, according to quality; Goodyear Rubber Company, \$1 to \$1.25 per foot; Canadian Rubber Company, 90c. to \$1.10 per foot; Dunlop Tire & Rubber Company, \$1 to \$1.30 per foot. The W. E. Seagraves Company put in a lump tender for aerial truck, hose wagons and combination chemical engine and hose wagon of \$19,983.

AWARDED.

Calgary, Alta.

The tenders for overhead material, feeders, etc., in connection with the street railway here were as follows: The Northwest Electric Company, Calgary, \$3,672.89; the Northern Electric Company, Calgary, \$1,526.69; the Canadian General Electric Co., Calgary, \$4,275.40; Dawson & Company, \$120; the Canadian West company, Calgary, \$208.50; Gorman, Clancy & Grindley, Calgary, \$3,089.70; Canadian Equipment & Supply Company, Calgary, \$407.40; J. W. Campbell (agent Phillips Wire Company), Calgary, \$4,155.00.

New Companies

Robert W. Hunt & Co., Ltd., Montreal, capital \$50,000, incorporated to carry on the business in all its branches of civil, mechanical, mining and electric engineers, etc. Incorporators, J. W. Moffat, civil and mining engineer; T. C. Irving, jr., civil engineer, both of Toronto, Ont.

J. H. McComb, Limited, Montreal, Que., capital \$50,000, incorporated to manufacture, etc., roofing, flooring, paints, etc. Incorporators: S. W. Jacobs, K.C., A. R. Hall

and Gai C. Papineau Courture, advocates, all of Montreal, Que.

Montreal Paper Company, Limited, Portneuf, Que., capital \$100,000, incorporated. Incorporators: Thomas R. Bishop, G. W. Bishop, both of Notre Dame de Portneuf.

Henry Gaffney, Limited, Toronto, Ont., capital \$100,000, incorporated to operate sand and gravel pits, etc. Incorporators: H. Gaffney, builder; S. W. Field, barrister at law, both of Toronto.

Casey Shaw Lumber Company, Limited, incorporated, Sudbury Ont., capital \$50,000. Incorporators: E. I. Casey, Chicago, Ill., lumberman; Charles McCrea and George J. Valin, barristers at law, both of Sudbury.

National Bridge Company of Canada, Limited, Montreal, Que., capital \$1,000,000. Incorporators: E. R. Partles, C. G. Green, sheldis, advocates, both of Montreal, Que.

Canadian Rotary Machine Company, Limited, Montreal, Que., capital \$50,000, incorporated. Incorporators: G. A. Cassin, O. B. MacCallum, barristers, both of Montreal.

The Elder Ebenezer Asphelt Company, Limited, Montreal, Que., incorporated, capital \$40,000. R. Brunet, contractor, J. G. Cartwright, office manager, both of Montreal.

Business Notes

John Marshall, builder, Toronto, is stated to have assigned.

Martin & Tremblay, plumbers, Montreal, are stated to have assigned.

Berthiaume & Campeau, plumbers, Montreal, are stated to have dissolved.

Morency, Cote & Co., hardware merchants, Montreal, are stated to have assigned.

A mile long boulevard is suggested by Alderman Prudholme, of Montreal, for Mount Royal Ward.

Central Construction Co., Ltd., Toronto, Ont. Petition is stated to have been filed for winding-up order.

The B.C. Gazette gives notice of the incorporation of the following companies: Western Engine & Supply Company Limited, capital, \$25,000; Vancouver Sand & Gravel Co., Ltd., capital \$20,000; British Columbia Building Trust Company, Limited; Kokislah Lumber Company, Limited, capital, \$35,000.

Tenders are now receivable for the clearing of the right of way and subsequent construction of the first section of the Transcontinental line on Vancouver Island. Although no official announcement is made it is understood to be the intention of the railway authorities to open tenders and award the contract for construction of this section about New Year. It is further expected that despite the fact that the company's agreement with the government does not necessitate such expedition in procedure, the entire steel section of the new transcontinental road from Victoria to Allertown will be under contract before the close of 1911, and construction of that division giving access to the Pacific seaboard will be completed within three years from date. There is every reason to believe that even before the first link in the Canadian Northern Pacific system on Vancouver Island is completed an extension of powers will have been obtained and steps will have been taken for the further extension of the metals northward by way of Campbell river to a point north of the terminus, most probably at Quatsino Sound.

Canadian Railway Development

Good Progress Being Made By Contractors in Various Sections — Remarkable Growth of C. N. R.

The Grand Trunk Pacific Railway is perfecting plans for an early start on construction operations for its line to Grand Prairie. Engineers who have made preliminary examination of the country state that fewer engineering obstacles will be met with than on any other possible route, and that the territory to be opened up is most suitable for agriculture and stock raising. It is understood that the railway company has approached the Provincial Government seeking a bond guarantee for this road.

Official statement has been made that if nothing unforeseen happens the National Transcontinental Railway will be completed from Winnipeg to Moncton by the end of next year, with the exception of the connecting link of the Quebec bridge. Pending the completion of the bridge a car ferry service will be operated across the St. Lawrence.

T. C. Ross, of Victoria, B.C., is making good progress with his contract for clearing the right of way for the first five miles of the Cowichan Lake extension of the Esquimalt & Nanaimo Railway, H. J. Cambie, chief engineer, Victoria, B.C. About 50 men are employed and the work will be completed early next year.

It is now believed that the grading of the last 30-mile section of the Alberni branch of the Esquimalt & Nanaimo Railway, from the Little Qualicum river to Alberni, will be completed this month. The line will probably be in shape for tracklaying in February, and will be opened for traffic between Nanaimo and Alberni not later than April. Janse & McDonnell have the grading contract.

For 2,254 miles of the C.P.R. system the trains are handled entirely by telephone. It is expected that about 2,000 miles more of the line will be equipped during 1911. For the work two new copper wires are erected, each weighing 210 pounds per mile, and in the stations the very best apparatus to be obtained is installed. On all sections where there are telephone train-despatching circuits, every train, whether passenger or freight, is equipped with a telephone set and a jointed pole, by which, in case of necessity, telephonic communication with the train dispatcher for the district can be established almost immediately, and in the event of a train being stalled between stations, a great deal of delay in obtaining assistance is avoided. These train telephone sets are also used to a great extent by freight trains at sidings where there is no regular telegraph operator and frequently many hours delay to a freight train are saved. It is intended to have the whole line equipped ultimately with this system.

Contractors for several divisions of the National Transcontinental Railway report good progress on the work this winter. According to their estimates the coming year will see all the work except ballasting on some sections completed from Winnipeg to Moncton. Several of the divisions will be ready for operation and the whole should be taken over by the fall of 1912.

Messrs. Janse & MacDonell, contractors for the Alberni branch of the E. & N. Railway, which is operated by the C. P. R. on Vancouver Island, report that the last thirteen miles of roadbed from Quilicum river to Alberni will be completed by the end of January, that track laying will be started in February and that the whole line from Nanaimo to Alberni will be open for traffic by April.

The new yards of the Canadian Pacific Railway at Calgary are now practically completed. Sixteen miles of new track have been laid and the new buildings comprise a 20-stall

round-house, a 40,000-gallon water tank, a 2,000-ton ice-house, and a new shed for outgoing freight, the old shed being given over to the incoming freight. A new wing is being added to the east side of the main station house.

The roadbed of the Canadian Pacific between Winnipeg and Portage la Prairie, 55 miles, is now entirely double tracked. Work on this section of the road had been going on for some months, and unusually good progress was made. There has also been considerable grading work done between Portage la Prairie and Brandon, 78 miles, where it is expected that a double track will be laid by November, 1911.

Remarkable Growth of the Canadian Northern

Some interesting figures of the remarkable growth of the Canadian Northern in the past fourteen years were recently given out by Mr. D. B. Hanna, third vice-president and general manager. In 1896, said Mr. Hanna, the company operated only 100 miles of track. To-day the length of track under operation and in course of construction is 7,135 miles. This estimate does not include the British Columbia section of some 600 miles, or the gap of 600 miles still to be constructed between Sudbury and Port Arthur. But it does include all of the lines in Ontario, Quebec and Nova Scotia. It is hoped that by the end of 1914 all the gaps will be filled in and that the system will then be a full fledged transcontinental with 10,000 miles of line in operation.

The pay roll has grown from \$650 per month in 1897 to over \$1,000,000 a month in 1910, and a gross revenue of \$60,000 in 1897, to over \$18,000,000 this year. In 1896 the staff included 13 men and a boy. To-day the employees of the railway and its allied industries number 48,400. At the present time there are 535 cities, towns and towns in embryo on the Canadian Northern Railway. Sixty of these towns have a population of over 500, and 85 places have been given transportation facilities within the past four months. The progress of the West may be further judged from the fact that in Alberta alone 20,000 acres of land are settled upon daily, and that every school day sees a new school house opened.

A Christmas Dinner at Montreal

The various constructional interests connected with the erection of the new Windsor street station at Montreal participated in a most enjoyable function recently when they held a Christmas dinner at the St. Regis Hotel.

Mr. W. S. Painter, chief architect for the C.P.R., who was in the chair, proposed the toast of "The King." The other toasts and speakers were as follows: "The Canadian Pacific Railway Company," J. R. Meadowcroft, F. L. Ellingwood; "The Architect," C. E. Deakin, W. S. Painter; "The Contractors," F. L. Ellingwood, C. E. Deakin and J. R. Meadowcroft; "The Steel Contractors," W. R. Duckworth, E. W. Brown; "Canada and Canadians," J. L. Thomas, Col. Evans and A. Boyer; "The Building Trade Merchants," G. B. Mitchell, D. L. Chadwick and Alderman Rutherford, of Westmount; "Our American Cousins," Col. Evans, F. L. Ellingwood and C. L. Weisner; "The Architectural and Contracting Staffs," G. McNight, J. L. Thomas, G. B. Mitchell and H. S. Brightly; "The Inspecting Engineers," C. L. Weisner, W. R. Duckworth and F. W. R. Cunningham.

The list of guests included: W. S. Painter, M. D. Barclay, F. Bell, C. Birmingham, A. Boyer, H. S. Brightly, E. W. Brown, D. L. Chadwick, A. Cherry, L. C. Content, H. P. Couillard, F. W. R. Cunningham, C. E. Deakin, F. Dufresne, W. R. Duckworth, Col. W. H. Evans, F. L. Ellingwood, F. O. Farey, H. Jenner-Fust, E. H. Kelly, E. G. Love, G. McNight, W. H. Madigan, G. B. Mitchell, J. R. Meadowcroft, W. J. Nicholson, M. Pope, E. T. Ramsay, C. B. Rittenhouse, W. Rutherford, G. W. Smith, J. L. Thomas, W. Tufts, Chas. Warnock, C. L. Weisner.

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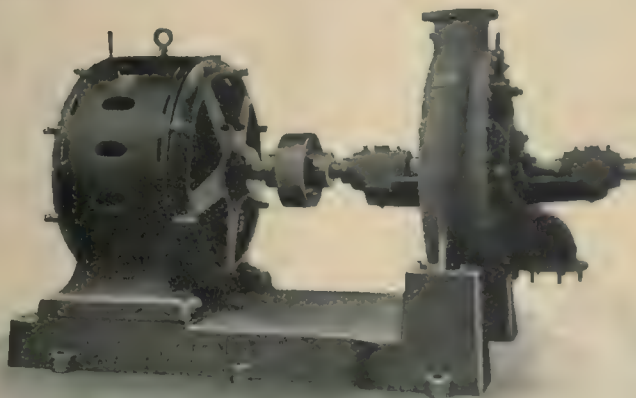
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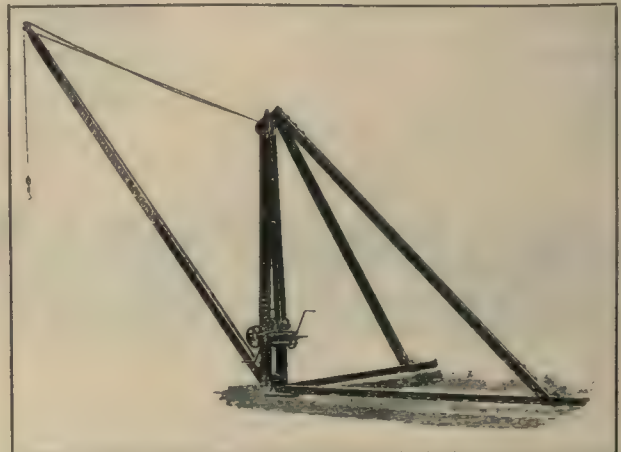
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January 4, 1911

No. 1

Are Civil Engineers Unfair to Contractors?

Among some civil engineers in charge of public works, there is a growing tendency to place unnecessary hardships in the way of contractors, complains Steam Shovel and Dredge. Frequently exactions are demanded that mean financial ruin for the contractor. Specifications, loosely drawn, are taken advantage of to force contractors to do work which in justice and fairness they should not be expected to do.

There are some civil engineers, most of them but recently graduated from some technical college, who seem to think it is necessary for them to put a few contractors out of business, in order to establish a reputation for themselves. Reputations built up by such methods are neither creditable nor are they likely to be lasting. Engineers with practical experience know this and they endeavor to be reasonable.

It is only recently that a case of this kind was brought to our attention on a railroad job in the north-west. The contractor who was doing the work was being discriminated against by young engineers and every day he was losing heavily on the work. When it appeared that he would be forced into bankruptcy, he requested the chief engineer of the railroad to take a trip over the line and learn the actual conditions.

We could, if we chose, cite dozens of such cases and we insist that it is time to call a halt on such tactics. Engineers who have had years of experience in construction work understand that questions arising under the specifications must be dealt with in a common-sense way. They have no desire to see contractors ruined, though at the same time they protect the interests they represent.

The fault often lies in specifications, which are not properly drawn, and in the interpretation of which it

requires men of experience and common sense. It is an easy matter to prepare certain plans on paper and draw up certain specifications. At the same time everyone knows that it is one thing to do work on paper and another thing to do it in actual operation. The contractor when he bids on the work, must in the very nature of things take some chance. He should be given every opportunity to make a reasonable profit, instead of being harassed and perhaps driven into bankruptcy.

Some Contractors' Shortcomings

Some contractors and builders have gained for themselves an unenviable reputation for honesty by their disregard for promptness in settling their material accounts. It might be added, though it is sad to relate, that there is some ground for this reputation, and that at least a few contractors have gained it by just cause from their actions. The policy of some builders is to get as much time on a quantity of material as they can, which is not a blamable method of doing business except that they will sometimes take advantage of the good graces of the material dealer to impose upon him. This lessens their standing, and decreases their credit to a considerable extent, and makes it harder for the man who is willing to do the right thing to obtain credit, writes Warfield Webb in the National Builder.

There is reason why every contractor or builder should be entitled to a certain amount of credit in his transactions with the material man. He takes most of his work on time payments, to be collected as the work progresses, and this simply enables him, in a large number of instances, to make his weekly payroll, and to meet such other contingencies as will arise. To pay for his materials until the contract has been completed, in a large number of cases, is naturally a difficult thing to do. Most material dealers and supply men understand and appreciate this fact, but they are still entitled to consideration, and they are placed in an awkward position at times to meet their requirements when the contractors are negligent about making their payments as promptly as possible.

You may give him a mechanic's lien, so as to protect himself against possible loss. This is merely a safeguard, and not a cash payment on his account. You may go farther and give him your notes, and he may discount them at his bank. If you fail to meet them when they are due it will place him in an embarrassing position, and will injure both his and your own credit and standing. It is not a matter of sentiment, for either the material man or for yourself, and is one that should be taken more to heart by the large majority of contractors. In order that the relations of the various interests in the building world become more pleasant each should seek to do his duty, plain and simple. It costs no more, and the returns are far more agreeable and the outcome is of such value as to become an inestimable asset to each party.

The question of credits to day is one of a complex nature. It has grown to such an extent that there is scarcely a transaction of any note that does not involve at least some credit, and that is one of the essentials that make for a much more wonderful and rapid growth to the business interests of our country. What is then desired is not an abuse of this system, but a more careful understanding and appreciation of the obligations of each party is of the highest importance to each. In order that we may enlarge the scope of our undertakings we must have credit, and this will be

found to be the most notable feature in connection with our business career, provided we do not seek to make of it an unjust profit to ourselves.

In making a bid on any contract we must be able to know that our credit is sufficient to enable us to secure the required supplies as early as we desire them, so that there will be no errors in making a contract to do certain work. Our help can be obtained readily enough, because we understand that this will be cash, and that the payment of our help is to be met each week. Not so with our materials. We hope to get them promptly, and still we sometimes wish to ask unreasonable conditions of the material man in extending to us unlimited credit for the same. Do we realize that there is an injustice in this method of conducting our business? The material man is under no obligation to us, and we should hesitate in asking him to give us privileges that we are loth to ask of others, or to have others ask of us.

Enthusiasm

Enthusiasm is the greatest business asset in the world. It beats money, and power, and influence. Single-handed, the enthusiast convinces and dominates where the wealth accumulated by a small army of workers would scarcely raise a tremor of interest. Enthusiasm tramples over prejudice and opposition, spurns inaction, storms the citadel of its object, and, like an avalanche, overwhelms and engulfs all obstacles. Enthusiasm is nothing more or less than faith in action. Faith and initiative, rightly combined, remove mountainous barriers and achieve the unheard of and miraculous. Set the germ of enthusiasm afloat in your shop; carry it in your attitude and manner; it spreads like contagion and influences every fibre of your industry before you realize it; it begets and inspires effects you did not dream of; it means increase in production and decrease in costs; it means joy and pleasure and satisfaction to your workers; it means life, real and virile; it means spontaneous bed-rock results—the vital things that pay dividends.—Selected.

Condition of Structural Iron After Long Service

For some years past certain government authorities in Germany have taken advantage of the occasions when an old iron bridge was being replaced by a new structure, by cutting samples from the metal of the old bridge and testing it to see whether the metal had lost strength by its continued service. Half-a-dozen or more such tests have been made, and uniformly the result has been very satisfying, giving practical certainty that a service of from 20 to 50 years wrought no injury to the metal.

The usual course of procedure was to cut two series of tensile-test samples out of floor beams, one set out of the middle part of the flange and one set out of the end of the flange; the latter metal, having been subject to only negligible stresses, would probably represent the original character of the material fairly well, while the pieces from mid-length of the ange would contain the effect of frequent repetitions of a moderate working stress. In testing these samples, the usual quantities were measured: elastic limit, ultimate strength, ultimate elongation and reduction of area at fractured section. In every case the results of the two sets of samples (end and middle) were as close as the unavoidable variations in material and in test-manipula-

tion permit. Some tests, indeed, showed better results (higher strength and greater elongation) for the much-stressed (middle) samples than for the end samples, though not sufficiently better to be outside the range of unavoidable variation. Moreover, the results were normal for new iron, thus eliminating the possibility that both sets of samples might have undergone serious but equal change.

Some further tests were made during the past year, and the results were of the same character. A terse statement on the subject is made in the annual report of the Prussian Royal Testing Laboratory. We quote the passage as follows:

Tensile tests of test bars taken from midspan and ends of chords and floorbeams of old wrought iron bridges (which had been renewed), "showed almost exactly equal ultimate strengths and elongations" for the corresponding pieces which had been under different stress. Comparative tests on annealed test-bars showed only slight decrease in strength. The results warrant the conclusion that "the mechanical qualities of the iron were not injuriously affected by the service of approximately fifty years."

In this case, says "Engineering News," it is not stated whether the test-pieces were from railway or from highway bridges, though the former seems probable. Previously reported tests included railway bridges, at any rate. We thus have quite definite reasons for abandoning doubts which may have existed, on the question whether structural iron is slowly weakened by the innumerable repetitions of stress during service. Further, while the tests were all made on iron bridge material, our present knowledge of the relative behavior of iron and steel gives every reason to believe that the statement holds equally for bridge steel.

A water-main subway will be constructed under the Manchester ship canal to contain the third instalment of the aqueduct from Lake Thirlmere to Manchester. The subway will be at a depth of 60 feet below the water level in the canal and will be circular in cross-section, 14½ feet in diameter and lined with segmental plates 1 1-8 inches thick with flanges 6 inches deep. The vertical shafts at the ends of the subway will be 600 feet apart and also lined with cast iron. It is proposed to carry the three large mains through the subway on cast iron chairs.

Heat transfer through the walls of a pipe at any point is stated, by Mr. W. Musselt, in the "Zeitschrift," of the Society of German Engineers, to be independent of the velocity, density and specific heat of the fluid in the pipe, but is directly proportional to the coefficient of heat conduction and inversely proportional to the diameter of the pipe.

Concrete telegraph poles 17½ feet high above the roof have been erected on one of the buildings of the United States Aluminum Company, at Niagara Falls, N.Y. They are 16 inches square at the base, 10 inches square at the top and are reinforced with eight ½-inch bars bound with ¼-inch hoops 18 inches centre to centre. At a height of 5½ feet above the roof and 4 feet above the parapet they are braced by three struts, two parallel to the building wall and one backward, all of them anchored to the roof by four ¾-inch bolts 2 feet long. The struts are 12 inches square reinforced with four ½-inch bars and 5-16-inch hoops 18 inches on centres.



Reinforced Concrete Arch Bridge at Coaticook, Que.—Completed Structure Before Removal of Centering

A Noteworthy Reinforced Concrete Arch

Possibilities of this Class of Construction Exemplified at Coaticook, Que.—Details of Design and Erection—An Expeditious Contract

Contractors:—Helmer and Winstanley

The river, at the bridge site, passes through a rocky gorge, the rock extending across the river bed and up the bank to a ground surface on each side. The southern bank of the river is nineteen feet higher than the northern bank, which necessitates a down grade on one side and an up-grade on the other. While this does not affect the strength of the structure in any way it detracts to some extent from its general appearance.

The total length of the bridge from end to end of the wing walls is 170 feet, clear span 100 feet, total rise from springing line 16 ft. 6 in. The bed of the river at the centre is 7 ft. 6 in. below the springing line. The thickness of the arch ring at crown is 24 in. The height of the bridge from springing line to top of spandrel walls is 21 ft., and the total width of the

bridge, 19 ft. The spandrel walls are 9 in. in thickness at the top and constructed with a batter of 1 in. to 1 ft. on the inside, with an expansion joint at centre. Spandrel walls are supported by buttresses at the ends, the centre and at intermediate points, and the walls are surmounted by a concrete railing 3 1-2 in. in height.

The roadway is built up to grade with sand, surfaced with gravel. The material used in the construction was rock concrete, reinforced with twisted steel bars. The concrete was composed of cement, sand and broken field stone in the following proportions: One of cement, two and a half of sand and four of stone. International cement from Hull, Que., was used. The steel varied in size from one-half in. to three-quarter in., and 30 tons were used in this structure. The exca-



Reinforced Concrete Bridge, Coaticook, Que.—Falsework Completed, Concreting in Progress

vation of the rock for the two seats was begun on September 19th, and the grading, which was about 1,400 yards, was completed on October 25th.

The arch centres were struck on the 29th of November, careful readings being taken on different parts of the bridge during the progress of the work. Although the readings were taken to 1-1000 of a foot, no variations appeared in the readings taken before and after

the removal of the arch centres. The total cost of the work, including all expenses, was in the neighborhood of \$6,000.

Those directly in charge of the work were: E. V. Norton, mayor; Thos. McCurdy, M.D., chairman bridge committee; Magwood & Walker, Cornwall, Ont., civil engineers; S. A. Meade, Q.L.S., inspector; Helmer & Winstanley, Morrisburg, Ont., general contractors.

Filtration Plant at Portsmouth, England

Economical Disposition of Space—Arrangement of Reservoirs and Filter Beds—Saving in Excavation Effected—Other Features of the Work

As an addition to the water supply of the Borough of Portsmouth, England, there has recently been constructed a series of filter beds and reservoirs, which, while not being distinctly novel in general design, are so economically located as to be worth description. The works are described in a recent issue of *London Engineering*, from which the following account has been abstracted:

The water supply of the borough is pumped from adjacent chalk springs through three mains 20, 24 and 36 inches, respectively, and has up to recently been delivered to the houses after receiving only the purification which it could get in two sedimentation reservoirs. On account of the discoloration which occurs in wet weather after a period of drought, it was decided to install slow sand filters between the springs and the reservoirs, and to build two new reservoirs to take care of the filtered water. As a part of the new work, covers were added to the old reservoirs. The old reservoirs were located on the side of a hill, partly in fill and partly in cut, and the new works were placed immediately alongside. This necessitated the upper end of the filters being put into the side hill and required that their lower end be some distance above the surface of the ground. In order to economize space, it was decided to place the new reservoirs partly under the filter beds. This not only reduced the area required for the total plant, but also materially re-

duced the amount of excavation and fill necessary.

Fig. 2 shows a section through the plant from the high point or upper end of the filter to the low point or lower end of the new reservoir. It will be seen that the north ends of both the filter beds and of the new reservoirs are formed in the steps cut out of the hillside, which is of solid chalk. At the north end the filters rest directly upon this chalk foundation, but at their south end they rest on the arched roofs of the reservoirs. These arched roofs are of concrete resting in turn on brick walls running north and south in the reservoirs and spaced about every 16 feet. To save weight and material the brick walls are arched. The divisions between the adjacent filter beds and also between the adjacent reservoirs are made by heavy concrete walls, laid up inside of a brick facing, afterward covered with a 1-in. cement coating. The bricks were used here because it was thought they would give a better line than timber forms and because also they make a better base to which to apply cement grout.

Those parts of the new reservoirs which are outside of the filter beds and all of the old reservoirs, are covered with a reinforced-concrete roof resting on concrete columns.

The seven filter beds are each about half an acre in superficial area, and each contains 3 feet of sand over 9 inches of gravel carried on a loosely-laid brick bottom. The raw water enters at the north end of each

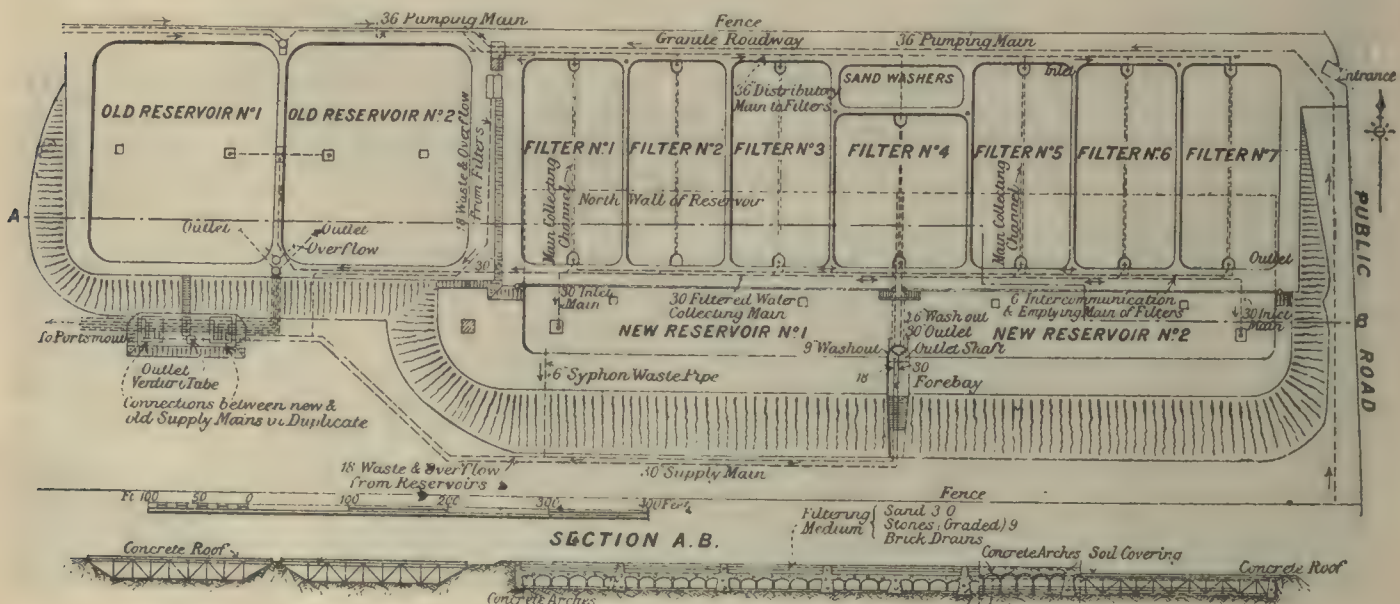


Fig. 1—Plan of the Filters and Roman Reservoirs at Portsmouth, England

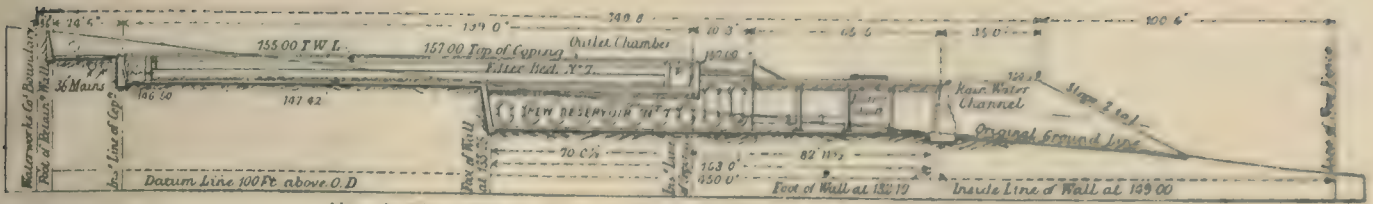


Fig. 2—Transverse Section Through Filters and New Reservoir

bed and after passing through the sand runs into a collecting trough in the middle of each bed out into the 30-inch main and thence into the reservoirs. The total filtering capacity of the plant is 12,000,000 imp. gals. a day. Each of the two new reservoirs measures 360 by 160 feet and contains 13 feet 6 inches depth when full.

Cutting Steel Sheet Piling with Oxy-Acetylene Blowpipe

In excavating the foundations for the chimney of the new sewage pumping station at Baltimore, Md., the conditions were found to be such that it was necessary to widen the footings. This was done, according to the last annual report of Mr. Calvin W. Hendrick, chief engineer of the Sewerage Commission, without increasing the size of the excavation at the surface, by driving United States steel sheet-piling at a considerable angle in the lower part of the excavation. The

blowpipe was therefore first used to heat the sheeting to redness, after which the acetylene blowpipe was applied to cut it off. This was done very quickly, although the thickness at the bulbs was considerably over 1 inch. The oil blowpipe was used only in order to expedite the work, as it was found possible to cut through the bulbs by means of the oxy-acetylene blowpipe alone.

Close-jointed granite block pavement was experimented with at Boston, Mass., during 1909, and in the last annual report of the street department of that city, from which these notes are taken, Mr. Guy C. Emerson, at that time superintendent, expresses the hope that this method of construction may be adopted as a standard for the future. Since the general use of concrete as a base it has seemed to him that the conventional block in Boston, with its depth of 8 inches, contained an excessive amount of granite and the depth

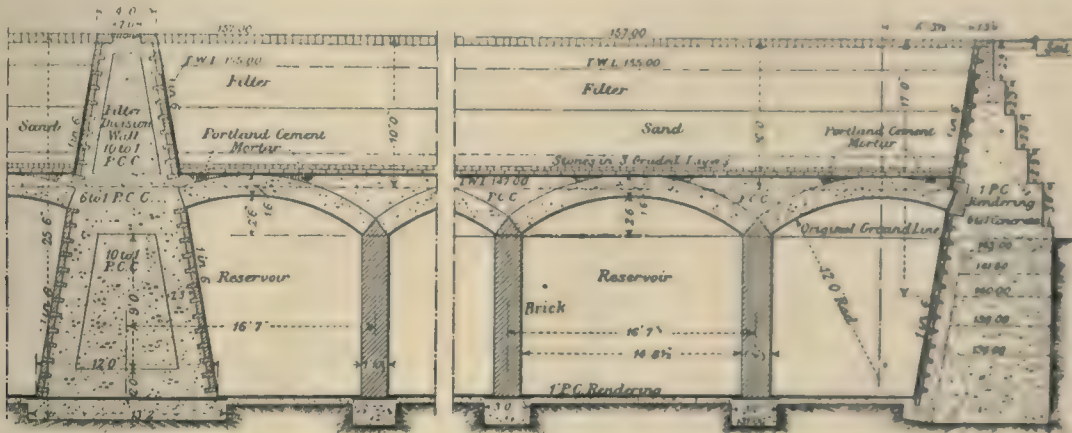


Fig. 3—Details of Reservoir Walls with Filters Above

upper ends of this sheeting projected inside of the designed lines of the foundation masonry, and, as it was embedded in the masonry, it was necessary to cut them off. It was impossible to get behind the sheeting at the proper elevation, and it therefore could not be cut off with hack-saws, and cutting it with cape-chisels would have been very tedious and expensive. There were two methods open, however, either of which would accomplish the work quickly and at a reasonable cost, these methods being the use of either an electric arc or an oxy-acetylene blowpipe; the latter being by all means the cheapest and most satisfactory, the work was done by this method. The gases used were generated on the spot, the oxygen being obtained by the distillation of potassium chlorate, and the acetylene from calcium carbide and water. On account of the small size of the apparatus used and the thickness of the sheeting at the bulbs forming the joints between the several sections, it was found that the heat was conducted away so rapidly from the bulbs as to make the process of cutting through them very slow; a crude oil

rendered it impracticable to prepare the vertical faces in such a manner as to lay with a close joint. A block of approximately 5-inch depth, with the same wearing surface, has been laid to cover 12,000 square yards on Massachusetts avenue with a maximum joint of 1/2-inch. This, Mr. Emerson states, has given a very satisfactory pavement, of greater smoothness than the previous standard. It is anticipated that the close joints will obviate the rounded corners now so common and also prevent to a great extent the noise from granite blocks. It is also believed that a softer quality of granite may be used than formerly, offering a more gritty surface and better foothold for horses than the hard granite.

A shortage of building supplies is reported from Calgary, where operations are stated to have been delayed, owing to the impossibility of getting material quickly enough. A notable shortage of brick is reported. The permits to date total five millions. The greatest optimism is prevalent. Building Inspector Harrison looks for an expenditure of 10 million dollars on building work during 1911.

Figuring Cost of Concrete Construction

Intimate Practical Knowledge of Work and Materials essential to Intelligent Bidding—The Cube System of Estimating—Records of Cost

By Charles L. Shepley

As practically all concrete bids are now let on a competitive basis, it is highly important for the estimator to approach the problem of cost with a thorough knowledge of the actual mode of construction and a general knowledge of material and labor costs.

As an average problem, let us assume that the reader wishes to estimate the cost of a re-inforced concrete building, and is well able to estimate carefully the cost of the brick work, stone work, mill work, glass, and in fact everything but the concrete work. The plans show the structural frame-work of concrete, the thickness of the floor slabs, and the size of the beams and columns, also the number and size of reinforcing rods, so that the amount and size of all the ingredients are clearly laid out and the problem is to gather together the units in a suitable way, in order to apply the units of cost. The frames which support the concrete work are customarily estimated at a price per square foot of superficial area, varying from 7 to 15 cents per square foot according to the intricacy or strength of construction. So the reader's first step is to itemize the number of square feet of area under the slabs, and on the sides of the beams and their soffits, upon which we will say a price of 10 cents per square foot of surface, which would ordinarily cover a plain, symmetrically arranged beam construction.

The square feet of area on the outside of the columns is next itemized, and a unit price applied to this, say 11 cents per square foot for a square column of ordinary length. The next step is to estimate carefully the cubic yardage of concrete in all slabs, beams and columns, which is customarily all lumped under one item of cubic yard of concrete and priced at, say, \$7 per cubic yard. This, of course, applies only to the raw structural concrete and not to any cement finish, which is usually priced by the square yard, varying from 30 cents to \$1.25 per square yard according to the mixture and thickness of the cement finish specified. For one inch of cement finish, mixed in the proportion of one part of cement to two parts of sand, a customary price is 60 cents per square yard.

Cheaper to Do Bending at Mill.

When round columns are used and metal forms are resorted to, these may usually be bought and erected for about 10 cents per square foot of the surface area of the columns. Corrugated iron forms for the under side of slabs may be placed at a cost of about 3 cents per square foot of area, and when this type of forms is used, the wooden posts and braces supporting the slab may be priced considerably lower, owing to the fact that much less lumber is needed, as the corrugated sheet iron will span a considerable distance between supports, making it unnecessary to have a solid plank floor. Forms of this type may be erected at 8 cents per square foot for large works. The reinforcing used in the concrete is usually priced by adding to its cost delivered to the work, a price per ton for its erection. The judgment of the estimator must here be fortified by experience with jobs of a type similar to that proposed,

as various works reinforced with round rods will vary in the cost of erection from \$4 to \$20 per ton, while patented rods have been used with as great a variance in cost. The amount of bending and tying to be done greatly influences this cost, and many of the modern works are having every unit of the reinforcing delivered to the job bent, ready to be placed. When this is done the bending can usually be done much cheaper at the mill than in the field.

As a specific example of the variance in cost for bending rods, an accurate cost sheet was recently kept on a very large piece of work, and it was developed that the total tonnage of steel bent for the girders above the second floor cost \$10.74 per ton, while another class of rods bent for girders cost only \$5.87 for bending. From these facts it will be seen that it is impossible to place a fixed price for bending rods on a tonnage basis. Experience in similar cases of work can be the only guide which will keep the estimator within safe limits. An ordinary job in which round rods are used in plain work, and where there is a large repetition of panels of similar size can be placed at \$1 per ton, ready for the concrete to be poured. No set price will cover any one type, however, as many conditions govern the cost of the reinforcing, and experience is the only teacher that will make you a good guesser.

Keep All Cost Data.

A common practice now used by many firms which furnish the reinforcing for a job, compete, is to deliver all of the reinforcing steel to the work, all fabricated and ready for erection. The columns are delivered all built up, with spirals coiled and spaced, the beam rods bent and designed and held in position by spacers, ready to be placed in the beam boxes, and all straight rods cut to exact lengths. When the steel comes in this form, the cost of erection is greatly reduced, and it can sometimes be placed as low as \$6 per ton. Competition has now become so active that the contractor of to-day seldom bothers to estimate carefully the total steel tonnage, but relies largely on bids sent to him giving a lump sum price for all the reinforcing delivered to the work, and it remains only for him to place a price on the erection of the wall.

Owing to many designs proposed for a single work involving various amounts of concrete, steel and forms, it becomes necessary to summarize the amounts for each design and price each in accordance with your judgment of the amount of work involved in order to arrive at a conclusion as to which is the cheapest of the proposed schemes. The only safe way to price a reinforced concrete job is from the costs learned in actual work, and it is highly important for the beginner in this field of engineering construction to keep a record of every available scrap of information on reliable cost data, as this habit will place firmly in his mind a remembrance of the cost of similar work previously done along the same lines. It is also advisable to obtain a cubic foot price on various jobs as an aid to giving a prospective buyer a rough approximate cost on certain types of

structures. This so-called system of cubing is perhaps the most definite and reliable of any method of getting a rough, approximate cost.

Estimate Cost by Cube System.

Several methods are used to determine the cubical units, depending upon the shape and size of the proposed rebuilding. One method is to multiply the square feet in the plan of the building by the height from half-way the depth of the foundations below the ground level, half-way to the roof. Another system uses the height from the bottom of the foundations and another obtains the actual cubical contents. Any of these systems may be used so long as the same one is adhered to in every case. It is advisable for one to obtain the actual cost per cubic foot on every reinforced concrete building erected by him. It will then be possible for him, guided by his knowledge of the conditions under which each structure was erected, to determine fairly accurately the cost per cubic foot which should be applied to any proposed new structure. Of course, even long experience will afford no safeguard against unusual construction in the interior of a building, so that a cubic foot price can be applied only to plain buildings of ordinary character and comparisons are reliable only between buildings of similar description and for similar uses. It is also highly important that one should keep accurate cost data on every piece of work undertaken, as these will serve as guides in pricing other work of a similar nature.

As an example of this, let us cite two or three cost sheets covering various kinds of work in which cement was used, and see what conclusions may be drawn from the costs obtained upon each piece of work per unit of quantity or area.

For instance, the cost of a retaining wall built during the winter months and under extremely severe conditions of construction, appears on the cost sheets as follows:

369 hrs. foreman laborer, 35	\$ 129.15
197 " laborer, 25	49.25
134 " laborer, 22½	30.15
1531 " laborer, 20	306.20
11778 " laborer, 17½	2,061.15
703 " teams, 47½	333.92
84 " blacksmith, 32½	27.30
244 " carpenter, 50	122.00
36 " carpenter, 47½	17.10
1055 " carpenter, 45	474.75
240 " foreman K. P. G., 45	82.30
339½ " engineer, 40	135.80
	\$3,779.07
Less received for hauling dirt	10.32
	\$3,768.75
1114¼ bbls. Cement at \$1.15	\$1,281.39
121 sacks lost at .10	12.10
	1,293.49
952 cu. yds. crushed rock	1,448.45
43630 bls. coal	109.08
3 days train service hauling dirt, \$40.00	120.00
Switching dirt	21.75
12 bolts and washers	1.92
11 rolls tar paper	5.50
	258.25
Total cost	6,768.94
Total cubic yards 1118	
1118 yds., concrete at \$6.768.94 -- \$6.05 per cu. yd. cost	

1118 yds. concrete at \$3,779.07 -- \$3.38 per cu. yd. for labor.

It will be seen by the above that the concrete for this particular retaining wall cost exactly \$6.05 per cubic yard, without the contractor's profit, and we might assume that should a similar piece of work again occur it would be safe for one to place a cost of \$6.05 per cubic yard upon the new yardage to be estimated. This would

Records of Plastering Cost.

As another example, we take the cost sheet covering the material and labor required in plastering with cement plaster the exterior of a large building, the exterior walls having been constructed of hollow tile, upon which the cement plaster was directly applied.

Actual cost of labor and material:

32 hrs. labor, 60	\$ 19.20
4 bbls., metal lath	22.00
600 hrs. plasterer, 63	378.00
200 sacks Portland cement	110.00
500 hrs. plaster helper, 30	150.00
35 bbls. brown lime, 65	22.75
14 single loads sand, 50	7.00
Drayage	25.00
	\$733.95

1056.6 yds. at 733.95 -- 69.4c. per sq. yd.

In this work there were 1056.6 square yards, and the actual cost of 69.4 cents per square yard. The mixture used was: 7 parts sand, 2 parts brown lime, 2 parts Portland cement.

The above cost sheet gives the estimator, figuring upon similar work, accurate data upon which to base the cost of plastering on hollow tile under fairly similar conditions.

It is examples such as the above that are of real service to anyone in the contracting business, and the benefits gained from keeping accurate cost data on each job cannot be valued too highly. There are hundreds of contractors who now operate on large and small scale who do not know the actual cost of an individual piece of work constructed under their care. They know the price at which they are awarded the contract, and they know the cost of the total work, but beyond that they have no knowledge of the actual cost of the various units that go to make up the job. They may price concrete at \$7 per cubic yard when the actual cost is only \$5 per cubic yard, and in so doing are estimating a profit which is too large to be warranted under the close competitive figures now taken. If a contractor kept actual cost data he would know before considering work, that the concrete would cost only approximately \$5 per cubic yard, and if satisfied with a profit of ten per cent, would price it at \$5.50 rather than at \$7, which would on a large piece of work act greatly to his advantage in putting in a competitive bid.

Adaptable to Many Conditions.

Not many years ago one would look incredulous if told that some 10,000 cubic yards of stone had been molded into a mammoth building seating some 15,000 people, and that this work was accomplished in the short period of 70 working days. Yet this feat was undertaken and completed about a year ago in the building of the Minnesota State Fair grandstand. Concrete forges steadily ahead by virtue of its adaptability to so many requirements. In the minds of many engineers, concrete is the logical solution of nearly every problem requiring speedy erection, great strength, durability and low cost.—Concrete.

Combined Curb and Gutter Construction

Importance of Good Materials properly proportioned — The Introduction of Steel Forms in Street Concrete Work—Value of Standard Specifications

By An Engineer

There are few branches of concrete work in which the contractor will welcome improved methods more than in the construction of combined curb and gutter. When this work began to be undertaken a few years ago it was quickly realized what a desirable feature of street work it was and how much better it looked than the ordinary straight curb. Since then the spread of this construction has been very rapid. Real estate people are quick to see that a street improved with a fine appearing curb and gutter makes property much more saleable and contractors in all progressive communities are having difficulty to lay combined curb and gutter fast enough to meet the demand.

Contractors, however, do not all yearn for this kind



Metal Curb and Gutter Forms in operation, showing the manner in which they are used

of work as they find it slow and expensive. In fact, under the methods generally in vogue a good round price must be charged in order to leave any profit in it for the builder. Furthermore it is only fair to admit that a great many contractors have gone into this line of work without realizing some of the important conditions which must be fulfilled if the work is to last and give satisfaction.

It is unnecessary here to point out the importance of good materials properly proportioned. If the contractor has not already learned this lesson, it is too late to change him now, and if he is inclined to believe that it is better to skimp a little here and there for temporary profit rather than to build up a reputation for first-class workmanship and materials, these points are not intended for him.

In pointing out the development of the past year in concrete work it is difficult to put one's finger upon the most important changes or improvements that have been made, but I think it would be fair to enumerate as

one of the most important the introduction of steel forms to take the place of wooden molds in certain forms of street concrete work. This is particularly the case with combined curb and gutter work, and the steel forms which have been put on the market for this purpose are deserving of careful attention. There are now for sale a number of different devices for curb and gutter work, but I prefer to describe for the purpose of this article the system of steel forms devised by the Hotchkiss Company and uniform with the so-called Hotchkiss system. The steel forms for sidewalk construction which are put out by the Hotchkiss Company are widely known and it will therefore perhaps be easier to describe this particular system of steel curb and gutter forms to illustrate this development.

The principle of the operation of these forms is the use of pressed steel channels for front and back molds, and in between these channels division plates or templates shaped to a cross-section of the desired curb and gutter. These division plates have tongues which project through slots in the steel channels and lock on the outside by means of lugs. When put together these channels and templates make a rigid structure which is self-sustaining and self-bracing. A glance at the cut will give a good idea of the method of setting up and operating the forms.

In witnessing an extensive piece of work done with these forms recently I noted that the contractor had hit upon a clever scheme of levelling his forms, which may be of interest to the reader. Instead of setting up the forms in sections and then raising or lowering each section to conform to his line, he simply drove into the ground at the bottom of his excavation at intervals a series of graded stakes and then set his forms up on top of these stakes.

Before witnessing the piece of work above described, I was inclined to fear that the work would not stand up properly if the forms were removed from it immediately. The curb in question was 12 inches high and it looked as if this would make a wall that would in part sag or fall down if the forms were not retained on it long enough to permit an initial set. I was agreeably surprised, however, to find that when the forms were removed no trouble of this kind whatsoever appeared. The manufacturers had taken the precaution of giving the back of the curb a batter of 1 on 12, and this was sufficient to avoid the danger.

I was pleased to note in the job in question that the contractor mixed his concrete stiff. It is a fad of mine that the secret of good sidewalk work is less water and more tamping, and this is equally true of curb and gutter work. I noted also that the contractor in question put on his top coat stiff enough so that he could tamp it and thereby not only make an excellent bond with the base, but also flush just enough moisture to the surface for finishing immediately. This is an excellent point for all sidewalk and curb and gutter contractors. If you will put in a stiff top coat and then tamp it you can easily strike off the surface and finish it immediately.

I have seen many pieces of work ruined because too much water was used in the concrete and when the walk was ready for finishing the finishers had to stand around and wait for some time before they could do their work, and they would frequently sprinkle dry cement on the surface in order to dry it out sufficient for using the float. This reprehensible practice is now pretty generally forbidden in municipal specifications and it should never be resorted to if you desire a good job.

One thing in the use of the above mentioned forms that pleased me particularly was the ease and rapidity with which they could be taken down and then set up further on. The contractor whose work I was observing did not have a very extensive equipment of forms, but used the same forms over six or eight times during the day, and I should, at a rough guess, estimate that his 30 running feet of forms would easily take the place of 200 running feet of wood forms and could be set up in a small fraction of the time.

I was much interested in observing the method of finishing used. The contractor in question did not permit the use of a steel trowel on his work, but insisted on the use of a wooden float which was applied as soon as the surface had been struck off with a piece of angle-iron operated by two men with a sawing motion. This latter device is simple, but it is very effective and it is surprising that it is not more generally used.

I mentioned above the use of the wooden float and it is worth while laying some emphasis upon this matter. Many a job that was otherwise good has been ruined by too much trowelling. The working over of the material has a tendency to force to the surface an undue proportion of the fine particles of cement and thereby not only rob the aggregate immediately below of its proper binding elements, but also to make a thin hard coat on top which after a time cracks and scales off. This is true both of sidewalk and of curb and gutter work. If on the other hand you will use a wooden float and not overdo the matter you will see it is possible to follow this up by brushing the surface off lightly with a dampened brush and give your work a finish, which is not only handsome, but which also is very practical. In preventing slipping it is much more effective than any stippling or brush-hammering.

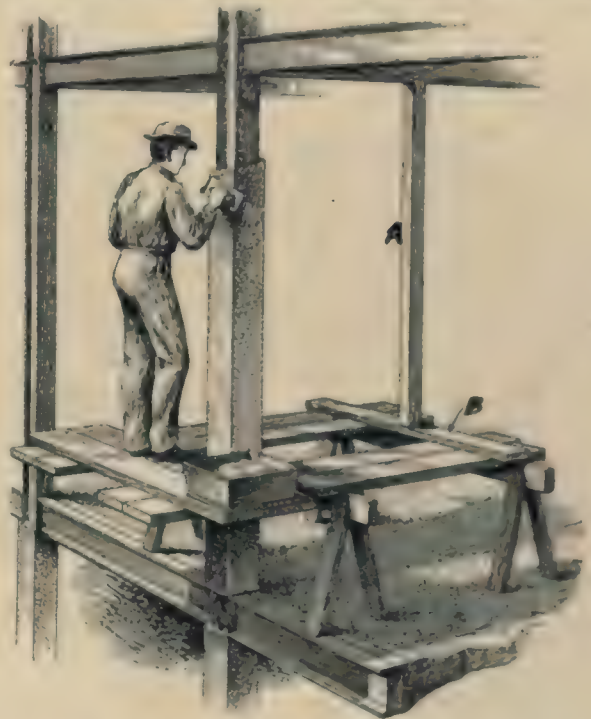
One other point in connection with curb and gutter work appeals to me strongly, and that is the question of standard specifications. To a certain extent this is a point which largely concerns the city engineer or the board of public works, but the contractor also is in a position to be of influence in this matter. Nothing is more important for the good appearance of the streets of a city than uniformity in the dimensions of its curb and gutter work. Nothing is so well calculated to give a bad impression to the visitor than to see such work done in different sizes and proportions throughout a city. Of course, it is perfectly feasible for a city to adopt specifications of its own and insist that these be followed out on all work in the city, but in many cities this has not been done and there are frequent opportunities for the contractor himself to recommend to the property-holder dimensions and specifications for this work. It may not therefore be out of place to call your attention to the fact that a large number of the progressive municipalities of the country have adopted as a standard size of curb and gutter the following dimensions: Height of curb 12 inches, thickness of curb 6 inches, height of face of curb $6\frac{1}{2}$ inches, gutter 18 inches with a dip of

$1\frac{1}{2}$ inches, thickness of gutter at front 7 inches, curve on edge of curb and at junction of curb and gutter $1\frac{1}{4}$ inches radius. Such a curb and gutter as this will be found to give general satisfaction everywhere. It is not necessary to point out here that the curb and gutter should be divided into entirely separate blocks from 6 feet to 8 feet long by expansion joints and it may be noted that steel forms such as those above described, or in fact any regular templates, make these joints without additional expense.—Cement Era.

A Form of Cantilever Scaffold used by Builders

In the construction of modern buildings of great height, many expedients are often necessary in order to facilitate the execution of the work. Attention is directed to a style of cantilever scaffold, which is used about the line of iron columns extending around the outer edge of a structure, the position of the scaffold being such that one end of it projects beyond the building.

A study of this scaffold shows that it is prevented



from tilting by means of a cross piece and upright. The planks are supported on masons' horses and used for supporting the workman while he paints and cements the outside faces of the front columns, channels and I-beams. The picture shows a mortar box placed near an outer column, while the workman upon the scaffold is enclosing in cement an iron column at one of the floor levels of a steel skeleton-frame building. The position of the scaffold is such that the workman is able to reach to the level of the floor above.

The planking used for this scaffold is 2 x 8 inches in dimensions, the cross pieces upon which the workman is shown standing being 10 feet in length, while the planking running at right angles thereto is 16 feet in length. The strut A is driven tight under the bottom flange of the I-beam to keep the planks upon which the workman stands from tipping up, while the cross piece B is a 2 x 4. The simplicity and rapidity of the construction of a scaffold of this nature render it extremely useful in cases of the kind mentioned.

Notes on Electrically Operated Shovels

Various Uses and Advantages — Mechanical Equipment—Protection of Motor by means of Automatic Magnet Switch Control—Operating Costs*

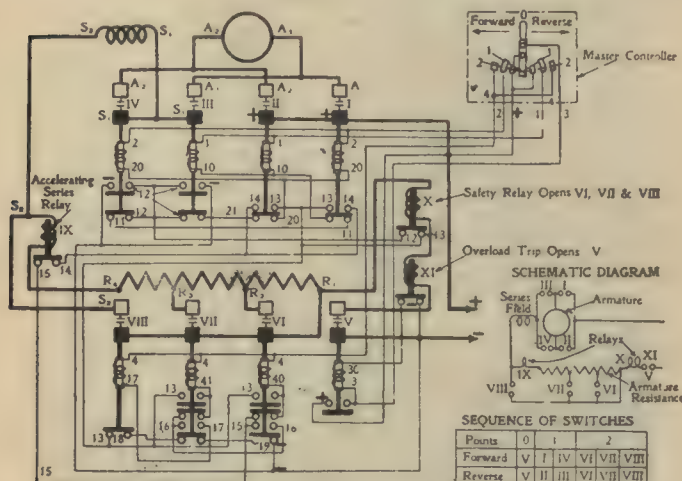
During the past six years great strides have been made in the application of electricity to power operated shovels. At present a number of them are being successfully used in grading operations, gravel pits, stone quarries, brick and tile yards, cement plants and in placer ore mines. These shovels are fully equal in power and capacity to steam shovels and may be built for any service desired.

Equipment.—The mechanical equipment of an electrically operated shovel, i.e., the dipper, boom, ear and trucks, is built along the familiar lines of the steam shovel. The power equipment consists of a motor of from 50 to 200 h.p. to operate the hoist, and two motors of from 25 to 80 h.p. to swing the boom and operate the thrust. The hoist and swing motors are located in the car, and are geared to the drums through suitable reducing gears. The thrust motor is mounted directly on the boom, and communicates its motion to the bucket staff through

overloads by cutting resistance into the circuit when the current exceeds a certain value.

The accompanying diagram shows the connections for such a method of control. The master controller has two running positions in either direction. The first position connects the motor to the line with all the armature resistance in series, the second position energizes magnet switches VI, VII and VIII through the accelerating relay IX. These switches short-circuit the resistance in sections, each successive step being delayed until the current in the accelerating relay falls below a fixed value. The various positions are interlocked, so that it is impossible for the switches to close in wrong order. The master controller can be thrown from full speed forward to full speed reverse, without damage to the motor, as the starting switches for either direction cannot close until all the control switches are opened and full armature resistance has been connected into the circuit. The reversal is thus made in the least possible time consistent with the safety of the motor.

In case of an overload on the motor, safety relay X opens, breaking the control circuit of switches VI, VII and VIII, and cutting all the armature resistance into the circuit. The motor will then exert its full starting torque continuously until the overload is removed, when the resistance will be automatically short-circuited again. This feature of the control is especially valuable for shovel work, as frequently a stone or log may be dislodged by a steady pull when it cannot be moved by a sudden jerk. If the overload current exceeds the value for which the overload relay XI is set, the line switch V opens, disconnecting the motor from the line. On moving the master controller to the off position, magnet switch V is reset, and the motor may be started again in the usual way.



Connections for Electrical Control of Steam Shovels

reducing gears connected to a pinion engaging a rack on the staff. The motors are of the crane or mill type, with high torque characteristic, and may be for either direct or alternating current. They are reversing and are under perfect control. When desired the controllers may be connected to the ordinary hand lever used on steam shovels, so that a steam shovel engineer can operate the electric shovel without any trouble. Data in regard to the sizes, capacities and motors required are given in Table I.

The power is ordinarily taken from trolley wires, or from a transformer located near the cut, the feed cables from the power circuit to the car being wound on a retractile reel in the cab and drawn in or paid out as the cut advances. The wiring in the car is enclosed in conduit, and is well protected from moisture and mechanical injury.

The chief objection in the past to electrically operated shovels has been the possibility of damage to the hoist motor when stalled, due to the bucket digging in too deep, or striking a rock or other obstruction in the bank. The heavy current taken at such times was liable to cause a burn-out, while if the motor was properly protected by fuses or circuit-breakers, their continual opening caused annoying interruptions of service. This difficulty has been overcome by the use of automatic magnet switch control, which protects the motor against such

TABLE I—ELECTRIC POWER SHOVELS.

Weight of Shovels, Tons.	Size of Dipper, Cu. Yds.	—Hp. of Motors—		
		Hoist.	Thrust.	Swing.
30	1	50	30	30
35	1 1/4	50	30	30
35	1 1/4	60	30	30
35	1 1/4	75	35	35
42	1 1/2	75	30	30
65	2	100	35	35
95	3 1/2	150	50	50
100	4	200	80	80

Where a more flexible control is desired a five point master controller is used. In this case, each of the switches which cut out armature resistance is controlled by a separate point on the master controller. The amount of resistance in the circuit is, therefore, under the constant control of the operator. At the same time the controller can be thrown immediately to the full speed position, and the motor will be automatically brought up to speed as rapidly as the accelerating relay will allow.

The motor driving the thrust may be operated either by a drum controller or by automatic magnet control. The motor and its controller must be of such a design that the motor will be able to develop a heavy torque for short intervals of time while standing still, or rotating very slowly. Its duty is to jam the dipper against the bank and hold it there while the hoist operates. As soon as the dipper strikes the bank the thrust motor ceases to revolve, except very slowly, but must still exert full torque in order to keep the dipper against the face of the cut. Its characteristics should, therefore, be such that it may

*A paper by W. H. Patterson in the Electric Journal

ne stalled frequently for a minute or more at a time and still keep developing full-load torque without injury.

The motor driving the swinging boom may be operated by hand control if provided with a magnetic brake to stop the motor quickly and keep the circuit-breaker from opening if the motor is reversed quickly; or may be operated by automatic control without a brake. The operator can place the bucket with greater precision and ease with the automatic control on account of the rapidity with which the magnet accelerates the motor. The controller panels and switches are placed in the rear of the car, while the faster switches or drum type controllers are placed in the front within easy reach of the operator. This makes a very compact and accessible equipment.

Operating Costs.—While the initial cost of electric shovels is more than that of steam shovels, their operating cost is much less. They can ordinarily be operated by a smaller number of men; the hauling of coal and water is dispensed with; their power economy is greatly superior to that of the steam shovels, and they can be handled with greater precision and rapidity. In addition the electric shovel is comparatively noiseless in operation, which is a great advantage for city use.

Some interesting data in regard to the cost of operation of electric shovels has been obtained by the Vulcan Steam Shovel Co., of Toledo, O. One of these shovels, has been operated by the Milwaukee Electric R. & Light Co. for several years, at a consumption of approximately 100 kw-hrs. per ten-hour day. It is used for loading gravel at a gravel bank and is operated by two men, who load from 300 to 400 cu. yds. of gravel per day. The average daily expenses of operating this shovel are:

One engineer	\$2.00
One craneman	1.75
Electric power at 1.5c. per kw-hr.	1.50
Oil, waste, repairs, etc.	.75
Total.	\$6.00

The Chautauqua Traction Co., of Jamestown, New York, has been operating a shovel equipped with a 75-h.p. hoist motor, since 1907. This shovel is used in loading a mixture of gravel, sticky clay and sand, which is very hard to dig, and is operated by two men on the shovel and two pitmen. The current consumption on a special test averaged 163 kw-hrs. per 8-hour day, and 534 cu. yds. of material were loaded in an average day. The total expenses per day, including the pitmen, were \$8.80, or approximately 1½ cents per cu. yd. The maximum capacity of this shovel is about 1,000 cu. yds. per 8 hours. If operated at this capacity, the power consumption would be increased in proportion to the output, but the labor charges would be the same as figured in the above statement. This would bring the cost of shoveling down to about 1 cent per cu. yd.

Perhaps the most promising field for electric shovels is in connection with electric traction lines, where electric power is usually available at a very low rate. For this service they are mounted on standard gauge trucks equipped with air brakes, and may be hauled on the regular tracks, or may be equipped with a trolley and made self-propelling, the maximum speed being about 5 miles per hour. Great economy can also be effected by the use of electric shovels in any territory where coal is hard to procure and water power is comparatively cheap, as experience has shown that with current at 2 cents per kw-hour, or less, their cost of operation is only about half that of steam shovels. And as part of this saving is obtained by decreased labor costs, and the cost for power is only about one-third the total cost of operating the shovel, local circumstances may determine a saving at considerably higher power rates.

The Pacific Coast Construction Company has compromised with the city of Victoria, B.C., for the sum of \$2,900 in payment of extras incurred on sidewalk construction. The amount claimed originally and which the city declined to pay was \$3,000.

A Concrete-Protected Water Tank

Before the National Association of Cement Users, Mr. Louis G. Perrot (Philadelphia) read a paper entitled, "An Increase of Value of Concrete in Reducing the Cost of Insurance." Mr. Perrot's firm had occasion recently to build, in the city of Camden, N.J., an elevated water tank resting upon a tall structural steel tower. This tank was in the heart of the city immediately adjacent to two business properties, the owners of which were somewhat fearful of the disastrous effect which might follow an adjacent fire and the possible collapse of the tower. It was found that the insurance rates on this structure, with its unprotected steel column legs, would amount to about \$500 per annum. It was figured, however, that each of the columns and horizontal members of the tower could be encased in concrete at a total expense of \$4,000. This fireproofing was thereupon done. It will be noted that the \$4,000 cost of fireproofing means an annual expense of \$240 at a 6 per cent. interest rate, whereas the insurance of the tower would have cost \$500. In addition, it is probable that the tower is so fireproof that a fire in one of the adjacent buildings would not harm it, although, if it had been left unprotected, the damage to the surrounding structures might have been very great. The total cost of the tower, with its fireproofing was about \$13,000.

Mill Building vs. Reinforced Concrete

At the annual convention of the National Association of Cement Users held in New York December 14-20, Mr. J. P. Perry (New York City) read an interesting paper entitled, "Comparative Cost of Maintenance of Various Types of Building Construction." He assumed, in the first place, a building with an original cost of approximately \$100,000, and on this basis figured out the relative annual costs of the two types of buildings. It is probable that the first cost of the concrete building would be some 10 per cent. greater than that of the mill building. In the maintenance, however, the concrete building would save money on account of the minimum amount of vibration, the ease with which it can be lighted, the reduction in its insurance and its freedom from vermin. The ordinary concrete building has a window percentage of the outside wall of from 70 to 80, whereas the ordinary mill building has only 30 to 40 per cent. This additional window space affords a much lighter interior and thereby allows the workmen to do much more work. Of late, the insurance rates on concrete buildings and on their contents have been much lower than similar rates on mill buildings. In regard to vibration, it has been the experience of owners of concrete buildings that a considerable saving has been noted each year on account of the better condition of the machinery due to the stability and lack of vibration in the concrete building. One owner, for instance, who has similar machinery in a concrete and a mill building, has noted that the maintenance of machinery in the vibrating mill building amount to some \$5,000 a year more than in the non-vibrating concrete building. Finally, in any building with perishable contents the loss from vermin is appreciable, and this loss, it is quite probable, can be avoided in concrete structures where the vermin find it hard to exist.

Assessing to each of these above items an approximate based on letters which he had written to some 35 architects and owners, Mr. Perry finds that the annual charges on the two buildings, capitalizing the first cost at 6 per cent., would amount to \$11,000 in the case of the mill building and \$9,000 in the case of the concrete building.

In the discussion, Mr. W. H. Ham (Boston), said that in a specific case he had observed that in the summer the temperature in a concrete building was some 10 degrees lower than in an adjacent mill building and in the winter some 10 degrees higher. While the difference in temperature in the winter probably made small difference, as the building was heated

from waste steam, the lower temperature in the summer certainly added considerably to the capacity of the workmen. Mr. Walter F. Ballinger (Philadelphia) stated that in his observation this lowering of summer temperature and raising of winter temperature was not true for concrete buildings, but it was noted afterward by another speaker that once the building was heated in winter the amount of heating necessary to maintain an even temperature was considerably less than in a wooden building. Mr. Ham further noted that the companion of mill buildings with concrete buildings should take account of the fact that mill buildings are generally designed for light loads, say, 60 lbs. per square foot, whereas in most cities the

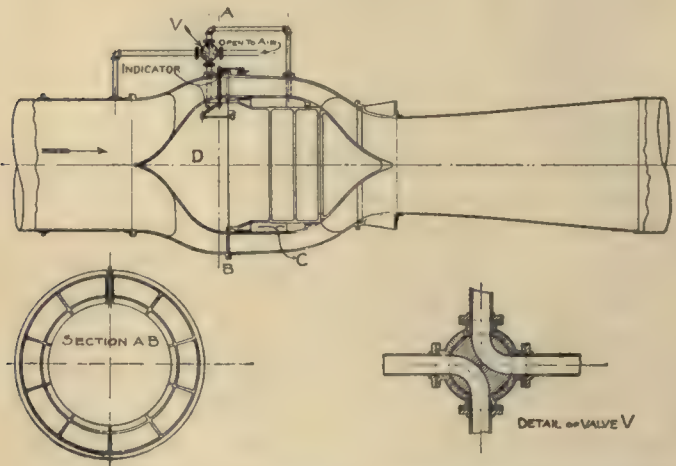
lowest load for which the regulations allow a concrete building to be designed is 150 pounds per square foot. He also noted that concrete buildings can have longer floor spans than mill buildings, which sometimes brings about a saving in the disposition of the machinery. Mr. L. C. Watson said that in his experience Mr. Perry's assumption that a concrete building would cost 10 per cent. more than a mill building did not always hold. He had found that for loads under 200 pounds per square foot the mill construction was cheaper, but for loads above that amount the reinforced concrete was as cheap or cheaper than the mill construction.

Pressure Valve for Control of Water Flow

Gives Perfect Control—Operated from Any Distance—Ideal Shape for Cheap Manufacture—Model Operating at Niagara Falls

The accompanying sketches illustrate the construction and plan of operation of a new pressure valve now being tried out by the Ontario Power Company's works, Niagara Falls, Ont. The valve is the invention of Mr. R. D. Johnson, hydraulic engineer, of the Ontario Power Company. The English patents have been taken out by Mr. Johnson in partnership with Mr. Boving, of the Jens Orten-Boving Company, which company will exploit the valve in Europe and Canada. For the United States the inventor intends to retain the patents in his own name. The model now in operation at Niagara Falls is working with entire satisfaction and its combination of simplicity and efficiency is calling forth warm expressions of praise from the engineers who have witnessed the demonstration. The descriptive matter which accompanies the cuts will, it is believed, be found amply sufficient to explain the operation of the valve.

A number of the advantages which may, we believe, be justly



Indicator may be attached to control valve to exclude possibility of main valve creeping from any desired opening.

If water is free to flow when main valve is open chamber "C" may be omitted by merging it into chamber "D." Its presence is desirable as an efficient factor of safety.

The valve "V" in the position shown reduces the pressure in the annular chamber "C" to atmospheric and main valve closes due to full pressure transmitted into chamber "D." Reversing the control valve, reverses the pressure and main valve opens.

claimed for this valve are given below. The advantages are apparently equally applicable to all sizes and to all pressures.

1st. All cross sections are circular, which is the ideal shape for cheap manufacture and minimum material to take care of stresses.

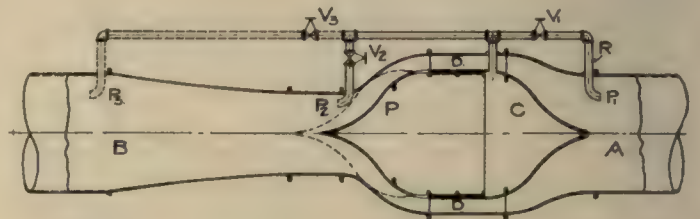
2nd. Perfect control, doing away with motor drive and mul-

tiplicity of gearing necessary to move a large gate valve.

3rd. Balanced pressures, avoiding any tendency to wear or cut. That is, the water pressure does not affect the sliding friction.

4. The venturi outlet recovers the head due to the increased velocity at the neck of the valve and the smooth flow makes the loss of pressure about 10 per cent. as much as in the ordinary valve.

5th. Applicability to remote control. It is quite as safe to operate this valve from a point a mile away as along side of it.



Operation, Flow from "A" to "B"—The operation of the valve is due to difference of pressures caused by changes in velocity of the water in the valve case (venturi effect).

Opening Effort—The start to open is due to the static pressure on the submerged surface of the plunger above the valve seat.

Closing Effort—The closing effort equals the static pressure inside the movable plunger.

To Open Valve—With the connections shown in solid lines and flow from "A" to "B" with or without pitometer tubes P1-P2. To open valve: Close control valve V1 and open V2.

Operation, Flow from "B" to "A"—With the flow from "B" to "A" pitometer tubes or additional connections shown in broken lines are used. Opening and closing efforts—same as above.

To Open Valve—Open V1 whilst remaining valves are closed.

To Close Valve—Open V3 or V2 whilst remaining valves are closed.

Opening Without Connection "R"—With the flow from "B" to "A" and connections shown in solid lines valve may also be opened without connection "R" to downstream end of valve case by closing V2, as sufficient water will leak through packing of plunger to allow valve to open.

Closing Without Connection "R"—Under above conditions valve may be closed by opening V2 and using pitometer tube "P2" thereby obtaining the dynamic effect of the water. Or valve may be closed by opening "V3" and using connection shown in broken lines without using pitometers.

This may be accomplished in many ways by electrically actuating the small control valve.

6th. This valve requires no by-pass to equalize the pressure on both sides of the gate previous to opening.

Selection and Maintenance of Pavements

Noise, Sanitariness and Durability as Elements of Choice—When to Relay Asphalt Pavements—Organization of Repair Force—Cost of Repairs

Under the title "The Street Pavement Problem in the Borough of Manhattan," Mr. George W. Tillson, Chief Engineer of Highways of that borough, presented some interesting facts and ideas before the Municipal Engineers of the city of New York at a recent meeting of that society. Much of this applied largely to local conditions only; but we quote below certain portions which were of value to municipal engineers generally.

Choice of Pavement.

First stating that Manhattan has adopted stone block, asphalt block, sheet asphalt and wood block as its standard pavements, he discusses the matter of selecting one of these for a given street, as follows:

For heavy traffic streets where the pavement is in constant use under all weather conditions and where the question of noise is not important, a well-laid granite pavement will be most satisfactory. But suppose, for instance, that such a street passes a hospital and it is necessary to reduce the noise to a minimum, then a change must be made. Under such conditions, where the grade is less than 2 per cent., the author would always recommend wood block. On steeper grades asphalt, sheet or block, to about 5 per cent., when a return must be made to granite. The problem then is to use this material in such a way that it will produce the least possible noise under traffic. It is a well known fact that American stone pavements are inferior to European more on account of the character and shape of the blocks themselves than the material. If, then, the blocks are so dressed that when laid the surface of the pavement shall be smooth and the joints between the blocks so small that it is practicable to fill them with a bituminous compound, the noise element will be eliminated to as great an extent as possible.

If, on the contrary, the traffic on a street be heavy, the question of noise on its entire length all-important and the grades below 2 per cent., the material to be used is undoubtedly wood block.

On light traffic, business or residential streets, either asphalt or wood can be used according to local wishes within grade limitations. It must be remembered, however, that on streets not in continuous use grade restrictions need not be so strictly adhered to, as on the comparatively few days when smooth pavements are unduly slippery they can be avoided to a great extent. To sum up briefly, then, the principles governing the selection of materials for different streets, one would say, first, for heavy traffic wholesale streets, granite block; second, for heavy traffic streets where noise must be eliminated where possible, wood block, asphalt-block, or improved granite, according to grades; third, for light traffic, or residential streets, asphalt or wood, according to local desires.

The above conclusions have been reached by taking into account the effect of using materials that do not contain all the requisites previously stated so as to produce the best results. For instance, granite is durable, fairly smooth when well laid, but so noisy as to prohibit its use on certain streets. Wood block is smooth, durable and almost noiseless, but slippery under certain conditions. Asphalt is smooth, less slippery than wood block and also less durable than either wood block or granite. With well-laid granite there is not much difference in the sanitariness of either of the above kinds.

It has been considered that a smooth pavement should always be laid whenever conditions are such as to permit it.

It will be noticed that up to the present time no mention has been made of the cost of the different kinds of pavement. The reason for this is that the author believes that in the borough

of Manhattan the pavement best adapted to any one street should be used irrespective of its cost.

In deciding specifically upon the material for any particular street the question of cost sometimes comes up and may be an important factor in reaching a decision; then the first cost and frequently that of repairs must be taken into consideration. Interruptions to traffic are very objectionable and should be reduced to a minimum. Streets are in use at all times and under all weather conditions. If a pavement be put in good condition and then weather conditions arise so that it is not possible to make repairs for three months, for instance, and in the meantime it becomes bad and in a general state of disrepair, it can safely be admitted that it has not been constructed of proper material. This last principle is important in making the decision. From all reports it is probable that the pavements of the cities of London and Liverpool are kept in better condition than those of any other large city. It would be of the greatest importance to know whether this is due to a more intelligent selection of material, better construction, or a more uniform and systematic method of making repairs. It is very likely due to all three, and a study of this would undoubtedly be of great value to American cities.

The damage to pavements is the actual wear and tear of street traffic and by extraneous causes. The first is provided for by repaving certain streets and repairing others. The selection of the streets to be repaved and the material to be used is a work requiring great care, judgment, and a complete knowledge of the requirements of each street. In order to do this intelligently and systematically a traffic census should be taken of all the business streets so that the engineer would have positive and specific instead of general knowledge of the existing conditions. Many claims are made of the needs of certain streets by interested parties which are entirely without foundation, and the engineer often requires positive facts to refute them.

When to Relay Asphalt.

An asphalt pavement in bad condition is generally full of holes with the asphalt worn down to the foundation. By patching the holes it can be put in good repair till after a certain time more holes occur and they must again be patched up. The frequency of this work and the cost of same will determine when the pavement should be entirely relaid. The entire expense of maintaining a pavement, no matter how its initial cost has been met, consists of this initial cost, the interest on same, the cost of repairs, and the establishment of a sinking fund that will be sufficient to replace it when it becomes worn out.

Putting this into the form of a formula it will be

(R)

$A + C \frac{1+i^N}{i} = \text{annual expense.}$

N

when N=life of pavement.

C=cost per square yard.

i=rate of interest.

R=total cost of repairs.

A=sinking fund to be paid each year to equal C at end of N years.

It follows, then, that an exact account should be kept of the cost of repairing each street each year, as it often happens that a large amount of repairs made one year on some streets will materially reduce the cost in succeeding years, while on others the same amount of work must be done until they are repaved. In other words, the entire history of each street

should be accurately kept. Applying the figures previously decided upon to this formula, the annual expense of maintaining an asphalt pavement is twenty-five cents. Consequently when the annual cost of repairs on any particular street reaches this amount the question of its repaving should be carefully considered. This is an average result, but knowing the age of a particular pavement and its repair cost, by the application of the formula it can be determined positively whether, from a financial standpoint, it should be repaved or not. This would seem to demonstrate not only that it can be accurately and scientifically determined when an asphalt pavement should be relaid, but that this is difficult to determine in any other way. Where a city charter requires that repaving shall be paid by special assessment and repairs out of the budget account, this determination is important.

Asphalt Repair Methods in Manhattan.

This work consists of keeping in repair all of the asphalt paved streets, sheet and block, both under and out of guarantee, a total, as has been previously stated, of 305 miles.

The out-of-guarantee, or maintenance streets, as they are called, are repaired by contract and paid for per square yard of pavement laid.

In order to facilitate the entire work the borough is divided into six inspection districts. These sections are divided into divisions, generally six, each division being in charge of an inspector and each section being in charge of a chief inspector. The division inspectors report to the chief inspector, who in turn reports to the assistant engineer in charge.

The division inspectors patrol their divisions daily, making notes of all defects in the pavement from whatever cause, whether by wear and tear, fire, plumbers, corporations, water department or builders. These are all located and recorded on a prepared blank which is forwarded to the main office. The clerk in charge of this branch sends to each contractor a copy of the list when the same refers to a guaranteed pavement. The maintenance streets are looked after directly by the engineer in charge.

In addition to the above, on Friday of each week the chief inspectors report to the engineer all streets in their respective districts that are in disrepair. These lists are also sent to the contractors and each one is expected to repair all the streets on his list before the end of that week. This plan has been in effect for about three years and has produced admirable results. The author believes it is impossible to keep the streets in good condition without a competent and systematic inspection.

In compiling statistics of the repairs to asphalt pavements in different cities the unit has generally been the cost per square yard. This, while somewhat satisfactory, is not entirely so, as the cost of doing the same work varies considerably. If, however, the percentage of the maintained pavement actually removed be given, an exact comparison can be made. The following figures have been made up by both plans and relate to the repairs of sheet asphalt pavements out of guarantee in the borough of Manhattan during the last five years, the figures for 1910 being estimated:

	Percentage of pavement removed.	Cost per sq. yd. in cents.	Cost per sq. yd. actually repaired.
1906.....	23	34	\$1.48
1907.....	18	20	1.11
1908.....	15	17.7	1.18
1909.....	12	11.7	.98
1910.....	13	11.8	.87

It would seem from the above figures that the limit of the reduction had about been reached.

It seems impossible to obtain reliable figures as to the cost of keeping streets in repair. The amount of money spent in the different cities for such purpose can be learned, but that

is a different proposition, as probably no American city spends enough to keep its streets in good condition. In speaking of this an official of a neighboring city said to the author: "We spend all the money we can get, but it is not enough for our purpose." It will be seen, then, of what little value such information is.

Use of Binding Materials

The principal objective points in the science and art of highway engineering at the present time are, first, the economical construction of roads which will withstand the disintegrating effect of excessive motor car traffic and excessive horse drawn vehicle traffic, and second, the elimination of the noxious dust.

The standard method used during 1909 on the state highway system of Rhode Island in the endeavor to accomplish the above results was the construction of bituminous pavements by the hand mixing method using as a binder in the mix 50 per cent. Texaco asphalt, grades No. 55 Special and J, and 50 per cent. Providence coal gas tar, and a flush coat of Texaco asphalt or Providence tar. The present practice is the result of experimental work conducted during 1906, 1907 and 1908 with various bituminous materials used in different methods of construction. It has been demonstrated that, under average conditions, if the traffic consists of 90 to 95 per cent. of motor cars, the flush coat is not a necessity.

Experimental work with the American Tar company's tar coating machine showed that the machine was economical in operation and satisfactory in the results produced, the superior quality of the mix as compared with the results of hand mixing being especially apparent during the cold periods of the working day after the first of October.

The following problems, some of which are of paramount importance, especially to those who are using the mixing method, should be carefully considered:

The relative merits of three methods of paying for bituminous macadam construction: first, materials and labor being paid for directly by the party of the first part; second, the extra labor involved in the construction of a bituminous pavement being paid for under the extra work clause common to many specifications, while the bituminous material is purchased directly from the producer by the party of the first part; third, the pavement being constructed for a contract price per square yard, under which method the bituminous material is furnished in accordance with rigid specifications.

The economics and relative advantages of hand mixing and machine mixing.

The economics and merits of heated stone used with tars, asphalts, soil at ordinary temperatures, and with asphaltic compounds.

The relative merits of the mixing and penetration methods of constructing bituminous macadam pavements.

The development of specifications covering the chemical and physical properties of bituminous binders through the medium of an exhaustive study of the character of the various component elements, the effect of each on the adaptability of the material for use as a binder under given conditions, and the requisite maximum and minimum percentages of each constituent. Results will be accomplished more expeditiously by a national organization investigating the problem in each country in which a large amount of bituminous work is being done than through the medium of an international body.

The restriction of the term "bituminous macadam pavement" to designate macadam roads built with a bituminous binder in which the bituminous material forms a bond between the surfaces of the stones composing the No. 2 course,

while the term "bituminous surface" can be used to designate the surface of a road or street, which is covered with a thin coat of bituminous material.

Use of Concrete Piles at Prince Rupert

Concrete piles are being used in the Government wharf at Prince Rupert, B.C. The Westholme Company have the contract. From details furnished by them we learn that each pile is sixteen inches square. The centre is perforated by a steel pipe which runs right through. This is for extracting all the matter between the bottom of the pile and the solid rock. Round the tube are placed four reinforcement girders which play the part of grapples. In order to render them immovable they are circled by stays at intervals of five feet. Outside these steel ribs is placed a closely latticed network of wire to give the concrete a groundwork. A huge derrick is now in readiness to place the piles in position, a task that will entail a considerable amount of power as the average weight of the piles is about sixteen and a half tons. The main piles will be supplemented on either side with other piles placed at a tangent, thus forming a support.

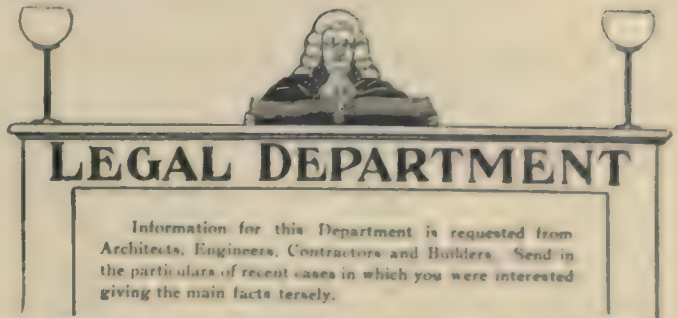
The test borings for the piers of the protected bridge across the Second Narrows at Vancouver are about completed and plans will shortly be prepared as a preliminary to taking tenders for the piers and abutments. According to President McNaught, of the Burrard Inlet Tunnel & Bridge Company, detailed plans and specifications for the superstructure of the bridge are practically finished, the type of bascule alone being undetermined. The plans show the longest span of the bridge to be 450 feet, and that extends over the greater portion of the deep water channel not covered by the 150-foot draw span. According to information received by Mr. McNaught from Contractor Owens, who has charge of the test boring, there is every indication that good bottom for the piers can be secured without going to any great depth along the north shore. Test borings made over a year ago showed that there is solid rock foundation available with very little excavation from mid-channel to the south shore.

The C. P. R. subway at the head of the St. Lawrence Boulevard, Montreal, is now practically completed. The subway is 900 feet long, and at its deepest point dips 15 feet below the level of the street, it is 60 feet wide and in the excavation work, 20,000 cubic yards of earth and 7,000 cubic yards of stone were removed. On either side are 17½-foot sidewalks, leaving space in the middle for two car tracks and two traffic roadways. A nice finish is given to the work by a heavy concrete balastrade. This runs the whole length of the retaining walls, and is made of reinforced concrete. Altogether, in the walls and balastrade about 3,000 cubic yards of concrete were used. The bridge over the subway is built of steel and has an entirely fireproof roadway. It is 65 feet wide and 155 feet long and carries four tracks.

Excellent Building conditions have been prevailing at Calgary, Alta. A number of structures were started during the Christmas season. The best building weather experienced at this season for years is reported.

City Building Inspector Snook, of Toronto, has been appointed a Justice of the Peace by the Ontario Government. One is not likely to forget his appointment as his initials are also J.P. Rather an odd combination—J. P. Snook, J. P.

Building permits issued at Winnipeg up to the end of November totalled \$14,186,200, as compared with \$9,192,000 for the corresponding period of last year. Last month permits totalled \$371,200, as against \$291,800 for November



Information for this Department is requested from Architects, Engineers, Contractors and Builders. Send in the particulars of recent cases in which you were interested giving the main facts tersely.

Onus of Risk in Dangerous Employment.—Hunter vs. Hamilton Bridge Company. This was an action to recover damages for the death of one Hunter alleged to have been caused by the negligence of one or both of the defendant companies, the Hamilton Bridge Works Company and the Hamilton Steel Company. The Court found that the plaintiff failed:

(1) Because there was no evidence upon which the jury could find an obligation on the part of the bridge company to employ a "look out man."

(2) Because there was no evidence that the failure to employ a "look out man" caused the accident.

(3) Because, upon the undisputed facts, the only proper inference was that knowing the dangerous nature of the employment the deceased voluntarily undertook the risk.

(4) Because upon the undisputed facts the accident was solely caused by negligence of the deceased himself. The man was in a position of safety so long as he did not place himself in the way of the moving cranes—he knew his peril and it was his duty not to forget the passing cranes, and so place himself in a position where death was almost certain. Forgetting may not be negligence in some circumstances, but where a man voluntarily places himself in a position calling for the exercise of extreme care in some particular respect—he must not forget or it is his own negligence that causes the accident.

The action was dismissed without costs.

Contract as to Party Wall.—Sterling Bank vs. Ross, Divisional Court of Ontario.

Plaintiffs and defendants owned a party wall. By a survey of the town it was found to encroach 20 inches on the public street. The survey permitted then existing buildings to remain until they were rebuilt, etc. Defendant's building having been destroyed by fire she desired to rebuild, and the town council required her to conform to the statute. Defendant desired to remove 20 inches of the party wall standing on the highway in front of her new premises so as to enable her to extend the front of her new building across the full width of her lot. Plaintiffs asked for injunction to restrain defendant from interfering with said wall.

Mr. Justice Middleton held that the wall in question constituted an integral part of each building and could be maintained so long as either building is entitled to remain upon the highway. Injunction granted plaintiffs with \$80 costs.

Divisional Court dismissed defendant's appeal from above judgment with costs.

Liability of Municipality.—Gamble vs. Townships of Vaughan and Markham Divisional Court of Ontario. Plaintiff brought action to recover \$3,000 for damages caused by an explosion of dynamite used by a contractor for the Township of Vaughan in a gravel pit adjoining the plaintiff's house. At the trial, judgment was given for \$570 and costs. The Divisional Court dismissed both defendants' appeals with costs, also plaintiff's cross appeal to increase the amount of damages.

Mr. Kenneth Chestnut, C.E., spent Christmas at his home at Fredericton, N.B. Mr. Chestnut has been in charge of some 800 miles of track on the G.T.P. Railway as chief inspecting engineer, with headquarters at Edmonton. He is to be transferred shortly to the Rocky Mountain division of the road.

The building permits issued at Montreal during 1910 totalled nearly \$16,000,000, double the amount expended during 1909.

Canadian City Engineers

Georges Janin, Montreal, Que.

Mr. Georges Janin, who has been appointed general municipal engineer for the city of Montreal, was born at Poitiers, France, in 1853, and came to Canada in 1892. With an extended knowledge of municipal engineering work he quickly acquired a wide reputation in his new sphere. One of Mr. Janin's earliest interests was the protection of running waters from sewage pollution. In his official reports he emphasized the necessity for introducing the system followed in Europe and the United States. Mr. Janin outlined his views on this subject at a conference held in Montreal in 1896, and received the support of the Provincial Board of Health. The St. Laurent College subsequently authorized Mr. Janin to undertake a sewage farm enterprise, and after his first experiment the city of Montreal entrusted to him a similar enterprise to utilize the sewage of St. Denis' ward.

In 1898 Mr. Janin entered the service of the city of acting superintendent of the aqueduct system, during the illness of the superintendent at that time. He was afterwards appointed assistant superintendent, finally assuming the direction of the Water Department, a post which he has continued to occupy since. The Provincial Board of Health also recognized his



City Engineer Janin of Montreal

experience by appointing him consulting engineer to their Board.

Mr. Janin has been identified closely with practically all the important works carried out in Montreal in recent years. Of these perhaps the present extensions to the waterworks are the most noteworthy. City Engineer Janin is progressive and thorough and the creation of his office is expected to mark the opening of a new era in civic improvement at Montreal.

Personal News and Notes

The annual banquet of the Montreal Builders' Exchange was held at the Windsor Hotel on Wednesday, Dec. 18.

Peter Lyall, head of the Montreal contracting firm of Peter Lyall & Son, has been elected a director of the Sterling Bank of Canada.

Charles Sharpe, contractor, leaves Winnipeg shortly for Proctor, on the Kootenay lakes, British Columbia, where he is erecting a large tourist hotel for the C.P.R.

The Undergraduate Society of the Department of Applied Science at McGill University, Montreal, was addressed last

Monday by Dr. James Douglas, New York City, past president of the American Institute of Engineers, and Mr. James White, Secretary of the Commission of Conservation.

Mr. W. Stewart, of the firm of Foley, Welsh & Stewart, who left recently for Scotland, is stated to be planning to bring 5,000 laborers back with him to build the section of the G.T.P. through the mountains, for which his firm has the contract. There is little labor available on the Pacific coast and the importation of Asiatic labor will not be sanctioned by the Government.

Mr. F. W. Ellingwood has been appointed superintendent of construction for the C.P.R. terminals with headquarters at the Windsor street station, Montreal. Mr. Ellingwood, who was formerly connected with the Pennsylvania Railway in connection with its big terminal scheme in New York, will have charge of the construction of the Windsor street station, and also, it is understood, of the terminal scheme of the company at the Place Viger station.

According to a dispatch from Ottawa, a difference of opinion is stated to have developed among the commissioners of the Quebec bridge over the awarding of the contract for the structure. Two of the commissioners are understood to favor the acceptance of the Canadian tender, which is made by the Canadian Bridge Company of Walkerville, and the Dominion Bridge Company, of Lachine, working in combination. One of the commissioners is said to favor the acceptance of the tender made by the British company. It is expected that a settlement will be reached very shortly.

We have received from Messrs. W. & L. E. Gurley Troy, N.Y., manufacturers of civil engineers' and surveyors' instruments, a copy of the 45th edition of their manual. This manual will be found indispensable to the profession. It is primarily a book of instruction in the adjustment and use of field instruments. It is comprehensive but, at the same time, concisely arranged. The object kept in view by the compilers was simplicity and the avoidance of such matter as should be discussed in technical publications.

The B. Greening Wire Company, Hamilton, Ont., have favored us with a good plain office calendar for 1911. The calendar shows an excellent view of the company's extensive plant, where wire work of every description is manufactured. Photos of four generations of the Greening family are shown, the first being Nathaniel Greening (1799) and the last the present managing director, Mr. H. B. Greening. The eastern depot of this firm is 422 St. Paul street, Montreal, Que.

According to a despatch from Montreal, the National Bridge Company has just been incorporated, with a capital of \$1,000,000.

Mr. J. E. Schwitzer, assistant chief engineer of western lines, has been appointed chief engineer of the C.P.R. with headquarters in Montreal.

The steel construction at the Windsor station extensions, Montreal, has now reached the sixth storey and the masons have started work placing the granite facing stones in position.

Convention of the Can. Soc. C.E.

Arrangements for the above meeting at Winnipeg (January 24 to 27), are now maturing and the programme will be issued early in the new year.

The meetings will be held at the Alexandra Hotel, which will be the headquarters of the executive during the session.

Eastern members will leave Montreal, Ottawa and Toronto on a special train on Saturday, January 21, and will return by a train expected to reach Montreal at midday, on Sunday 29th, while special arrangements are being made for western members. Arrangements for excursions include visits to the city power plant at Point Du Bois, St. Andrews locks and the Grand Trunk Pacific shops.

Contracts Department

News of Special Interest to Contractors, Engineers, Manufacturers and Dealers in Building Supplies.

Information for insertion in these columns is invited from Architects, Contractors, Engineers, etc.

Waterworks, Sewerage and Roadways

Goderich, Ont.

The by-law providing for the expenditure of \$16,000 on an extension of the town's sewer system was carried.

Lethbridge, Alta.

We are informed that preliminary lines and estimates of cost have been made in regard to the proposed gravity water line from Belly river, length, 43 miles. Estimated cost, \$880,000. C. M. Arnold, city engineer.

Moncton, N.B.

The report of Engineer Chipman endorses that of Engineer Edington submitted eight years ago, and favors the McNutt brook as a source of water supply, with a recommendation that a reservoir be constructed about 3½ miles from Moncton. Estimated expenditure about \$230,000. The water and light committee will secure legislative authority for the issuing of bonds for that amount.

Montreal, Que.

A by-law is being drafted for presentation to the Council this week for the loan of \$2,000,000 for the city's new filtration plant. As soon as it is passed the Council will call for plans and specifications. Messrs. Hering and Fuller of New York have submitted a tender for getting out the plans.

The City Surveyor in his reports recommends that all the streets running north and south should be asphalted, new pavements laid on Sherbrooke street and St. Antoine street. It is the intention, we understand, to ask for tenders for public works in January instead of May or June.

Ottawa, Ont.

Works to cost the city in the neighborhood of \$750,000 will be undertaken this year by the Ottawa municipal engineering department. The chief work will be the western drainage system, which will cost \$500,000. Then there will be the drainage of the Dow's lake district, which will cost considerably over \$100,000.

Pembroke, Ont.

Pembroke has adopted a by-law for the raising by debenture of the sum of \$65,000 to extend the intake pipe of the waterworks system.

Simcoe, Ont.

Willis Chipman, C.E., of Toronto, is preparing plans for the proposed sewage disposal plant to cost \$50,000 to \$60,000. Work will likely be done in 1911. W. C. McCall, town clerk.

St. Catharines, Ont.

A. Milne, C.E., St. Catharines, Ont., is in charge of the waterworks extension lately authorized by the ratepayers. 24,000 feet of 24 inch, 30 inch and 36 inch pipe will be required; pipe, specials and valves, the materials. Tenders had not been called under date of last information.

Toronto, Ont.

Tenders are being called by the Board of Control until February 7th for main drainage of which description will be found in the official tender in "Tenders and For Sale Department" of this issue. G. R. Geary, chairman.

Winnipeg, Man.

The city engineer was instructed to prepare specifications for pumps for two new wells which the city will sink in a short time.

Tenders are being called until February 6th for manufacture, etc., of two pumping plants, etc. For further information see "Tenders and For Sale Department," of this issue.

Tenders addressed to chairman, Board of Control, will be received until January 13th, for construction of water mains on William avenue, Lorette avenue, and on Helen street. M. Peterson, secretary.

AWARDED.

Toronto, Ont.

The contract for the construction and erection of the 15-ton and 10-ton overhead traveling cranes for the main and high level pumping stations has been awarded to John T. Hepburn, crane builder, Toronto.

Railroads, Bridges and Wharves

Belleville, Ont.

The Dominion Railway Commissioners have passed an order in regard to the requirements of construction of C.N.R. bridge across River Moira that five piers be used. Dredging of the rocky shoal at the point where the bridge is to be constructed has been recommended by Public Works engineer. Noted previously.

Fredericton, N.B.

Tenders for Wilmot's low water wharf will be received until January 16th at the Department of Public Works.

London, Ont.

The plebiscite on question of guaranteeing the bonds of North Midland Railway was carried. That for construction of bridge over the Thames was defeated.

Ottawa, Ont.

J. D. MacArthur has been in the city investigating his chances for securing the contract for the construction of the Hudson Bay Railway. He is said to have intimated that in case he is unable to get at least a slice of this contract, he will proceed to sell out the expensive plant acquired in the construction of the National Transcontinental.

A temporary arrangement has been reached between the G.T.R. and C.P.R., by which the former may run their tracks along C.P.R. property under the Wellington street viaduct until such time as a permanent arrangement can be reached between the two companies, thus avoiding the closing up of J. R. Booth's mills, which would have been caused until such time as an agreement could be reached since the logs, etc., going to the mills passed over

the tracks of the G.T.R. These formerly crossed Wellington street on the level. The tracks were ordered removed and the G.T.R. to pass under the viaduct.

Regina, Sask.

The Railway Commission has approved the city's plans for the Broad street subway was the news received here. The plans provide for a subway under 16 tracks, the whole to cost \$280,000. The civic estimates for the year filed at the council meeting last night provide for an expenditure of \$40,000 next year, and it is possible that more than that amount will be spent if the work progresses favorably. See "Miscellaneous" for further estimates.

St. John, N.B.

Wm. Murdoch is authority for the statement that there is talk of constructing a new bridge, but nothing definite yet.

AWARDED.

Toronto, Ont.

Contract has been awarded to Messrs. T. R. Hinds and D. A. Deeks, by the Toronto Construction Company for the remaining 38 miles to Bethany, on the C.P.R. line from Victoria Harbor to tidewater at Montreal.

Public Buildings, Churches Schools, etc.

Bracebridge, Ont.

Queen's Hotel was destroyed by fire on the 31st inst. Estimated loss about \$15,600.

Brantford, Ont.

The vote on the question of a post office site is taken to mean that the government should secure its own site. The government had promised a \$150,000 post office if the city would provide a site.

Architect Green, of Buffalo, N.Y., has been in consultation with the Hospital Board and Ladies' Auxiliary in regard to plans for hospital improvements.

Calgary, Alta.

The permit for the Mount Royal (Calgary) College was granted. The specifications call for a \$45,000 building.

Cardston, Alta.

The Board of Trade are interested in the establishment of a hospital. E. N. Barker has given a site.

Quelph, Ont.

The Homewood Sanitarium here was destroyed by fire on the 6th inst. Loss about \$75,000. Dr. Hobbs is interested.

The campaign for raising \$50,000 for Y.M.C.A. building fund has been launched. It is stated that the site has been selected on Quebec street opposite the Carnegie library.

Granby, Que.

The College of St. Joseph was destroyed by fire on the 5th inst. Estimated loss about \$75,000.

London, Ont.

The by-law for a new City Hall was carried.

Lunenburg, N. S.

Tenders addressed to R. C. Desrochers, secretary, Department of Public Works, will be received until January 18th for electric light fixtures for Public Building here. Plans, etc., on application to the local caretaker, district engineer, Halifax, and at the above department.

Montreal, Que.

Sir Lomer Gouin received a deputation recently from the Council of the Bar, asking for alterations and additions to the Court House Library. It is suggested that a gallery be constructed round the library to accommodate additional books. The Premier approved of the plans submitted and promised to submit them to the Department of Public Works.

Details have now been settled for the opening of a Juvenile Court in Montreal. A Detention Home is to be procured before the opening of the court. It is understood that this will be a temporary arrangement and that after a year's experience a special building will be erected.

It is stated that the Montreal Musical Society, represented by Lieut.-Col. Meighen and Mr. Harry Higgins, president Hotel Ritz Company, have been conferring together regarding the erection of a modern opera house.

Mount Forest, Ont.

Tenders addressed to R. C. Desrochers, secretary Department of Public Works, will be received until January 30th for construction of public building here. Plans, etc., on application to local postmaster and at the offices of Thos. Hastings, clerk of works, postal station F, Yonge street, Toronto, and at the above Department.

Odessa, Ont.

The Methodist Church here was destroyed by fire on January 6th. Loss \$20,000.

Ottawa, Ont.

The plans for the new departmental building to be built by the Dominion government in Mackenzie avenue are nearing completion and it is expected that tenders will be called for in a few weeks. D. Ewart, architect.

Tenders addressed to D. T. Elderkin, secretary, Eastern Ontario Live Stock and Poultry Show were called until January 9th for several trades in connection with the Howick Pavilion alterations.

Pembroke, Ont.

The People's Theatre was destroyed by fire on the 4th inst. Estimated loss on building, \$10,000. James Stewart owner.

Port Arthur, Ont.

N. G. Neill, Industrial Commissioner, informs us that the ratepayers authorized the expenditure of \$12,000 for additions to present City Hall.

Rainy River, Ont.

The money by-law for completing the fire hall and purchase of new hose were carried.

Saskatoon, Sask.

Plans were accepted for the erection of Emmanuel Divinity College, and instructions given to the architects, Brown & Vallance, Montreal, to call for tenders.

Sherbrooke, Que.

The ruling of the court holds that the school building in the Township of Westbury is unfit for occupation and that a

new school should be erected in that district.

St. Thomas, Ont.

W. R. Darrach, St. Thomas, is the architect in charge of the alterations proposed for Alma College. Further particulars not ready for publication at present. Toronto, Ont.

The first draft of plans are prepared for the new Students' Club Building in connection with the University of Toronto. Estimated cost about \$300,000.

Vancouver, B.C.

The exact location of the University of British Columbia has been selected by the provincial government. The site chosen consists of 175 acres almost on the crown of Point Grey and overlooking the sea on three sides. A plan showing the land selected is being prepared by the surveyor-general.

Victoria, B.C.

The report of the fire wardens for the purchase of two sites for fire halls was adopted.

Winnipeg, Man.

The Board of Control invites the architects resident in this city and registered in the Province of Manitoba, etc., to submit designs for a contagious hospital. Particulars to be had from M. Peterson, secretary, Board of Control. Applications must be in by January 25th.

Samuel Hooper, provincial architect, is preparing plans for new government buildings to cost over \$5,000,000, according to estimates. These buildings include new legislative buildings, a new agricultural college and a new asylum at Brandon to replace that destroyed by fire about a month ago.

AWARDED.**Chatham, N.B.**

The contract for erection of Salvation Army headquarters has been awarded to John McDonald & Co.

Vancouver, B.C.

The contract for erection of new isolation hospital was awarded under modification of original plans, to Wm. O'Dell, \$49,986. The lowest tender on first plans was about the same, but included heating. Other tenders were U. G. Patterson, \$56,465 C. F. Perry, \$63,000. Heating, Murray Bros, \$3,200. The contract time has been extended from five to six months.

Winnipeg, Man.

Dunn Bros., of Winnipeg, were awarded the contract for the steel work on the police sub-stations, at \$7,01.

Residences**Montreal, Que.**

Building permit was issued to W. H. Creed for construction of apartment house on Cote des Neiges road, \$90,000

Ottawa, Ont.

Thomas Deane has purchased five lots on Goulbourne avenue on which he will erect residences.

Nimmo and Soper will build five or six fine residences in the spring, to cost around \$6,000 each.

Toronto, Ont.

A permit has been issued to Mr. T. P. Stewart for apartment house, Oriole road, \$30,000.

Business Buildings and Industrial Plants**Belleville, Ont.**

The factory now operated by Mr. Deacon was destroyed by fire on January 7th. Estimated loss on building, \$15,000.

Calgary, Alta.

The C.P.R., it is stated, have put in their estimates for the next year a request for an appropriation to complete the west wing of the station.

Chatham, Ont.

Under date of last information the contracts for construction of plant for Western Bridge & Equipment Co. had not been awarded. The building will be of steel frame and fireproof; size, ground floor, 82 x 196. Estimated cost of building, \$10,000; of equipment, \$10,000. Engineer, A. W. Connor, Toronto street, Toronto.

Edmonton, Alta.

Fire destroyed the two storey frame building on First street occupied by the A Carruthers Fur Co., on the 31st ult. Loss estimated at \$5,000.

Fort Frances, Ont.

Work has commenced on the new mills for the Shevlin-Clark Company, and it is expected they will be finished by June 1.

Gilbert Plains, Man.

The large brick store owner by Fred Davis has been recently destroyed by fire. Loss about \$7,000.

Iberville, Que.

We understand that the Norcross Bros. Co., contractors and importers, whose premises were destroyed by fire on December 26th last, will commence rebuilding almost immediately.

Islington, Ont.

The by-law granting site to a carpet factory was carried.

Lacombe, Alta.

The Victoria Hotel, Kasha & Curtice's implement warehouse, and other buildings were destroyed by fire on the 3rd inst. Estimated loss, about \$75,000.

Lake Megantic, Que.

The largest business block here was destroyed by fire on the 4th inst. Loss, about \$30,000.

London, Ont.

The McClary Manufacturing Company has taken option on about 24 acres of land between Trafalgar street and the Thames river as the site for further extensions. Other additions are under consideration.

Montreal, Que.

Tenders are being invited by Messrs. Peden & McLaren, architects, Montreal, for some alterations in the Bank of Montreal, consisting of construction and moving of certain offices, and alterations in connection with the teller's cages.

Mr. H. Higgins, president of the Ritz Hotel Company, has announced that arrangements for erection of the hotel to be built on Sherbrooke street have been concluded. Mr. Wetmore, architect; Mr. Maxwell, Montreal, associate architect.

The Canada Rubber Company have taken out a permit to erect a factory costing \$250,000 on Monarch street.

Mr. Wilder has purchased another large block of land on Bleury street, Montreal, and intends erecting a ten-storey building there as soon as plans can be completed.

New Westminster, B.C.

Galbraith & Sons will erect a large saw-mill and factory on Lulu Island, and have applied to the city for a 25-year lease. The mill will be three storeys, 40 x 225 x 60 feet. It may be necessary to submit the proposition to the ratepayers.

North Hatley, Que.

Messrs. Reed, McRae, McNerny and Robinson, all of this place, and a recently formed company, will erect a large sash and door mill and will operate the same. Construction will begin at once. Cost about \$25,000.

Owen Sound, Ont.

The Bell Telephone Company will erect a new exchange on Ninth street east, two storeys in height, with basement of concrete construction. Cost of plant and equipment, about \$23,000. Total cost, including site and underground conduits, about \$50,000.

Penticton, B.C.

A proposition is being entertained by local capitalists and others to build a large tourist hotel here at a cost of about \$100,000.

Quebec, Que.

Press reports state that tenders for demolition of the old Champlain Market will be called this week. When this is finished tenders for construction of Trans-continental Depot will be called. Estimated cost, \$500,000. Noted previously.

Mr. Arthur E. Scott, honorary treasurer of the Quebec Board of Trade, has purchased the property forming the southeast corner of Mountain Hill and Notre Dame street, Lower Town. Mr. Scott, we understand, intends increasing the height of the building and fitting the same up as a modern office building.

Price Brothers contemplate the erection of new pulp and paper mills at Riviere du Sable with the opening of spring. About 14,000 h.p. will be developed and a village established to accommodate in the neighborhood of 4,000 people.

St. Catharines, Ont.

Messrs. Howard and Cluff, representing the Steel & Radiation Co., Ltd., have signed an agreement with the city council to erect a new factory on a site near the new Welland Canal, next to Jenekes' machine factory.

St. John's, Que.

S. M. Green, Springfield, Mass., is the architect in charge of the erection of factory and power plant for the Cluett Peabody Company, headquarters, Troy, N.Y. Sizze, 200 x 86; number of floors, five. H. G. Clark, engineer in charge. Information sent under recent date did not state whether contracts were awarded. Noted in issue of December 14.

Sydney, N.S.

The following building permits have been issued: To F. L. Dixon for the erection of a shed for brick storage for the Dominion Steel Corporation, \$4,000; to S. H. Stevenson for the reconstruction of the Alfonso Hotel, \$3,000.

Toronto, Ont.

Permit was issued to C. P. R. for 2-storey brick station, West Toronto, \$20,000.

Three Rivers, Que.

Application has been made to the town by Messrs. Greenshields, Jaques, Bureau and Craig, for exemption of taxes for 20 years and eight-inch water mains on the

streets surrounding the proposed property of the St. Maurice Valley Cotton Company, who propose to erect a million dollar building devoted to cotton spinning.

Plans are being prepared by Mr. T. Pringle, of Montreal, for the erection of a 100-ton pulp and paper mill here for the Wayagamite Company. Mr. C. E. Whitehead is in charge of affairs at Three Rivers. Work will be commenced in the spring.

Vancouver, B.C.

The Eastern Townships Bank, is stated to have purchased a site here suitable for the erection of a branch bank. Mr. J. McKinnon, general manager, head office, Sherbrooke, Que.

Newspapers reports state that Mr. C. H. Lilly, president of the C. H. Lilly Company of Seattle, wholesale miller, grain and seed dealers, will establish a branch here and possibly erect in the near future a mill-plant.

Plans were presented for large ware house, corner of Homer and Drake streets, to be built for W. D. Morison, \$65,000. Contracts have been let.

Victoria, B.C.

Tenders were invited for a brick office building on Broad street until January 10 for P. R. Brown. H. S. Griffith, architect, 1006 Government street.

Mr. James E. Wilder has purchased lot 176 St. Lawrence Ward, with buildings, at the corner of Sherbrooke and Bleury streets, Montreal, for the sum of \$50,000. He will probably erect an eight-storey building there.

Virten, Man.

The block owned by W. C. Wainwright was destroyed by fire on the 4th inst. Estimated loss about \$10,000.

Welland, Ont.

The work of tearing down the buildings, preparatory to the erection of Mr. John Goodwin's new block will commence about the 15th inst.

Windsor Mills, Que.

The Chateau Windsor was burned to the ground on January 5th. Loss, \$20,000.

Winnipeg, Man.

Mr. Patterson, chairman of the telephone commission, has announced that early in the spring work will be commenced on the extension of the Main Exchange building on Portage avenue east. This will take the form of an addition to the building from the ground up, and when completed will be used as the quarters of the commercial staff.

The following building permits have been issued recently: Permit for a steam turbine power station to be erected by the Winnipeg Electric Railway Company on Mill street, \$72,000. The Crane-Ordway Company, Limited, will spend \$35,150 for additions and alterations to its warehouse on the east side of Lombard street.

AWARDED.**Montreal, Que.**

The Queen's Hotel Company will commence work on a seven-storey annex on St. James street, to cost \$100,000. Saxe & Archibald are the architects, and the contract has been awarded to Mr. Peter Lyall. Work to be finished by July 1st.

The contract for the building of the two extra storeys on the extension of the Place Viger Station of the Canadian Pacific Railway has been let to Stewart & Co., and

the construction work will be commenced in a few days.

Ottawa, Ont.

Taylor & Lacey have been awarded the contract for the carpentering work on the Stinn-Shoulds bakery. J. Mather, architect.

The steel for the Canada Foundry Company for the Blackburn building has arrived. An effort is to be made to have this first section of the building completed by July 1st. Holbrooke & Sutherland general contractors.

Quebec, Que.

Simoneau & Dion, of Sherbrooke, have been awarded a \$200,000 contract for an office building for the Quebec Railway, Heat & Power Company, at Quebec. The building must be completed by November 15th.

Saskatoon, Sask.

The contract for erection of King George Hotel here has been let to Carter, Halls and Aldinger of Winnipeg, \$246,000. Total cost, about \$400,000. The Saskatoon Investment and Trust Company are interested.

Power Plants, Electricity and Telephones

Arthur, Ont.

The by-law to take \$30,000 stock in the People's Railway carried.

In West Garafraxa township the by-law to take \$40,000 stock in the People's Railway was defeated by a small majority.

In Dundalk the by-law to aid the People's Railway was defeated by 84 majority.

Cornwall, Ont.

Messrs. Moloney and P. F. Campbell are reported to be considering plans for building a proposed electric railway between Hawkesbury and Cornwall.

Dundas, Ont.

The Hydro-Electric by-law was carried.

Edmundston, N.B.

The town clerk of Edmundton publishes notice of application to the legislature for authority for the town to issue bonds for \$40,000 to establish an electric light and power plant, and to build and maintain a dam at the second falls at Green River for this purpose.

Lunenburg, N.S.

See Public Buildings.

Owen Sound, Ont.

See Public Buildings.

Ottawa, Ont.

An application will come up at the next meeting of the city council to give permission to the Morrisburg and Ottawa Electric Railway to come into the city along Main street, Ottawa East, connecting with the Ottawa Street Railway there.

The White Way will be extended along Bank street and Rideau street. It is expected that 40 ornamental poles will be needed for Rideau street and along Bank street. There is also a move to have the ornamental lights along Wellington street.

Tenders addressed to Chairman, Municipal Electric Department, will be received until January 12th for 150 ornamental posts and also 150 McBeth Evans alba 14-

(continued on page 30)

Tenders and For Sale Department

Steam Shovels

We own and have for sale near Niagara Falls, 2 Vulcan 75-ton, 2½-yard steam shovels, late model with new extra large boilers and in excellent condition; also one 70-ton. These will stand most rigid inspection and we are offering them at unusually low prices. Confer with us.

WILLIS SHAW MACHINERY CO.,
171 La Salle St.,
Chicago, Ill.

Tenders

Sealed tenders are asked (for all and part) for Brick Church, Foldens. Tenders open till JANUARY 14TH, 1911. For plans, etc., see Wm. Pullin (chairman), or C. W. Budd (secretary), Foldens, Ont. Bell phone service 49, ring 14, Ingersoll. Lowest tender not necessarily accepted.

WM. PULLIN,
Foldens, Ont.

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Positions Vacant

Advertisements under this heading two cents a word per insertion

WANTED IMMEDIATELY.—Competent architectural draftsman. Must be first-class on design, working drawings, details, and perspectives rendered in colors, and be capable of taking charge of office in western city. State salary expected; send samples of work. Only first-class men need apply. Address Box 187 "Contract Record," Toronto. 2-3

Toronto Main Drainage

Sealed Tenders addressed to the Chairman of the Board of Control, City Hall, Toronto, Canada, endorsed "Tender for Section No. 1, Low Level Interceptor," or "Tender for Laying Reinforced Concrete Over-flow Pipe from Sewage Tanks," etc., as the case may be, for the construction of the several sections of Low Level Interceptor and other works, as mentioned below, will be received by registered post only, until noon of TUESDAY, FEBRUARY 7TH, 1911.

The following is an approximate description of the various works:—

1. Low Level Interceptor, Section No. 1, Egg shape, 8 ft. 10 in. x 4 ft. 3 in., 4,566 linear feet.
2. Low Level Interceptor, Section No. 2, Egg shape, 8 ft. 2 in. x 4 ft. 9 in., 2,475 linear feet.
3. Low Level Interceptor, Section No. 3, Egg shape, 8 ft. 6 in. x 5 ft. 8 in., 2,295 linear feet; Circular, 4 ft. 6 in. diameter, 1,023 linear feet. (Total length Section No. 3, 3,318 linear feet).
4. Laying reinforced concrete overflow pipe from sewage tanks, 292 linear feet of 60-inch circular pipe in lengths of about 24 feet.
5. Cast Iron Penstocks for Low Level Interceptor.

Tenderers shall submit with their tender the names of two personal sureties approved by the City Treasurer, or in lieu of said personal sureties the bond of a Guarantee Company, approved as aforesaid.

Specifications may be obtained from, and original drawings will be on file and can be seen at the Main Drainage Department, City Engineer's Office, on and after January 9th, 1911.

For the convenience of Contractors, sets of blue prints have been prepared and will be issued to contractors, upon application to the City Engineer and upon receipt of deposits as follows: For items 1, 2 and 3 combined, \$5.00; for item 4, \$2.00, and for item 5, \$2.00. Deposits should be made by cheque payable to the City Treasurer. The deposits will be refunded upon return of blue prints in good condition within thirty days of receiving tenders.

The usual conditions relating to tenders as prescribed by City By-law must be strictly complied with or the tender will not be entertained. The lowest or any tender not necessarily accepted.

G. R. GEARY (Mayor),
Chairman, Board of Control.

City Hall, Toronto,
January 3rd, 1911.

2-4

Miscellaneous

Advertisements under this heading one cent a word per insertion. Box No. ten cents extra

Agents Wanted

Agents wanted in all parts of Canada to handle wood preserving for Poles, Cross-Arms, Railroad Ties and Construction Timber. For particulars write W. D. Ward, Tribune Building, New York. 1-2

City of Winnipeg

Tenders for

Pumping Machinery

Sealed tenders addressed to the Chairman, Board of Control, Winnipeg, Canada, will be received at the office of the undersigned up to 11 a.m., on MONDAY, FEBRUARY 6TH, 1911, for the manufacture, delivery and erection complete of Two Pumping Plants each of a capacity of one million imperial gallons per 24 hours. Specifications and forms of tender, together with conditions governing tenders as prescribed by by-law, may be obtained at the office of the City Engineer, 223 James Avenue, Winnipeg. The city reserves the right to reject any or all tenders, or to accept any bid which appears advantageous to the city's interest.

M. PETERSON,
Secretary.

Board of Control Office,
Winnipeg, Jan. 6th, 1911.

2-3

Extension of Time

City of Regina

Tenders for Power Plant

Tenders are asked for by the City of Regina for the supply and installation of any or all of the following, together with the necessary connections ready for operation:

- 1 1500 k.w. Steam Turbine Generating Unit.
- 1 500 k.w. D.C. Generating Unit.
- 2 500 Horse Power Boilers.
- 1 Economizer.
- 1 Hand Power Travelling Crane.
- 1 Coal and Ash Conveyor.

Tenders will be received for the above until noon, TUESDAY, JANUARY 31, 1911. Specifications and all information will be furnished on application to the undersigned or to E. W. Bull, City Electrician.

(Signed) A. J. McPHERSON,
City Commissioner.

51-2

Positions Wanted

Advertisements under this heading one cent a word per insertion. Box No. ten cents extra

ALL ROUND ARCHITECTURAL DRAFTSMAN.—14 years' experience, capable of handling large projects as well as ordinary commissions, managing an office and interviewing clients. Four years' private practice. At liberty May 1st. Vancouver, Victoria or other Pacific coast cities preferred. Address LOUIS R. CHRISTIE, 2542 North Spaulding Avenue, Chicago, Ill. 2-3

An Experimental Road at Ithaca, N.Y.

An experimental road was constructed during 1909 and 1910 by the co-operation of the U. S. Office of Public Roads and the Sibley College of Civil Engineering at Cornell University. The general plan of these tests is much the same as that of the Ohio State Highway Commission at Columbus, Ohio.

The Ithaca road is described in the October number of the "Cornell Civil Engineer" by Mr. Charles H. Hoyt, U. S. Superintendent of Public Road Construction. It is built in widths of 16 feet in 15 sections as follows:

Section 1—Coal-gas tar, penetration method, 300 feet; Section 2—Coal-gas tar, mixing method, 300 feet; Section 3—Paving brick grouted with cement, macadam foundation, 306 feet; Section 4—Semi-asphaltic oil, mixing method, 275 feet; Section 5—Refined asphaltic oil, penetration method, 300 feet; Section 6—Refined semi-asphaltic oil, penetration method, 300 feet; Section 7—Kentucky rock asphalt, 300 feet; Section 8—Refined water-gas tar, penetration method, 300 feet; Section 9—Refined semi-asphaltic oil, penetration method, 300 feet; Section 10—Open-hearth slag water-gas tar, penetration method, 100 feet; Section 11—Open-hearth slag, 200 feet; Section 12—Semi-asphaltic oil, mixing method, 260 feet; Section 13—Cinder concrete, 35 feet; Section 14—Limestone concrete asphalt paint coat, 30 feet; Section 15—Limestone concrete, 500 feet.

The work was interrupted by the coming of winter, and in the following spring a legal question, involving the right of way, delayed the work until this last fall, when it was again resumed. It is, therefore, too early to draw any conclusions as to the respective wearing properties of the various materials. It would appear, from descriptions on the two experiments, that the Ithaca road does not have nearly as much traffic as the Columbus one.

Nap. Leblanc, lumber merchant, St. Pierre de Wakefield Que., is stated to have sold assets.

Miramichi Pulp & Paper Company, Limited, manufacturers of pulp, are stated to be in liquidation.

The manse and building board of the Presbyterian Church has authorized loans for the building of churches at Dayton, Alta., Netherdale, Sask., Bowell, Alta., Grassy Lake, Alta., and Kinsela, Sask. Manses will be erected at Woldon, Moss Lake, and Eyebrow in Saskatchewan; at Creston, C.B., and at Whitewater. Permission has been granted to the congregation at Ochre to float a loan for the purpose of erecting a church building and manse.

Power Plants, Electricity and Telephones

(Continued from page 29)

inch globes and 600 McBeth Evans alba 12-inch globes. J. E. Brown, electrical superintendent.

Application for a charter will be made by the Imperial Traction Company to build proposed railways, telegraph and telephone lines to connect Hamilton, Guelph, Stratford, St. Marys, London, Ingersoll, Woodstock and Brantford, and back to Hamilton, with branches to Niagara Falls and to Sarnia. It is reported that construction will begin in the spring on proposed network of lines. Headquarters, Hamilton; capital, \$6,000,000; directors: L. B. Howland, of Toronto; Roger Millar, of Ingersoll; Geo. M. Reid, of London, and S. W. Hay, of Listowel.

Fenticton, B.C.

The by-law to raise \$71,000 for the installation of electric light service was carried.

Prescott, Ont.

The Aluminium Company of America have purchased 3,500 acres of land, including Barnhart's Island, in St. Lawrence river. They propose, it is stated, installing a plant capable of developing 300,000 h.p.

Port Arthur, Ont.

We are informed that the ratepayers authorized the expenditure of \$15,000 for improvement to street lighting. N. G. Neill, industrial commissioner.

Regina, Sask.

Tenders addressed to S. P. Porter, deputy Minister of Railways, will be received until January 14th for supply of telephone poles. Particulars obtained on application to the above.

Bids will be received January 17th by A. J. McPherson, City Commissioner, for furnishing and installing the followings:—A 1,500 k.w. steam turbine generating unit; A 1,100 k.w. steam turbine generating unit; 500 k.w. d.c. generating unit; 500 h.p. boiler, economizer; hand-power traveling crane, and a coal and ash conveyor. E. W. Bull, City Electrician.

Strathroy, Ont.

The by-law to raise \$6,000 for improvements to the electric light and waterworks systems carried.

Thorold, Ont.

Local improvement and two power by-laws were carried.

Winnipeg, Man.

See Public Buildings.
The sum of \$80,000 was recommended for the construction of power conduits on the main city thoroughfares, viz.: On Main street from Higgins avenue to Graham street, on Portage avenue from Main to Carlton; on Notre Dame from Portage to King, and on McDermot avenue from Main to King.

AWARDED.

Regina, Sask.

The City Council decided to place an order with the Ottawa Car Company for four single and two double-truck cars for the new municipal street railway, under construction. Delivery July 5th, 1911.

Sherbrooke, Que.

The contract for development of the Drop Off power here has been awarded to

Messrs. Morrow & Beattie, Peterborough, Ont., \$51,220, providing it is satisfactory to the Board of Control, City Attorney and Engineer. Ross & Holgate, Montreal, will supervise the construction of plant until complete. The above contract does not include the hydraulic and electrical machinery. Work will be commenced at once, it is stated. Total cost of development, \$100,000.

Victoria, B.C.

The tender of Messrs. Hawkins & Hayward for the supply of the following number of articles, at the following prices, was recommended for acceptance by Electric Light Committee 250 lamps at \$127 per hundred; one gross of 14-in. globes at \$270; two gross of 12-in. globes at \$162.

Winnipeg, Man.

The board of control has recommended for acceptance the tender of Siemens Bros. Dynamo Works, Toronto, for supply of motor generators, \$16,410.

Miscellaneous

Montreal, Que.

Tenders are to be invited by the Richelieu & Ontario Navigation Company for two large ferries for the Bourcherville & Longueuil services from Montreal.

City Attorney Ethier has completed a draft of contemplated by-laws showing what loans the city may float during the current year, as follows: Four and a half millions for various public works. Five millions in order to construct underground conduits. One and a half millions to instal a filtration plant. One million to be used as a working capital. Two millions to be borrowed in order to instal an electric municipal lighting plant. These await approval of Council.

Ottawa, Ont.

Tenders addressed to the Secretary of the Militia Council will be received until January 20th for supply of target frames.

The permits taken out recently include: W. A. Gardner, dwelling, Heney street, \$3,500; J. W. Featherston, dwelling, Bay street, \$3,000; Gordon Rogers and E. R. McNeill, oce building, Queen street, Geo. Tomlinson, builder, solid brick construction, \$10,000; W. Hunt, shop and dwelling, Division street, \$3,000; Ottawa Electric Railway, addition and power house, Middle street, \$7,000; O. K. McDonald, dwelling, Arlington avenue, \$3,000; William Coats, dwelling, Clarey avenue, \$3,600.

Port Arthur, Ont.

We are informed that the ratepayers have authorized the expenditure of \$20,000 for fire alarm system. N. G. Neill, industrial commissioner.

Regina, Sask.

The City Commissioner recommends that the following programme of work be completed this year pending the confirmation of the new assessment roll:—Extension to power plant, \$100,000; fire hall equipment, \$7,185; sewer and water extensions, \$20,000; increase of water works supply, \$10,000; city's share of pavements, \$51,800; trunk sewer and disposal works, \$51,800; Broad street subway, \$40,000. After the confirmation of the assessment roll he recommends that the following work be done:—Trunk sewers—Extension east to Toronto street, \$25,000; completion of disposal works, \$51,700; Wascana Valley trunk sewer, \$90,000; total, \$166,700. Sewer and Waterworks Extensions (including damage

claims), \$45,000; increase of water supply—possibly, \$100,000; city's share of pavements, \$30,000; Broad street subway, \$45,000.

Toronto, Ont.

Recent building permits include: W. Burton, 3 attached 2-sty. brick dwellings, on Symington, \$6,000; McCausland & Black, 3 att. 2-sty. brick dwellings, 24, 26 and 28 Shirley, \$6,000; J. M. Lower Company, 3-sty. brick warehouse, 92 Sherbourne street, \$16,000; E. B. Smith Estate, alterations to store, 54 Yonge, \$4,500; M. Rawlinson, 3-sty. brick stable, on St. Nicholas, \$19,000; Mrs. W. H. Barker, pair semi-detached 2-sty. brick dwellings, 456-8 Margueretta, \$4,000; S. J. Gee, 3 pair semi-detached 2-sty. brick dwellings, Palmerston Gardens, \$12,000; F. B. Allan, 2-sty. brick factory, on Logan, \$7,000; Toronto Feed & Produce Company, 2-sty. brick warehouse, on 106 Vine street, \$4,000; J. J. Farrell, 2 detached 2½-sty. brick dwellings, 161-3 Campbell avenue, \$4,600; T. P. Stewart, 2-sty. brick apartments, on east side Oriole, \$30,000; A. W. Pike, 3 detached 2-sty. brick dwellings, on south side of Dewson, \$7,500.

Victoria, B.C.

The tenders received for motor apparatus for fire purposes were recommended as follows: One Seagrave combination hose and chemical wagon, as per specifications, for the sum of \$6,725. One Seagrave hose wagon, as per specifications, \$6,334. Both of these machines are motor propelled.

Vancouver, B.C.

Permits were granted recently as follows: Dr. McAlpine, Point Grey road, \$25,000; C. E. Strong, 1552 Twelfth avenue east, three houses, \$6,000; Baker & Hay, 120 Hamilton street, warehouse, \$16,000; E. Brant, 556 Eighth avenue east, \$3,000; Findlay & Anderson, 1456 Eighth avenue east, \$3,000; L. Elliott, 1350 Walnut street, \$3,500; William Mitchell, 1222 Twelfth avenue east, \$2,550.

The following tenders for the new hospital boat were received and referred to the chairman and medical health officer: Hof far Motor Boat Company, Campbell engine, \$4,786; Page Gasoline Engine and Supply Company, Campbell engine, \$4,786; N. G. Ross, boat to be remodelled, \$4,900.

New Companies

Internations Contracting Company, Limited, Winnipeg, Man., incorporated, capital, \$50,000,000. Incorporators, R. Lash Miller and E. W. Peters, financial brokers, S. H. Green and E. R. Chapman, barristers, all of Winnipeg. Besides contracting, lumbering, manufacturing, oil refining and shipbuilding, the company is empowered to acquire the carbon oil works.

Reynolds Company, Limited, Montreal, Que., capital, \$20,000. Incorporators, Percy C. Ryan advocate, Romeo Houle real estate agent; Agenor H. Tanner and Russell T. Stackhouse, advocates, and Edouard Rodier, manager, all of Montreal. The company to engage in construction, etc.

Mahoney Building Company, Limited, incorporated, Guelph, Ont., capital, \$50,000. Incorporators, J. J. Mahoney, painter, W. A. Mahoney, architect, and H. Mahoney, plumber, all of Guelph.

The Insurance Brokerage & Contracting Company, Limited, incorporated, Toronto, Ont., capital, \$50,000. Incorporators, M. F. Van der Voort, barrister, and J. Lees Galloway, accountant, both of Toronto.

Tests of Reinforced Concrete Columns

By H. Burchartz, Gross-Lichterfelde.

Extensive tests have been made in the Royal Testing Laboratory at Gross-Lichterfelde on reinforced concrete columns in order to determine the influence on the strength of the reinforcement in general and especially of the kind of cross-reinforcement (bands and hoops). Professor Rudeloff has recently reported on the results of these tests in the fifth volume of the publications of the German committee on reinforced concrete.

In the following paragraphs is given a brief summary of the results of the tests.

The tests were made in two series. In the first series 13 columns of 2-m (78 inches) length were tested. Eleven columns had a 30-cm (12-inch) square section and two columns an octagonal section. The longitudinal reinforcement consisted in all cases of four round steel bars of 16-mm ($\frac{5}{8}$ -inch) diameter. The cross-reinforcement was of various types, made with wire 7 mm. (about $\frac{1}{4}$ -inch) thick. The concrete was gauged with a large percentage of water so as to obtain a soft consistency.

The tests demonstrated the well-known fact that the influence of the reinforcement is much less than that due to the care in tamping. Besides this fact the surprising result was found that all columns when tested broke at the end last tamped whether this end was placed in the top or bottom of the testing machine.

Some specimens gave very anomalous results and these deviations appear to have been caused partly by the columns being made in the open air, partly in moist and partly in dry weather.

On account of this result of series 1 it was found necessary to undertake further tests, series 2. The columns for this series were made in a closed room kept as uniformly warm and moist as possible. Their length was only 90 cm (about 35 inches). Of the seven kinds of columns tested five had square sections with four 16-mm ($\frac{5}{8}$ -inch) round longitudinal bars each; two had octagonal sections with eight 8-mm (5-16-inch) or 11-mm (7-16-inch) longitudinal bars each. The cross-reinforcement of spiral steel bars and partly of rings made with 6-mm ($\frac{1}{4}$ -inch) rods; whereas the square columns were reinforced with various kinds of bands of 7-mm. wire.

The results of the second series show a greater uniformity than those of the first one. For instance, the columns without reinforcement showed by far the greatest increase in cross-section and the least resistance. The two octagonal columns reinforced with steel rings carried the largest loads up to the beginning of the formation of cracks and up to fracture.

As in the first series it was observed in the second with nearly all columns that failure began at the end last tamped. In order to learn the reason for failure at this point another column was tamped and immediately after tamping samples of the concrete were taken from various parts of the column and examined for content of water, content of cement and weight per volume. This examination showed that the content of water and also of cement increased from the bottom to the top, although to a slight extent only, but that the weight per volume was without doubt greatest at the bottom and less at the top of the column. The top, which naturally was subjected to less tamping and was consequently less dense than the other parts of the columns, showed the least resistance.

Cost of a "Rattler" Brick Testing Outfit

For several years past the vitrified blocks used by the city engineer's department of Baltimore, Md., have been tested for abrasion by the Highways Division of the Maryland Geological Survey. Last year, however, the city decided to install a rattler at the city yard for the department's use. The rattler is the standard National Brick Manufacturers' Association machine, 28 inches in diameter, 20 inches long within heads. The barrel is a regular polygon of 14 sides and contains about 12,018 cubic inches. It was manufactured by Olsen Bros., Philadel-

phia, Pa. The machine is driven by a 5 h.p. Westinghouse Type A, single phase electric motor, making 1,710 revolutions per minute. The speed was geared down at the rattler end of the belt to produce 30 revolutions per minute. The speed in operation runs from 1,799 to 1,801 revolutions per hour and is very satisfactory in that respect. The first test of vitrified block with the outfit was made August 31st, 1909. The cost of the outfit and the expenditures during the year ending December 31st, 1909, were:

One vitrified block rattler with belt.....	\$192.50
One 5 h.p. motor	150.00
Cast steel shot	12.00
Freight and drayage	10.20
Building foundations and remodelling shed..	53.32
One set scales	8.70
New cast-iron shot	10.20
One new pulley	5.20
One revolution counter	4.00
Electric installation	37.64
Electric Co.'s electric connection.....	3.73
Electric current	5.69

Total \$493.18

Strengthening Old Wrought-Iron Trestle with Concrete

A most important use of concrete in engineering structures is the method which has been adopted for the strengthening of the old wrought-iron trestle approaches to the Danville, Illinois, railroad bridge, and the St. Charles bridge. These structures, which were built many years ago, were constructed of Phoenix columns, with diagonal tie rods. With the great increase, says the "Scientific American," that has come of late years in the weight of trains, it has become necessary either to strengthen these trestles or remove them altogether. The former course was followed; and the method adopted was to incase the columns in concrete. Tests of the strength of these reinforced compression members show that the addition of the concrete has raised their strength fully 50 per cent.

A vibrator for compacting concrete roadways instead of the usual tamping methods was employed in building the Munger Boulevard at Dallas, Tex., by Mr. R. C. Stubbs, of that city, who has secured a patent for his device. The subgrade, according to "Good Roads," was prepared in the usual manner and finished with its surface 5 inches below the grade established for the pavement surface. A 1:3:6 concrete, mixed in an Austin cube mixer, was then spread to the full depth of 5 inches and struck to the proper grade. A coating of medium sized broken stone was then placed upon the surface and boards or platforms laid over the pavement. Upon these the vibrator was operated, the planking being moved forward when one section had been consolidated. The vibrator consists of a motor-driven mechanism mounted upon a hand truck, through which the vibrations set up are transmitted to the planking and thence to the concrete below. The operation serves not only to consolidate the concrete itself, but also to embed the stones in the upper portion of the concrete. The machine has a rated capacity of 1,000 square yards of pavement per nine-hour day. The advantages of this method of consolidating concrete pavements, as set forth by its inventor, are that a greater density and more even texture in the concrete are obtained than is possible by ordinary tamping. The rapid succession of comparatively light blows delivered by the vibrator, in conjunction with the weight of the apparatus, are more effective, it is claimed, than tamping, since the air and water are driven out and the resulting mixture is practically without voids. Another advantage is said to be that all parts of the pavement may be made equally dense; the combination depending upon a mechanical process capable of exact regulation.

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CRUSHED GRANITE for Floors and Sidewalks

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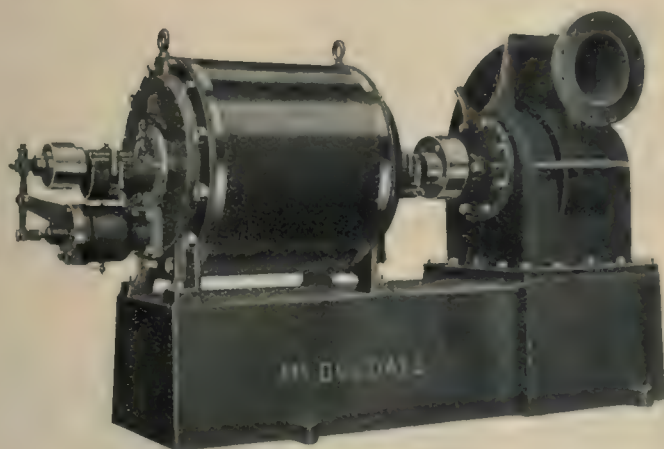
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OUR NEW BULLETIN NO. 106, SHOWING MANY APPLICATIONS OF THESE PUMPS, WILL BE SENT ON APPLICATION TO OUR SALES OFFICES, MONTREAL, TORONTO, COBALT, WINNIPEG, CALGARY, VANCOUVER

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THE JOHN McDOUGALL CALEDONIAN IRON WORKS CO.

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Our Concrete Mixing Equipment also includes:
**Chicago Concrete Mixers, Concrete Hoists,
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for the maintenance of concrete floors; protecting them against abrasion and wear.

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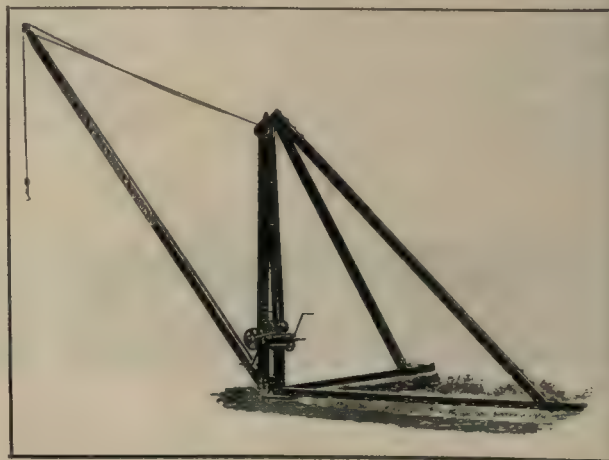
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Contract Record

ESTABLISHED 1886

A Weekly Journal of
Building, Contracting, Engineering, Public Works
Municipal Progress, Advance Information

PUBLISHED EACH WEDNESDAY BY

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THOMAS S. YOUNG, General Manager.

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SUBSCRIPTION RATES

Canada and Great Britain, \$2.00 U.S. and Foreign, \$2.50

Vol. 25

January 11, 1911

No. 1

New Offices of the Contract Record

For the past eighteen years the Toronto offices of the "Contract Record" have been located in the Confederation Life Building. From time to time additional accommodation was secured to meet the growth of the business. This being no longer possible, we have now



New Headquarters of the Contract Record
at 220 King Street West, Toronto

removed to the new building illustrated above at 220 King street west, where a most cordial welcome will be extended to our friends and everyone interest in engineering and contracting. May the reader consider this a personal invitation to visit us in our new home.

With the greater facilities and better equipment of

our new building, coupled with an efficient organization, the "Contract Record" will not only maintain its present strong position, but will forge ahead to a much higher standard of efficiency and usefulness. Watch its development during 1911!

Conditions in Transcontinental Railroad Camps

Last September, the Norwegian consul at Montreal, Mr. Jacobson, sent his countrymen a warning against coming to Canada to engage in railroad construction, stating that the contractors in this country were both inhuman and unfair.

According to official statistics, some 35,000 men are employed on Canadian railroad construction, and with the rapid developments of the field and the ever-growing demand for labor, it is most desirable in the interests of the country at large and the contractors in particular that statements like those made by Mr. Jacobson should be discussed fairly.

The matter is recalled by a letter written by one, Gubrandsen, published in the Montreal Star of recent date. Mr. Gubrandsen, having worked for seven years on the railroads of eastern Canada, both on construction and as a sub-contractor, has some claim to authority. His complaints, in the present case, are laid exclusively against the N.T.R. Much of this construction, he says, is carried on in the wilderness and the labor conditions should be supervised by the government. Not only are the sanitary conditions of living bad, but the camps themselves are badly constructed and unhealthy, besides being inadequately protected against damp and cold. In addition to this, they are congested and stuffy, and altogether make excellent breeding places for innumerable diseases.

As for the system of medical inspection, according to this writer it is often a farce. In cases of emergency instruments and appliances are seldom available. At one camp where Gubrandsen remained for nine months the only medical appliance kept at the contractor's office was a case containing one roll of absorbent cotton—no carbolic acid or salve of any kind.

A particular grievance is that connected with the system of payment. It is claimed that laborers have to sacrifice ten cents on the dollar in order to cash the orders and cheques for their wages.

All kinds of advantage, it would appear, are taken by the contractor over those who take subcontracts for sections of the track. The contractor supplies the stores, food and equipment and charges pretty much as he likes for them. In this connection Mr. Gubrandsen writes:

"In order to show what the contractors usually pay the sub-contractors for the work in the eastern part of the National Transcontinental Railway, I give the following prices:

"Mining of stock is paid at the rate of from 95 cents up to \$1 per cubic yards. The contractor generally receives \$1.50 or more.

"As regards prices of supplies, there is an item for two horses about \$7 a day. All the working days in the week have to be paid for, whether the horses are used or not.

"On dynamite and powder the contractors charge a profit of about 100 per cent. of the original price, and on clothes the increase is about the same. I am prepared at any time to give detailed accounts from various contractors proving this statement."

The manner in which the interests of the victims of accidents and explosions are neglected is discussed at some length. Many deaths occur and little or no effort is made to locate the relatives. The system employed by the contractors is claimed to be primitive and the

books in which the labor is entered up are of little value.

The foregoing is only the gist of the letter, but the statements are reproduced impartially. We cannot but think that if such letters as these appear in the public press and remain unconfuted, the effect will be inimical to the interests of those connected with railroad construction. Indeed, it may help to develop a situation that will be a menace to the progress of our most important national enterprise. Without the personal knowledge of the conditions that would enable us to speak with authority, we cannot adduce any weighty arguments in favor of the contractor. The contractor himself is able to make the most abiding impression, and it will certainly be advantageous to hear from him at this time.

Skilled Labor for Concrete Work

The fallacy that concrete can be properly mixed and placed by any kind of labor under any kind of supervision is fast disappearing. A very pertinent clause relating to this subject appeared in the specifications for concrete work on a large contract recently placed with the Aberthaw Construction Company, of Boston, Mass. This clause is as follows:

All reinforced concrete must be constructed by laborers skilled in this special field and under the supervision of an expert in reinforced concrete construction. The loads and stresses in the proposed construction are high and while the design has been carefully prepared with due consideration of safety factors and accurate locations for steel, much depends on the manner in which the work is executed, and the engineer will not jeopardize the work by permitting incompetent workmanship."

Specifications as they Affect the Contractor

A paper entitled "Specifications from a Contractor's Point of View" was read a short time ago by James Parkinson, a contractor, before the Liverpool Architectural Society. Some of the points made in the following extract will doubtless appeal to quite a few of our readers:

A specification is always preceded by a number of conditions, pains and penalties, making the contractor responsible for every conceivable act or damage to property or life. With the majority of these conditions I agree, as it tends to make the careless contractor more careful regarding the scaffolding, etc. There are some clauses, I think, which require leaving out and others inserted in their place. First is that of the architect appointing himself the arbitrator as to the full meaning of the specification and drawings, which is binding on all parties without appeal. This, to my mind, is not fair between man and man, and de-

prives one of their rights to sue, and is contrary to common reason.

Second, a clause reading: "No compensation will be made to the contractor for any losses or increased outlay they may incur arising from errors in the said drawings and specification." Also another on the same: "If any portion of the work, reasonably and obviously to be inferred as necessary, shall not be expressly described, either in the quantities or on the drawings, the contractor shall execute the same in a satisfactory manner without any extra charge on the amount of estimate."

I think enough responsibility is placed on the contractor in being responsible for damage to property and life without being made responsible for the architect's and surveyor's mistakes and omissions in the drawings and quantities, with which he has had nothing whatever to do, except to have a casual glance at the drawings. I think every one should bear their own mistakes without trying to saddle others with them, and these clauses should be removed.

In place of the above conditions a clause should be inserted regarding the final payment. As a rule, we are kept an unreasonably long time for the settlement. I would recommend a clause something like the following: "The accounts to be gone into and the final certificate granted within two months after the account is rendered, or 5 per cent. interest paid on the balance." I have been kept six to nine months when there was no reason why it should not be certified in a week or two. . . .

Another matter I wish to bring before your notice is the fact, no matter what sort of a job is expected on completion, the specification never varies; the best is always specified.

Now it is an undisputed fact that Mother Nature does not produce everything of the best quality; she always varies what she produces, which we, in our wisdom, divide and classify into grades or qualities. No matter what department of nature we look into, whether the mineral, vegetable or animal kingdom, there is always good, middling and indifferent, and each have their separate value on the market, according to the grade or quality. . . .

I have often heard the remark passed when an architect has found that his specification has not been adhered to and cheaper material substituted in place of that specified, "Have we got value for our money?" Now, to be fair to all concerned, that is not the question, "have I got value for money?" The question is, "Have I got what was specified?" If not, you should insist on having it, otherwise it is not fair to those who tendered to faithfully carry it out.

An Ottawa alderman declared last week that when the city engineer wanted to obtain the contract for small blocks of pavement he tendered low and when he did not want to take contracts for large blocks of pavement he tendered high. While we entertain nothing but the most friendly disposition toward City Engineer Ker, we can quite understand that if there is any truth in the worthy (or unworthy) alderman's statement, it is reasonable to ask whether such a system offers any inducement to private companies to put in low tenders. Ottawa is the proud possessor of a civic asphalt plant. The aforementioned alderman claims that this asphalt plant is not the protection to the city that it should be. He contends that something more is required of such a plant than an apparently good financial showing and that the plant should be extended so that the city engineer could bid with equal heart on all paving work. Then he says it would be a real guarantee of reasonable prices.

At Vancouver, B.C., 25 miles of water mains were laid in the city during 1910, according to the annual report of the waterworks engineer. The total number of water services put in was 3,065.

Forthcoming Conventions

Jan. 24-27. at Winnipeg; Canadian Society of Civil Engineers.—Secretary, C. H. McLeod, 413 Dorchester street, Montreal.

Feb. 15-16 at Winnipeg; Canadian National Association of Builders.—Secretary, J. H. Lauer, Builders' Exchange, Montreal.

March 6-11 at Toronto; Canadian Cement and Concrete Association (convention and exhibition).—Secretary, Wm. Snaith, 57 Adelaide east, Toronto.

Handling Concrete During Cold Weather

Satisfactory Measures for Counteracting Action of Freezing—Additional Equipment Not Necessarily Expensive—Details of Various Methods Employed

By J. H. Chubb

Laboratory results, together with those obtained in everyday practice, show the folly of attempting to carry on concrete construction during the winter months without taking proper precautions to counteract the action of freezing. A given amount of heat expended in heating materials and protecting the work from freezing immediately after placing will be infinitely more effective than an equivalent amount of heat expended in attempting to hasten the hardening of concrete that has been mixed with cold material and subjected during the next few days to unfavorable conditions.

A case is reported where it was possible to remove the forms from an upper floor concreted during favorable weather conditions late in April before those of the floor directly beneath, which was constructed during cold weather in February; yet the lower floor was subjected to the same favorable weather conditions which influenced the hardening of the upper one, and was, in addition, nearly two months older. During the construction of an 8-storey reinforced concrete building, where the work progressed at the rate of about two storeys in three weeks, it was found necessary to use eight sets of floor forms. While they were concreting the lower three or four storeys, the temperature was close to, but rarely went below freezing, and the contractors did not consider it necessary to heat materials or protect the work. During the concreting of the fourth storey the weather turned exceptionally cold. This was housed in with canvas, heated with salamanders and the water used for mixing concrete heated. An examination of the work showed that the concrete in the upper floors when but a week or ten days old, was stronger and better than that in the lower floors, which were many weeks older. Had the contractor taken the precautions at the beginning that were taken later on, only about half as much lumber would have been required for forms, and the extra cost of handling the work would have been but a fraction of that for these additional forms.

As the example of the benefit to be derived from the proper handling of winter work the experience of a contractor during the construction of a reinforced concrete bridge will answer. The bridge consisted of three 3-centered arches having a clear span of 110 feet each. While the arches proper were being concreted the weather turned quite cold, from 12 to 15 inches of ice forming on the river. Nineteen days after the centre span was concreted a warm rain set in, resulting in a flood which carried away the false work and centering for this span, but did not result in any damage to the bridge. The materials for the concrete were thoroughly heated, being delivered to the mixer at an average temperature somewhat above blood heat, and as soon as the concrete was deposited it was protected with a covering of tar paper and boards. The proper handling of the work in this case probably prevented the total destruction of the middle span when the forms were accidentally removed long before the intended time.

These and numerous other examples in every day practice clearly illustrate that winter work cannot and should not be handled in the same manner as summer work.

The proper precautions necessary to insure satisfactory results with concrete during freezing weather depend very much upon the class of construction, large plan mass work such as retaining walls and abutments, not requiring the same care and protection as thin walls, columns, beams and floor slabs. Elaborate and expensive plants for heating the materials and protecting the work have been constructed and successfully used on important work, but the additional equipment considered necessary for winter work is really comparatively limited, consisting simply of a sufficient amount of canvas for housing in or covering the work, salamanders or some other form of heaters for maintaining a temperature above the freezing point and some provision for heating materials.

Half cylinders of sheet steel set directly upon the ground in the form of an arch, make a simple form of sand heater, as also do lengths of metal culvert pipe closed at one end and provided with a short piece of smaller pipe for a flue. Sand and stone may be heated by piling directly upon pipe coils supplied with steam or by covering with tarpaulins and applying the steam directly to the material to be heated. Where the materials are delivered in cars excellent results can be obtained by this latter method. For heating water the common practice of relying upon a steam pipe placed in an ordinary barrel is not to be recommended, the water is generally used too fast to permit of its being properly heated by this method. A suitable tank should be provided, the water being heated by means of a coil supplied with steam from the boiler supplying the mixer engine or from one erected for this purpose. The size of the tank will, of course, depend upon the amount of water needed and the time required for heating it.

Satisfactory Methods.

Work can be successfully carried on during freezing weather by either one or both of two methods; heating the concrete materials and then protecting the work until it has had a chance to harden, or for temperatures but little below freezing by lowering the freezing point of the concrete. This latter method is probably the simplest and cheapest but not the best, and consists of adding some substances to the concrete that will reduce its freezing point. Only those substances that have no effect on the strength and durability of the concrete can be used. Ordinarily salt is most commonly used for this purpose and experiments indicate that while the addition of a limited amount of salt retards the hardening somewhat and lowers the initial strength, the ultimate strength of the concrete is not affected by its use. Even when salt is used it is important that the aggregate be free from frost as it is impossible to properly mix such materials. Approximately one per cent. by weight of salt to the weight of the water is required for each degree F. below freezing, but more than ten per cent. of salt should not be considered safe and this amount is not effective for temperatures lower than 22 degrees F. Calcium chloride has been used in place of salt for the same purpose and apparently gives very good results. In one case where commercial muriatic acid was used

to prevent freezing, a small amount of acid being added to the mixing water, the results obtained were not entirely satisfactory, and the present unsatisfactory condition of the concrete both as to color and strength, is undoubtedly due to the use of the acid. At any rate, the use of acid in this connection is not to be encouraged.

To insure satisfactory results during cold weather the material should be heated and the work protected until it has attained sufficient strength to withstand the action of frost, either the water, sand and water, or sand, stone and water should be heated. Heating the materials accelerates the rate of hardening, lengths the time before the concrete becomes cold enough to freeze and in temperatures but little below freezing will insure the hardening of the concrete before it can be damaged by freezing.

For heavy mass work, thick walls, abutments, etc., it is not necessary to heat the sand if it is dry and free from lumps of frozen matter. The water, however, should be heated, and if the concrete goes into place unchilled it will harden quite rapidly, as mass work retains its initial heat for a long time and additional heat is generated during the process of hardening. If the forms are tight and made of heavy material it will be necessary to protect the top or exposed surface of the work. This may be accomplished by covering with tarpaulin and applying a jet of steam, or by covering with boards, building paper or some other suitable material and applying a thick blanket of straw or manure. A thickness of from 10 to 12 inches of manure laid on paper or canvas will, if kept dry, protect work from freezing for days at a temperature as low as 10 degrees F. Manure should not be placed directly upon the concrete, however, as it is very apt to discolor the work and in some cases is thought to have caused a slight disintegration of the surface coming in contact with it.

As an additional precaution for keeping the work from freezing through the forms, a covering of building paper furred an inch or two from the forms has been found to be effective. Actual tests in practice have shown a difference in temperature of 15 degrees between the outside air and the space between the paper and the forms.

Careful Inspection Necessary.

Careful inspection of winter work is necessary before removing the forms and it must be remembered in this connection that frozen concrete, which, upon thawing, has but little strength, closely resembles thoroughly hardened concrete in appearance, and when broken frequently shows a fracture through the aggregate.

To prohibit placing of concrete when the temperature is near or below freezing, as is frequently done in specifications, causes unnecessary delays and imposes an unjust hardship upon the contractor. If concrete work it properly handled it may be successfully carried on irrespective of weather conditions. The cold weather clause in specifications, instead of prohibiting, should be so written as to permit of construction during freezing weather, provided proper precautions, which should be specified, are taken.

While winter work will entail some additional expense, depending upon the class of construction, there are also advantages to be obtained at this time of the year which compensate for this additional cost. Labor is very apt to be cheaper and more plentiful and the same is true to some extent of the materials of construction, deliveries of which are more prompt. This is a consideration of much importance, as those will affirm who have had work held up for weeks and the cost in-

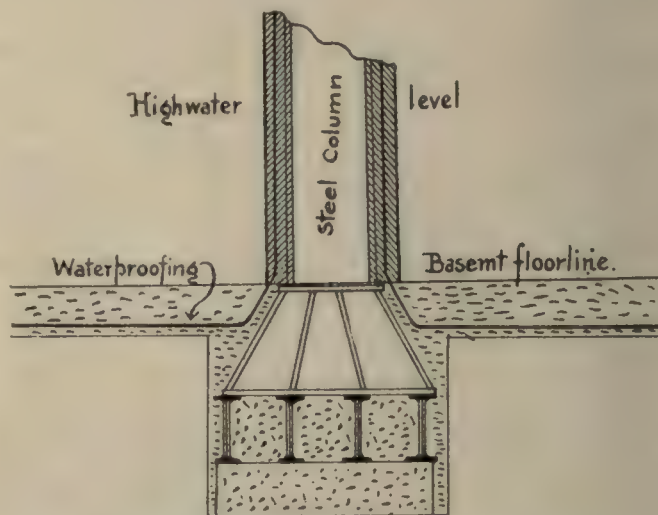
creased due to the delays in obtaining materials during the busy building season.

Where conditions and importance of the work will warrant this slight extra expense, concrete construction may be carried on during the severest winter weather with the assurance that it will be entirely satisfactory, providing proper precautions are taken in placing and protecting the work.

Membrane Method of Waterproofing

The subject of adequately protecting not only the rooms, areas, cellars and necessary pits occurring below water line in modern structures, but the structural members and elements themselves, from water and moisture, is receiving an increasing amount of attention from architects and engineers. It is also pretty generally realized that the danger from stray electric currents or other destructive agencies is real, and one that demands protective measures on the part of the designer. As a result, the practice of waterproofing with an insulating membrane the footings of columns and walls supporting and constituting a part of important structures is becoming the rule, whereas it was but recently the exception.

The change is in the direction of better construction and more permanent buildings, and therefore one to be commended, says the American Architect. In undertaking it the architect is confronted with the problem of materials and means, and upon his selections will depend largely the results obtained. The methods most commonly employed, from which it may perhaps be

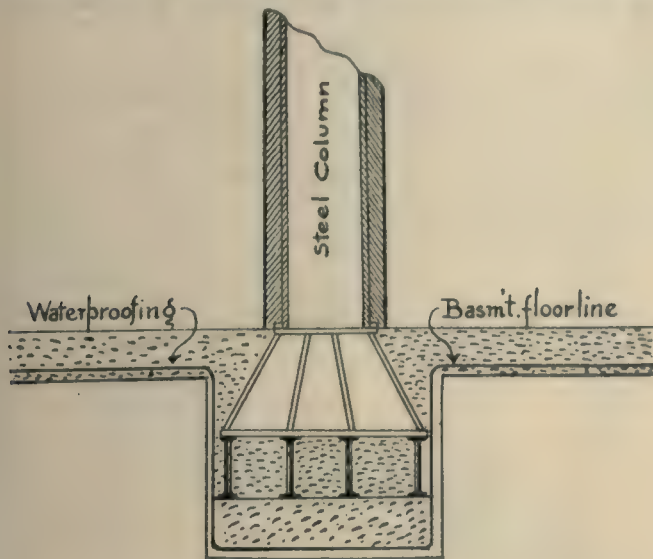


Older membrane method, leaving base of columns and footings submerged and exposed to possible injury from electrolysis, etc.

inferred that satisfactory waterproofing has been secured, at reasonable cost, seem to be those of using felt in a number of layers, stuck or cemented together with a cementing material possessing certain essential properties. The requirements of the felt are that it must be tough and durable, and at the same time soft and pliable. The cementing material must be of such a nature that it will absolutely repel water and moisture and be unaffected by it. It must also remain elastic and to a certain degree pliable in the coldest temperature, and yet be sufficiently firm not to soften and run when exposed to the heat of the sun in summer.

Manifestly such materials as are here described are not easy to manufacture or readily obtainable from a great many sources. It is of greatest importance, how-

ever, that materials designed for the purpose of water proofing possess the properties indicated, and it therefore becomes incumbent upon those to whom the responsibility of making selection falls to test and examine the nature of the various materials available with extreme care. In this, as in all departments of building,



Manner of applying membrane method of waterproofing now more generally employed

the success or failure of the entire undertaking depends in great measure upon a wise and proper selection of materials.

Cutting Structural Steelwork with the Oxy-Acetylene Flame

Nearly all of the steel superstructure of the Gillender building, New York, was taken apart by cutting out the rivets. The lower sections of 12 of the columns were not, however, removed by the subcontractor who handled the remainder of the structural steel work, and in order to provide clearance as quickly as possible for the installation of the pneumatic caisson foundation equipment, it was decided to cut off the upper portions of these columns about 40 feet long at a point just below the level of the street, so that the temporary working platform from which caisson operations were conducted and on which the main hoisting engines were located, could be installed before the lower portions of the columns and the grillages and girders on which they were seated were removed. The lengths and weights of columns also made them difficult to handle, so that this arrangement promoted the convenience as well as the rapidity of the work. The columns were cut off and some other similar work was rapidly and satisfactorily done by an oxidizing flame operated by the Oxy-Acetylene Appliance Company, New York.

Each of the columns had a 13x24-inch closed rectangular cross-section of about 130 sq. in. made up with a centre web composed of two 18x $\frac{3}{4}$ -in. plates and four 3 $\frac{1}{2}$ x5x3 $\frac{1}{2}$ x $\frac{3}{4}$ -in. flange Z-bars and two pairs of 24x $\frac{3}{4}$ -in. outside cover plates. The working platforms were built around the columns just below street level and on them a torch was operated with which a horizontal cut was made through the column.

If the columns had been a solid steel member a single continuous cut could have been made with the flame, but as it was made up of a number of laminations or superimposed plates and bars, the joins between the

units of material formed a serious obstruction to the cutting and made it necessary to cut off sections of the outside plates about 12 in. high vertically, exposing the outer surface of the inner cover plates, then cut off somewhat narrower sections of them, then cut the Z-bars and then the centre web plates from both sides to the centre, thus involving five cuts through the plates and four through the Z-bars on each side of the column, making 18 cuts in all, in addition to cutting the heads from sixteen $\frac{7}{8}$ -in. rivets, which were backed out afterwards. When the column was cut through, excepting the last cut in the centre web plate, the upper end of it was attached to the hoisting tackle of a derrick boom and a light strain taken to prevent it from falling when the last of the metal cut away.

Besides cutting off the 12 columns the acetylene flame was used for cutting four 12-in. I-beams, eight 20-in. I-beams, two plate girders 32 in. deep, and for cutting holes in eight underpinning piles and also for cutting them in two in the middle. The underpinning piles were the regular 16-in. steel pipes, filled with concrete and were about 70 feet long. It was necessary to remove them to secure clearance for sinking the wall caissons, and it was found impossible to pull them by eccentric connections to the upper end, therefore the acetylene flame was used to cut two 2 $\frac{1}{2}$ x14-inch. holes to opposite sides of the shell near the top. The concrete between them was removed and heavy steel bars were inserted in the holes and jacks were set under the ends of the bars and operated to start the piles, after which they were easily pulled with the derrick tackles. Owing to the great length of the piles it was necessary to cut them in two for transportation, and this was easily accomplished by making a transverse cut with the acetylene flame through the 6-in. outside sleeve coupling. As soon as the coupling was cut the concrete broke and the pile separated into two parts. All of the above work was done by one torchman and helper working one week and an additional torchman working one-half week. The average speed of cutting with this flame is one 24x $\frac{1}{2}$ -in. plate in 1 minute, but on heavy solid steel a speed as great as a 4 $\frac{1}{2}$ x4 $\frac{1}{2}$ -in. section in 1 minute has been attained.

This work was done with a portable plant including three acetylene safety cylinder like those used for ear lighting apparatus and other purposes. Each cylinder was 12 in. in diameter and 26 in. long and contained 225 cubic feet of acetylene gas at atmospheric pressure, condensed to a pressure of 150 lbs. per square inch. These cylinders are two-thirds filled with an asbestos-like porous substance called acetone, which is a by-product of wood alcohol and has a capacity for absorbing 25 times its own volume of acetylene gas at atmospheric pressure. When the cylinders are charged with gas up to a pressure of 200 lbs. they can be exposed to heavy impact or great heat without danger of explosion, but when the valve is opened acetylene gas is delivered at a pressure here regulated to 150 lbs. This gas is mixed with pure oxygen at a pressure of 300 lbs., delivered from a cylinder of 100 cubic feet capacity. The mixture, proportioned 1.28 oxygen to 1 acetylene, is delivered through the nozzle of a special torch and makes a very slender flame developing 6,300 degrees of heat. The aperture in the nozzle varies with the thickness of the metal to be cut and for this work had a medium size of about 1/64-in. diameter. The flame is applied to the cutting line and when its temperature is raised to a cherry red a pure oxygen jet is applied at the same point through an auxiliary independent nozzle and rapidly oxidizes the metal, making a smooth

deep cut about $\frac{1}{8}$ in. wide. The torches are made of brass pipes and fittings and are very light and convenient and are fitted with five sizes of nozzles pro-

vided for a considerable variety of work and enabling very complicated cuts to be made.—Engineering Record.

Unsafe Buildings and How to Treat Them

The Practical Part in Reconstructing Defective Walls and Similar Structures—An Example from Experience in the Case of a Party Wall

It goes without saying that the experience of a practical builder, covering a period embraced within the past 35 years, would be an extensive and varied one and exhibit many peculiar phases calling for the display of ingenuity and originality. Among these probably there is none more interesting than what might be technically termed "unsafe buildings and walls," and it is of these that the writer purposes to treat in the comments which follow.

Of "unsafes" there are many kinds, all of which are worthy of consideration by the architect, the building contractor, the engineer and the excavator. In fact, it

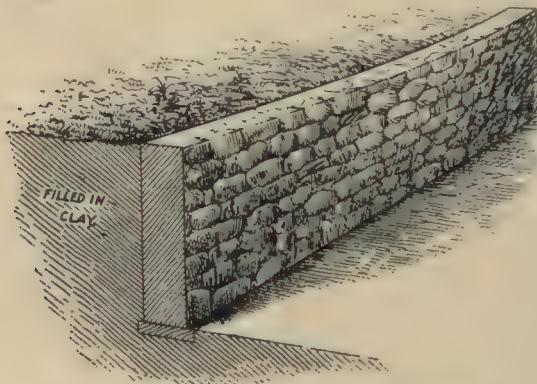


Fig. 1.—A common case of bulging wall

is too often obligatory in these days, when old buildings and walls are being demolished to make way for modern structures, that all persons interested or connected with the work should possess a knowledge of how to proceed when such "unsafes" are either evident or develop as the work progresses.

How do walls become unsafe? From experience we find that buildings and walls become dangerous and unsafe from many causes, among which mention may be made of the following: By bad judgment or haste in building; the natural decay of the constituent materials; by exposure to climatic changes and chemical action; by constant usage, wear and tear, as well as abuse, such as by overloading, neglect, lack of repairs, fires, etc.

Let us, however, first take up the most frequent cases and suggest how they should be remedied. Referring to Fig. 1 of the accompanying sketches the reader will observe a very common "unsafe." It represents a 24-in. stone retaining wall supporting a bank of filled-in clay or earth, which presumably is the substratum of a street or yard. Having been recently built and known as what might be termed a "green wall," it has succumbed to the literal pressure of the filled-in material. The ends of the wall being held fast by the right-angled or square returns cannot yield to this pressure, but the unsupported stretch of wall, say it be 25 feet, 50 feet, or 100 feet in length, must give way, so that

the wall becomes out of plumb, bulged and unsafe, as represented in the picture.

This is one of the most common cases of "unsafes" and is caused by filling in the clay or earth before the mortar in the wall has "set" or hardened and before the wall has obtained its full bond. It is prevalent in

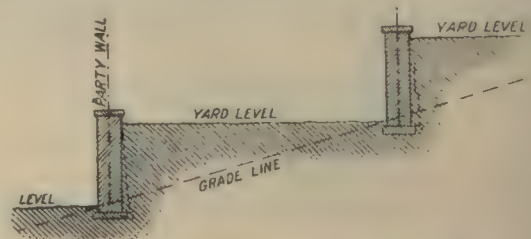


Fig. 2.—Section showing another cause of "unsafe" walls

yards which follow street grades and dip or slope, as represented in Fig. 2. It is a bone of contention between owners not alone on account of the matter of trespass, by reason of overhanging or being out of plumb, but also because of its being "party," as these the owner must himself preserve its integrity and ar-

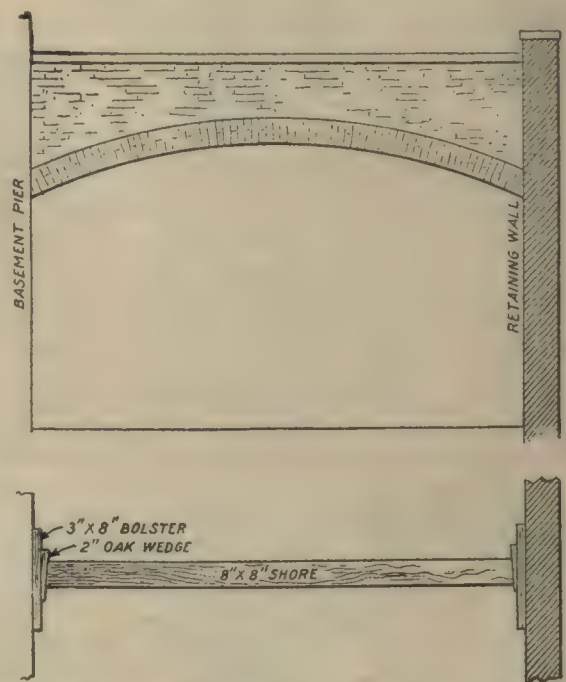


Fig. 3.—Method of shoring and buttressing a front retaining wall.

range with his neighbor in the matter of injury or trespass. Now as to the remedy. When this condition becomes manifest on front retaining walls it is a very simple matter to shore or buttress such a wall with one owner to contribute to the expense of building a retain-

ing wall to support his neighbor's bank unless it is "party" or by mutual agreement to the benefit of both.

Now as to party walls. Let us take a case which actually came within the experience of the writer. In demolishing a house built about 25 years ago, it was found that the east and west party 12-in. brick walls were about 8 in. out of plumb, leaning toward the east, as indicated in Fig. 4 of the drawings. It was the intention of the owner to rebuild the house, replacing an old-fashioned high-stoop, four-storey brown stone dwelling with a modern, basement dwelling, but what to do with the defective walls was the question. They were not necessarily unsafe, yet were defective in being warped and out of plumb.

After careful consideration it was decided to line up the west wall with brickwork, carrying it up plumb

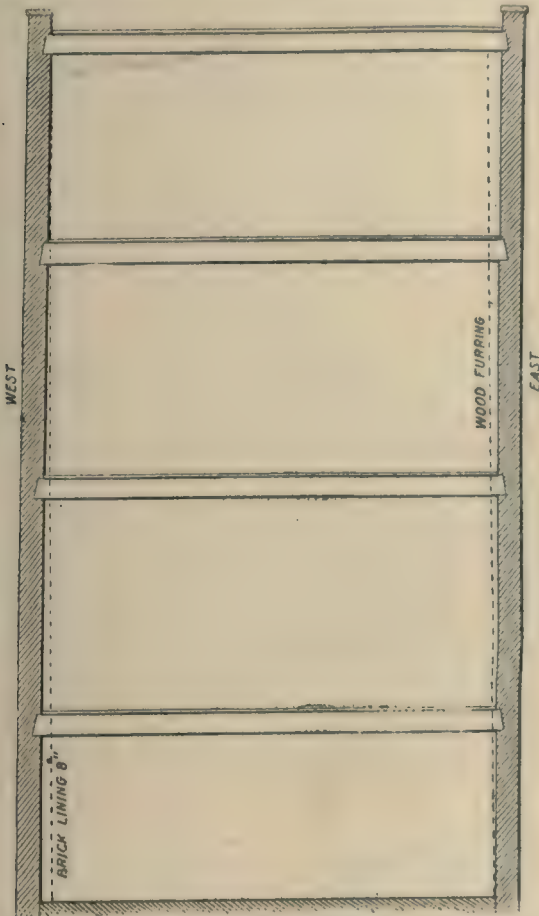


Fig. 4.—Showing how the perpendicularity of the interior walls of a building out of plumb was maintained.

until it practically merged with the old wall and anchoring it to the latter with L-anchors and then fur out the old east wall with diminishing wood studding, thus preserving the perpendicularity of the interior walls.

It will be observed that this method maintained the integrity of the party walls without disturbing the tenants in the east and west dwellings adjoining.

Great indeed is the value of brick work, for it must be remembered that a brick wall properly anchored and tied, although out of plumb and solid in the mass, is not virtually unsafe unless both walls have passed outside the line of gravity. They will stand if kept exempt from jar and shock and the foundations secure from settling or slipping.

The matter of over-loading in the centre of the span between walls will, as has frequently been found, cause the walls to draw in or buckle. This can only be re-

medied by shoring with girders and posts set, if possible, intermediate between the walls.

Exterior and isolated walls and piers of buildings, if out of plumb, bulged, from unequal settlement, disintegrated by fire—or from any cause, in fact—must be braced, shored or needled. Broken or fractured walls of brick, concrete or stone must be rebuilt. In the case of the latter, if of rubble work, danger is never imminent; if of cobblestones of "nigger heads" it is dangerous, probably for the reason that the contraction of the mortar allows the stones to become loose and drop out by reason of their roundness and lack of bond.

Let us sum up the subject, by noting what is unsafe in timber. Of course its natural diseases, knots, shakes, dry rot, subsidence, etc., under strains are included in this category. Similarly, too, with iron, cast or wrought, and steel. Cast iron is brittle, hence in recent modern practice its comparative disuse, except, perhaps, for columns and lintels. Steel and wrought iron must, in spite of their wonderful capabilities, be protected and kept safe by coatings of paint, cement, concrete, etc.

And so it goes; the best part of a builder's practice is not always the actual construction, for he must not alone be experienced in this, but also be so well versed in a knowledge of the action of the materials used in the construction of buildings that he may know how to act and proceed when any kind of an unsafe wall, part of or even an entire building is brought to his attention for advisement.

Deterioration of Concrete by Oil

Engine breakdowns have been caused many times by the deterioration of concrete by oil, according to the report of Chief Engineer Michael Longridge, of the British Engine, Boiler & Electrical Insurance Company. Formerly most of the oil fed on the moving parts of an engine found its way over or through the engine foundations, he said, and softened the cement of the mortar or concrete. Eventually the foundations settled through the mortar shifting its place. This set up such strains in the bedplates that the latter finally cracked. Mr. Longridge recommends, in the case of concrete foundations, covering the concrete with strong cast-iron plates, with raised facings to receive the planed feet of the engine bed and raised edges to retain the oil and water. Where this is impracticable on account of its cost, he recommends the use of much broader bearing surfaces than are usual on the bottom of bedplates, or the use of more holding-down bolts with a pair of large accurately machined folding wedges between the bed plate and concrete at each bolt.

A smoke preventer, known as the "Torpedo" apparatus is described in London Iron and Coal Trades Review. This device is a hollow conical structure of special perforated fire-brick blocks supported in the combustion chamber just back of the bridge wall and in the direct track of the gases from the grate. Air is admitted from a pipe passing through the ash pit. The fire-brick blocks become red hot and the heated air readily combines with the unburned carbon and hydrocarbons.

In connection with the British Antarctic expedition, which left England last June in charge of Captain Scott, it is interesting to learn that the living huts and observatory for the expedition have been lined with two layers of Cabot's double-ply quilt. The houses must be as absolutely coldproof as possible and yet must be light in weight for ease in handling.

Depositing Concrete by Gravity Chutes

Description of Special Apparatus and Appliances used in Conveying and Distributing Material — Rapid Work and Reduced Labor

For handling and distributing concrete and delivering it into place in the forms, various arrangements of wheelbarrows, tracks, cars and elevators are used, while conveyors have been used in some cases. A method of an entirely different character is that of raising the concrete to an elevated point and then distributing it to the forms by inclined chutes, through which the concrete slides by gravity. This method has been employed on a number of works of varying character, and has been made a specialty by the Concrete Appliances Company, of St. Louis, Mo. While the method is used by other firms, this company has developed and patented special apparatus and appliances for the conveying and distributing of concrete by gravity. The accompanying details are by courtesy of Engineering News.

A typical arrangement of the plant on this company's system is shown in Fig. 1, but the booms are now set at an incline, to reduce the thrust on the tower. The elevator tower (rectangular or triangular in plan) is erected on a convenient part of the site. The concrete from the mixer is delivered directly into the automatic dumping skip, and at the top of the tower it is discharged into a hopper. From the bottom gate of this hopper it is discharged as required into a swiveling pan, and flows from this through a chute, or an elbow to receiving pans on the upper ends of the inclined conveyor pipes. These pipes are supported by booms, which also carry hoisting trolleys for handling the forms, etc. The

pipe may end in a vertical drop spout for filling column and wall forms, or it may have a swiveling adjustable inclined spout for distributing the concrete over a wide area such as a floor surface. By this flexible piping system the concrete can be delivered close to or at a distance from the elevator tower, and it is stated that it can be delivered in this way to a distance of 500 feet. For long distances, the pipes may be suspended from overhead cables and supported by intermediate towers. The various arrangements mentioned are shown in Fig. 1, but for each job they are modified or adapted to suit the plan of the site and other conditions.

Means are provided for conveniently raising the hopper and pipes as the work progresses. Four vertical timbers (A), fitted against the posts of the tower and connected by the upper and lower trolley track (B) and (C), form a skeleton mast. This carries the boom and its guys, so that the mast and boom form a complete unit which can be raised by block and tackle as the height of the tower is increased. On some of the earlier work the boom step and guy were carried by trolleys, so that they could be moved to any side of the mast or tower. The moving was found to be inconvenient, however, and two booms are now fitted on opposite sides. The cage carrying the main hopper and receiving pan can also be raised by tackle. For buildings of small area, no booms are required.

There appears to be no trouble in the way of separation or segregation of the materials as the concrete slides down the pipe chutes. In fact, it is claimed that the churning motion in the pipes serve to agitate and mix the concrete during its travel; with his agitation and the speed of movement there is no opportunity for the concrete to be at rest and begin to set.

Among the advantages claimed are rapidity of work

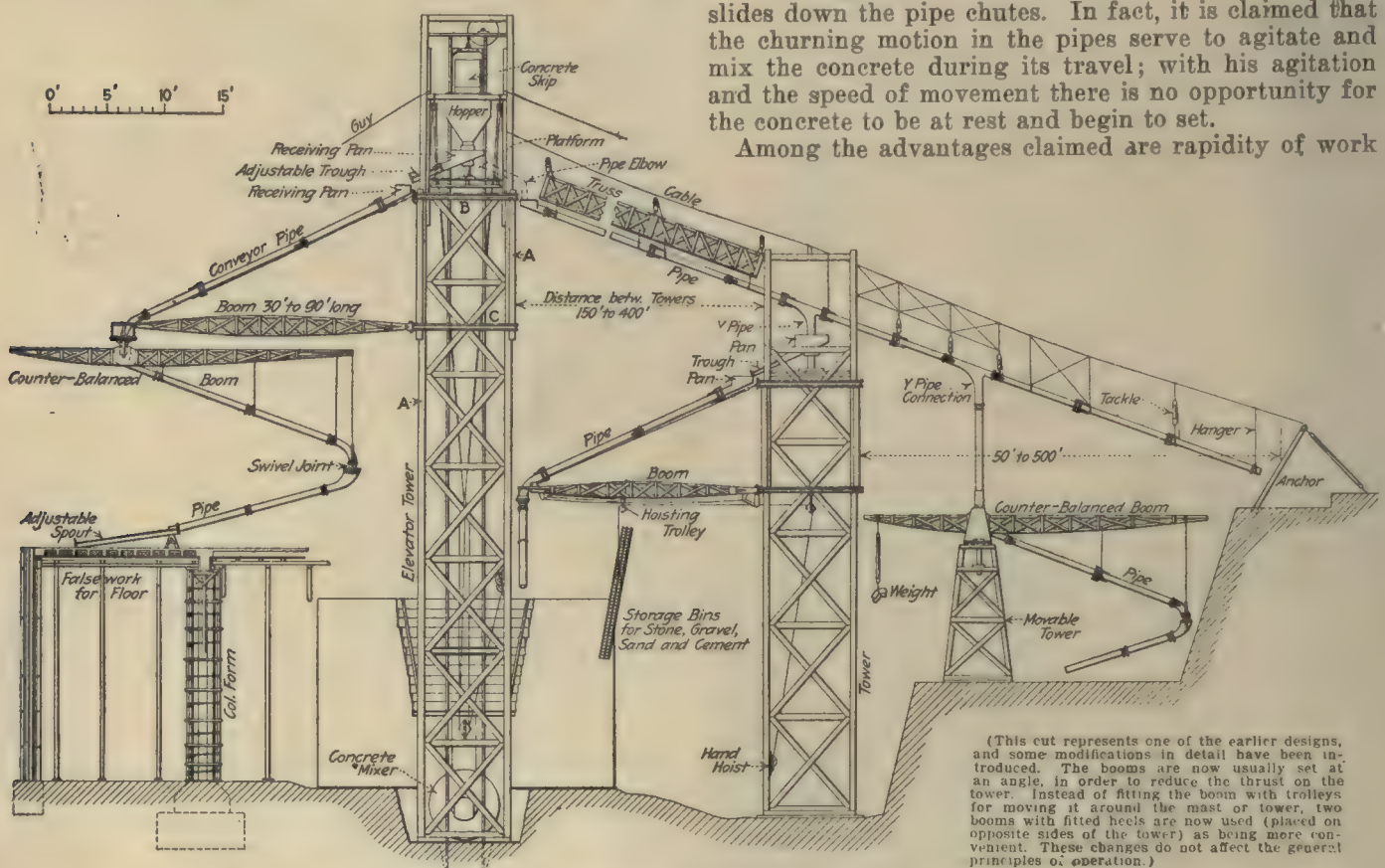


Fig. 1—Typical Arrangement of Plant for Distributing Concrete to the Forms by Gravity Pipe Chutes.

and a reduction in the amount of labor required. The force for ordinary work will include two men at the material bins, one at the mixer, one at the hoist, one at the cage at the top of the tower, and two men handling the end of the discharge pipe (for each additional pipe there will be two more men). It is said that with this force of seven men, from 35 to 40 cubic yards of concrete per hour can be mixed and deposited in place. It is stated further that ten men under this system can place nearly twice as much concrete per hour as 35 men working with wheelbarrows or carts. The cost of delivering concrete in place by this system is given as 25 to 50 cents per cubic yard, as compared with 40 to 75 cents by wheeled carts and 60 cents to \$1 by wheelbarrows.

It is to be noted also, that each batch of concrete can be deposited in place at one operation, instead of by separate wheelbarrow loads. The delays usually involved in such work by the wheelbarrow men waiting their turns at the mixer, the elevator or the dumping point are eliminated by this direct handling and distribution of the concrete. Other advantages are that large quantities can be handled quickly, the concrete in place is dense and homogeneous, the floor space is left unobstructed for the use of carpenters and other workmen, and damages to floors, etc., by wheeling over them, is avoided. The method is applicable to concrete and reinforced-concrete structures of all kinds.

In erecting a concrete building in Chicago, the Falkenau Construction Company used a main chute 10x18 inches, with auxiliary movable section in 13-foot lengths. All these were open troughs, and the main chute extended from an elevator tower. The company states that the minimum and maximum angles of the chutes were about 8 degrees and 25 degrees respectively. So far from the travel of the concrete in the chutes having any tendency to cause segregation, it appeared rather to mix the concrete more thoroughly.

The distribution of concrete by spouting was used in building the new plant of the American Sheet & Tin Plate Company, at Gary, Ind. This case is of interest and differs from the other works mentioned in that a portable mixing and elevating plant was used. We are informed by Mr. John M. Davidson, resident civil engineer of the company, that the plant used for this purpose by the contractors consisted essentially of a 1½-yard mixer mounted on a flat car and dumping into a bucket which was raised by an electric hoist to a height of about 70 feet. The bucket was then dumped automatically, the concrete falling into a hopper and passing thence along a steel-lined trough to an 8-inch swinging discharge pipe which permitted the depositing of concrete by gravity through the pipe within a radius of 50 feet. On account of the size of the foundations it was necessary in most cases to use a steel-lined trough at the discharge end of the spout in order to convey the concrete to all parts of the form.

The concrete was mixed very wet, as was the practice with other concrete on this work. No trouble was experienced from segregation of the concrete, but this was considered due in part to the fact that the concrete was spread by hoes to all parts of the form. It is believed that there would have been trouble of this kind if the concrete had laid where it fell, and if the forms had been narrow, but that such segregation would have occurred when the concrete was falling from the discharge pipe or spout rather than during its travel in the trough. The angle of slope of the spout varied from 25 to 50 degrees from the horizontal, as a rule the angle was about 35 degrees. Choking occurred occa-

sionally at the flatter slopes, and usually at the flared end of the spout pipe which received the concrete discharged from the upper trough. While very good results were obtained with this portable arrangement, the time required to shift the machine detracted from its efficiency. It is considered that the most satisfactory work with the spouting process would be in cases where a great volume of concrete is placed from one position.

A very similar method has been used in building the retaining walls for the approaches to the Detroit river tunnel. In building the approaches to the La Salle street tunnel under the Chicago river, the work is done in open cut for the length of one block at each end of the work. Here the concrete mixer is placed at the edge of the cut (travelling along as the work progresses) and dumps the concrete directly into the head of a sheet iron pipe, the lower end of which has a movable section for delivering the concrete at any point within its reach. This method is used for the arches as well as for the walls.

Difficult Sewer Construction

In another column are given the methods employed for constructing sewers in wet trenches and opinions held concerning them by engineers in a number of cities. In criticism of these methods the Municipal Engineer has the following to say:

In our opinion the supporting of the pipe in such a way that it must act as a beam is more or less unsafe, where—as is likely to be the case—the back filling under the pipe is not so thoroughly compacted as to slightly lift the pipe from its bearing on the collars or wedges. It is true that good pipe has considerable strength to support loads as a beam; but on the other hand there have been a number of instances when it has been broken by the superimposed weight, and when so broken it is apt to collapse entirely. Allowing the pipe to rest upon its bell also seems to us unsafe. Possibly no part of an ordinary sewer pipe is more easily broken than the connection between the body and the bell, and there would, therefore, seem to be a possibility of the crushing of the under side of the bell and possibly a cracking of the body of the pipe by any considerable weight which may come upon it. Moreover, if the weight is supported by the bells alone, we have pipes subjected to even more beam stress than when supported by collars at each end.

One other possible danger in connection with the practices described by most of the engineers quoted is that of the plank or other timber decaying and allowing the pipe to settle. As all of these methods are employed only in wet trenches it might seem that the timber would always be submerged and consequently would not decay. We presume that in the majority of cases the ground water continues to stand above the level of the plank and this would probably be the case. Sewer trenches are known to effect more or less drainage of the soil, but it does not seem probable that such drainage would extend below the bottom of the sewer, unless there were a sub-drain, in which case it is not probable that the plank would be used. Even should it decay it would probably lose its supporting power and crumble so slowly that the earth would gradually work in and take its place, or else would have become so compacted around the pipe that it would support it even when the wood had lost all its strength.

Probably the best practice is either the bedding of the pipe in a somewhat lean concrete placed under and part way up it; or, if this is considered too expensive, the placing upon the platform of a bed of gravel, cinders or

other porous material, as is done in New Orleans; this bed being so thick that the body of the pipe is supported without permitting the bell to rest upon the plank. Where there is no danger of the quicksand or other wet material rising bodily in the trench, but it is merely a case of soft material, any possible danger from decaying of the wood may be avoided by substituting for it burlap or bagging laid upon the soft material and covered with the gravel or other good bedding material; and the burlap serving to keep the gravel from mixing with the muck or other soft material below it.

There are, fortunately, indications that engineers are coming to realize that it is not extravagant to spend a little more money in constructing a sewer under difficult conditions. Too many engineers and superintendents, however, still seem to feel that, having obtained a good sewer pipe, the work of laying it should be done as cheaply as possible, no matter what conditions may be encountered. A sewer is as important to the safety of the citizens as the foundation of a building, and a failure in the former is much less liable to detection. Good engineering, therefore, requires that as much thought, care and expense be given to the proper and safe construction of sewers as of any other municipal structure or utility. Moreover, the increasing number of purification and pumping plants and the increasing extent of articulation in sewer systems call for greater care in excluding ground water and make even considerable expense in securing this an ultimate economy.

An unusual wood floor has been discovered in a small building in Derbyshire, England. It was carried by beams supported entirely by exterior walls without intermediate columns for piers. The width of the floor was about three-fourths of its length and was carried on two longitudinal and two transverse beams, all of them spaced nearly equidistantly and none of them long enough to reach across from supporting wall to supporting wall. Each beam reached about two-thirds of the way across the building and was framed at one end into the middle of a beam at right angles to it, the other being supported on the wall. The four beams were thus framed together at their middle points, forming a rectangle concentric with the outer walls of the building and with each of its sides about one-third the length of the parallel side of the building. The beams were mortised and tenoned together at their intersections and were covered with diagonal flooring boards. Another unusual wooden floor 60 feet square is said to have been constructed in Amsterdam without any beams or girders whatever, except on the exterior walls, where the corners were tied together with iron straps. The floor was really a solid wooden dome 4 1-2 inches thick with a rise of only 2 1-2 inches at the centre. It was made of three crossed courses of 1 1-2 inch boards "grooved and fingered" together. The first courses were laid diagonally at right angles to each other and the third course was laid transversely, all three courses being nailed together.

Reinforced concrete pipe for waterworks has been used for the first time in Scotland in connection with the Loch Bradan water scheme, for supplying the boroughs of Troon and Prestwick and a large part of the county of Ayr. According to the Surveyor, the pipe is 18 in. in diameter and is laid at a gradient of 1 in 400. The concrete tubes are laid chiefly in cut and cover, although at one place duplicate lines of pipe extend through 100 yards of tunnel.

Road Foundations of Cinders, Logs, Plank and Slag*

The improved roads of this country having foundations of material such as gravel, cinders, broken field stone, brickbats, etc., comprise only a small percentage of our total mileage of improved roads. Broken stone, brickbats, gravel and materials scarified from old pavements or roads are the most common in brick and bituminous construction, as well as for regular materials employed for such foundations, and are sometimes used in brick and bituminous construction, as well as for regular macadam surfacing. The thickness usually varies from 4 to 12 inches of such material well rolled and it should be filled as much as practicable with sand or other suitable material. Unless the subsoil is very porous and well drained, it is essential that this class of foundation have an impervious wearing surface. This is especially true of the regions where a cold winter climate prevails, as they would then also be subject to the disintegrating action of water and frost.

Other miscellaneous foundations consist of logs, forming a corduroy road, or of planks. The latter are more common, as they can usually be built at a less cost and give greater satisfaction. Such foundations should only be used when they are necessarily kept wet all the time, as is the case in localities which have to be protected by levees and have water practically at the surface of the ground continuously. It is not practicable to build any considerable length of corduroy foundation on account of its cost being so much greater than one of plank. A corduroy foundation is made by placing logs in the ground longitudinally with the road and about 3 feet apart, to act as stringers, the upper surface of these logs to be as nearly level as possible crosswise of the road. Logs are then placed across and as close together as possible and spiked to the stringers.

A plank foundation should be built by having 3-inch by 6-inch stringers placed longitudinally with the road and about 3 feet apart. These stringers should be sunk in the ground so that their upper surfaces are level and even with the ground in the same cross section. One-inch boards should then be laid across the stringers at an angle and spiked to them, on top of which another layer of 1-inch boards should be laid across at the reverse angle and all spiked together. This foundation is then ready to receive the surfacing material, the thickness of which will vary according to the usual governing conditions.

All kinds of slag from iron and steel furnaces and ore smelters have been successfully used in building the foundations for roads.

The slag is usually taken in the crucible or pots in its molten state on a tramway from the furnace plant to where it is dumped. There it accumulates in great piles and is allowed to cool, when it becomes practically a hill or ledge of stone. These dumps are then quarried similarly as is stone, or powerful steam shovels are used to excavate them, and the slag is thus broken into suitable fragments to be used in the foundation of roads, or by being run through a regular rock crusher all sizes desired may be obtained.

The acid slags will only form a physical bond when consolidated by a roller, but the basic slags not only form a physical bond, but a chemical reaction takes place in them when subjected to the conditions which usually exist in the foundation of roads, and results in the cementing together of all of the pieces, thus forming a sort of concrete foundation. Therefore, such material forms an excellent foundation when due care is used in its construction. The results obtained have been so satisfactory that slag is being used for the whole depth of the road surfacing material, including the foundation, and in some cases experiments have been made with other materials to bind the slag surface. After more experimental work has been done in this line, it seems probable that such construction will be successful and economical in some localities.

*From a report by Vernon M. Pierce, Chief Engineer U.S. Office Public Roads, presented at the Second International Road Congress at Brussels.

Methods of Laying Sewers in Wet Trenches

Practical Notes from the Experience of Numerous Engineers—The Plank and Wedge Method—Piles and Timber Foundations—Toronto's Practice

The American Society of Municipal Improvements, through its Clearing House of Municipal Information, has recently collected some information concerning methods employed in various cities in laying sewers in wet trenches. This was in response to a request for information concerning the advisability of laying sewer pipe upon plank and holding the same to line and grade by wooden wedges, placed back of each bell.

In New England, no engineers reported having used this method. The city engineer of Beverly, Mass., has employed iron pipe for wet trenches, the particular trench in question being in very wet, running sand. The pipes were blocked up at the bell ends until an inch or so above grade. The joints were then calked by oakum, followed by lead wool, after which two men using a piece of 6-inch x 6-inch timber as a rammer drove the pipe to grade. No other method was reported from New England, aside from the common practice there of first laying an underdrain surrounded by crushed stone or gravel, thereby draining off the water from the trench and permitting the laying of sewers directly above it on comparatively dry ground.

Plank and Wedge.

In the Central States a number of engineers reported having used the plank and wedge method. From New York one engineer reports that "In wet quicksand this is about the only plan I have found at all practical, but a trough or cradle was often necessary instead of simply a plank. Without such a foundation the pipes will not be apt to stay in place at all." Mr. E. B. Codwise, of Kingston, N. Y., states: "I have had 18-inch to 24-inch pipe sewers laid on a timber and plank foundation held in place by wooden wedges. Some such sewers were built 15 to 18 years ago and I have never heard of any trouble from them." From Elizabeth, N.J., Mr. W. H. Luster reports having laid 500 feet of sewer pipe in this way without having experienced any trouble. Among the Pennsylvania reports, Mr. B. E. Briggs, of Erie, states that in bad trenches of running sand he prefers to lay the pipe on plank, but block it up with dry earth; two pieces of 2-foot x 6-foot or 2-foot x 8-foot laid lengthwise of the trench being used. Mr. B. K. Finch, of Wilkes-Barre, has used the plank, but in place of wedges employs collars or blocks of wood having an arc of a circle sawed in the top to fit the pipe, which collars are placed under the pipe resting upon the plank. Mr. Harry T. Barker, of New Brighton, Pa., reports this method having been used very satisfactorily and states: "The plank ought to outlive the usefulness of the sewer which rests upon it." Still another states that his experience warrants him in recommending this plan, without giving details. In Wilmington, Del., practically this plan has been followed, and is reported by Mr. A. J. Taylor, chief engineer of the Sewer Department, to have given very satisfactory results so far as known. Mr. Hatton of that city writes somewhat at length concerning this method as follows: "I have supported miles and miles of sewer pipe in wet trenches upon timber foundation, laying a 2-inch plank on its flat side upon the sub-grade, and upon the top of this plank placing two cradle blocks under each length of pipe, if it to be 2 feet or 2½ feet in length, and three cradle blocks if it be in 3-foot lengths. These cradle blocks are usually made of 3-inch or 4-inch timber cut out to fit the external radius of the sewer pipe and toe-nailed to the plank on the bottom. In laying pipes under these conditions I am careful to have the bottom plank placed to precise line and grade, and then, the blocks being all of the same pattern and the pipes of uniform

thickness, it is an easy problem to lay them all to a true line and grade.

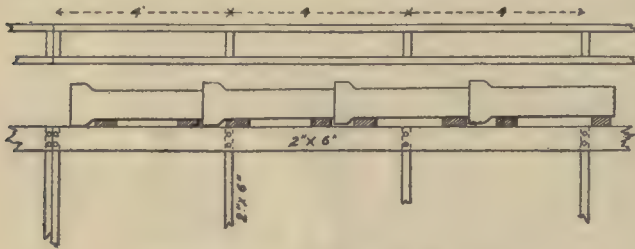
"I would not recommend the use of wedges under the pipes because the stability of these wedges would depend entirely upon the manner in which they were placed by the pipe-layer, who is usually working under most adverse conditions, it being possible for the position of the wedges to be changed without the knowledge of the inspector; but if the cradle blocks are all made uniform the pipe layer cannot possibly make any mistake, as the inspector can readily see whether these blocks are placed under each pipe and toe-nailed to the foundation plank." Incidentally, Mr. Hatton states that he has recently done a considerable amount of work in wet trenches using for jointing material a mixture of cement with soft pine tar in the proportion of two cement to one tar, the mixture being worked up to the consistency of putty and inserted in the joint in this condition.

A number of engineers from the Central States report other methods of handling sewers in wet trenches. City Engineer Allen, of Syracuse, reports that his plan is to "Excavate from 6 to 12 inches below grade and fill in with bank sand and gravel; also fill around and over the pipe to six inches above the top with the same material. Joints are made with a special gasket and Portland cement." He has considered the plank and wedge method, but fears that it would not be successful in maintaining the sewers at grade and the pipe or bell would be crushed with the load. Mr. Theo. S. Oxholm, of Richmond Borough, N.Y., has used a foundation plank where the bottom persisted in squeezing up from the flowing sand, the plank being fastened to the sheeting to hold it in place. Wedges were not used, however. In Bronx Borough, N.Y., the plank foundation method has been used, but preference is given to a concrete bed "as the support is more uniform and there is less liability to breaking from unequal bearing." Professor H. N. Ogden, of Ithaca, N.Y., has laid pipe in V-shaped wooden troughs with concrete placed around and under the pipe. He believes the plank and trough method would be useful in many cases. Mr. Walter Greenaleh, Commissioner of Public Works of Albany, N.Y., reports that in that city it has been the general practice, in the case of wet trenches, to lay sewer pipe on a concrete bed. His objection to the use of plank is that a much longer length of trench must be kept open while the plank and sewer pipe are being laid, whereas with concrete it is necessary to open the trench for only a few lengths at a time. Mr. R. A. McClanathan, city engineer of Niagara Falls, states that he has laid an 18-inch tile sewer in a 12-foot cut with three feet of quicksand at the bottom; in which case he "used planks of various lengths, usually not over 4 to 6 feet, being unable to bottom more than that length ahead of the work; wedging up the pipe temporarily just enough to hold and immediately bedding it and covering it to a thickness of 2 inches with gravel concrete. Six months after this sewer was finished I examined it and the greatest settlement found at any one point was about 1¼ inches out of grade. The quicksand in this trench was very soft, so much so that I excavated a good part of it by attaching a hose to the hydrant, stirring up the sand ahead of the work and working it back through the pipe, afterwards scraping it out from the sewer outlet." The same engineer also built a 48-inch brick sewer in quicksand by using a plank cradle formed of three planks 10 inches wide and 10 feet long, laid to break joints. There was no appreciable settlement in this sewer.

Mr. Edward S. Rankin, engineer of sewers of Newark, N.J.,

reports having used the plank and cradle method, a cradle being placed under each end of each pipe. He believes, however, that there is danger of the pipe cracking with this style of construction unless very great care is taken in back filling around the pipe; also that they obtained as good results without this blocking up. The city of Plainfield, N.J., has formerly had considerable trouble with sewers in wet trenches, and City Surveyor Andrew J. Gavett states that most of their sewers in wet trenches are now laid of cast iron. Mr. Edw. D. Rich reports that while city engineer of Summit, N. J., he used cradles consisting of two 2-inch x 10-inch plank laid flat and connected by cross ties of 2 x 4's spaced so as to have one come under each end of the pipe. Wedges cut to fit approximately the outside of the pipe were placed on top of the 2 x 4's to hold the pipe in line. In quicksand such cradles had to be braced to the sheeting to prevent their being raised above the grade by the upward pressure. "This method holds the pipe from 4 to 6 inches above the bottom of the trench, and if pumping is continuous the joints can be kept dry until set. Back filling should be carefully made around the pipe, and if the trench is deep the pipe should be concreted. The only objection I can see to the cradle method is that the pipe rests largely on the two points; and the back filling should be compact enough, whether of earth or of concrete, to prevent this."

In Carbondale, Pa., Mr. Benj. Anthony always puts a flat stone under the bell, using wedges for holding the pipe in



Plan Employed at Oak Park, Ill.

position on this. Mr. N. S. Sprague, Superintendent of Construction of Pittsburg, states that their method, where a plank foundation is used, is to bed the pipes on concrete about 3 inches thick so as to insure a uniform bearing along the full length of the pipe. The use of wedges he considers bad practice. Mr. S. Cameron Corson, Borough Engineer of Norristown, Pa., advises sub-drains of tile or otherwise for draining the ditch, on top of which he would place concrete carried up to the haunch of the pipe, if necessary covering the pipe entirely after the joints have been properly connected. "In some instances most excellent results have been obtained by a plank reinforced with concrete, using bell-less pipe entirely, especially made or by breaking off the bells. If the special bell-less pipe is used on top of the planks, a cement mortar collar may be placed entirely around the joint. The water passes down the trench under the plank."

Possibly no city of the south has had more extensive experience with wet trenches than New Orleans. Mr. Geo. C. Earl, general superintendent of the sewer and water works construction there, describes their method as follows: "Our practice in laying sewer pipe in bad bottoms is to lay either a horizontal plank under the pipe or, if the bottom is very bad, floor over the whole trench bottom. The top of this plank or flooring is laid deep enough to give a good strong clearance for the bell of the pipe. Over this shells or gravel (porous material through which water will run freely) is spread and the pipe laid to grade there and filled around and up at least to the centre of the pipe with similar material. We prefer to have the pipe nowhere in contact with the foundation plank, sheeting or bracing of the trench." In Knoxville,

Tenn., City Engineer Thompson has used the plank and block method and finds it satisfactory in some cases. Another method he has used "is to take out the soft material below grade and refill to a depth of 6 to 12 inches with steam coal cinders. Where cost is not to be considered, but it is desired to obtain the best results, or where foundation is very unstable, I would recommend a concrete base of 4 to 6 inches. Sometimes a cushion of sand, fine stone screenings, pulverized slag or cinders can be used to advantage on this base, in which to bed the pipe and render it less liable to breakage." Dallas and Austin, Tex., both report having had no experience with wet trenches, a condition on which they can be congratulated. Mr. F. F. Colby, city engineer of Chickasha, Okla., has laid a large amount of sewer in wet trenches and finds the plank and wedge method the best he knows of for holding the pipe in shifting ground.

Construction of Wooden Foundation.

Mr. W. F. Sargent, of Oak Park, Ill., reports having had considerable experience in laying sewers in saturated sand where the "well point" system was used with wonderful success (as at Gary, Ind., in 1908). In other cases he has supported both ends of each length of pipe on cross plank fastened to the sheeting. In a particularly difficult case a sewer was supported on a wooden foundation constructed as follows: 2 x 6 planks were driven as piles in the bottom of the trench every 4 feet, the 6-inch being crosswise of the trench, and 2 x 6 stretchers, with the 6 inches vertical, were nailed one to each edge of the plank piles, and with their top edges slightly below sewer grade. The pipes were supported on this by short pieces of plank laid across the trench and resting upon the tops of these stretchers. This plan he reports to have been perfectly successful in a 12-foot trench in sand which was completely saturated with water.

While a number of reports were received from Ohio (only one city, Columbus, reports using the plank and wedge system, stating that it works well. In Cleveland a timber cradle or grillage has been used in some cases, but in addition thereto a bed of concrete is made so as to insure a proper support of the pipe.

In Grand Rapids, Mich., the plank and block has not been used, but gravel is generally placed for a foundation where the soil is insecure. All reports from Kansas indicate that the trenches there are never wet enough to make this or any similar method necessary. Ogden and Provo, Utah, report having used the plank and block method and finding it satisfactory. City Engineer Rust, of Toronto, states that in that city the pipes are laid on planks, but are usually supported by concrete under and up to the haunches of the pipe. In some cases wooden cradles are used instead of planks, but here, also, the concrete bed is added.

Word has been received at Winnipeg that the first unit of the city's hydro-electric generating plant for Point du Bois is ready for shipment. It has been tested at the plant of Vickers Sons & Maxim and found most satisfactory. The testing was done under the supervision of Mr. Glasco, representing the construction engineers, and a firm of British experts, representing the city. This unit, and there are five of the same design, will develop 3,000 kilowatts, and the second unit will be placed on the testing floor at once.

Toronto's building business was greater than that of Detroit last year. City Architect McCallum has received the report from the latter city, showing that the permits issued there totalled a value of \$17,250,000, an increase over the preceding year of 28 per cent. Here they were \$21,250,000. The increase here over the preceding year was 16 per cent.

The Construction of Good Gravel Roads

Careful Survey and Suitable Plans the First Essentials—Equipment Required—Gravel Bed and Shoulders—Harrowing and Rolling—Maintenance*

A well graded and well drained earth road is necessary for the foundation of any kind of an improved road, therefore money expended on such work is not lost even though it be several years before the road receives a hard surface. In building any good road, the first essentials are a careful survey and suitable plans.

Grading.—The cost of grading depends upon the kind and amount of earth that must be handled and the distance it has to be moved. Where old roads have been regarded for the purpose of building state reward roads, the cost has usually run from \$200 to \$400 a mile—\$300 being a fair average. A few hilly roads have been graded at a cost of more than \$2,000 a mile.

Tools Required.—For rather low turnpikes no tool is so efficient as the road grader in skilful hands. For turnpikes with deep ditches, the flat, or Doan scraper, is excellent. This tool is not intended to move earth far, but spreads it evenly over the road when rightly handled.

The drag scraper is good for hauls up to 150 feet. Between that distance and 700 feet, wheel scrapers are best, but to use them economically, there should be enough scrapers working, unless moving soft sand, to keep a snatch team busy, and where the soil is heavy another team on the plow. For hauls longer than 700 feet it is cheaper to use wagons.

Drainage.—In most soils sufficient drainage is provided by building the ordinary turnpike with side ditches or gutters just large enough to provide for the free flow of water that naturally comes to the road. In clay soils the bottoms of the side ditches should be not less than 2 feet below the crown of the road, unless supplemented by tile drains. Especial pains must be taken to make sure that the ditches have free outlets.

Tile drains are a necessity in all springy soils. A 4-inch land tile along the upper side of the road to cut off the spring water before it reaches the road bed will usually prove sufficient. A line of tile can be placed on the other side later if found necessary. It is always advisable to cover the tile to a depth of 6 inches or more with gravel or cinders, and in very wet soils the drainage will be facilitated by filling the entire trench with some porous material.

In clay soils trenches should be cut through the shoulders described in the next paragraph, making outlets into the side ditches for water that may collect in the gravel bed during construction, and later before the surface becomes hard and waterproof. Such trenches should be 8 inches or more in width and slightly deeper than the gravel bed. They should be placed at all low points in the grade and not farther than 100 feet apart in retentive soils and filled with coarse gravel when the first layer of gravel is put on.

Gravel Bed and Shoulders.—After the rough grading and drainage above described have been completed the gravel bed should be formed in the central part of the road grade by placing shoulders of firm earth on each side and far enough apart to retain the proposed width of gravel, which the law provides, shall be not less than 9 feet wide nor less than 6 inches in depth. It may, however, be such greater width as the commissioner may specify and as deep as 12 inches if necessary, but where any greater depth than 6 inches is used the gravel should be put on in two or more layers as herein described.

Where the road grade is as high or higher than the finished road should be, the shoulders are best formed by scraping earth from the centre to each side with the four-wheeled grader. But

first the road should be leveled by driving the grader back and forth on the centre of the turnpike, with the blade set square across, so as to cut off the high places and deposit the earth in the hollows, using the grader as a planing tool. A double row of pickets set 1 foot farther out on each side than the margins of the gravel bed, so as to clear the hubs and whiffletrees, is a convenient method of staking out the grader work.

If the old road grade is much too low, it is usually cheaper to regrade and turnpike before beginning to form the shoulders. But should the old bed be about the right height for sub-grade, shoulders may be formed by bringing up earth from the sides with the grader provided it can be spared from the gutters or ditches. If not, earth should be brought with scrapers or wagons from other places where it can be spared. Many places will be found where the centre can be notched out, leaving the undisturbed sides for shoulders, using the earth thus obtained to build up shoulders on slightly lower ground.

The shoulders thus formed should extend to the side ditches or gutters with the same grade and curvature as required for the finished road, viz.: an average rise of 1 in. for each foot of distance from the inner edge of the ditches or gutters to the centre line of road. Thus, an 18 ft. roadway would have a 9 in. crown and a 24-ft. roadway a 12-in. crown.

After the machine work above described has been completed, lines should be set up on the margins of the gravel bed and enough hand trimming done with mattocks and shovels to bring the gravel bed to the exact subgrade, giving it the same width and curvature as required for the finished road. Gravel is too expensive a material to fill hollows with, for they can be filled with earth from the shoulders for less money than gravel can be shoveled into wagons at the pit, and every high point protruding into the gravel means a defective place in the finished road.

Gravelling.—Next to proper drainage, the most important thing in building gravel roads is to secure a good quality of gravel. Authorities have differed as to the requirements of suitable road gravels, most of them in my opinion, placing too much stress on the immediate packing qualities. Indeed the average township commissioner and farmers generally have become so imbued with the idea that it is necessary to use a gravel that will pack quickly that they have almost lost sight of the fact that the only thing which makes a gravel road better than an earth road is the pebbles—real stones—that it contains and is dependent upon to bear up the traffic and resist wear.

The most common material sought after for the binder in gravel roads is clay. But, considering all kinds of weather, it is probably the poorest cementing material we have. If present much in excess of 20 per cent. of the mass it will make mud whenever there is a prolonged wet spell. Ideal clay gravels contain only enough clay to coat the pebbles, with no free lumps. Such gravels are excellent for the first layer on sandy soils, but sand gravels are much better for the first layer on clay and loamy soils.

Gravels that come from the pit with the pebbles cemented together, even though they contain no clay, will re-cement in the road and become harder than they were in the pit. Tests of specimens of this kind always show that there is much lime present and usually some iron, both of which are excellent cementing materials. Briefly, the experience of the State Highway Department warrants the statement that there are few, if any, bank gravels in Michigan that do not contain enough

*From the Third Biennial Report of the Michigan Highway Department

limestone and other soft pebbles which grind up under traffic and furnish sufficient binder to cause them to consolidate in a few months time, if separated from the surplus sand and earth, and properly treated after applying to the road.

Testing Gravel.—To insure a sufficient pebble content the State Highway Department's specifications require that the gravel for the first course shall be good clean bank gravel, not less than 60 per cent. by weight, a larger per cent. if possible, of which shall be pebbles that will be retained on a screen of 1-8 inch mesh and pass through a screen of 2½-inch mesh. The gravel for the top course must be the same, except that no pebbles are allowed in this course too large to pass through a screen of 1½ mesh.

Screening Gravel.—Michigan is full of gravel pits which are too sandy to use pit run. In most cases excellent gravel can be obtained from such pits by screening, the cost of which can be kept down to a little more than double the cost of shoveling pit run gravel into wagons if cheap power driven portable screening plants are used. As the screened gravel is delivered into elevated bins from which it is drawn by gravity into the wagons there is no further cost for loading. Next in order of cheapness comes the wagon screen. This is a long screen about the length of the wagon box and 3 ft. wide, which is attached to the far side of the box. The gravel is shoveled over the box against the screen, allowing the pebbles to slide back into the wagon while the sand falls through the screen onto the ground on the opposite side. Hand screening is more expensive, frequently costing as much as 40 cents per cu. yd. for the screened product.

Applying the Gravel.—After the road has been graded and shoulders formed as above outlined gravel of the quality described should be put on the road in two courses and each course compacted separately.

Gravel will compact to about 80 per cent. of its depth, loose measure, as applied to the road, provided it is shouldered in and not allowed to waste away to the sides. If the compacted depth is to be 8 ins. and the width 9 ft. as required to secure state reward, it will take about 1,500 cu. yds. of gravel to the mile, and it is best to make the first layer 6 ins. deep loose measure, and the second layer 4 ins. deep loose measure.

To reduce the amount of spreading to the minimum it is advisable to place the gravel on the 9 ft. road bed by dumping two loads side by side, stringing them out just far enough to make the required depth. Thus, if two loads of gravel containing 1 yd. each are dumped on such a road bed, they will reach 12 ft. along the road and spread just 6 ins. deep. This requires only a very little drawing out of each load at the ends. Should the teams draw 1½ yd. loads, they would reach 18 ft. down the road and spread to the same depth, necessitating moving ahead about a wagon length to dump the second half of each load. The top layer would be dumped in the same manner, bearing in mind that to spread only 4 ins. deep the same sized loads will reach a half farther—making two 1-yd. loads each 18 ft. and two 1½ yd. loads reach 27 ft. The distance two loads should reach is best gaged by setting little stakes the proper distance apart in the shoulders along the margin of the gravel bed. These stakes can be moved ahead as the work progresses.

Harrowing and Rolling.—Usually the gravel should be placed on the road commencing at the end of the road nearest the gravel supply so that the teams will aid in packing. As soon as the 30 or 40 rods of gravel have been spread on the road it should be harrowed with a spike tooth harrow, preferably one of the lever type. If but few teams are hauling, the harrow may be used twice daily—just before quitting time at noon and again at night. If a 100 yds. or so of gravel are hauled to the road daily, one team should be working on the harrow all the time. The harrowing should be done the same for both courses. As soon as the gravel has been well wet by rains it should be rolled with the best roller available. For this purpose a weighted

field roller may be used if one can be had that is strong enough to bear weighting to three or more tons. A heavier roller of larger diameter is preferable, and where possible it is better to use a regular road roller, either of concrete or cast iron, weighing not less than four tons. In some places such rollers have been hauled with traction engines, the engine wheels doing as much or more compacting than the roller. Where a power roller is obtainable, it is better and more efficient than any of the others.

Each course should be rolled separately, commencing at the sides, rolling lengthwise of the road, but gradually working towards the centre. In the final rolling the whole surface of the roadway, including the shoulders, should be rolled and left in such perfect condition that water will flow without obstruction to the side ditches. The grader or float may have to be used at times to preserve the crown, but the harrow should be kept running until the rolling is completed, or until the gravel becomes so well compacted that the teeth refuse to penetrate the surface.

Maintenance.—Gravel roads completed in the prescribed manner may not become thoroughly compacted, no matter how well they are rolled, until after several months of travel—usually not until they have passed through one winter. During this formative period the road must be looked after and kept free from wheel ruts and hollows. It can usually be kept smooth by the systematic use of the plank float, the timber or angle iron drag, or sometimes by the careful use of the road grader. The last named tool often does much damage by digging up hard places, while the former tools only shove the loose gravel forward, gradually pushing enough of it towards the centre of the road to preserve the crown, but always depositing it where there is a hollow. Wherever there is an extra deep wheel track or other evidence of rutting and not enough loose gravel to completely fill the depressions, a little new gravel of the best quality should be put on before the floating is done. This work should always be done immediately after rains, preferably when water is still standing in the little hollows, as then they can be seen more readily, and at such times the gravel is in the best possible condition for packing and uniting with the hardened road bed. Such treatment systematically followed up will preserve the gravel road in as good condition as when new until the surface has worn down so far that it needs a new top.

About 7,000 miles, or approximately one-tenth of the total road mileage of Michigan, have been reported as surfaced with gravel. Some of these are very good and some scarcely better than common earth roads. This is caused, first, by placing gravel on improperly graded and undrained roads and, second, by using gravel which contains too much sand or too much loamy clay. Since the state reward road law became operative there have been built about 350 miles of gravel road which have received a state bounty. These roads have ranged in cost from a little less than \$1,000 upwards to \$3,000 per mile, the average being not far from \$1,500.

The treatment of boiler water with lump and with hydrated lime has been tested by Mr. C. E. Thomas, general foreman of waterworks, Illinois Central Railroad, whose findings regarding the comparative merits of the two materials are embodied in a paper before the Illinois Water Supply Association. A test was made on 24 tanks, each containing 65,000 gallons of water; 12 tanks were treated with hydrated and 12 with lump lime, 3,432 pounds of hydrated lime and 2,808 pounds of lump lime being used. Although about 22 per cent. more of hydrated lime than lump lime was used, the lower cost of the hydrated lime showed a saving of about 2½ cents per tank over the lump lime. A more uniform treatment was maintained by the use of the hydrated product and the uncertain and deteriorating effects of storage upon lump lime were eliminated.

Municipal Construction at Fort William

Comparative Costs of Contract Work and Day Labor—The latter not an "Inefficient Monstrosity"—Methods and Cost of Paving

Some interesting comments on the subject of day labor, together with comparative costs on one or two examples of sewer construction, are given in the 1910 annual report of Mr. H. S. Hancock, jr., city engineer of Fort William, Ont. The report also contains a considerable amount of useful information on paving work, and the following general extracts from the various sections will doubtless be of interest:

The contract sewer on Amelia street, consisting of 692 feet of 15-inch tile and 1,296 feet of 12-inch tile averaged complete \$6.68 per foot, while a similar sewer on Christina street with 1,200 feet of 15-inch tile and 300 feet of 12-inch tile cost only \$3.70 per foot. Of course, the extra work on Edward street and two flush tanks probably accounted for an additional 50c. a foot to the contractors, and they undoubtedly made good money to which were largely avoided by their skill and energy, but, nevertheless, the comparison is a distinct tribute to the foreman on the Christina sewer. On Mary street, however, constructed during the last three weeks in about 15 inches of frost plus a macadam road to be picked and the bugbear of winter work in picking back-filling, the cost rose to \$6.69. Of course it was all 15-inch tile as compared with 60 per cent. 12-inch tile in the case of Amelia, but it still fails to reveal any gross negligence.

The contract sewer on May street does not lend itself readily to comparison as the excavation was much shallower than either May or Brodie South, but considering that on these latter streets all sewer connections had to be reconnected from the old sewer to the new, I am more than satisfied with the showing made.

The Francis street-Edward street contract was undertaken by day labor after receiving the following tenders: J. J. Flanagan, \$51,000; E. S. Rutledge, \$51,685; Stewart & Hewitson, \$51,750; Laidlaw & Grant, \$54,000; Stewardson Bros., \$60,761; H. R. Murphy, \$62,000; A. Cameron, 64,145.

The actual cost without engineering and inspection is \$40,232.54. Total cost including engineering and inspection \$41,371.88, or a saving under the lowest price bid of over \$10,000. The machine cost \$5,200, and a charge has been made against this job for its use based on a life of five years and working 100 days a year, whereas its life is more likely to approach fifteen years. In any case, this decrepit organization has made something over \$5,000 for the city and presented it with the machine. This also in view of the fact that a Lidgerwood cableway would have cost \$1,000 less and saved over \$1,000 of expense in crossing the C.N.R. track, a total saving of \$2,000, an economy which I did not feel justified in effecting on this job as the Lidgerwood machine can not be used in trenches under eight feet in width, whereas the Carson machine we have purchased can be used in any of our trenches, and its future usefulness fully warrants the additional expenditure.

Sewer Purification.

Some time in the future, possibly five years hence, probably nearer twenty years hence, you will face the problem of sewage disposal. To attempt to treat sewage as suggested, with a septic tank at each outlet, is not practicable. When the time comes it will be necessary to instal a separate sanitary sewerage system from which the sewage will be pumped to the tanks and filtration beds. The present combined system can then be utilized for storm and flood water. This change, in my opinion, cannot be necessary for many years in the case of Fort William, in fact, may never be necessary as there is no question of the contamination of any water supply, but I wish to warn you that any attempt to instal separate disposal plants at each outlet can only be productive of enormous expense and continual disappointment. When the proper time comes a separate system may

be necessary, but until then you should resolutely refuse to adopt any other scheme.

In this connection there has already been some comment on the pollution of the Neebing river. It is obvious that the increase of navigation on the Kaministiquia is rapidly driving boats and canoes from its surface. The Neebing river offers an alternative if the sewage does not become offensive by the disturbance of the water. My idea to overcome this objection and at the same time make this river the best stretch of pleasure water possible is to build an intercepting sewer down both banks of the river. These sewers would be perfectly parallel with their covers about three feet above the water level and these tops finished as a sidewalk and dock about twelve feet wide of reinforced concrete. Water for flushing could be drawn from the upper waters of the Neebing river. This would give



H. S. Hancock, Jr., City Engineer of Fort William, Ont.

you a pleasure canal, say, seventy-five feet wide, spanned by ornamental concrete bridges that would be superior to anything of the kind on the continent and the cost would be far less than you suppose. I would ask you to study this scheme and I think that in about five years you will be ready to carry it out.

Roads, Pavements and Sidewalks.

During the past year the quantity of paving in the city has been practically doubled. Asphalt block has been used throughout, and practically all the main business streets in the centre of the city are now paved with this material. On Syndicate avenue centre pole construction was adopted for the street railway and all other poles removed from the street. This improvement combined with a new 12-foot reinforced concrete sidewalk on both sides of the avenue has produced the finest street in the city. The cost of this work has been considerable, but is, nevertheless, low considering the amount of excavation necessary in some parts and the amount of fill in others to reach the new grade.

Concrete sidewalks have all been constructed on the reinforced slab principle and I am still confident that this class of

construction will outlive any other in this climate and subsoil.

The 12-foot walks built this year show a substantial saving over last year's prices and are certainly considerably less costly than a rockfill walk of similar width and depth of fill.

The 6-foot walks all show a higher cost per square foot than the 12, but this is only natural when one considers that the supporting walls of a 6-foot walk are almost as costly as those for a 12-foot walk with only half the number of surface feet to share the cost. However, when the grade has to be raised to any extent, the superior results obtained by this method of construction fully warrant its use.

On the other hand, in strictly residential districts some cheaper form of construction must be devised, and I would suggest that residential concrete walks be built at the same time as, or after, the boulevard. Then make a shallow excavation of say six inches in which should be laid two inches of gravel or cinders, and on this bed a slab of 4-inch concrete properly reinforced and divided into sections five feet or six feet square. In case of settlement or raising from frost, the affected slab could be barred up and rebetted at small expenses without danger of breaking the slab. After the boulevard has been filled this construction should cost between 15c. and 18c. per square foot.

Macadam roads have been to a large extent held in abeyance this year as hard trap rock was difficult to secure because of the large quantities of rock used in other branches of construction.

Since the growth of automobile traffic, it may be taken as an axiom that the plain or water bound macadam road is not satisfactory either from the viewpoint of service or dustlessness, and that some binder of a cementing tendency is essential.

For cheap and effective road construction, I think the best of the bituminous binders is Tarvia X. It has been used in a large number of cities in Canada and has given good results on roads of ordinary traffic as distinct from heavy city traffic, for which a more substantial paving is necessary, and I think you will act wisely in laying some experimental pieces of this road.

Also, the Roemac system of road making seems, on all the evidence that can be procured, to make an excellent roadway. The evidence from England and Scotland is overwhelmingly in its favor, but as it has only recently been introduced into this country, evidence is not so easily obtained. The city of Port Arthur has laid an experimental piece this season. The department of highways of the state of New York, who spend, I think, some ten millions of dollars annually on roads, state through their first deputy commissioner: "We built about a mile of highway under the Roemac system in 1910. So far this road has been very satisfactory and we are seriously considering continuing the extension of this work next year. We feel justified in the way the road has turned out in giving it a more extended trial, and will do so next year."

The construction of the Roemac road is somewhat similar to Travia X, but the bituminous binder of the latter is replaced in Roemac by a solution, which, I understand, contains caustic soda, sugar, molasses and several other ingredients not divulged by the makers, and is mixed with carboniferous limestone to form a matrix, 15 gallons of the solution being thoroughly mixed into every cubic yard of limestone.

The preparation of the subgrade is of the greatest importance and must be thoroughly sound and compact. Upon this subgrade a layer of the matrix is laid, the amount depending on the finished thickness of the macadam, but approximately $\frac{1}{8}$ -inch matrix for 4-inch of 2-inch stone. The rock which should be trap, basalt or granite is then spread over the matrix and thoroughly rolled with a ten-ton roller until a slurry appears on the surface, at which time all the voids of the rock are filled with the matrix. It is undoubtedly a process worthy of the most serious investigation and it may possibly prove the ideal roadway of its type.

Several roads have been improved by gravelling or by a layer of crushed rock.

The following tables give details of cost and progress:

PAVING—

	Cubic Yards.	Rate.	Total.
Victoria ave. (Syndicate to Vickers) .	4910.4	\$3.89	\$ 18610.42
Donald st. (Syndicate to Brodie) . . .	1362.2	3.36	4587.15
Syndicate ave. (Victoria to Duncan) .	10406.	4.63	48241.62
Donald st. subway	198.2	315	624.33
	16876.8	\$4.27	\$72063.52

Average rate per cubic yard for all paving constructed, \$4.27.

The paving at present laid in the city, including that laid by the street railway department by years, is as follows:

1906	988 square yards
1907	5,878 square yards
1908	12,930 square yards
1909	4,216 square yards
1910	23,251 square yards

Total 47,263 square yards

BOULEVARDS—

	Feet.	Rate.	Total.
Syndicate ave. (Ridgeway to Duncan) . .	984	\$.65	\$ 639.60
Archibald st. (Arthur to Ridgeway) . . .	1106	.69	762.60
Dease st. (Simpson to McKenzie)	1050	1.34	1408.35
Syndicate ave. (Leith to Dease)	2604	.76	1981.77
Catherine st. (Arthur to Ridgeway) . . .	1116	.66	741.36
	6860	\$.80.6	\$5533.68

Average rate per foot for all boulevards constructed, 80.6c.

CONCRETE WALKS—

	Feet.		
John St. E. (Victoria to Miles) . . .	6	2,700	38c. \$1,029.36
Miles st. s. (May to Brodie)	6	1,242	45c. 564.30
Frederica st. (Edward to Brown) . .	6	4,032	46c. 1,885.08
Miles st. n. (Simpson to Lane) . . .	6	787	45c. 354.15
Cummings st. n. and s. (do.)	6	1,574	44c. 701.23
Victoria ave. n. (Vickers to Syndicate)	12	7,674	32c. 2,363.15
Donald st. n. (Brodie to Syndicate) . .	12	2,406	30c. 721.80
Donald st. s. (Brodie to Syndicate) . .	12	2,406	30c. 721.80
Syndicate e. & w. (Victoria Ridge-way)	12	39,408	30c. 12,177.06
		62,229 at 32.9	\$20,517.93

Average rate per square foot for all concrete walks constructed, 32.9c.

Asphalt pavements in Berlin, Germany, aggregate about 45 per cent. of the total paved area of the city, according to a United States consular report. About 53 per cent. is stone pavement and 2 per cent. wood.

Artesian wells in London are being sunk by a number of firms in order to secure water at lower cost than it can be purchased from the Water Board. "The Builder," London, points out that the water level in the chalk formation has been falling at a rate of 2 feet a year, and that if the subsidence continues many of these private wells will cease to be effective after a time.

The writer has in mind two buildings, almost identical, one of structural steel and one of reinforced concrete, and both used for printing purposes. In the case of the steel building the vibration of the machinery may be felt and heard in the main entrance, whereas in the case of the reinforced concrete building, no such vibration is noticed.

The writer has personally stood next to a large printing machine on a reinforced concrete floor where a slight vibration could be felt in the floor within the particular panel where the machine was placed; but no such vibration could be felt in any one of the adjoining panels.—Exchange.

Consolidation of the Building Interests

President Nesbitt at Toronto—The Work and Aims of the C.N.A.B.—Preparations for the Annual at Meeting Winnipeg

On Saturday afternoon, January 7, an interesting address was given by Mr. E. T. Nesbitt, of Quebec, president of the Canadian National Association of Builders, before some sixty members of the Toronto Builders' Exchange.

Mr. Nesbitt visited Toronto on his return from London and St. Thomas. The former city is one of the most active workers in the C.N.A.B., and the latter Mr. Nesbitt succeeded in affiliating.

A short time ago, it will be remembered, Mr. Nesbitt, accompanied by Mr. J. H. Lauer, secretary of the National Association, took an extended trip through Western Canada with the object of trying to interest that section of the country in the important aims of the parent body and inducing them to promote the same by their affiliation and co-operation. The results of this tour and their bearing upon the future work and development of the Association were the subject matter of Mr. Nesbitt's address. Some account of this work has already been given in these columns from time to time, but Mr. Nesbitt gave much additional information that will be found of interest.

Mr. Nesbitt's itinerary covered 12,750 miles and the net result of the trip was the affiliation of the Regina, Calgary, Edmonton and Lethbridge exchanges. "During the past year," said Mr. Nesbitt, "we have increased our membership 100 per cent. At the time of our last convention the Association was comprised of six exchanges. Now there are eleven, representing a total membership of 1,200."

The meetings held at Winnipeg and the above cities were marked by the greatest enthusiasm. Elaborate preparations were made for Mr. Nesbitt all along the line, and what was even more gratifying than the wild duck suppers and sundry other little surprises that he encountered at various points, was the whole-hearted and responsive interest manifested in his objective. He spoke in the highest terms of the hospitality of the West and stated humorously that he had gained seven pounds in weight during his tour.

In dealing with the enthusiasm of Western Canada, Mr. Nesbitt emphasized very forcibly the responsibility of the East, urging those present to do their utmost to promote the welfare of the Association as a truly national institution and to forget the existence of the gap that had divided the East and the West in the past. In this way alone could the building interests of the country be consolidated. The labor organizations had forfeited themselves in a manner worthy of emulation. At present, labor had the field almost entirely to itself. The master builders and their associations must be brought to see the value of co-operation, and organized so as to present a united front. Mr. Nesbitt considers that the time is opportune for the establishment of headquarters of the National Association, with a permanent secretary in charge. If a competent, live man were appointed, they would be notified promptly of all adverse legislation under consideration by the Federal or Provincial Governments and be in a position to take protective measures and to secure adequate representation. This matter is one of many important subjects that will be discussed at the annual meeting of the C.N.A.B., which, Mr. Nesbitt announced, will be held at Winnipeg, February 15-16 next.

Speaking of the forthcoming convention, Mr. Nesbitt expressed the hope that he would see a large number of delegates from Eastern Canada at Winnipeg, where extensive preparations are being made by the local exchange. The membership of the latter body is considerably over 400 and for the

banquet which is to be held during the convention, seating accommodation is being provided for 650. The Winnipeg exchange has arranged to contribute a number of interesting papers, among which are the following:

"Technical Training," T. E. Deacon.

"Ethics of the Master Builder," Geo. W. Murray.

"Organization," J. W. Morley.

"Contracting, from a General Contractor's Standpoint," W. A. Irish.

Mr. Nesbitt enumerated some of the many important subjects that will come up for discussion at Winnipeg. Foremost of these was that of technical education. It was no good having skilled architects to draw up elaborate plans if there were no skilled workmen to carry them out. The decline of the apprenticeship system was a serious consideration and it would



Mr. E. T. Nesbitt, Quebec, President of the C. N. A. B.

be necessary to provide better facilities and greater inducements for learning the building trades.

The policy of the Government in discouraging the immigration of skilled labor from England was criticized severely by Mr. Nesbitt. Pressure should be brought to bear upon the authorities, he said, with a view to the removal of all restrictions. His own experience was that not one "skilled" workman in twenty was properly qualified. The question was most urgent as the eight-hour law would increase the demand 20 per cent.

Another matter that would be discussed was the application of the Lemieux Act to industrial disputes. Mr. Nesbitt dwelt briefly upon the value of such an enactment in cases of strikes.

They would also endeavor to define more clearly their relations with the architects, and to arrange, if possible, for the principal issues, such as uniform contracts, details in plans, and so on, to be taken up with the Royal Architectural Institute of Canada.

Mr. Nesbitt is enthusiastic over the future of the C.N.A.B. and looks forward to the day when it will be as powerful a body as the Canadian Manufacturers' Association.

Further details concerning the convention at Winnipeg next

month may be obtained on application either to Mr. Nesbitt, Quebec, or to J. H. Lauer, Builders' Exchange, Montreal. Mr. Nesbitt informs us that special arrangements are being made whereby the usual transportation rates will be reduced one-half.

Mr. Nesbitt issues the following open letter to the building and contracting interests of the Dominion:

To the Builders, Contractors, Supply Men and Building Exchanges of Canada

Office of the "Contract Record,"

Toronto, January 7th, 1910.

As president of the Canadian National Association of Builders, I take the liberty of addressing you this open letter on a matter of the greatest importance to you all. It is the question of organization. As this is the era of organization, without which nothing can be achieved, I ask you to join your local Builders' Exchange. Where none exists, I say organize one at once, and then affiliate it with the Canadian National Association of Builders. In it we have an association composed of eleven of the most important Builders' Exchanges of Canada, viz.: Quebec, Montreal, Ottawa, Toronto, London, St. Thomas, Winnipeg, Regina, Calgary, Edmonton and Lethbridge. It is only in its infancy and we aim to make it as powerful and influential as the Canadian Manufacturers' Association.

Heretofore we were as units distributed over the Dominion, without influence because we lacked organization and numbers, and therefore the power to impress governments with our views on legislation—often detrimental to our interests—that is being continually forced upon us.

When we think that the building business of Canada represented last year some \$120,000,000, is it not time for us to wake up to the pressing need of organizing ourselves to safeguard our interests?

Questions of great moment to every builder and contractor are continually arising. Day after day such matters are before us, and we find ourselves powerless to deal with them because of the want of a central organization.

The annual convention of the Canadian National Association of Builders opens in Winnipeg on February 15 next. The Association proposes to perfect its organization and you are cordially invited to attend. If you have not a Builders' Exchange in your town, get together and form one, or else join the existing one in your nearest town or city. In any event, come to Winnipeg on February 15, and see and hear what is being done in your interest.

Yours truly,

E. T. NESBITT.

Water Filtration and Typhoid Fever

In their report on the purification of the Montreal water supply, Messrs. Hering & Fuller, consulting engineers, New York, made the following comments on the presence of typhoid fever germs in natural and filtered water:

Occasionally typhoid fever in scattering cases is found on the watershed of the Onorean. The germs of this disease sometimes continue to be evacuated from the bodies of persons for months and years after their recovery. The infection of water is therefore likely to be more frequent than was formerly supposed. In the soil and ordinary waters as found in nature typhoid germs die quite rapidly as a rule. Some, however, will live for months. So far as present knowledge goes, the investigation of the most experienced workers in bacteriology indicate that this germ rarely if ever multiplies in water and soil as found in nature.

At the Paris Exposition in 1900 the German government presented statistics and charts making a comparison of the typhoid statistics in various German cities, grouped so as to make the different cities generally comparable with respect to conditions other than the water supply. Without detailing these various features, attention is called to the following statement of the

average typhoid fever death rate per 100,000 population in German cities for the years 1896, 1897 and 1898, which is illustrative of the sanitary quality of filtered surface waters in comparison with ground water.

Filtered surface water: Stuttgart, 4; Chemnitz, 4; Berlin, 4.6; Altona, 6; Magdeburg, 6; Hamburg, 6; Bremen, 6; Brunswick, 8.3; Breslau, 8.6; Konigsburg, 17.6; Stettin, 20.6.

Ground water: Munich, 3.6; Dresden, 4.0; Charlottenburg, 4.3; Nuremberg, 4.6; Hanover, 5.3; Orefeld, 6.3; Elberfeld, 6.3; Aix-la-Chapelle, 7.3; Barmen, 8; Leipzig, 8.3; Cologne, 9; Mannheim, 9.3; Cassel, 10.3; Flensburg, 11.3; Strassburg, 12; Dantzig, 12.3; Holle, 13; Essen, 13.6.

On this side of the Atlantic, the experience of the past 15 years or more allows statistics to be presented which show, as did the hygienic exhibit at the Paris Exposition in 1900, that, with other sanitary conditions the same, it is possible by means of filtration to purify surface waters so that they will be substantially equal in purity to ground waters of the best quality. Such statistics are afforded from cities provided with sand filter plants, as set forth in the accompanying table.

Death Rates from Typhoid Fever per 100,000 Population in American Cities Using Filtered Water.

City	Plant completed.	Typhoid death rate.	
		Years averaged.	
		Before filtration.	After filtration.
Sand filters.			
Albany, N. Y.....	1899	10	9
Lawrence, Mass.	1893	7	15
Pittsburg, Pa.	1907	8	1
Mechanical filters.			
Binghamton, N. Y.....	1907	5	5
Cincinnati, O.	1908	4	1
Columbus, O.	1908	11	1
Paterson, N. J.....	1902	5	7
Watertown, N. Y.....	1904	5	5
York, Pa.	1899	2	8
Hoboken, N. J.....	1905	7	4

*Including Allegheny, supplied with unfiltered water.

Ten years or so ago mechanical filters had their standing predicated to a large extent on results of laboratory investigations of an exhaustive nature. To-day modern mechanical filter plants which are well built and well operated show that communities adopting them have experienced as marked reduction in water-borne diseases, notably typhoid fever, as was the case when sand filters were introduced at Lawrence, Albany and Pittsburg. Representative results are also given in the foregoing table.

Vancouver City Engineer's Report

City Engineer Clement, of Vancouver, B.C., dealing with the work of his department during 1910, reports that 30.64 miles of streets were cleared and rough graded. In the southwestern section of the city 6½ miles of plank walk was laid.

The season's work on concrete sidewalks breaks all records in this line, 23.39 miles having been laid. This work was all done by contract by Messrs. G. Ledingham and M. P. Cotton & Co. The season's work on cement curbs totalled 2.47 miles.

The advance work in sewer extensions is very noticeable, many miles of sanitary drains having been laid. This work is classified as follows: Tile pipe drains, by day labor, 14.95 miles; by contract, 3.02 miles; brick and concrete sewers, by day labor, 2.12 miles; by contract, .85 mile; basement drains, .28 mile; box drains, 2,800 lineal feet; concrete culverts, 10; timber culverts, 16. In addition to the above list outlet sewers were built at the foot of Columbia avenue and Burrard street.

A feature of the report is the mention of plank roadways, a large number of which were laid this fall to meet the demand

1910 Great Year in Railroad Construction

Progress of the Canadian Pacific in Western Canada—N.T.R.'s Good Showing in New Brunswick and Quebec—News of Construction

The year 1910 was one of progress for Canadian railways as far as the laying of tracks and the building up of new grades were concerned. At the beginning of the year all of the companies had prepared plans for the building of hundreds of miles of new lines during the summer and more railway construction was accomplished in the year just closed than during any previous year. A good percentage of this work was carried out by the Canadian Pacific Railway. In western Canada alone over 1,330 miles of new grades were built during the year, and of these the C. P. R. built over 600, according to the following table:

Grading by Grand Trunk Pacific, 350 miles; by Canadian Northern, 380 miles; by Canadian Pacific, 600 miles; total, 1,330 miles.

In the east, between Coldwater and Orillia, and on the main line in the vicinity of Peterboro, grading operations are being carried on by the C.P.R. for a distance of 75 miles. A line was built from Coldwater to Victoria Harbor and at the latter point a million-and-a-half-dollar terminal elevator has just been completed, to be used in connection with the new grain route. The St. Maurice Valley line was extended from Shawinigan Falls to Grand Mere, a distance of five miles, and grading and track-laying operations were carried on between Ingersoll and Code Junction, four and a half miles. Between Montreal Junction and Adirondack Junction the line was double-tracked and work was started on the double-tracking of the bridge across the St. Lawrence river.

In Western Canada, on the Weyburn line, 45 miles of track were laid, leaving matters in good shape for eventually continuing the line to Lethbridge. Construction work was carried on on the line from Macleod to Outlook, a distance of 147 miles, track being laid for 90 miles from Macleod on what will eventually be a main line from Edmonton to Minneapolis and St. Paul. A bridge is being built at Outlook and in the coming summer a through service will be established.

In Alberta the grade of a branch from Carmangay to Aldersyde was built but no steel was laid. This work will be continued this year and will be finished early in the spring. From Irricana east a line 30 miles long was built, and the steel is being laid at the present time.

In Saskatchewan the longest stretch of line on which work was done was from Craven to Colonsay, 110 miles. Steel was laid for 50 miles and the work has now been suspended for the winter. The line from Regina to Craven was completed, and a good deal of work undertaken on the line from Craven to Bulyea. From Virden, on the main line west of Brandon, a branch 14 miles long, in a northwesterly direction, was opened for traffic, and from Tilston the grading on a 25-mile extension was completed. At Komarno, 29 miles of new track was opened for traffic to Arborg, on the Icelandic river.

According to a Vancouver despatch, track laying has been started on the Kettle River Valley Railway from Merritt south-east up the Coldwater river on the 30-mile contract held by Macdonell, Gzowski & Company. Grading is already proceeding ahead of the rails and it is the intention to have the whole contract completed within a short time. At present grading has been completed for twelve miles out of Merritt and the steel can be laid that distance, at least, without interruption. It is expected, however, that before the rails are down for the first twelve miles from Merritt the remainder of the grading will be in such a condition that the track work can continue

straight ahead. The contractors have over 1,000 men on the job and are rushing it as fast as possible. Before this contract is finished the railway company will be asking for tenders for another stretch eastward from the termination of the 30 miles now in charge of Macdonell, Gzowski & Company, in order to reach the objective point of Midway within the least possible time.

The N. T. R. in New Brunswick and Quebec

Good progress is reported on the National Transcontinental in the provinces of New Brunswick and Quebec. Fully ninety per cent. of the total work on the 257 miles across New Brunswick and seventy per cent. of the 203 miles in the province of Quebec east of the St. Lawrence at Levis have been completed.

The first section west of Moncton, a distance of 50 miles, ending at a point near Chipman, which was awarded to the Grand Trunk Pacific Construction Company, and sub-let to Corbett, Floech & Company, has been fully completed, including track laying and ballasting, and so has the following section of eight miles, which has been built by J. W. McManum & Co., Ltd.

The third section to the westward, 40 miles in length, was first taken by the Grand Trunk Pacific Construction Co., but sub-let later to the Toronto Construction Co., and fully completed to McGivney Junction, where the road crosses the old Canada Eastern, now a part of the Intercolonial.

The Toronto Construction Company also built the fourth section in New Brunswick, a distance of 66 miles, and it will be to this point, 166 miles from Moncton, that the Transcontinental Railway will be opened during next year.

The fifth section was awarded to Willard, Kitchen & Company, and the grading has been almost completed by that firm from the Tobique River to the Grand Falls on the St. John River, some thirty-one and eight-tenths of a mile.

The No. 6 or last section in New Brunswick extends from Grand Falls to the Quebec province boundary—some 61 miles. Lyons & White are the contractors, and their track is all laid, although a good deal of ballasting has yet to be done. The work, however, is progressing rapidly at this point.

The next two sections to the west, numbering seven and eight, were given to Messrs. M. P. & J. T. Davis, who are building the substructure of the Quebec bridge. The first section of a little over 53 miles from the New Brunswick boundary has been sub-let to Messrs. Casechi & Pegano, and they have completed three-quarters of the grading and have also laid about thirty miles of track.

The Davis Brothers are building the final section of the Transcontinental east of the St. Lawrence to Point Levis, the distance being a little over 149 miles.

The substructure of all the bridges on these contracts are completed, and the superstructure furnished by the Dominion Bridge Company, the Hamilton Bridge Company, and the McNeill Bridge Company, of New Glasgow, is well advanced.

The right-of-way clearing on the C. N. contract from New Westminster, B.C., to Popkum, a distance of 57 miles, which was awarded to the Northern Construction Company, has been completed and the contractors are now engaged in grading operations. Over 750 men are employed between the two points, not including, of course, the clearing work at Port Mann, which is under a separate contract. Some 250 of the laborers in the grading gangs are located on the three-mile stretch

on Sumas mountain, where the heavy rock work necessitates extensive side-cutting. It is expected that the whole contract will be on the way to completion by spring.

An action in which C. Matheson, a contractor of Edmonton, is suing to recover \$3,000 on a contract he held from one of the contractors on the Grand Trunk Pacific main line west of the Athabasca river, is to be tried in the Edmonton courts this month. Matheson was awarded a contract for three cuts in the rock work west of the Athabasca, which would have totalled something like \$30,000. Matheson started to work early last summer, but was called off by the contractors who, it is said, gave him to understand that the work was not to be proceeded with until the grade had been completed to the Athabasca. Matheson claims that he is out \$3,000 on the work that he did on the contract, and on other expenses. The case has been pending for some time.

Arrangements for the construction of the electric radial line between Ottawa and Brockville have been completed, and it is probable that the work will be begun next spring.

Proposed "Uniform Contract" for Quebec.

Important Negotiations Proceeding in Montreal.

Negotiations have been reopened between the architects and builders of Montreal, for the purpose of drawing up a "uniform contract" similar in effect to that which obtains in the other provinces. Two years ago negotiations for the same purpose were commenced, but were dropped when it was stated that the architects felt that the contracts used were sufficiently clear and were protected by the Civil Code. The Code Napoleon, however, which obtains throughout the Province of Quebec, is unsatisfactory, recent judgments having shown that architects' orders, even when written, cannot be upheld in a court of law, unless signed by the owner of the building.

A prominent builder told the "Contract Record": "The need for such a uniform contract is pressing, for very often a builder signs a contract full of technicalities and provisions he cannot understand unless he is a lawyer acquainted with the civil code. Then he practically signs his own death warrant unless the architect and the proprietor are willing to treat him right. Of course it cuts both ways and gives the builder occasional opportunities to get the better of the other side. Needless to say, opportunities for this sort of petty dishonesty are not wanted on either side, and we feel that they can best be wiped away by means of a uniform contract agreeable to all parties."

The drawing up of this contract has been put in the hands of Mr. S. Baudin, a capable commercial lawyer, who will submit same to both parties for consideration at a conference to be held next month.

Calgary Builders Must Wait for Warm Weather

Building Inspector Harrison, of Calgary, Alta., recently issued the following letters to the contractors and builders of that city: "At the present time there is a large amount of building being done, and contractors are rushing the work on buildings to completion. For the last few days the thermometer has registered below zero, and although hot water is being used for the mixing of mortar, and sand and gravel are also heated, I have lately seen brick laid in walls and the mortar frozen solid within a few minutes, and the brick practically impossible to move and I was forced to stop the laying of brick. I think it is now time that owners and contractors used some judgment in building during this bad weather. The placing of concrete in footings and brick in walls is in my estimation dangerous, and should not be permitted during zero weather.

"I have heard contractors claim that frost has no evil effect on brick or concrete work. I beg to differ. Even in this city

during the past winter, concrete floors and brick and stone walls were built, and although special precautions were taken in the following spring, the concrete crumbled, and if any load had been placed on this floor, a big calamity might have occurred. In another case the brick walls, though built plumb and in a workmanlike manner during the winter showed the action of the sun in the spring, the ice coming out of the walls, and in a very short time these walls were completely out of plumb and showed cracks and settlement all over the building. In a case like this I might point out the impossibility of granting a permit for additional storeys to be placed on a building in this state. I think it is time, considering the importance of the buildings concerned, to take immediate action and not wait until some calamity has occurred; I claim that it is my duty as building inspector of the city to stop any of this outside work when the thermometer is below zero, and to insist on proper precautions being taken between freezing point and the zero mark."

Personal News and Notes.

Jno. White, contractor of Eastview, Ottawa, succumbed recently to an injury received by a fall from his work.

The annual meeting of the Montreal Builders' Exchange will take place on January 23rd at 4 p.m.

Mr. H. Neville-Smith, C.E., of New Westminster, B.C., was recently presented with a handsome smoking set by the members of his staff.

Messrs. Bell & McCubbin, consulting engineers, St. Thomas, Ont., have opened an office at Chatham, Ont., with Mr. Geo. A. McCubbin in charge.

The Hon. L. P. Brodeur, Minister of Marine and Fisheries, and the Hon. Geo. P. Graham, Minister of Railways and Canals, will be the chief speakers at the banquet of the Montreal Builders' Exchange on January 18th.

At Calgary, Alta., the carpenters are asking for a further increase of five cents an hour, to go into effect on July 1. This would mean \$4.40 per day instead of \$4. The stonecutters are asking for an increase from 62½ cents to 65 cents an hour.

Mr. S. Robinson, C.E., left Edmonton recently via the Peace River trail for the interior of northern British Columbia, where he will spend the greater part of the winter surveying. He is accompanied by two assistants.

Mr. Charles H. Macmillan has been appointed general superintendent of the Dominion Steel Co., in place of Mr. W. C. Mitchell, who recently resigned. Mr. Macmillan, who is regarded as one of the best steel men on the continent, has been associated with the Schwab interests.

The death occurred on December 30th of Mr. Henry McDonald, railway contractor, at his home at 626 Dorchester street, Montreal. For many years the deceased was connected with construction work on the Canadian Pacific Railway and in recent years took an active interest in the development of the Northern Ontario mining regions, where he had several claims.

Medicine Hat, Alta., the town from which the weather emanates, reports excellent conditions. Much progress has been made in municipal work during the past year, especially in paving construction. During 1911 it is possible that an additional high pressure water plant will be installed. Everything is said to point to prosperity.

A recent visitor to Fredericton, N.B., was Mr. H. H. Charles, formerly resident engineer of the National Transcontinental Railway at McGivney. Mr. Charles is now at VanBuren, Me., where he is the engineer in charge of the construction of the new international bridge across the St. John river. The new bridge will be open for traffic about May 1st, the contractors,



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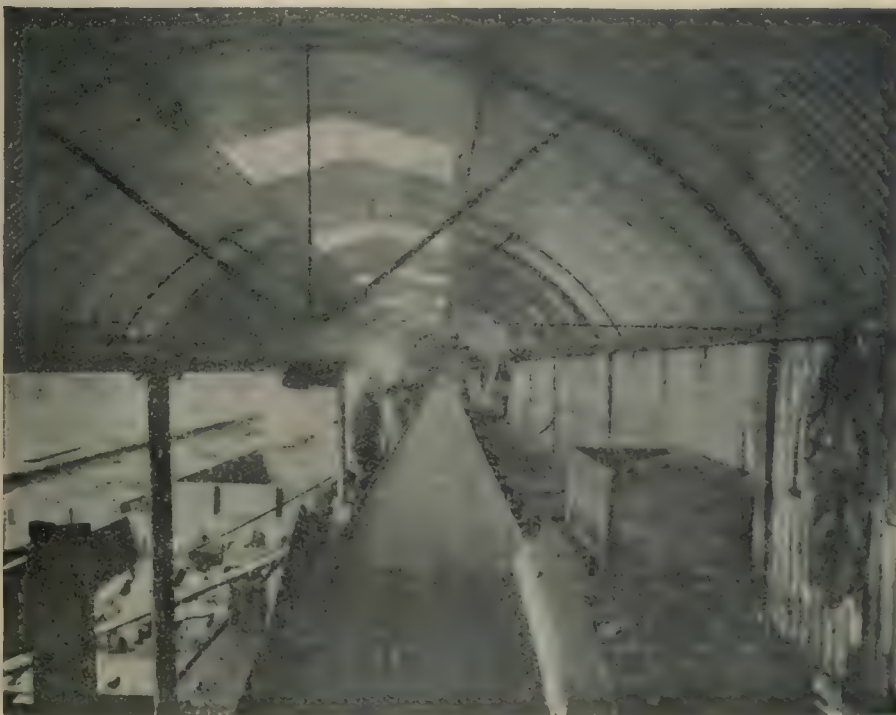
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Messrs. Powers & Brewer, having made a record on the concrete work of the substructure, erecting 3,000 cubic yards in six working weeks.

The Winnipeg bricklayers have secured an advance of from 62½ cents to 67½ cents an hour. The pay for the other artisans, per hour, is as follows: Stonecutters, 60c.; carpenters, 45c.; plumbers, 55c.; plasterers, 55c.; lathers, 50c.; steamfitters, 55c.; painters, 40c.; electricians, 40c.; tinsmiths, 42½c.; builders' laborers, 27½c.; ordinary laborers, 25c.; team and wagon, 50c.; team drivers, 25c.; structural ironworkers, 40c. These figures are taken from the minimum fair wage schedule acknowledged by the provincial government and the Winnipeg city council on all public works for the coming year.

A year ago the J. I. Case Threshing Machine Company offered a free trip to the factory to two salesmen in each territory. The trip was a reward for the salesman selling the most goods for the year, and for the salesman showing the largest increase over the year 1909 in the territory he worked for that year. No one salesman was allowed to have both records. As a result, about seventy salesmen are now in Racine, looking over the plant and getting a line on the company's output for 1911.

An interesting letter on the subject of empty cement bags recently appeared in the Montreal "Gazette." The writer states that the bags in which cement is shipped to the Isthmus of Panama are returned to the manufacturers, who allow 8½ cents each for them. As fast as the bags are emptied they are loaded into box cars and taken to an old building, where a squad of twenty men, under a white foreman, are employed sorting and preparing the bags for shipment. Damaged bags are not thrown away, but are utilized by filling them with sand for the construction of dykes. All the bags are well shaken before being bundled up and this results in the recovery of about 60 barrels of cement a day, which is, of course, in good condition, and is used in the locks. These "shakings" pay the wages of the men. The writer suggests that there is a hint in the story for local contractors.

Messrs. Belliss & Morecom, engineers, of Birmingham, who have within the last few years introduced a steam turbine of their own design, report very successful progress. Within the last few weeks they have secured an important order from the Birmingham Corporation Electricity Supply Dept. for eight 1,000 k.w. Belliss exhaust steam turbines running at 1,500 r.p.m., to work in conjunction with a similar number of Belliss 1,500 k.w. reciprocating engines in the Summer Lane Station, Birmingham. Repeat orders have also been received for Belliss high-pressure steam turbines. The first Belliss high-pressure turbine built to a customer's order was for the Aston Manor Corporation, and gave such satisfaction that a repeat order was placed. Quite recently the city of Johannesburg, South Africa, placed a repeat order for a Belliss live steam turbine of 3,000 k.w. capacity. Messrs. Laurie & Lamb, Board of Trade building, Montreal, are Canadian agents for this firm.

The year 1910 was a prosperous one for the C.P.R., whose earnings amounted to nearly \$101,000,000, an increase of between five and six millions over 1909.

The Montreal City Council has approved of the plan to erect on one of the public squares, a statue to the memory of the late King Edward VII.

The customs report just issued by the Revenue Department shows an increase of two million dollars in receipts over last year for Montreal, and eleven millions for the whole of Canada. Most of the increase comes from Winnipeg, Vancouver, Calgary and Edmonton.

Contracts Department

News of Special Interest to Contractors, Engineers, Manufacturers and Dealers in Building Supplies.

Information for insertion in these columns is invited from Architects, Contractors, Engineers, etc.

Waterworks, Sewerage and Roadways

Edmonton, Alta.

Estimates of the Engineering Department will provide for the construction of the Rat Creek trunk sewer, which it was decided to construct last year, but upon which suspension of plans was made pending the report of Alex Potter, C.E., on the sewerage and water systems of the city. The sewer will be 10 feet in diameter, of reinforced concrete, and will be some 3,600 feet in length. It will form the first portion of a general plan of sewers for Edmonton.

Montreal, Que.

Tenders addressed to the Board of Commissioners will be received until January 20th for construction of a 2' x 3' sewer in Boulevard avenue from Decarie avenue via St. Luke Road, to the limits of Westmount. Plans, etc., in office of the Superintendent of Sewers L. N. Senecal, secretary.

Niagara-on-the-Lake, Ont.

Plans for a system of experimental roads between Bridgeburg and Niagara-on-the-Lake are being prepared by Cr. W. A. McLean, Provincial Good Roads and Highways Engineer. The work, which is being paid for by the Niagara Falls Park Commission, is designed to show just what results can be secured from the various methods of road construction known to the engineers of the Public Works Department.

Ottawa, Ont.

Mayor Hopewell in his opening address recommended in the near future the purchase of a water power for the municipal light and power plant.

A bill will come up before the Ontario Legislature to give the city permission to raise \$300,000 with which to construct six miles of sewer to drain the western section of the city. It will run from a 12-inch circular concrete sewer. A septic tank will also be required.

The municipal campaign emphasised the desirability of extending the sewer system very much in the western portion of the city this summer and provision will be made to do even more there this summer than last. The question of draining the lands around Dowe's lake is also under serious consideration. At present the sewer mains are not low enough to take away this water.

Regina, Sask.

The city has decided upon the overhauling of the present system of water supply.

Sault au Recollet, Que.

At a meeting of the council the question of borrowing \$140,000, through raising the borrowing power from twenty to forty per cent., will be further considered and action taken. The proceeds to be used for the installation of a modern water system and sewers.

Toronto, Ont.

The City Engineer asked for an interim appropriation of \$50,200 for the Water Works Department and \$87,800 for the Works Department. The Board of Control was asked to confirm these appropriations and to provide the funds in advance of the estimates for the current year.

It is reported that a commission of three will be appointed to spend the \$300,000 voted by the city, York County and the Provincial Government for good roads leading into the city, each body to have one representative. The commission will prepare plans, not only for the construction of the roads, but for their maintenance after construction.

Vancouver, B.C.

The ratepayers have authorized the issue of debentures for the following.—Street improvements, \$425,000; waterworks extensions, \$400,000.

Winnipeg, Man.

The City Engineer has submitted estimates of the cost of operating three softening plants which would have a total capacity of 13,000,000 gallons daily. He estimated that the cost would be about twenty-three cents per thousand gallons. It was recommended that the old plant be used to soften the water from wells 2, 3 and 4, and the new plants be secured for wells 5 and 7. The committee laid the proposition over to a later meeting.

AWARDED

North Vancouver, B.C.

MacDonald Czonski & Co. secured the contract separately and in bulk for initial sewer installation. The total amount of the contract is \$206,000.

Point Grey, B.C.

The Council awarded a contract for laying a 12-inch water main on Bodwell road from Heather street to the site of the new reservoir near Granville street to the Power Contracting Company. Tenders were received. The contract includes all work in connection with digging the trenches and hauling and laying the pipe. Mess J.L. Cameron are the engineers in charge.

Winnipeg, Man.

The contract for water mains was awarded to the Engineer of Construction, \$1,675.

Railroads, Bridges and Wharves

Edmonton, Alta.

On January 27th the ratepayers will vote on a by-law to raise \$164,000 for the construction of a bridge over the Northern Saskatchewan River, in the northern end of the city.

Kingston, Ont.

The directors of the Ontario Exploration Syndicate with iron mines at Wilbur, have applied to council with regard to their request for land for shipping

and smelting purposes and the deepening of the lower harbor and widening of the Catarqui draw bridge. They are anxious to proceed with the erection of a large pier.

Montreal, Que.

The C. P. R. have ordered sixty steel cars of fifty tons capacity specially designed for the transportation of pitch, add railroads CMY

Michipicoten River, Ont.

Tenders are being called until February 13th by the Public Works Department, Ottawa, for the construction of a wharf at the mouth of the Michipicoten river, West Algoma. Plans, etc., at above Department and at the office of J. G. Sing, Esq., District Engineer, Confederation Life Building, Toronto, Ont.; E. B. Temple, Esq., District Engineer, Port Arthur, Ont., and on application to the local Postmaster, R. C. Desrochers, secretary.

Ottawa, Ont.

Tenders will be received until January 30th, 1911, for the construction of a breakwater at Brooklyn, Queen's County. N.S. R. C. Desroches, Secretary, Department of Public Works, Ottawa.

Calgary, Alta.

The timbering part of the cement pier work for the G. T. R. bridge at Lignite is well under way; also the steel work. The bridge is well over a quarter of a mile long and is 125 feet above the water.

Peterboro, Ont.

George S. Deeks, of Toronto, who has the contract for building the line from Coldwater to Bethany, just outside of Peterboro, a distance of about 80 miles, states that he is now busy letting sub-contract, with a view to putting workmen on the whole route as early as possible in the spring. About 17 miles of the road have already been completed.

Peticodiac, N.B.

Measurements and elevations for a new bridge over the Babcock stream have been taken. This bridge will be built as a permanent structure on concrete abutments, and will be covered. Tenders will probably be asked for in the spring. Mr. McVey, Public Works Engineer; Structural Superintendent, J. T. Forbes, Moncton.

Quebec, Que.

It was announced in the Quebec Legislature last week by Mr. Taschereau that in ten years the wooden bridges would all have disappeared from the province and been replaced by iron ones.

United States bridge experts will probably be chosen to settle the difficulties regarding the Quebec bridge. The disagreement is caused by the inability of the commissioners to agree as to whether the tenders submitted on the original plans must be adhered to or whether the tender of the Dominion Bridge Company, drawn up on their own plan is admissible.

Tenders for the new bridge across the St. Charles river were received as fol-

lows: Eastern Steel & Iron Works, J. H. Gignac, Phoenix Bridge Co., McGuegan Construction Works (Montreal), J. Lemoine & Fils, and Jos. Gosselin, and were referred to Mr. L. A. Vallee for a report upon the most advantageous of the offers, as several of the tenders included figures for a swing bridge as well as a draw bridge.

Vancouver, B.C.

The ratepayers approved of the issue of debentures for aid to Second Narrows bridge, \$115,000; but defeated the projects for the two bridges contemplated to connect the central section of the city with other districts.

AWARDED

Ottawa, Ont.

The Public Works Department recently awarded the following contracts: Duncan's Cove, Halifax Co., N.S., breakwater, A. W. Giroir and Kingsman Sweet, contractors, \$6,960; Three Fathoms Harbor, Halifax Co., breakwater, Obed A. Ham, contractor, \$7,848; Ottawa St. Joseph LaTrelle, Que., wharf, N. Warren, contractor, \$18,900.

Public Buildings, Churches Schools, etc.

Anitgonish, N.S.

A proposal is under consideration for the extension of St. Francois Xavier College.

A new wing will be added to St. Martha's College Hospital. Work will commence early in the spring.

It is also understood that during the coming year a new wing, capable of accommodating sixty residential lady students, will be added to Mount St. Bernard's Convent.

Atkinson, Ont.

Tenders will be received until January 20th, 1911, for the erection of the new Sand Hill Presbyterian Church, Township of Pittsburgh. Rev. H. W. Reede, M.A., St. John's Manse, Kilbirnie, Ont.; Henry Johnston, jr., Atkinson, Ont.

Battleford, Sask.

Tenders are being called until January 30th by the Department of Public Works, Ottawa, for Post Office, Customs and Inland Revenue Fittings. Plans, etc., on application to W. R. Latimer, local clerk of works and at above Department. R. C. Resrochers, secretary.

Brandon, Man.

T. Sinclair, architect, has been gathering information as to the different cold storage plants throughout the Dominion and has prepared rough plans for the proposed local structure.

Plans for the new hospital for the insane will be completed shortly and tenders called for within a few weeks. The proposed structure will be 372 feet long and 150 feet deep, of brick and stone construction. Electric elevators will be installed.

S. Hooper, Provincial Architect, Winnipeg, writes that plans are being prepared for the new Asylum and power house for same, new addition to Land Titles Building; also for the new Agricultural College and addition to main Telephone Exchange, Winnipeg.

Brantford, Ont.

At a meeting of the governors of the John H. Stratford Hospital last week, Architect Green, of Buffalo, submitted

plans for remodelling the building. Mr. Green recommended partial completion at an estimated cost of about \$65,000. It is possible, however, that the structure will be demolished and a new building erected at a cost of \$100,000.

Brockville, Ont.

It is stated that the General Hospital Board of Governors have had an offer from Mr. Chas. W. MacLean to erect an addition to the south wing of the hospital as a memorial to his wife. Chas. E. Cossitt, president.

Edmonton, Alta.

The Dominion Government has made a grant of \$50,000 for a Military Drill Hall for Edmonton, also \$10,000 for a wharf.

It is reported The Masonic Temple Ltd., purpose erecting a five or six story block on the corner of 6th street and Jasper avenue this spring.

On January 27th the ratepayers will vote on a by-law to raise \$175,000 by debentures for improving the Exhibition Park and erecting additional buildings thereon.

Commissioner Turner, of the School Board, is preparing plans for the McCauley School to be erected this spring between McCauley and Heiminick streets at a cost of about \$100,000.

According to the estimates which have been placed before the Provincial Legislature \$515,000 will be expended towards the completion of the new Parliament buildings; \$140,000 will be expended to complete the new Court House, and \$50,000 is granted for a site and building for a new Land Titles Bldg.

Fort Steele, B.C.

The Church of England are considering the erection of a new church this year.

Fort William, Ont.

Geo. H. Williamson, general secretary, Y. M. C. A., invites competitive plans for a new Y. M. C. A. building. Conditions and full information upon request.

Guelph, Ont.

A number of small modern buildings, cost of all about \$80,000, will be erected by the Guelph Sanitarium to replace the structure recently destroyed by fire.

Lachine, Que.

Plans are being prepared for a large club house. Mr. P. Magor, of Lachine, is interested. Estimated cost, \$100,000.

Lindsay, Ont.

Tenders addressed to R. C. Desdochers, Secretary, Department of Public Works, Ottawa, will be received until January 30th for interior fittings at the post office. Plans and specifications to be seen on application to Mr. W. Healey, caretaker, Public Buildings, Lindsay, Ont., Mr. T. A. Hastings, Clerk of Works, Postal Station "F," Toronto, and at the Department of Public Works, Ottawa.

London, Ont.

A special committee of the County Council is considering the extension of the court house at a cost estimated from \$6,000 to \$10,000.

The City Council are considering the appointment of a special committee to arrange for the erection of a new city hall. City Architect Nutter will prepare preliminary sketches. The site of the proposed new building is at present under consideration. Probable expenditure, \$125,000 to \$150,000.

Macleod, Alta.

Among the town projects in the coming season are a new \$35,000 hospital; a

new \$10,000 Government Post Office building; a new \$40,000 municipal building containing fire and police accommodation, and the town hall.

Medicine Hat, Alta.

St. Patrick's Roman Catholic congregation has purchased half a block of land on which to erect a new edifice in the spring.

Montreal, Que.

A meeting of the members of the Engineers' Club has been called for the 18th inst., for the ratification of the proposed additions and alterations to the present building. The sum of \$92,500 is to be spent and Messrs. Saxe and Archibald, architects, Beaver Hall Hill, have prepared preliminary plans.

Ottawa, Ont.

A deputation will wait on the Premier and Minister of Militia at as early a date as possible to urge that a new drill hall be erected in this city.

Recent Government estimates passed include \$19,000 for a Post Office in Maisonneuve, P.Q., \$15,000 for one in Marieville, P.Q., and \$5,000 for improvements of the Post Office at Aylmer, P.Q.

The foundation for new Bethany Presbyterian Church is almost completed and it is stated work will begin in the spring. J. A. Ewart, architect. Noted previously.

It is semi-officially announced that plans will be made at an early date to demolish the present printing bureau and to erect a more modern structure in another part of the capital. The present site, which is near Neapean Point, will be converted into a park by the improvement commission.

The plans are out for a new machinery hall in connection with the Central Canada Exhibition. It will be 280 feet long, and 140 feet wide and of Japanese architecture. It will have a steel frame with brick on the outside and the roof will be of red tile. The pillars, etc., will be of concrete. W. E. Noffke prepared the plans and it is expected that tenders will be called for it in the spring.

Prince Albert, Sask.

The ratepayers authorized the expenditure of \$8,500 on high school addition.

Quebec, Que.

P. E. Ryan, Secretary of the Commissioners of the Transcontinental Railway, invites tenders until January 23rd for the demolition of Champlain Market. Specifications, etc., may be obtained on application to A. E. Doucet, district engineer.

Regina, Sask.

Fourteen school districts of the province have been authorized to expend \$15,000 in all for the erection of new buildings. Details are as follows:—

Daybreak school district, Maple Conlee, \$1,500 for the purpose of erecting and furnishing a school house and building a stable.

Hayfield school district, Central Butte, \$1,500 to erect and furnish a school house.

Springside school district, Springside, \$600 for the erection of a teacher's residence.

Stuckle school district, Lenora Lake, \$1,100 to erect a school house.

Meadowbrook school district, \$1,500 for the purpose of erecting and furnishing a school house.

Pillar school district, Neudorf, \$1,000 to erect a new school house.

Plans have been prepared for the erection of the new Baptist Church at the

corner of Victoria avenue and Lorne street. Estimated cost, \$75,000

Saskatoon, Sask.

The Third Avenue Methodist Church has disposed of its present site and will erect a new building farther out from the business section.

The R. C. Order has purchased a site of 10 acres near the end of the city and will erect a large boarding school or convent thereon. Rev. F. Vachon is interested.

South Middleton, Ont.

Tenders for reconstruction of school house, S.S. No. 7, township of Middleton, addressed to Geo. Fisher, secretary-treasurer, will be received until March 15th. Plans, etc., at office of above.

Toronto, Ont.

Tenders addressed to R. C. Desrochers, Secretary, Department of Public Works, Ottawa, will be received until January 30th for interior fittings, postal station B.

Plans and specifications to be seen on application to M. T. A. Hastings, Clerk of Works, Postal Station "F," Toronto, and at the Department of Public Works, Ottawa.

Tenders addressed to Darling & Pearson (architects, 2 Leader Lane, will be received until January 28th for all trades in the erection of a power house for the General Hospital. Plans and specifications upon application.

At a meeting of the Weston Presbyterian Church last week plans were approved for the construction of a new school building. Dr. Meldrum may be addressed.

Vancouver, B.C.

This municipality has authorized the issue of debentures for public improvements totalling \$2,525,000, and voted down proposed expenditures totalling \$946,000. The objects approved are as follows: Schools, \$967,000; hospitals and lands, \$286,500; Exhibition Purposes Association, \$115,000.

Wainwright, Alta.

A new town hall is being considered by this municipality.

Winnipeg, Man.

Architect Wm. Bruce has submitted to the Board of Control amended plans for the public bath to be constructed in Selkirk park. Plans were submitted some time ago which called for the expenditure of \$75,000, which was \$25,000 in excess of the appropriation, and the board refused to consider them. The amended plans have been referred to the chairman of the public library and baths committee.

Woodstock, N.B.

The school trustees have approved plans for a new building submitted by G. E. Fairweather, architect, this city. The building will contain six class rooms and will cost approximately \$60,000.

AWARDED

Ottawa, Ont.

It was decided to have the alterations at Howick Hall done by day labor under the supervision of the City Engineer at a cost not to exceed \$1,600. The association reported that three tenders were received but one came in too late. The other tenders were A. Slack, \$1,761; Smith Bros., \$1,527.

Among the recent contracts awarded by the Public Works Department are St. Henri, Que., addition and alteration of Post Office, contractor, Joseph Jacob & Co., \$4,890; Toronto Central Post

Office, E. P. McGrath & Co., contractors, Ottawa, \$12,125; militia stores, fittings and racks, E. P. McGrath & Co., contractors, \$3,875.

St. John, N.B.

Mr. Michael Sullivan, of Kingston, the well known contractor, has been awarded the contract to build the armory at St. John, N.B. It is estimated the building when completed will cost about \$250,000.

Residences

Strathcona, Alta.

Mr. W. J. McNamara, of Weta-skiwin, has purchased property here on Eighth avenue, on which it is stated he will erect this year a residence costing about \$20,000.

Vancouver, B.C.

A building permit was granted for the erection of a three-storey apartment house for Dr. William Moody at 1672 Georgia street.

AWARDED

Montreal, Que.

Mr. W. H. Creed, builder, Roslyn avenue, Westmount, is erecting two apartment houses on Cote des Neiges Road near Westmount Boulevard. Cost \$90,000.

The contract for the plumbing and heating of a residence for Mr. A. T. Lane, Bellingham Road, Outremont, has been awarded to John A. Gordon, 301 St. Antoine Street. Architects, Hutchison, Wood & Miller, Royal Ins. Building.

Business Buildings and Industrial Plants

Chatham, Ont.

Mr. R. O'Hara will erect a fine residence on Forest street.

The Western Bridge and Equipment Company will erect a larger building than at first contemplated.

Edmonton, Alta.

Building permit was issued to A. W. Ormsby, store, Fifth street, \$2,500.

R. Tegler will erect a six-storey building on the southeast corner of First and Elizabeth streets, 50 x 150 feet, at a cost of about \$100,000.

Crafts, Lee & Gallager propose erecting a four or five story block on the northwest corner of First and Peace avenue, 100 x 150 feet.

Architect H. A. Magoon is preparing plans for a five-storey hotel to be built by J. B. Mercer, on present site Grand Central Hotel. Cost about \$100,000.

It is reported an Edmonton Syndicate has purchased 50 feet of property adjoining the Journal office, First street, at \$35,000, for the erection of a 10-storey block.

Messrs. MacDongall & Secord contemplate the erection of a ten-storey business block on the corner of First and Jasper streets. The date of construction has not been decided upon.

Lethbridge, Alta.

The Balmoral Hotel was burned on the 12th inst. Estimated loss, \$75,000; F. W. Downey, part owner.

Maisonneuve, Que.

The Shawinigan Company has purchased a block of land comprising 235 vacant lots fronting on Charlemagne street, Maisonneuve, for the sum of

\$75,000. Although no information can be officially gained as to the company's intentions, it is understood that considerable extensions are to be made to their Montreal terminal station.

Medicine Hat, Alta.

The Alberta Linseed Oil Company, capitalized at \$500,000, will erect a large refining plant here.

W. Poper Hull, a Calgary capitalist, has purchased 125 feet frontage on Toronto street on which he will erect a four-storey block in the spring.

Midland, Ont.

The Campbell Milling Company, Toronto, it is announced, will erect a flour mill here; capacity, 1,000 barrels daily. Work will start in the spring.

Montreal, Que.

It is stated that the Montreal Terra Cotta Co. will locate at Pointe Claire, P.Q., and will erect a new plant and kilns there.

Sets of plans and specifications for certain works for Messrs. Workmans and others are to be displayed in the Builders' Exchange, Montreal, by Mr. Harry Jones, architect.

Nelson, B.C.

Among the plans for extension by the British Columbia Telephone Company is that for the erection of a new exchange building here. Estimated cost, \$10,000. Other exchanges are reported for Kamloops, Alberni and Duncan.

Ottawa, Ont.

T. D. McFarlane will build two stores on Bank street in the spring.

R. Mulhall & Co. will probably erect a large storehouse near the Union Station in the spring.

A. LeB. Weeks, architect, is calling for tenders for a residence for W. M. Southam to be erected at Rockcliffe. It will be of brick.

Ex-Ald. T. Clarey will make extensive changes to a property he recently purchased, corner Maclaren and Bank. It was partially destroyed by fire.

Parkhill, Ont.

The Hastings Hotel was damaged by fire on the 9th inst. to the extent of about \$15,000.

Quebec, Que.

The stores of Glover, Fry & Co. were destroyed by fire on the 11th inst. Estimated loss, \$125,000.

Regina, Sask.

The Imperial Bank of Canada, it is stated, will erect a large block at the corner of Scarth street and Elworth avenue.

A six-storey fireproof office building will be erected by English capitalists on Eleventh avenue in the spring. The name of the company which will erect the building and the exact location are withheld for the present, but the plans are under preparation by M. W. Sharon, architect. The first two stories will be constructed of cut Bedford stone, and the balance of the building of buff terra cotta. Cost, \$200,000.

The Western Manufacturing Company, Limited, are their own architects for additions and alterations to their plant here and at Moose Jaw. The additions at Moose Jaw will be of brick and reinforced concrete, of one-storey, 28 x 42. Estimated cost, \$2,500; cost of equipment, \$5,500. The estimated cost of the one-storey power house here is \$3,500; of equipment, \$8,500. Plans and specifications for the latter were supplied.

(Continued on page 36)

Tenders and For Sale Department

ROCK CRUSHERS

We have a No. 6 and a No. 5 McCully gyratory type with manganese steel head and concaves, suitable for breaking very hard material. Both are new; never set up. Located New York State. Also a 60-ft. elevator and a 48-in. x 12-ft. McCully screen. Will sell separately. Attractively priced. Confer with us.

WILLIS SHAW MACHINERY CO.,
171 La Salle St.,
Chicago, Ill.

Tenders

Toronto General Hospital

Tenders addressed to the Chairman of the Building Committee will be received by the undersigned up till noon, Saturday, January 28th, 1911, for all the various trades required in the erection and completion of a Power House in connection with the General Hospital.

Plans and specifications and all other information can be obtained at the office of the Architects, DARLING AND PEARSON, 2 Leader Lane.

The lowest or any other tender not necessarily accepted. 3-3

Toronto Main Drainage

Sealed Tenders addressed to the Chairman of the Board of Control, City Hall, Toronto, Canada, endorsed "Tender for Section No. 1, Low Level Interceptor," or "Tender for Laying Reinforced Concrete Overflow Pipe from Sewage Tanks," etc., as the case may be, for the construction of the several sections of Low Level Interceptor and other works, as mentioned below, will be received by registered post only, until noon of TUESDAY, FEBRUARY 7TH, 1911.

The following is an approximate description of the various works:—

1. Low Level Interceptor, Section No. 1, Egg shape, 2 ft. 10 in. x 4 ft. 8 in. 4,566 linear feet.
2. Low Level Interceptor, Section No. 2, Egg shape, 3 ft. 2 in. x 4 ft. 9 in., 2,475 linear feet.
3. Low Level Interceptor, Section No. 3, Egg shape, 3 ft. 6 in. x 5 ft. 3 in., 2,295 linear feet; Circular, 4 ft. 6 in. diameter, 1,023 linear feet. (Total length Section No. 3, 3,318 linear feet).
4. Laying reinforced concrete overflow pipe from sewage tanks, 292 linear feet of 60-inch circular pipe in lengths of about 24 feet.
5. Cast Iron Penstocks for Low Level Interceptor.

Tenderers shall submit with their tender the names of two personal sureties approved by the City Treasurer, or in lieu of said personal sureties the bond of a Guarantee Company, approved as aforesaid.

Specifications may be obtained from, and original drawings will be on file and can be seen at the Main Drainage Department, City Engineer's Office, on and after January 9th, 1911.

For the convenience of Contractors, sets of blue prints have been prepared and will be issued to contractors, upon application to the City Engineer and upon receipt of deposits as follows: For items 1, 2 and 3 combined, \$5.00; for item 4, \$2.00, and for item 5, \$2.00. Deposits should be made by cheque payable to the City Treasurer. The deposits will be refunded upon return of blue prints in good condition within thirty days of receiving tenders.

The usual conditions relating to tenders as prescribed by City By-law must be strictly complied with or the tender will not be entertained. The lowest or any tender not necessarily accepted.

G. R. GEARY (Mayor),
Chairman, Board of Control.

City Hall, Toronto,
January 8th, 1911.

2-4



SEALED TENDERS addressed to the undersigned, and endorsed "Tender for Interior, Fittings, Postal Station B, Toronto," will be received until 4.00 p.m., on Monday, January 30th, 1911, for the work mentioned.

Tenders will not be considered unless made upon, and in accordance with conditions contained in forms furnished by Department.

Plans and specifications to be seen on application to Mr. T. A. Hastings, Clerk of Works, Postal Station "E" Toronto, and at the Department of Public Works, Ottawa.

Each cheque must be accompanied by an accepted cheque on a chartered bank, payable to the order of the Honourable the Minister of Public Works, equal to ten per cent. (10 p.c.) of the amount of the tender.

By order,

R. C. DESROCHERS,

Secretary,
Department of Public Works,
Ottawa, January 12, 1911.

3-3

Plaster Manufacturing Plant for Sale by Tender

Tenders will be received by the undersigned up to noon on Monday, 6th February, 1911, for the purchase of the assets of The Imperial Plaster Company, Limited, Toronto and Cayuga as follows:—

Parcel 1.—Toronto Assets.	
Buildings, Plant and Machinery	\$8,616.55
Stock in trade and Chattels	2,714.79
	\$11,331.34
Parcel 2.—Cayuga Assets.	
Mine and Buildings	\$6,750.00
Plant and Equipment	4,413.83
Rock, mined and crushed ..	627.45
	\$11,791.28
	\$23,122.62

Intending purchasers may tender for the above mentioned assets en bloc or for either or both of the parcels separately.

Each tender must be accompanied by a certified cheque, payable to the Assignee, for ten per cent. of the amount of such tender. Information as to terms, etc., may be had and inventories seen at the office of the undersigned.

J. P. LANGLEY, Assignee,
McKinnon Building, Toronto, Canada.

Positions Vacant

Advertisements under this heading two cents a word per insertion

WANTED IMMEDIATELY.—Competent architectural draftsman. Must be first-class on design, working drawings, details, and perspectives rendered in colors, and be capable of taking charge of office in western city. State salary expected; send samples of work. Only first-class men need apply. Address Box 187 "Contract Record," Toronto. 2-3

Positions Wanted

Advertisements under this heading one cent a word per insertion. Box No ten cents extra

WANTED.—Position as superintendent or general foreman, railroad work preferred. Twenty years experienced. Address, Box 189, Contract Record, Toronto, Ont. 3-4

ALL ROUND ARCHITECTURAL DRAFTSMAN.—14 years' experience, capable of handling large projects as well as ordinary commissions, managing an office and interviewing clients. Four years' private practice. At liberty May 1st. Vancouver, Victoria or other Pacific coast cities preferred. Address LOUIS R. CHRISTIE, 2542 North Spaulding Avenue, Chicago, Ill. 2-8

City of Winnipeg

Tenders for

Pumping Machinery

Sealed tenders addressed to the Chairman, Board of Control, Winnipeg, Canada, will be received at the office of the undersigned up to 11 a.m., on MONDAY, FEBRUARY 6TH, 1911, for the manufacture, delivery and erection complete of Two Pumping Plants each of a capacity of one million imperial gallons per 24 hours. Specifications and forms of tender, together with conditions governing tenders as prescribed by law, may be obtained at the office of the City Engineer, 223 James Avenue, Winnipeg. The city reserves the right to reject any or all tenders, or to accept any bid which appears advantageous to the city's interest.

M. PETERSON,

Secretary.

Board of Control Office,
Winnipeg, Jan. 6th, 1911.

2-3

Miscellaneous

Advertisements under this heading one cent a word per insertion. Box No ten cents extra

REPRESENTATIVES WANTED.—Reliable firm manufacturing complete line of electrical measuring instruments want responsible representatives to handle their lines throughout the whole of Canada. Are prepared to deal separately for Eastern and Western Canada. Box 194 Contract Record, Toronto, Ont. 3-5

Business Buildings and Industrial Plants

(Continued from page 35)

plied by O. E. Tench, architect, Newmarket, Ont. T. A. Wilson, manager. Equipment has been supplied.

Stony Plain, Alta.

One section of the town on Main street from Railway avenue to Second avenue, was destroyed by fire on the 9th inst.

Three Rivers, Que.

Plans are being prepared by Messrs. Pringle & Co., Coristine Building, Montreal, for the buildings in connection with the Wayacamite pulp and paper mills. Although the prospective cost of these buildings cannot be ascertained, it is understood that it will be in the neighborhood of \$100,000.

Tofield, Alta.

A business block at Ryley, east of here, was destroyed by fire. Estimated loss, \$20,000. The principal losers were Wick, Bugar, J. L. Hay and others.

Toronto, Ont.

Mr. P. J. Mulqueen, it is stated, will erect a hotel on Yonge street north of the Tremont House on the expiration of the present lease in April, 1912.

Vancouver, B.C.

The Western Steel Corporation are stated to have purchased 300 acres on the south side of the Fraser river through the Canadian Incorporated Subsidiary Company. About \$2,000,000 will be expended on construction of buildings and wharves and installation of machinery. Among the Vancouver men

interested are Messrs. R. P. McLennan, G. M. Gibbs, and S. G. Faulkner, direct- the American Company, of Irontdale, Wash., has approved of the site. Noted previously.

Welland, Ont.

Mr. Bugar has been authorized by the Niagara Falls, Welland and Dunnville Electric Railway to secure sites for their depot, it is stated.

The Canadian Automatic Transportation Company, with head office at Toronto, a branch of the Automatic Transportation Company, of Buffalo, it is reported, will erect its Canadian plant here, having purchased a site of three acres adjoining the Ontario Iron and Steel Company. Building operations will begin at once.

Winnipeg, Man.

The Kelly Block was destroyed by fire on the 14th inst. Total loss, about \$400,000.

The Allan Line Steamship Company has purchased 30 feet on the west side of Main street immediately north of All-oway & Champion's new banking premises. It is the intention to tear down the old building and early in the spring the Alan Line will erect a handsome modern office building on the site.

AWARDED

Montreal, Que.

Messrs. National Steel Co. are erecting a large plant at Longue Pointe to cost one million dollars. General contract awarded to Messrs. Peter Lyall & Sons Limited, general contractors, Board of Trade Building.

The Queen's Hotel Co. are making an extension to their present premises at the corner of St. James and Windsor streets. The general contract has been awarded to Peter Lyall & Sons Limited, Board of Trade Building. Architects, Saxe & Archibald, 59 Beaver Hall Hill.

The contract for the ornamental iron works in connection with the new office building being erected for the Dominion Express Co., St. James Street, has been awarded to Messrs. John Watson & Son, Limited, 173 Wellington Street. Architects, E. & W. S. Maxwell. General Contractors, Peter Lyall & Sons, Limited.

Three Rivers, Que.

The contract for the 200 ton pulp machine for the Wayakamite Paper Co. has been let to the Jeffrey Manufacturing Company.

Power Plants, Electricity and Telephones

Arnprior, Ont.

The by-law to authorize the pumping of water by electric power was carried. This power will be developed by a company on the Mississippi at Galetta.

Calgary, Alta.

It has been decided to build a passable road to the power site on the recommendation of City Engineer Child. This is considered the initial step in the development of water power on the Elbow river. The road is required to furnish thoroughfare along a trail which now entails the fording of the river thirteen times within six miles.

Ottawa, Ont.

There is a proposal on foot to build a large dam across the Rideau river at Hog's Back, at the outskirts of the city. It is claimed that there would be a 30-foot head available there for developing

power. Engineers are now investigating the feasibility of developing this power.

The Morrisburg and Ottawa Electric Railway asked permission from Council to run electric cars over Main street and Hawthorne avenue, in Ottawa East; for an entrance into the city to the freight and passenger terminal station, which it is proposed to erect on the west side of Main street at the corner of Hawthorne avenue. The city was also asked to grade Main street before the tracks were laid.

Press reports state the establishment of an electric smelting plant at Chats Falls, on the Ottawa River. Active work preparatory to the erection of the plant will begin early in the spring. It is proposed to build an electric line from the falls to the mines.

Port Hope, Ont.

A by-law granting a 30-year franchise to the Seymour Electric Power Company was carried here.

Regina, Sask.

The tenders for overhead work in connection with the installation of the street railway system, have been received by the commissioners, and were considered. The tenders are very complicated, according to the commissioners, and will require considerable attention before an accurate comparison can be made of them. City Commissioner, McPherson.

Toronto, Ont.

The City Engineer was instructed to report on the desirability of putting cluster lights on residential and other streets as local improvements.

The recommendation of the City Engineer that the Toronto Railway Company be ordered to lay a double line of car tracks on Danforth avenue from Broadway to a point 200 feet east of Greenwoods avenue and to extend the service thereon, was endorsed, along with the recommendation that the track allowance be paved with brick block, placed on a concrete foundation, at an estimated cost of \$66,000. It was further recommended that the company be ordered to lay tracks on Greenwoods Avenue from Gerrard Street on Danforth Avenue, and to extend the service thereon and that the track allowance be similarly paved at an estimated cost of \$54,050.

Vancouver, B.C.

The British Columbia Hydraulic Power Co., Ltd., Vancouver, is making application under the Water Act for a water record of 500 cubic feet per second, to be taken from Nanaimo river and lakes at a dam 30 feet high, about 1,200 feet above Nanaimo falls, and raising the water level to a point 3,500 feet above the point of diversion.

Victoria, B.C.

The arrangement between the city and the British Columbia Electric Company, of a flat rate of one and seventy-five one thousandths cents per kilowatt hour for electricity to be supplied by the company's Jordan river plant, is approved of by the company and notification to council. A. T. Goward, local manager.

Winnipeg, Man.

It is stated that Mackenzie & Mann will erect a subsidiary steam power house at the foot of Mills street. This with the present Assiniboine plant would furnish 44,000 h.p. within the city limits should the appeal to Privy Council from the decision against the com-

pany furnishing power for domestic lighting from its Lac du Bonnet water power plant be dismissed this move will probably enable the company to comply with the city's demand.

AWARDED

Calgary, Alta.

Chapman & Walker, Toronto, Ont., have been awarded for the Calgary Municipal system the contract for the supply of one 1,500 h.p. 2300 v., 3-phase, 60 cycle, 400 r.p.m. synchronous motor, to be direct connected to a 1,000 k.w. d.c. 550-600 volt generator; also one 200 k.w. motor generator exciter set; also complete switchboard apparatus—motor generator and exciter set, manufactured by Dick, Kerr & Co., Ltd.; switchboard by Cowans, Ltd., Manchester, England.

Ottawa, Ont.

The lowest tender for ornamental electric light poles for the extension of the white way was that of Northern Electric Co., which was \$6,750 for 150 poles the same as those already placed on Sparks street and that of the Canada Foundry Company for \$6,950 for a shorter pole which is fluted and would be more attractive. The Municipal Electric Commission has recommended in favor of the latter.

Miscellaneous

Ottawa, Ont.

Tenders will be received until February 17th, 1911, for the supply of a marine boiler for fisheries protection cruiser "Curlew." G. J. Desbarats, Deputy Minister of Naval Service, Department of the Naval Service, Ottawa.

Toronto, Ont.

Recent building permits include:—Harris & Lee, 1 pair semi-detached two-storey brick dwellings on Conduit street, \$4,800; S. R. Campbell, two-storey theatre on Main street, \$5,000; J. J. Farrell, 1 pair semi-detached 2½-storey brick dwellings 159-7 Campbell avenue, \$4,600; Fletcher Mfg. Co., five-storey brick and steel addition to factory, Hayter street, \$6,000; J. T. & H. Hutson, two-storey and attic brick dwelling, cor. Oriole road and Heath street, \$5,000; Geo. Gander, 2½-storey brick dwelling, Gladstone avenue, \$3,300; Ed. Elliott, 2 pair semi-detached 2-storey brick dwellings, on Concord avenue, \$12,000; Caulfield, Burns & Gibson, Ltd., alterations to factory, Spadina avenue, \$3,000; J. Castleman (in trust), three-storey brick store and dwelling and warehouse, S.E. cor. Elm and Elizabeth streets, \$12,000; Weismiller & MacKenzie Bros., two-storey brick store and dwelling, corner Rideau and Macdonnell, \$3,000; H. B. Reesor, 1 pair semi-detached two-storey brick dwellings on west side George street, \$5,500; The Chemical Laboratories, galvanised iron testing room, 148 VanHorne street, \$5,000; H. Jennings, 2½-storey brick dwelling on St. Clair avenue, \$5,500.

Vancouver, B.C.

Building permits were issued as follows: T. N. Yates, 1572 Graveley street \$6,000; W. J. Read, 1818 Cornwall street, \$3,500; J. Coleman, 260 Eleventh avenue east, \$4,000; W. H. Brown, Semlin and Barnard, three houses, \$8,400.

Tenders are called until February 6th for purchase of the assets of The Imperial Plaster Company, Limited, Toronto and Cayuga. Advertisement in "Tenders and For Sale Department" of this issue.

Laying Wood Paving with Cement-Grout Cushion along Street Car Tracks

A difficulty which attends the use of wood block paving is that of adjusting and supporting it effectively at such breaks in the pavement as are caused by manholes, sewer inlets, street railway rails, etc. The greatest amount of trouble occurs at the rails, as they form a continuous break in the center of the street, where traffic is most congested. The manholes and inlets are scattered and are placed where they are subject only to an average amount of traffic. This matter has been investigated by Mr. H. G. Davis on behalf of the Chicago Street Improvement Association, and the following information is taken from a report on the investigation.

The trouble at the rails is due to the following causes: (1) vibration caused by the movements of cars, (2) leakage of water into the sand cushion by passing between the rail and the paving, (3) the heavy stress to which the paving is subjected due to concentration of traffic upon it. Under these conditions, where any block pavement (wood, brick or stone) is laid upon a sand cushion, a special treatment is needed to prevent the sand from being washed or jarred out of place, and a consequent settlement of the paving. This settlement, however slight, is disastrous to any pavement, and especially so for wood block paving. As soon as blocks settle the paving begins to get the pounding effects of heavily loaded vehicles and a rut is produced.

The vibration alone will tend to shift the sand, but when water gets into the sand the latter becomes extremely mobile and the movement is accentuated. The vibration has also a pumping effect upon the saturated sand, and may cause it to flow to the surface of the pavement. Should this saturated bed of sand become frozen, it is likely to heave to such an extent as to cause damage to the pavement. To reduce the jarring, the joint along the rail should be fitted as perfectly as possible, so that wheels of vehicles will not drop or climb in passing from the rail to the pavement.

The remedy for the shifting of the sand and consequent settlement of the paving is believed to be in the treatment of the sand cushion. About five years ago the South Park Commission (Chicago) began using wood block paving for intersections of parkways with streets having car tracks, and laid the blocks on a cushion of cement grout instead of sand. This paving has proved successful under heavy traffic. The plan suggested, therefore, is to use this sand-cement grout instead of sand for the cushion bed between the rails and for at not entirely new, and is included in the plans prepared least 12 inches outside the rails. This cushion will not be affected by water or vibration. This arrangement is some time ago for Chicago street railway track construction with brick pavement. In this case, however, the grout cushion is used only for a strip on each side of each rail.

It is recommended that a dry mixture of 1 part Portland cement to 3 parts sand should be made, and spread in the same way as the ordinary sand cushion. The blocks are laid upon this and tamped. Then the paving is flushed thoroughly, so that the water will pass through the joints and interstices and saturate the sand-cement base. It is best to keep traffic off the pavement for 24 or 48 hours, in order to give the grout time to set. It is said that this is not absolutely necessary, however, as even if the traffic is admitted immediately, the material will "cake" sufficiently to be superior to a sand cushion. The additional cost is said to be very slight. This grout cushion may be used with either

wood, brick or stone block paving; it may be used also around manholes, etc., if desired.

Another difficulty experienced where wood block paving is laid between the rails is the development of transverse ruts or grooves at the tie-rods which hold the rails together. This is due to the wide joint, and it is suggested that where such rods are used the blocks should be chamfered so as to permit of making the usual close joint. This would cause a little trouble in laying the pavement, but not enough to add materially to the cost.

Notable Concrete Bridge

A long concrete girder bridge has recently been completed by the Southern Railway Co. for its two-track line across the French Broad River near Asheville, N.C., between which city and Craggy, N.C., a new alignment and construction has been in progress. The bridge is 733 ft. 10 in. long, and consists of a series of twenty-two 30 ft. spans, each span of three parallel reinforced concrete girders, all resting on a solid concrete pier extending, on a skew of 30° to the axis of the bridge, clear across its width. The three girders are spaced 13 ft. 4 in. c. to c., the outside two each 24 in. wide and 7 ft. 7 in. deep, and the middle girder 36 in. wide and 9 ft. 7 in. deep, both reinforced heavily. The roadway is carried on a solid concrete slab between these girders 24 in. deep in the middle and with large brackets reaching down to the supporting girders. The spans are divided into series of four, at each of which the piers are 4 ft. thick at the top, the intermediate piers being but 3 ft. thick. The foundations are carried down to solid rock. The girders are continuous for the entire length of the bridge, but on each pier, at the foot of the small brackets reaching up to the girders, a grooved expansion joint was made by placing along it two thicknesses of ordinary tar paper. Further expansion was provided by a 2 in. space at each end of the continuous girder. Design loads and stresses were: Loading, Cooper E-50 + 100% impact; tension in steel, 12,500 lbs. per sq. in.; compression in concrete 450 lbs. per sq. in. Work was completed in May, 1910. The approximate cost of the entire structure was \$125,000.

Use of Sawdust Concrete

Sawdust concrete has been used in the new Public Library building at Springfield, Mass., as a base on which to lay the cork carpet covering the floor. The object of the sawdust concrete was to obtain a layer into which nails could be driven and which at the same time would hold the nails. The company that laid it states that it accomplished both these purposes. If it had not been used it would have been necessary to lay the usual wooden floor, on sleepers and a cinder fill, between the structural slab and the cork carpet. The mix originally specified was 1:2:2, one part cement, two parts sand and two parts sawdust; but before applying it the contractors decided to experiment with various proportions. It was found that the 1:2:2 mixture would not set and after a couple of weeks could almost be blown away by the wind. Further experiments led to the conclusion that a 1:2:3/4 mix, three-fourths of a part of sawdust, would give proper results and 5,000 sq. ft. of this mixture were laid. The thickness of the layer was 1 in. and after four months of service indications are that the material is successful. No cracks developed, even in strips as long as 125 and 150 ft., except at the joints at the end of a day's work. At some of these points cracks opened to a width of 1/4 in.

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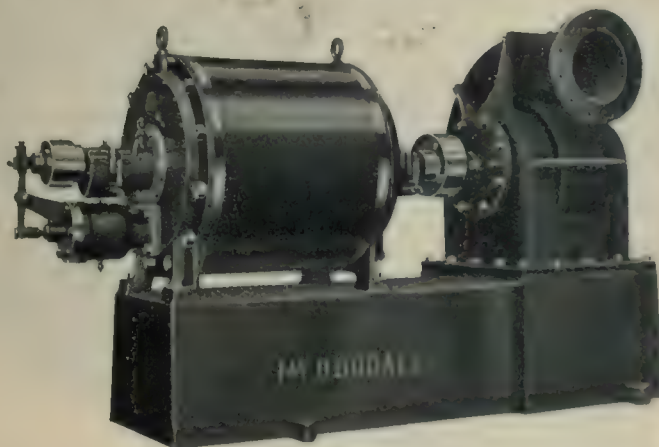
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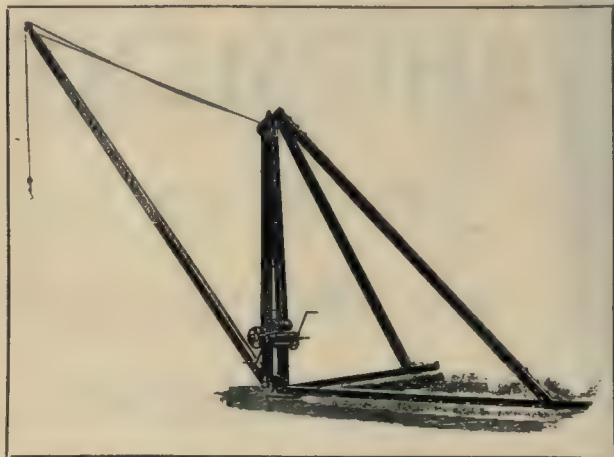
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Responsibility of the Public Press

The recent investigations at Woodstock, Ont., have been productive, as might have been expected, of a certain amount of bungling on the part of the public press. The inaccurate and distorted versions of the newspaper reporter are continually a source of trouble in the technical field. The fact of it is, the value of getting news is impressed upon the reporter so much that it becomes subversive of everything else in his composition. The spirit in which many so-called "news" items are obtained and published, puts one in mind of the Quaker's advice: "My son, get money; honestly if you can, but get money." There may or may not be a certain amount of worldly wisdom in this principle, but when it is applied to the circulation of reports concerning established institutions and business men of repute, it is time to call a halt.

An announcement was made recently in the Toronto papers that James A. Vance, acting as agent of the Hamilton Bridge Works Company, Limited, paid E. L. Sutherland, one of the municipal officials, a bribe of \$50 to secure a contract for a highway bridge. As a matter of fact, the name of the Hamilton Bridge Works Company was not even mentioned at the Woodstock investigation, a statement which is authorized by Judge Snider, the presiding officer, and also by counsel for the Government and County. Upon discovering that the said Vance was not an agent of the company, and that the only transactions that had been made between him and the bridge concern were in the regular way of business as purchaser and vendor, the statements were retracted. Neither apologies nor damages, however, are any compensation for this sort of thing.

The Hamilton Bridge Works are one of the most responsible concerns of the kind in Canada, and they are doing an enormous business on their merits and on good sound principles. The slandering of such institutions, whether wilfully or from neglecting to obtain proper confirmation of news reports, is a violation of business ethics for which there is no palliation.

Practical Work in the College

In another column will be found an interesting letter on the Training of the Engineer-Contractor, by Mr. A. W. Connor, Toronto. A brief consideration of this subject is appropriate in this number. Mr. Connor's letter is written in criticism of an article by Mr. W. R. Harris, published in our issue of November 2, and of a reply thereto by Mr. Henry Holgate, of Montreal, in that of November 23. Inasmuch as the matter was discussed editorially in the latter issue, it is not our intention to make extended reference to the subject at this time, but a number of the statements made by Mr. Connor appeal to us as being particularly suggestive. Mr. Connor's opinion coincides to some extent with that of Mr. Holgate, in that the college is *not* the proper place to acquire practical knowledge relating to construction. "I believe it is a great mistake," he writes, "for a college to attempt teaching shop work. This can be done better and more economically in a real shop that has to earn dividends." The two writers agree upon the value of practical work during the vacation, and Mr. Connor admits the force of Mr. Holgate's suggestions in this connection.

All things considered, the impression of Mr. Harris' article is still with us. Possibly he is a little over-enthusiastic upon the value of practical knowledge, but we are living in a practical age and this is excusable. Certain it is that the man who is going to make a success of engineering-contracting in its modern application must have an intimate knowledge of practical work and appliances as well as of design.

"Too much must not be expected of the newly fledged graduate," to quote again from Mr. Connor's letter in this number. Certainly it is folly to put a boy on a man's job. After all, the college has well defined limitations, and while its training and qualifications are indispensable, the real business of life will always start outside. It depends very much upon the man, and the extent to which he tries to improve himself in the practical side of his training. For our own part, we think that there is a certain tendency on the part of the college to sacrifice the practical to the theoretical. This tendency can be counteracted to a certain extent by the profession itself, but too much must not be expected.

Toronto Branch, Can. Soc. C. E.

At the annual meeting of the Toronto branch of the Canadian Society of Civil Engineers, held at the Engineers' Club on Friday, Jan. 6th, Dr. Galbraith in the chair, the following officers were elected for 1911: Chairman, H. E. T. Haultain; Secretary-Treasurer, A. C. D. Blanchard; Executive, T. C. Irving, Geo. Powell, P. Gillespie, W. E. Douglas and E. A. James. The reports submitted were adopted and forwarded to the Canadian Society. The Auditor's report showed a balance of \$130 to the good.

Annual Meeting of the Ontario Good Roads Association

Active preparations are being made for the annual meeting of the Ontario Good Roads Association, which is to be held in Toronto March 1-3. Mr. W. A. MacLean, the Provincial Highways Engineer, who is Secretary of the Association, is working energetically in the interests of the convention and a most interesting programme is being prepared. Special arrangements are being made in the way of transportation. A record gathering may be expected.

1910 Was Canada's Greatest Building Year

Twenty Five Leading Cities Expended nearly One Hundred Millions—An Average Gain of 44 per cent—Optimistic Forecasts for Coming Season

The building returns for 1910 submitted by the principal cities of the Dominion, show an average increase of 44 per cent. over 1909. In 1910 the expenditure was \$94,180,778, compared with \$65,459,456 for the preceding year. December, 1910, showed an increase of more than two and one-half millions over December, 1909. These figures, taken in conjunction with the favorable indications for 1911, should be a source of much gratification and encouragement to those interested in building and engineering work throughout the Dominion. In the

may be gleaned from the reports. Toronto maintains its place at the head of the list with an increase of 16 per cent. During the first six months of 1910 a gain of 11 per cent. was recorded over the corresponding period of 1909, so that the final return can only be regarded as an evidence of steady development and well maintained prosperity.

Perhaps the most noteworthy feature of the returns is Montreal's gain of 103 per cent. The figures are particularly striking when it is considered that they are

Town or City.	Dec., 1909.	Dec., 1910.	12 mos., '09.	12 mos., '10.	Approx. Increase for 12 mos.
Toronto	\$1,593,365	\$1,353,265	\$18,139,247	\$21,127,783	16
Montreal	166,885	856,800	7,783,621	15,815,859	103
Winnipeg	33,425	970,250	9,226,825	15,106,450	64
Vancouver	512,919	958,775	7,258,565	13,150,365	81
Calgary	151,550	354,300	2,420,450	5,589,594	131
Ottawa	104,125	174,350	4,527,590	3,040,900	33*
Hamilton	69,300	49,550	1,623,100	2,604,605	60
Fort William	247,800	404,135	2,970,365	2,381,125	20*
Regina	9,025	30,625	749,194	2,352,288	214
Victoria	71,700	131,750	1,673,420	2,273,045	36
Edmonton	9,780	141,321	2,128,166	2,159,106	1
Lethbridge	33,885	25,450	1,268,215	1,210,810	4*
Port Arthur . . . . .	.....	76,800	584,810	1,062,615	82
Moose Jaw . . . . .	.....	25,000	497,440	1,060,290	113
Brandon	60	6,368	350,120	932,385	166
London	32,155	63,085	850,134	805,074	5*
Brantford . . . . .	.....	62,500	439,335	681,030	55
Peterboro'	2,095	9,240	343,489	517,958	51
Halifax	33,550	18,770	630,379	471,140	25*
Windsor	2,500	22,700	392,040	423,885	6
Strathcona	1,200	10,200	572,330	373,670	35*
Sydney, N.S.	7,700	12,800	160,470	347,554	116
St. Thomas	5,700	10,150	261,600	286,650	10
Kingston . . . . .	.....	495	452,695	220,092	51*
Stratford	2,017	1,068	155,856	186,504	20
Totals	\$3,090,736	\$5,769,747	\$65,459,456	\$94,180,778	
Average increase 44 per cent.					*Decrease.

reports received from city engineers, city clerks and building inspectors, the consensus of opinion is that the standard of prosperity set up by 1910 will be raised to a still higher level during 1911. In connection with the average increase of 44 per cent. for the year, it is significant to recall that the returns for the first six months of 1910 showed an average gain of 41 per cent. A greater falling off might have been expected towards the close of the year, in view of the fact that an effort is always made to get an early start on the more important works of the season. The final returns for 1910 are indicative of natural and healthy progress in all departments. The average increase of 44 per cent. is a representative figure for the Dominion.

In the accompanying table several decreases will be noted. In a number of cases, however, these are attributable to some exceptional inflation the previous year, as

exclusive of the returns from the suburbs. Allowance must be made, however, for the fact that the annexation at the beginning of the year brought in the town of St. Louis, one of the most rapidly developing districts on the island, and other municipalities later on in the year. Thus had the total from municipalities which became part of the parent city in 1910 been added to the Montreal total for 1909, a more accurate basis of comparison would be reached. These former municipalities, now city wards, in 1909 showed building operations amounting to \$2,929,800, which, added to the \$7,783,621 shown in the city records for the year, would give a total of \$10,713,421. As compared then with returns from practically the same area of \$15,815,859 in 1910, the actual gain for the year was about 50 per cent., and not over 100 per cent., as would at first appear.

Of the other eastern cities, Hamilton, with a gain of

60 per cent., and Port Arthur, with an increase of 82 per cent., are entitled to special mention.

From Western Canada there is every evidence of consistent development. Winnipeg, which occupies third place in the table, expended over fifteen millions during 1910, and made a gain of 64 per cent. Vancouver, in the fourth position, has a most creditable record, with a gain of 81 per cent. and a total expenditure of only two millions less than Winnipeg. The fifth place falls to Calgary, with an increase of 131 per cent. To Regina belongs the honor of making the highest gain for the year of Canada's leading cities—214 per cent. Only two decreases are to be found in Western Canada, and in neither case are these attributable to any depression in trade.

Further information, retrospective and prospective, will be found in the following reports:

Toronto, Ont.—P. L. Fraser, Secretary, Builders' Exchange, Toronto, writes: "At the end of 1909 there was a general feeling that Toronto had reached the high water mark in the building industry for some years to come. The first six months of the past year dispelled this view and it was generally admitted that the amount of building for 1910 would exceed that of the previous year by several million dollars. This has proved the case and 1910 leads that of the previous year which was the highest by about \$3,000,000 or 16 per cent. In fact, Toronto permits this year are several millions higher than any other Canadian city.

The question is being asked, "Is Toronto not over building?" There seems to be nothing to indicate that this is the case. Outside of the buildings that are erected under contract, the reports from the speculating builders are the very brightest. In the majority of cases, they report having sold their complete number of buildings. The only danger existing that should cause any one to have a pessimistic view are the inducements that the West offers for investment. As long as we can hold our money in this city there is no reason why the building industry should suffer any relapse.

Conditions have been good the year through. The continual fine weather was a great factor in facilitating the work. There were no serious labor troubles and always sufficient workmen to carry along operations. The contractors experienced most trouble in acquiring supplies. Brick has been scarce all the year and the G.T.R. strike was a source of delay in securing lime, gravel, stone and other supplies from outside points.

Prospects for 1911 at this date seem even brighter than at this period a year ago. There is much large work under way, and along with the uncompleted work of last season, such as the new General Hospital, the indications are for a very busy year.

Montreal, Que.—Correspondence of the "Contract Record."—As will be seen by the above returns there was no abatement of activity in Montreal in 1910. Building conditions throughout the year were most satisfactory and there was a comparative immunity from labor troubles. Many important projects are under way and contemplated. The city itself has a most extensive programme. Generally the outlook for 1911 is excellent.

Winnipeg, Man.—City Building Inspector Rodgers, who has earned a reputation by virtue of his ability to forecast building conditions and totals, expects the year 1911 to at least equal 1910, with a total of over \$15,000,000. Present conditions are satisfactory. Things are rather quiet in the supply business, but a considerable amount of winter building is going on. It is stated that more bricklaying and carpentry work has been carried out in Winnipeg this winter than for years past.

Vancouver, B.C.—S. H. Jarrett, Building Inspector, writes: "In closing the year's business it is very gratifying to report such a substantial increase over 1909. The increase is phenomenal when it was made without taking in any new terri-

tory. The present area of the city is only 8 square miles. In the outlying portions I can safely say that \$1,000,000 worth of building has been done. For this my record gets no credit."

Calgary, Alta.—The year 1910 has been a record one from a building standpoint and is easily ahead of any other year in the city's history. Building Inspector Harrison looks for an advance in 1911 and it is hoped that the seven million dollar mark will be reached. This is most probable owing to the enlargement of the city boundaries.

Ottawa, Ont.—Correspondence of the "Contract Record."—Commercial building in the city during 1910 was heavier than for years but from an all-round building standpoint the year was not so satisfactory, the activity being confined pretty much to the one class of work. The outlook for 1911 is good. An increase in residential work is looked for. The following is a comparison of the wages prevailing last year in Ottawa with those of Toronto and Montreal:

Masons and bricklayers, per hour, Toronto 50 cents, Montreal 50 cents, Ottawa 50 cents (increasing to 52 on May 1 next).
Stonecutters, per hour, Toronto 50 cents, Montreal 40 cents, Ottawa 50 cents.

Marble cutters and setters, per hour, Toronto 30 and 40 cents, Montreal 37½ cents, Ottawa 35 to 40 cents.

Cement finishers, per hour, Toronto 40 cents, Montreal 30 to 35 cents, Ottawa 25 to 30 cents.

Laborers and hod carriers, per hour, Toronto 25 cents, Montreal 15 to 22 cents, Ottawa 25 cents.

Painters, per hour, Toronto 30 cents, Montreal 25½ to 30 cents, Ottawa 27 to 30 cents. Paperhangers 30 cents.

Electricians, per hour, Toronto 30 cents, Montreal 25 to 27½ cents, Ottawa 25 to 35 cents.

Sheet metal workers, per hour, Toronto 33 cents, Montreal 30 cents, Ottawa 35 to 45 cents.

Plumbers, per hour, Toronto 42½ cents, Montreal 30 to 35 cents, Ottawa 39 to 43 cents.

Steamfitters, per hour, Toronto 42½ to 47 cents, Montreal 30 to 35 cents, Ottawa 39 to 43 cents.

Plumbers' and steamfitters' helpers, per hour, Toronto 15 cents, Montreal 7½ to 15 cents, Ottawa 8 to 15 cents.

Gasfitters, per hour, Toronto 40 cents, Montreal 30 to 35 cents, Ottawa 39 to 43 cents.

Roofers, per hour, Toronto 30 cents, Montreal 25 to 30 cents, Ottawa 30 to 45 cents.

Carpenters, per hour, Toronto 35 cents, Montreal 25 to 30 cents, Ottawa 25 to 32 cents.

Tile setters, per hour, Toronto 50 cents, Montreal 25 cents, Ottawa 25 to 40 cents.

Lathers, per thousand, Toronto 42 cents, Montreal 44 4-9 cents, Ottawa 45 cents.

Plasterers, per hour, Toronto 50 cents, Montreal 40 cents, Ottawa 40 to 42½ cents.

Hoisting engineers, per hour, Toronto 35 cents, Montreal 25 cents, Ottawa 30 to 40 cents.

Ornamental iron setters, per hour, Toronto 30 to 35 cents, Montreal 25 to 30 cents, Ottawa 30 to 35 cents.

Structural iron setters, per hour, Toronto 25 to 35 cents, Montreal 33½ cents, Ottawa 30 to 35 cents.

Hamilton, Ont.—The substantial increase recorded during 1910 by this city is regarded with much satisfaction by Building Inspector Anderson, who writes: "1910 was a good year but the prospects for 1911 are even brighter. We look forward to a very busy year in the erection of factory buildings. A number of important additions are contemplated and several new concerns will erect large plants."

Fort William, Ont.—S. Macnamara, Building Inspector, writes: "1910 was a record year at Fort William. Our figures are somewhat lower than for last year, but it is owing to the fact that elevator work was practically eliminated, only one permit having been issued, representing an outlay of \$235,000, whereas last year the permits for elevator work totalled one and a half millions. The increase in factories, business blocks and warehouses more than compensates for the apparent decline. Each year shows a marked improvement on the previous one by the class of dwellings, blocks and stores erected—larger, better and a more lavish expenditure of money. Altogether the year's work has exceeded the most sanguine anticipations, and apparently little relaxation will take place during the winter months. Spring prospects look good."

Regina, Sask.—R. G. Burdett, Secretary, Board of Trade,

writes: "Trade conditions in Regina and in Saskatchewan generally were never better than in 1910. The prospects for 1911 are even brighter. The grain crop was exceptionally good in this locality last season and this accounts to some extent for the excellent local trade. It is the consensus of opinion that 1911 will be the greatest year in our history. Important municipal improvements are contemplated, these including the installation of a street railway, the building of the Board street subway, extensive water and sewer additions, disposal works, street paving, etc. The entrance of the G. T. P. with five lines into Regina and the opening of additional branch lines of the C. P. R. and C. N. R. will doubtless attract new industries and give a general impetus to business. It is estimated that the building during 1911 will exceed the three million dollar mark."

Edmonton, Alta.—Ernest H. Cotterhill, Superintendent of Buildings, writes: "Last year was Edmonton's busiest season. The work done was \$1,000,000 above the value of the permits, as several large works, such as the new Parliament Buildings and the new Court House, commenced one or two years ago, have been in full swing this season. The prospects for the coming year are very bright. The spring will see the commencement of a number of metropolitan buildings, between 6 and 10 storeys high. The architects are all busy and report numerous projects."

Lethbridge, Alta.—H. V. Meech, Building Inspector, writes: "Building operations here have been delayed somewhat during the last two or three months owing to the early cold weather. This has affected to some extent the year's returns. Judging by inquiries and trade indications, prospects for the spring are bright."

Port Arthur, Ont.—J. McTeigue, City Clerk, writes: "During the past four or five years building conditions in this city have been healthy and regular. A noteworthy feature is the improvement in the class of structures erected. The prospects for 1911 are excellent."

Moose Jaw, Sask.—W. F. Heal, City Clerk, writes: "The building prospects for Moose Jaw for the year 1911 are higher than they have been before at this season. It is anticipated that a number of new business blocks will be started as soon as spring opens. Among other buildings assured are Gordon, Ironsides and Fares' new packing plant, the Saskatchewan College, armory and market building. A large number of other buildings are in contemplation, but nothing definite has been announced. The Canadian Northern and Grand Trunk Pacific Railways will reach Moose Jaw early in the year, and the outlook is that 1911 will be the biggest year that Moose Jaw has yet had."

London, Ont.—Arthur E. Nutter, City Architect, writes: "The general character of the work done this year has been largely in the form of permanent improvements to existing property, this accounting for the large increase in the number of permits and the slight falling off in value, and indicating permanence and stability of existing institutions, rather than the launching out into new and possibly "wild cat" ventures. The prospects for 1911 are good. The proposal of the Council to erect a new \$150,000 or \$125,000 City Hall is an index of the feeling for progress, and undoubtedly will have a beneficial effect in inciting emulation on the part of other building owners."

Brantford, Ont.—T. Harry Jones, City Engineer, writes: "The record for 1910 is the greatest in the history of the city. It exceeds that of the previous record year, 1907, by \$167,000. Prospects are good."

Halifax, N.S.—F. W. W. Doane, City Engineer, writes: "The value of the work done during the year is less than that shown for 1909. The comparative showing, however, may be very easily misunderstood. The figures for 1909 were unusually large, as the building operations for that year included permits for a large cathedral and other expensive buildings. The figures for 1910 have returned to about the normal

sum. The prospects for 1911 do not promise anything unusual and there is no evidence at this date that there will be any building erected of unusual value that will increase the total for 1911 beyond the average. The most important building work for which a permit was issued during the past year was a new building for the Y.M.C.A., which is now in course of construction, the cost of which, when completed, may reach \$125,000."

Strathcona, Alta.—A. J. McLean, City Engineer, writes: "With the exception of inside work, building construction has stopped for the winter. There is every prospect of a large increase for 1911."

Sydney, N.S.—D. McD. Campbell, City Engineer, writes: "The prospects for 1911 were never better. A number of substantial brick buildings—stores for the most part—are under consideration. Our returns for 1910 do not include the expenditures on the plant of the Dominion Iron & Steel Company, Limited."

Kingston, Ont.—H. B. R. Craig, City Engineer, writes: "Despite the apparently bad showing of this city, 1910 was a normal year for building operations. The preceding year, 1909, was exceptional, as it included a new building for Queen's University and a new wing for the Hotel Dieu Hospital. Prospects for 1911 are for a normal year."

Woodstock, Ont.—J. H. Morrison, City Clerk, writes: "Prospects for 1911 are bright—more promising than for years. The outlook for industrial buildings is exceptionally good, the commissioners now being in negotiation with several manufacturing concerns. Increased activity may be expected in the line of residential work."

A breakwater at the British Navy Yard at Simon's Bay, Cape of Good Hope, is built with large concrete blocks placed in courses inclined 20 degrees to the horizontal. In order to secure this inclination it was necessary to lay on the rubble mound foundation a triangular bed of concrete for each course, so that the foundation was saw-toothed. As described in "Engineering," London, iron box frames of the exact triangular shape were constructed, the under side consisting of loose bars 1 inch in diameter spaced 6 inches apart. The boxes were lined with canvas to form a bag, which was filled with concrete, the projecting canvas at the top being folded over. The box with its concrete contents, weighing about five tons, was lifted by the crane and deposited on the level surface by divers. The bottom bars were then withdrawn and the frame of the box lifted, leaving a triangular-shaped bag of concrete to set and form an accurate foundation for the lowest tier of sloping blocks.

A breakwater on the east side of the new British Navy Yard at Simon's Bay, Cape of Good Hope, is 86 ft. wide, 6 ft. 3 in. high above the high-water level, 51 ft. high above the rubble mound foundation, and 2,500 ft. long. It consists of two walls 37 ft. apart in the clear, having the space so formed filled with selected material. Coal sheds having an aggregate length of 1,000 ft. and coal handling machinery are placed on the breakwater. The outer wall is uniformly 30 ft. thick and consists of 28-ton rectangular concrete blocks which are placed in courses inclined 20 degrees from the vertical. By this scheme the blocks were readily slid to place, insuring good bearing on their beds, as well as on the ends. This type of construction is carried to the deck level, but above low water there is a stone facing set in the blocks when they were cast. The inner wall, 14 ft. 3 in. thick in the upper part and 19 ft. in the lower, is built of concrete blocks with enlarged ends, which act as keys to tie the wall together. Above low-water level the inner wall is faced with granolithic concrete in courses, with granite stones at intervals to act as fenders for the protection of the granolithic work against rubbing action by the ship's fenders. These courses are backed with concrete. The large blocks in the outer wall were set by a titan crane having a lifting power of 40 tons at a radius of 75 ft.

Steady Progress of Calgary Power Company

The power house and step-up transformer house buildings at Kananaskis Falls, on the Bow river, are nearly completed, and the turbines are being installed. The initial installation consists of two 3,750 h.p. turbines, Jens Orten-Boving manufacture. These will drive two 2,500 k.v.a., 12,000 volt, 60 cycle, horizontal type, Canadian General Electric generators, which were delivered about December 1. The installation of these will be completed early in the new year. The accompanying figure represents the general layout of the Calgary plant. No's 2 and 3 are the units now being placed.

The 55,000 volt, 47 mile, transmission line to Calgary is pretty well completed. The double circuit 12,000 volt, 8 mile line to the Western Canada Cement Company's mill at Exshaw is quite complete, as is also the sub-station at this point, and everything is in readiness for the delivery of 3,000 h.p. to the Cement Company. The transmission wires are carried on wooden poles. Aluminium cable is used throughout and was supplied by the Northern Aluminum Company. The insulators are the pin type, Locke manufacture.

The main terminal station in Calgary is well under way. The station equipment is designed for receiving current at 55,000 volts and stepping it down to 12,000 volts, 24,000 volts and 600 volts. The 600 volt circuit will supply the Alberta Portland Cement Company, who are under contract to use 1,500 h.p. as soon as the system is in operation. The other two circuits will feed the city of Calgary, who are under contract with the Cal-

The dam and headworks are making good progress and everything points to the probability that the plant will be in operation early in the spring.

gary Power Company to take a minimum of 2,000 h.p.

The step-up transforming station at the falls will contain three 3,000 k.v.a. 3 phase units and the Calgary terminal station

will contain a total of 8,500 k.v.a. transformer capacity to take care of the city of Calgary and the Cement Company. This apparatus is being supplied by the Canadian Westinghouse, as is also all switching equipment for both stations.

Already the demand for more power has necessitated the placing of an order for a third unit, provision for which was made in the original plan of the power house as shown in the figure. The third turbine will be 6,000 h.p. capacity and is already being built. The Wellman-Seaver-Morgan Company, of Cleveland, Ohio, have the order. The third generator will have a capacity of 4,000 k.v.a., and will be installed by the Canadian General Electric Company. The installation of this third unit is to be completed early in the year. Smith, Kerry & Chase, Toronto, are the consulting engineers.

Dry-rot fungus was discovered on the floor joists of a certain house and an examination by Mr. William Ransom, Assoc. M. Inst. C.E., who has reported his findings in the "Surveyor," showed that great sheets of the fungoid growth existed beneath the lath and plaster. After trying a number of preparations to remedy the trouble, treatment of the wood and brickwork with carbolineum is said to have prevented the growth. The Board of Agriculture and Fisheries, Mr. Ransom states, recommends an application of carbolic acid to check dry rot fungus. Creosote, carbolineum and similar preparations, according to Mr. Ransom, should be applied to the ends of timbers resting in buildings as a preventive to the growth of dry rot and the ventilation of ground floor timbers should be assured by the provision of sufficient air bricks.

Mr. R. A. Brocklebank was elected President of the Calgary Builders' Exchange at the annual meeting of that body on Jan. 11th.



General plan of Calgary Power Company's Generating Plant, Kananaskis Falls, Bow River

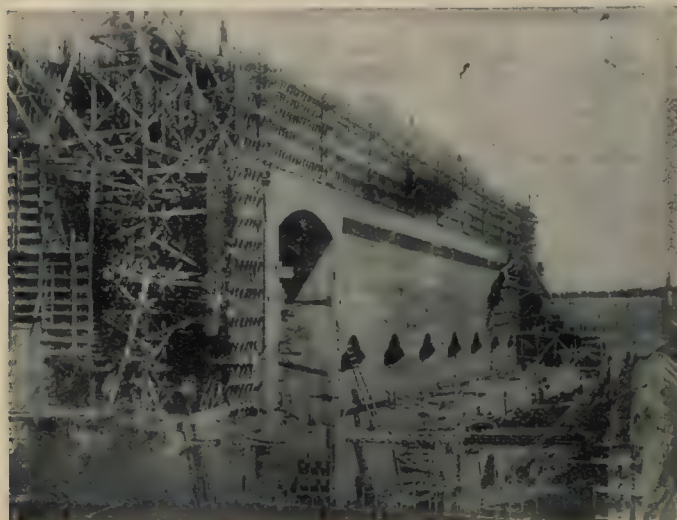
Point du Bois Hydro-Electric Development

City of Winnipeg's Important Enterprise on the Winnipeg River— A Brief Outline of Design, Construction and Progress—Equipment

The work at Point Du Bois is being carried on by the city of Winnipeg as a municipal investment. Surveys were begun in 1905, but actual construction work was not begun until 1909. However, a standard gauge railway twenty-four miles long, was built from Lac du Bonnet eastward during 1907-8, an investment of about \$400,000 being made in this track and in the two considerable bridge crossings of the north-flowing branches of the river. The Consulting Board, consisting of Messrs. C. B. Smith, William Kennedy, Jr., and Col. H. N. Ruttan, reported in 1906 on the available sites and on the cost of development at Point du Bois, setting this, along with the cost of transmission line and transformer station in Winnipeg, at \$3,250,000. The work of construction and equipment is now well in hand, and it has been shown that the estimate made by these gentlemen is practically correct.

The Winnipeg River is very similar in drainage area to the Ottawa River and has a large proportion of lake

water into electric current for transmission. There are five distinct compartments in the building—the rack and gate room, the turbine chambers, the generator room, the transformer and switch room and the arrester compartments. The building is one hundred and fifty feet wide and one hundred feet high. The present construction is two hundred and fifty feet long and the building is five hundred and four feet long. Special features

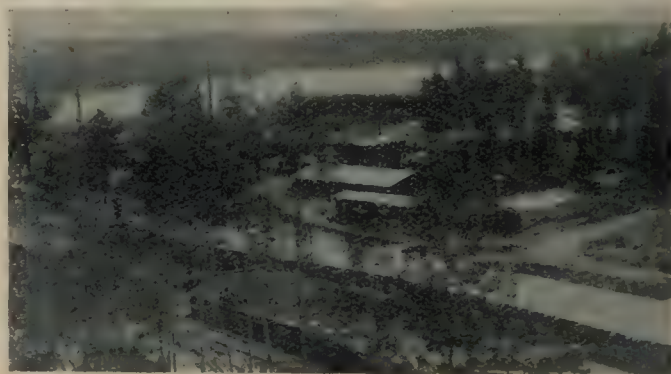


1.—Power Station.

area, though the watershed has not as yet been so nearly denuded of timber. The discharge of the river is therefore much more uniform than that of the Ottawa, and the minimum flow at Point du Bois is sufficient to guarantee a twenty-four hour output of 60,000 horse power, for which dimension the general works are laid out.

The general arrangement of the works at the generating station, consisting of a canal cut across two rocky points of land, a series of river walls, rockfill dam and power house, is noteworthy. At the present stage the canal excavation is nearly completed; the river walls and intake have been finished; the power house building, half of which is now being built, is being roofed and the travelling cranes are erected therein; the rockfill dam is about three-quarters completed, having been built eastward from the west shore. The natural waterfall at the site was thirty-two feet, but by the city's construction this has been increased to forty-five.

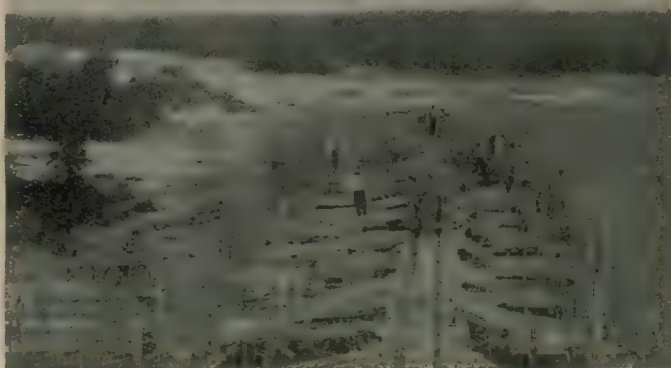
The power house building contains all of the equipment necessary to transform the energy of the entering



2.—General View of Plant.

which may be noted are the great area of the racks and the method of support, the larger inlets to the wheelpits, the wheelpits themselves, which are a series of circular tanks, the compact arrangement of generating and transforming apparatus and the liberal water passage at draft tube and tail race. The fluctuation of head expected at this point is about three per cent. of the average head. The first view shows the power station with wheelpits completed, but forms not removed, the south and east end walls of the building not being yet formed up.

The second illustration shows the contractors' temporary structures and the power house in the far distance (centre of the picture). In the foreground are the cement sheds, and to the left may be seen the city's engine house and coal dock. In the middle ground may be noted the smokestacks of the contractors' air compressing and rock crushing plant, the elevator of which is seen alongside. To the far left may be seen the canal wall, completed to the neighborhood of power house. This view is looking down the river. Photograph No. 3



3.—Constructional View from Power House.

is taken from the roof of the power house looking down upon the forms for the construction of the walls above the wheelpits. The natural fall is shown well to the background, and to the extreme left may be noted the easterly end of the rockfill dam.

The last view, No. 4, is taken from the canal wall looking north-easterly, and shows some of the laborers' cottages in the foreground, the upper portion of the waterfall to the right and rockfill dam and river wall No. 1, which is the overflow. There is altogether a length of fifteen hundred and fifty feet with crest at the same elevation as the crest of this overflow wall.

The transmission line consists of a series of double circuit steel towers upon concrete foundations, and carrying at present two circuits of aluminum cable of capacity of 11,250 K. W. each. At the date of writing about one-half of the cable is strung and the steel towers are erected for a further quarter of the line.

The terminal station building is ready for the roof. The building is of red brick and stone, erected on Point Douglas and occupies the north end of a city block facing on the river. It is built at present to accommodate a capacity of 24,000 K.W. in transformers, 16,000 K.Ws. now being installed. The transformation in this station is from 60,000 volts to 12,000 volts; the frequency of transmission is 60 cycles.

The equipment for these stations is in an advanced stage of manufacture: four water turbines are received and all are shipped; the first generator has recently



4.—Point du Bois Development

passed satisfactory tests in the manufacturers' shops; four of the high tension transformers have also passed satisfactory tests and are shipped.

It is hoped that the plant will be put into operation on or about July 1st, next.

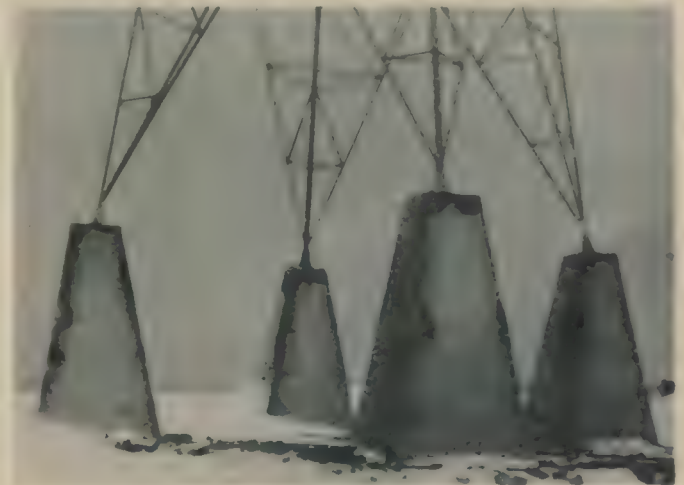
Concrete Tower Bases in Lake Ontario.

The hydro-electric transmission line enters Toronto along the lake front from a point just east of Swansea to the foot of Jamieson Ave. The construction of concrete bases, in the water, to carry the transmission line towers proved to be a very interesting and important feature of this work. It was necessary that the tower bases should be of ample strength, not only to carry the towers, but also to resist lateral pressure of ice, which at times is very severe.

The design finally adopted for these tower bases consisted of four separate bases of solid concrete, three feet square at the top, eight feet square at the bottom, and about fifteen feet above water level. Fig. 1. Each of these concrete bases was reinforced by eight steel rods one inch square, running from top to bottom. Four bolts 1½ inches in diameter, and 6 feet long were placed in the top of each base, as an anchorage for the steel

towers. It was originally intended to carry the concrete down to rock where possible.

Nine sets of these tower bases were built by Wells & Gray, Limited, and nine by the Foundation Company, Limited, both of these firms being sub-contractors under



1. Close view of Tower Base: Hydro-Electric Transmission Line along Lake Front at Toronto

the F. H. McGuigan Construction Company, the general contractors for the hydro-electric transmission line work.

The writer is only familiar with conditions encountered by Wells & Gray, Limited, in the construction of the nine westerly sets of tower bases, to which these remarks are confined.

The first four sets built were behind the sea wall, and since they were protected from the action of waves and



2. View of Hydro-Electric Transmission Line, Toronto

ice, it was considered sufficient to carry the concrete down to good solid earth. The foundations were prepared by driving 2-inch sheet piling about four feet into the lake bottom, pumping out the water and excavating about three feet of sand, at which depth a bed of firm gravel was found.

On the first foundation east of the sea-wall, an attempt was made to carry the concrete down to solid clay or rock. Anchor piles were driven and heavy whalings 6 inches x 8 inches were provided inside and outside of the sheet piling, which was of 3-inch southern pine. An automatic steam hammer was used. After excavating about seven feet of sand, it was found impossible to keep the excavation dry with two pulsometer pumps supplied with steam from a 30 H.P. boiler, and on taking soundings it was found that it would be necessary to go nine feet further to get a good solid foundation. This would be very expensive procedure and it was decided that driving piles would be much cheaper. Accordingly, the remaining foundations were prepared as follows: five piles 12 inches in diameter at the top were driven under each base, and three extra piles were driven under the bases most exposed to ice action. After the piles were driven, the foundations were prepared in the same way as they were prepared for the tower behind the sea wall.

Since these towers are located close to the shore (from 100 to 150 feet), the concrete was mixed by machine on the shore and wheeled in barrows over runways built from the shore out to the work. The concrete was first brought up to water level, and after it had set sufficiently the forms for the upper part of base were put in place and filled with concrete. Enough forms were provided for two complete towers, these forms being used four or five times.

The work done by Wells & Gray, Limited, was completed in eight weeks. It included the driving of 175 piles, driving 36 M. feet of sheet piling, building 1,500 lineal feet of runway over water, excavating 360 cubic yards of sand, building forms for and depositing 1,250 cubic yards of concrete, placing reinforcing steel, unwatering excavations, etc.

Operations were commenced on October 3, and although the contractors, who were working under a heavy penalty for non-completion by December 1st, were delayed a great deal by rough weather, they succeeded in completing the work well within the time limit.

Since the original contracts were completed the Hydro-Electric Power Commission have filled all around these tower bases with rubble stone, as an additional protection.

Water and Sewer Systems at Wetaskiwin

Problems Encountered in Design—Interesting Features of Various Sections of the Actual Work—Construction Remarkable for its Economy

The subject of waterworks and sewers for the city of Wetaskiwin, Alta., was first brought up in 1907. As a start, three cased wells were sunk to form the basis of the water supply, and some materials were ordered for the distribution system.

The financial depression in the following year held the works in abeyance until June, 1909, when they were put into the hands of the John Galt Engineering Company, under whose supervision they have been carried to completion. Water was delivered to the consumers and the sewers were available for use within a year from the above date, viz., in June, 1910. The following is a brief description of the systems:

The water supply is obtained from three drilled wells 10 inches diameter and about 240 feet deep, cased with wrought iron pipe—the three wells yielding an ample supply. Water is raised from the wells by compressed air, discharged into the 3-inch delivery pipes near the bottom of the well through a "Harris" air-lift nozzle, and delivered to a covered reinforced concrete reservoir.

Figure 1 shows the pipe connections to No. 1 wellhead. These wellheads have since been protected by a wood house over each. The reservoir is circular on plan 60 feet diameter and with 10 feet depth of water, giving 176,000 Imperial gallons capacity. The circular walls are 8 inches thick, and walls and floor are reinforced with Kahn cup bars. Ceresit waterproofing was used and there have been no leaks. The reservoir is covered with a wooden roof supported on concrete columns.

From this ground reservoir the water is pumped to the mains and to the elevated steel tank, which is situated on a knoll at the west end of the town.

The power house is of solid brick construction with this has a hardwood floor. The foundation walls are The power house is the full size of the building. The power house contains a Deane triplex pump of 500 gal-

lons per minute capacity, direct connected through a clutch to a 50 h.p. Westinghouse vertical gas engine; also an electrically driven Ingersoll Sargeant air-compressor with automatic regulation, to supply air to the wells. The air receiver pipe connections to pump, etc., are contained in the basement. The gas engine is operated on producer gas from the adjoining electric light plant, with a small proportion of natural gas.

Room has been left in the building for another pumping unit, which will be either gas or steam driven, depending upon the success or otherwise of a well now being driven for gas.

The elevated steel tank shown in Fig. 2 has a capacity of 176,000 Imperial gallons, and a height of 120 feet to the balcony. The tank and riser pipes are entirely protected with a wooden frost casing, and provision has been made for heating when necessary. The tank was supplied and erected by the Ontario Wind Engine and Pump Co. An electrically operated valve, controlled from the power house, is being installed to close off the tank when a fire call is rung in.

The distribution system consists of about six miles of cast iron pipe 10 inches to 6 inches diameter, with the usual gate valves and about 50 fire hydrants. The domestic pressure from the elevated tank is about 75 lbs. per square inch, and the fire service, direct from the pump now installed, is at the rate of 500 gallons per minute at 100 lbs. pressure at the hydrant. The whole system has been very favorably reported on by the Fire Underwriters' inspector.

A meter is being installed on the supply main at the power house and all domestic and other services are being metered.

The sewer system presented a difficult problem on account of the very flat topography. There appeared to be no natural outlet, and pumping seemed to be inevit-

able. After considerable prospecting, however, an outlet was secured to the north-east, and a gravitation outfall constructed discharging to a creek at a point $3\frac{1}{2}$ miles from the town. Ground has been secured at this point as a site for sewage disposal works, but the construction of the works has been postponed as a result of the memorandum issued last year by the Alberta Provincial Board of Health. The entire system is constructed of vitrified tile pipes from 8 inches to 20 inches diameter, there being approximately 5 miles of collecting sewers within the town limits.

Unusual difficulties were experienced on the main intercepting sewer on account of the nature of the underlying strata which consisted of a fine wet silt underlying a layer of running sand. The silt soon worked up into liquid mud and special methods of timbering had to be adopted. All pipe joints on their sections were entirely surrounded by a solid block of concrete. The manholes were all built of cement brick and cement coated inside and outside. There are upwards of 120 manholes in the system.

It will be of interest to note that these works were carried out by administration (or the "day labor" method) under the supervision of the engineers, and that this method has proven satisfactory in every way. In order to satisfy any doubts on the part of the citizens, the council obtained tenders for a considerable portion of the works this year. As a result it was demonstrated that the work was being done under administration at

the fact that there were practically no injuries to workmen, and that the works were completed three months within the contract time.

The estimated cost of these works was \$250,000, based on current contract rates. A sum of \$22,000 has been retained to complete the sewage disposal works and install the additional pumping unit, leaving \$228,000 as the



1.—Wellhead No. 1, showing air line and discharge pipe



2.—Elevated Tank: Capacity 102,000 Imp. Gallons

estimated cost of the portion constructed. The actual cost of construction was \$217,000, including engineering, time-keeping and inspecting, land, insurance and all charges. The difference of \$11,000 has been saved to the city as a result of efficient management, and there can be no doubt that in this instance the "day labor" method of construction has been a success.

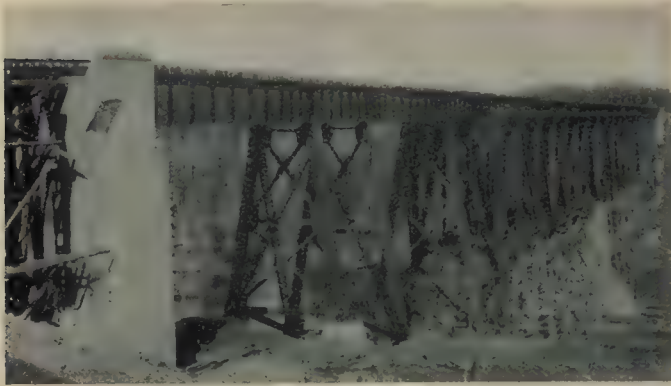
The principal part of the works was carried out during the term of office of Mayor H. J. Montgomery, who was chiefly instrumental in carrying through the preliminary financial and other arrangements. The engineers were the John Galt Engineering Company, of Toronto and Winnipeg, represented on the ground by E. L. Miles, A.M. Can. Soc. C.E.; and W. L. Crane acted as the city's inspector of works.

prices which the contractors could not approach, although they were bidding on the "easy" portion of the work, the more difficult "wet" sections having already been completed by the engineers under "day labor." The fact that nearly 6 miles of water mains were laid without one leaky joint speaks for the quality of the work. The noticeable absence of any law suits or even of any serious dispute is a further point of interest, also

Reinforced Concrete Piles are to be used to support about 850 ft. of the centre guide wall of the Gatun Locks. About 3,500 piles will be needed in the foundations; they will be driven to depths of from 20 to 70 ft. The piles will be made of 1:1½:3 concrete and will be cast on platforms about 80 ft. wide and 400 ft. long. Two steam pile drivers, having a maximum height of 93 ft., and equipped with steam hammers weighing 10,000 lbs. will be used in putting down the piles. The hammer will fall about 42 in. and strike 60 blows per minute. A cast-steel driving head, containing a cushion of sand and rope fits the head of the pile.

Interesting Bridge Work on N. T. R.

In connection with the work carried out last season by the National Transcontinental Railway, a number of contracts executed by The Hamilton Bridge Works are noteworthy. The first photo shown is that of the completed structure over the Abitibi River, a few miles east of Cochrane, Ont. This is one of the important bridges on this line in Northern Ontario, and it is a fair sample of the excellent class of structures now being erected by the N.T.R.. The total length of this structure is 840 feet and the weight, 2,400,000 pounds. The contract price for the superstructure was close to \$100,000. The structure is divided into two rivetted lattice spans, each 210 feet long and 43 feet deep, erected over the main channel of the river. At each end of the channel spans are approaches built on steel towers with deck plate



1.—Bridge over Abitibi River, near Cochrane, Ont.

girder spans, the height of these towers varying from 40 feet to 70 feet. The work was carried out under first-class specifications and was rigidly inspected, both in the shops and during erection. The erection of this structure was performed in a similar manner to that described later for the Mistongo trestle.

The remaining views were taken during the process of erection on the Mistongo Viaduct, also on the line of the Transcontinental Railway, about 25 miles east of Cochrane, Ont. This fine structure consists entirely of deck plate girder spans on steel towers. Its total length is 1,070 feet, divided up into eleven spans of 30 feet, eleven spans of 60 feet and one span of 80 feet, all resting on 11 steel towers varying in height from 35 feet to 70 feet. The weight is 1,600,000 pounds, and contract price about



2.—Lowering 2nd. Post, Mistong Viaduct.



3.—Running out Second Girder, Mistong Viaduct.

\$65,000. Fig. 2 shows a portion of this structure erected, and the derrick car lifting up portions of the tower columns ready to place same in position. Fig. 3 shows the Company's erection car running out on the completed portion of the structure and carrying out one of the 80-ft. girders for the long span. It will be noted that one of these girders is already in place. Fig. 4 shows the erection car placing one of the 60-ft. girders of the last span. The method of erecting this structure is the very latest idea in modern bridge practice. It is only within the last seven or eight years that heavy steel construction cars have been used for railway erection work. Previous to that time very light wooden derrick cars of small capacity were used for handling work in sections. Consequently, in most of this kind of work it was necessary to build falsework at very heavy expense and great delay in the erection and completion of structures.

With cars of the kind used on the work described above it is now possible to place in a very few hours, work which a few years ago would take weeks.

Mr. Gordon J. Grant is chief engineer of the National Transcontinental Railway, and Mr. R. F. Uniacke, bridge engineer. Hon. John S. Hendrie is president, and R. Maitland Roy, manager of the Hamilton Bridge Works Company.



4.—Girder in Place, Mistong Viaduct.

Western Canada Flour Mills' Extension

The Design and Construction of a Modern Reinforced Concrete Building at St. Boniface, Man.—Noteworthy Features of the Work

The addition comprises a concrete handling and cleaning house having a mill cleaning capacity of 3,000 bushels an hour, a system of concrete mixing bins with a storage capacity of 60,000 bushels, together with a concrete storage annex giving a capacity of 325,000 bushels. The elevation of the completed structure is shown in Fig. 1.

The cleaning house is 40 ft. x 50 ft. x 150 ft. high, with two track sheds 85 ft. x 16 ft. located on either side. The mixing bins are circular and eight in number. They are 12 feet in diameter with three interspaces. The height of these tanks is 65 feet, and they are supported on a two-storey concrete mixing house. The storage annex comprises 21 circular tanks made up of three rows of seven each with 12 interspaces or quadrilateral bins, the total height being 80 feet and each tank 16 feet in diameter. These three units, namely, the cleaning house in the centre and the mixing bins and storage annex on either side, are distinctly separate buildings resting on separate foundation slabs, all abutting on one another with slip joints at the junctions.

Design.—The plans both in general and detail were prepared in the office of the contractors and embrace a thoroughly fireproof building and machinery installation, the only wood in the entire building being the frames of the cleaners. The foundation slabs for the three units rest upon the soil in the same horizontal plane. The bearing value of the soil is computed to carry with safety a load not exceeding 4,000 lbs. per square foot, and the base of the footing slabs is 16 ft. below the yard grade. The slabs are made up of reinforced concrete 2ft. thick, the top of which forms the basement floors of the working house, mixing plant and conveyor tunnels—Fig. 2. The concrete in the footing slabs and the side walls up to the grade level are composed of one part Portland cement, $2\frac{1}{2}$ parts sand and 5 parts broken stone or gravel. The sand used was a clean coarse grain, the stone crushed to pass through a 2-in. ring, and where gravel was used it was screened to give the same sized aggregates.

The reinforcement was medium open hearth steel and

stressed in tension not to exceed 16,000 lbs. per square inch. The concrete was allowed a direct compression load of 600 lbs. to the square inch, and an extreme fibre stress of 750 lbs. to the square inch, vertical shear allowed for concrete 50 lbs. per square inch; ratio of modulus of elasticity steel to concrete, 15 to 1.

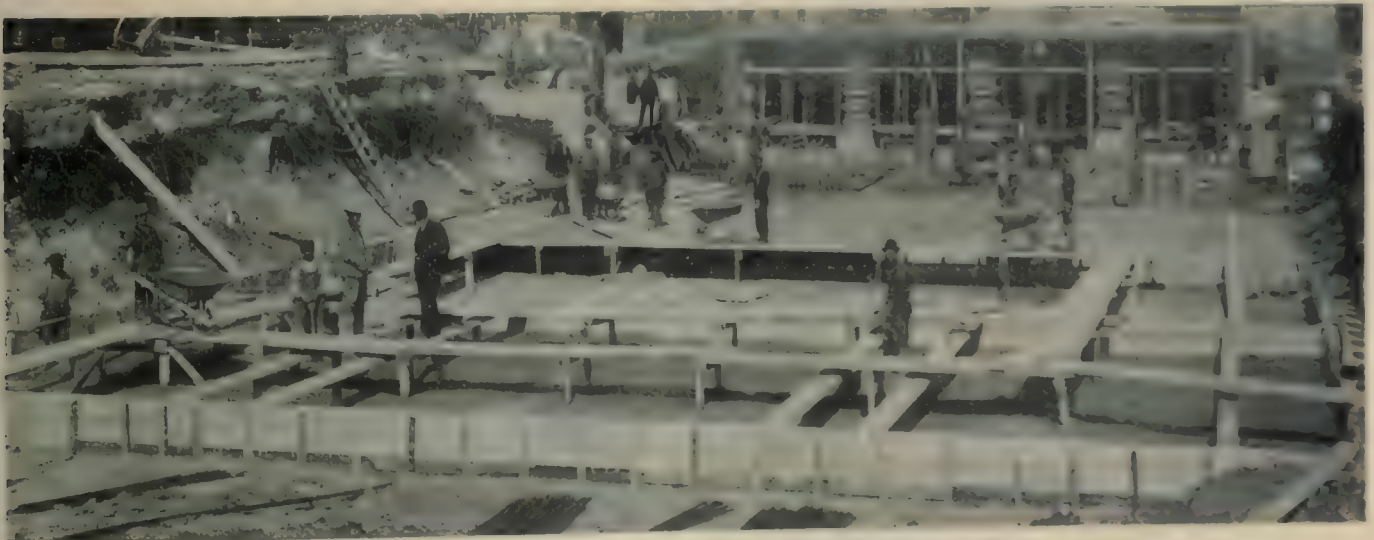
The concrete comprising the columns, beams and all floors of the cleaning house was composed of cement, sand and stone, in the proportion of 1:2:4, and the same mix was adopted in the walls of the storage tanks and the track sheds. The floors and roofs throughout the working house, except the basement, as well as the roof



1.—View of Completed Structure

of the cupolas on the tanks, are of combination tile and concrete.

Construction.—After the excavation was completed tile drains were laid along the bottom of the footings leading to a 12-ft. diameter brick sump, located 30 feet away from the building line. As the walls were being built to grade, a broken stone backing of 12 feet in thickness was inserted between the exterior face of the walls and the earth, backfilling extending from the bottom of the slab to the grade level. This prevents seepage and



2.—Western Canada Flour Mills' Extension. View of Foundations, May 14th, 1910

carries off all the surface water about the building. Risers of tile pipe were also brought to the grade level from the main tile drain, for the purpose of connecting down-spouts from the roofs. The sump is 25 feet deep and is fitted with a motor-driven rotary pump, which discharges into an adjoining sewer approximately 8 feet below the yard grade. In this manner rain or surface water is admirably taken care of.

The mixer was placed in one of the receiving pits, which was the first concrete work constructed on the job. A frame tower for the purpose of supporting the guides for a concrete skip was extended upward from the mixer as the work progressed. The concrete conveyed from the mixer into the skip was discharged into a moveable steel hopper which in turn discharged into a gravity steel spout or into concrete carts of the Ransome type, delivering thence to the forms.

The walls and columns were moulded together from the basement floor to the yard grade. From this point the cleaning house of 8 stories and a roof, and the mixing

giving a more pleasing color than the dark finish which would have been produced by cement.

Tank Construction.—The special tanks devoted to the purpose of storing mixed and mill wheat are located a sufficient height above the concrete floor to enable the installation of a harnessed automatic system of weighing before delivery to the mill conveyors. These tanks rest on column and beam construction. The main storage is outlined above. In both sets of tanks the walls are of concrete, 7 in. thick, reinforced both horizontally and vertically with round mill steel, stressed not to exceed 10,000 lbs. per square inch. The bars are placed in the centre of the 7-in. wall and at variable distances apart, and also of different sizes to care for the external pressure of wheat. The forms for the construction of the tank walls were made up of 2-inch lagging 4 ft. long, spiked to segments of the outer and inner surfaces. The segments are supported by the yoke standards. The yokes are of steel channels hung on a shoulder nut which is supported on a screw jack operating with a grip on a 1½-inch gas pipe. These pipes are embedded in the concrete walls and are continuous from bottom to top. The work of concreting these tanks was continuous night and day, progressing at the rate of 36 inches in height every 24 hours. The lagging was faced with galvanized iron to insure a smooth cast. All tank bottoms are hoppers to the discharge spouts. Each tank is furnished with steel ladders from top to bottom, and charging and discharging spouts, as well as clean-out doors for all exterior tanks. The cleaning house below grade is connected with the old working house by means of a tunnel in which the transfer conveyor belts operate. Openings for ventilation and light are provided in the underground tunnels. The sides of the belt gallery, or cupola, are of similar construction to the walls of the cleaning house. All roofs are covered with a five-ply tar and gravel roof. Eaves, gutters and cornices are of galvanized iron, heavy pattern, and down-spouts are of the same material connecting to the drain risers. All windows are of galvanized steel, glazed with ¼-inch wired glass, the upper sash pivoted and fitted with the necessary fastenings to meet the requirements of the fire underwriters. All doors are of metal and the track shed doors are of the Kinnear roller type. The stairs throughout the cleaning house are of reinforced concrete built at the same time as their respective floors, and all stair-wells and openings are provided with hand rails. Metal doors are placed in the different floors of the cleaning house for the purpose of removing machinery to and from the building.



3.—Progress View August 9, 1910

house to the bottom of the mixing bins, was of skeleton construction, as shown in Fig. 3.

The forms of concrete were of pine boards and planks S 1 S and E, and cut to exact dimensions. These were used over three times. All floor finish work was carried on within six hours after the pouring of the floor, the finish used being 1 of cement and 3 parts coarse, sharp sand. As soon as the skeleton work was stripped the curtain walls of the cleaning house were proceeded with. These were built of solid concrete 6 feet thick poured between sheets of Kahn rib lath which eliminated the necessity of wooden forms. The lath was fastened to Kahn steel studs, spaced 12 inches on centres vertically, and fastened securely into chases which were formed in the sides of the columns and the top and bottom of the wall beams. After the studs were erected the outside of the wall was lathed full height, the windows securely placed in position and the inside wall lathed 3 feet at a time as the concrete was being poured. After the concrete was placed and set the outside of the curtain was plastered with a waterproof mixture of cement and sand in proportions 3 to 1, the thickness of the plaster being 1-in. The inside of the curtain was finished with hard-wall plaster and wood fibre, which enabled a smooth and even surface both outside and in, the hardwall plaster



4.—Building nearing completion, Oct. 14, 1910

Equipment.—Equipment is designed in duplicate, each half of the house being entirely independent of the other, and in general consists of two 30-inch bent conveyors under the tanks to carry the grain to the necessary lofting legs. Instead of discharging the wheat direct from the bins to the belt this is performed by the use of a steel belt loader. There are also 24-inch belt conveyors connecting the extension to the old plant. In the conveyor galleries or cupolas over the annex there are two 30-inch belt conveyors, fitted with trippers of the double discharge, self-propelling type.

There are two receiving legs for elevating from the receiving pits to the scales, each with a capacity of 8,000 bushels an hour; two lofting legs for elevating grain from the basement of the cleaning house to the cupola; one shipping leg for handling wheat to the scales; one lofting

needed to the machines. These cleaners are arranged in two groups of five machines each, each group being driven by an independent motor.

The cars are handled through the two unloading sheds by means of two single drum car pullers of heavy pattern and unloaded by two pair of Clark double automatic car shovels.

There are nine motors used to operate the plant, these varying in power from 5 to 100 horse power. They are of the induction type, operating under a three-phase, 60-cycle, 550-volt electrical installation. The main switch board and controllers are on the first floor of the cleaning house, the switches being enclosed in dustproof iron boxes.

Rope drives are used for transmitting power from one floor to another. All clutches used throughout the plant are of the Webster steel plate type.

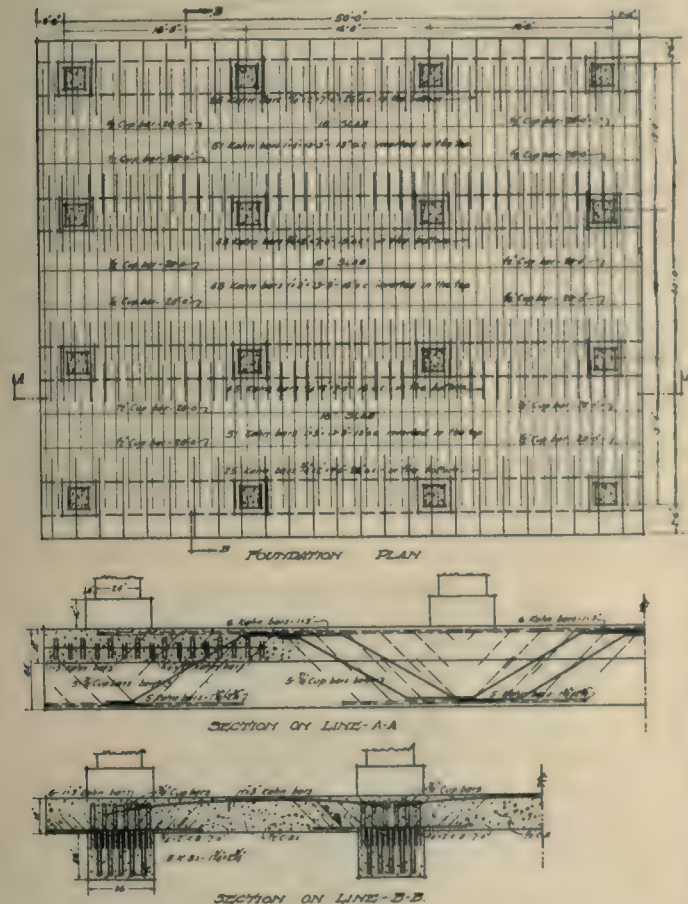
The electric lighting system, distributing light to the different departments, is what is known as "open conduit work," this being considered more advisable (in the event of the necessity of adding additional lights) than the customary method in reinforced concrete buildings of embedding the conduits in the floors.

Ticket elevators and a complete bell and telephone system have been installed.

It is believed that this house is absolutely fireproof.

The reinforcement throughout the entire plant, with the exception of that used in the concrete storage tanks is the Kahn system, furnished by the Trussed Concrete Steel Company, of Canada.

The plant was designed and built by Geo. H. Archibald & Company, engineers and contractors, Winnipeg.



5.—Detail of Working House Footing Slab

leg to deliver mixed grain from the automatic mixing system to the mill bins, as well as a screening leg.

There are three 2,000 bushel scales of the Gurney pattern; three 2,000 bushel steel garners; ten No. 92 In-vincible milling separators; one Humphrey passenger elevator; two car shipping spouts.

The dust collector system installed in this plant is what is known as the Day type, and is complete in every particular, including a sweep system for each floor. The air vents from the dust collectors are brought to the outside of the building and the dust is discharged through a system of piping to the boiler room of the present milling plant.

The receiving pits, garners, scale hoppers, legs, boots, and all fixed and movable spouting in connection with the machinery installation, are of sheet steel construction.

The separators are driven by independent friction clutch pulleys on the cleaner countershafts and belt con-

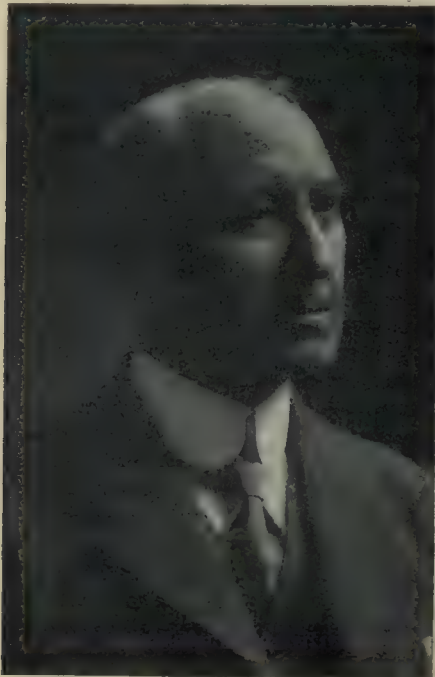
The tooling of concrete surfaces was discussed by a number of members at the convention of the National Association of Cement Users, and their experience indicated that a hammer with 2 to 16 star points gives generally more satisfactory results than a bush hammer. These hammers are made with different numbers of points. One of the speakers had used with satisfaction a 2-in. square head with 16 points for merely removing the surface film of cement and the board marks without especially exposing the aggregate. This tool, pneumatically operated, is rapid and common labor when once instructed will cover a larger area with it and do the work as well as skilled labor. While the bush hammer gives a fine finish it clogs readily and has a small output. The star-pointed hammer is easily sharpened by merely drawing the temper and using a file on the face to give the desired finish.

The underpinning of a masonry conduit, two 48-in. east-iron water mains, and one 72-in. steel lock-bar pipe line is to be undertaken in connection with the building of the new Richmond Hill trunk sewer now under construction in the Borough of Queens, New York City. The existing water-works structures are part of the supply system for the Borough of Brooklyn and the sewer will be carried under them in a double-barrel inverted siphon. It is proposed to put in pile footings on either side of the conduit to carry the ends of two heavy steel box girders, each about 46 ft. long and slightly less than 5 ft. deep. From these girders there will be hung by 1-in. steel rods 26-in. I-beam stringers which will support the bottom of the conduit at intervals of 2 ft. Wooden sheeting is to be driven along either side of the conduit to allow the underpinning to proceed without removing the earth cover from the top and sides of the conduit.

The Canadian Society of Civil Engineers

Programme for the Twenty-Third Annual Convention at Winnipeg Next Week—Work, Aims and Personnel of the Institution

The 25th annual meeting of the Canadian Society of Civil Engineers, which is to be held at the Royal Alexandra Hotel, Winnipeg, from Tuesday, Jan. 24th to Saturday, Jan. 28th, gives every promise of being one of the most interesting and successful conventions ever held by that institution. Arrangements for the meeting have been in active progress for several months, and thanks to the untiring energy of Professor McLeod and to the characteristic enterprise of the Westerners, a programme has been arranged which will make 1911 a red letter year in the history of the Society. Winnipeg, the metropolis of the West, is the centre of a section of the country that has witnessed wonderful developments in the last few years. Many of the most interesting works, from an engineering point of view, have been put under construction during the



Col. H. N. Ruttan, President, Canadian Society of Civil Engineers

last year or so—notably the Point du Bois construction and the G.T.P. shops—and altogether the occasion presents a most favorable opportunity for every member of the Society to visit Winnipeg. From the indications received from the various branches of the Society there is every prospect of an exceptionally good gathering.

Since its inception in 1887 the Society has risen steadily in the estimation of the profession, until today it ranks among the foremost institutions of its kind in the world. Its object, as defined in its original charter—to promote the acquisition of engineering knowledge and to encourage investigation in all branches of the profession—has been steadily adhered to, and its achievement in this connection during the comparatively brief period of some 23 years may well be a source of national gratification.

Many valuable papers and reports are scheduled

for presentation at Winnipeg, and these, with the ensuing discussions, will be of incalculable benefit to the engineer.

The society has a membership of approximately 3,000 and a large number of its members are resident in Western Canada. Both the Vancouver and Winnipeg branches are in a flourishing condition, and the contingent from Vancouver will doubtless be most representative in view of the special inducements in the way of transportation. The programme of the meeting is as follows:

Tuesday, 24th January.

10 a.m.—Meeting for the nomination of Scrutineers, receiving the Report of Council, reception and discussion of Reports of Committees, and general business of the Society.

1.30 p.m.—Complimentary luncheon by His Worship the Mayor and the Aldermen of Winnipeg.

3 p.m.—Continuation of business meeting for the discussion of reports.

8 p.m.—The members of the Manitoba branch will entertain the visiting members at a smoker in the ball room of the Royal Alexandra Hotel.

Wednesday, 25th January.

9 a.m.—A special train provided by the Canadian Pacific Railway will convey members to the city power plant at Point du Bois and to the St. Andrew's Locks. The members are also invited to visit the Grand Trunk Pacific shops in Winnipeg.

8.15 p.m.—Members' dinner in the Royal Alexandra Hotel.

Thursday, 26th January.

10 a.m.—Meeting for the discussion of Committees' reports and reading of papers.

3 p.m.—Address by the retiring President. Reading and discussion of papers and general business.

Friday, 27th January.

9.30 a.m.—Reports of Scrutineers and general business.

11 a.m.—Meeting of the Council under by-law 33.

The biographical sketches of the officers of the Society for 1910, which follow, will doubtless be of interest at this meeting. We regret one or two noteworthy omissions, but these are attributable rather to individual reticence than to any lack of effort on our part to make this feature complete.

H. N. Ruttan, Winnipeg, Man.—President.

Lieut.-Col. Henry Norlande Ruttan, C.E., President of the Canadian Society of Civil Engineers, has been City Engineer of Winnipeg for the last quarter of a century. He was born at Cobourg, Ont., on May 21, 1848. Previous to his connection with the City of Winnipeg he had extended experience as engineer and contractor on the construction of the Intercolonial and Canadian Pacific Railways. During his term of office he has witnessed wonderful developments in the western capital; indeed, to his own energy and foresight is attributable a good share of the city's advancement. City Engineer Ruttan has had a distinguished military career, having served in the Fenian Raids and Northwest Rebellion. He is the possessor of medals for his part in both of these expeditions. The Long Service Decoration has also been conferred upon him.

He was a member of the first Council in 1887, and has always put forth his best endeavor in the interests of the Society and

of his profession. He was elected Vice-President in 1909 and President at Ottawa, January, 1910.

Geo. A. Mountain, Ottawa.—Past President and Hon. Councillor.

Mr. George A. Mountain, of Ottawa, Chief Engineer of the Canadian Railway Commission, has had a long and honorable connection with the Canadian Society of Civil Engineers, of which he is a charter member. He has been a Councillor of the Society ten times and a Vice-President three times, while he was the immediate predecessor of Colonel Ruttan in the presidential chair. Mr. Mountain has taken a keen interest in the work of the Society since its inception. His name has always been included in its various committees, of most of which during some period he has been Chairman. On three occasions he has been Chairman of the Nominating Committee.

As may be supposed, the career of one so prominently identified with the Canadian Society of Civil Engineers has been of considerable interest. A native of Quebec, having been born at the ancient capital in 1860, Mr. Mountain received his earliest training as a civil engineer in the Polytechnical School at Quebec, after which he was connected with Messrs. Kinnipie & Morris, civil engineers, London and Greenock, and later with Chevalier Baillargie, City Engineer of Quebec.

Mr. Mountain obtained his first actual experience in 1878, in which year he assisted on the surveys and designing of the Princess Louise Embankment, Quebec, and the graving docks at Levis, Que. In the following year he was employed as transit man on the survey of the Quebec and Lake St. John Railway, now completed. His next appointment was in 1880 as assistant engineer on the Island Railway of Newfoundland, now the Reid Railway, under the chief engineership of Mr. Morris, of Messrs. Kinnipie & Morris above mentioned. In 1881 Mr. Mountain joined the engineering staff of the Canada Atlantic Railway, serving as assistant under Chief Engineer Walter Shanley. Three years later he was appointed division engineer, and in 1887, upon the retirement of Mr. Shanley, chief engineer of this road.

One of the noteworthy works carried out under Mr. Mountain's supervision was the Coteau Bridge, 6,000 feet long, across



Mr. G. A. Mountain, Ottawa.

the St. Lawrence River, which was built in 1888 in the record time of ten months and twenty days.

The surveys of the Ottawa and Parry Sound Railway, from Ottawa to the Georgian Bay, were commenced in 1890 by Mr. Mountain. The construction, which included elevators and docks at the terminals, was completed in 1897. During this period Mr. Mountain was chief engineer of the Adirondack and St. Lawrence Railway, from Malone to Valleyfield, and also of the Canada Atlantic Railway, from Vermont State boundary to the Georgian Bay,

and branches. In addition, he was consulting engineer for the Temiskaming and Northern Ontario Railway Commission.

In July, 1904, Mr. Mountain resigned from the Canada Atlantic Railway to accept the position he now occupies, that of chief engineer of the Board of Railway Commissioners for Canada.

While Mr. Mountain is in every sense of the word an enthusiast in the work of the Canadian Society of Civil Engineers, his interests are naturally wide and varied. He is a charter member of the American Railway Engineering and Maintenance of Way Association, and has served on many of its most important committees. He is also a Dominion, Ontario and Quebec land surveyor. Of his various other connections may be mentioned the Rideau Club and the Moose Lake and Black Bay Fish and Game Clubs.

Last year's convention, held in Ottawa under the chairmanship of Mr. Mountain, was noteworthy in many respects, and among the many impressions that one received at the meeting in the federal capital, the genial face of the President will be the most lasting.

C. H. McLeod, Montreal, Que.—Secretary.

Clement Henry McLeod, B.Sc., M.A.E., P.R.S.C., is so much a part of the Society that he seems to be connected inseparably with



Professor C. H. McLeod, Montreal.

its work and future. Some brief particulars of his career are of particular interest at this time, in view of the fact that he is just coming of age as Secretary.

Professor McLeod was born at Cape Breton, N.S., Jan. 21, 1851, and was educated at the Model and Normal schools, Truro, N.S. Proceeding to McGill University, he graduated from the Faculty of Applied Science in 1873.

Upon graduation he was appointed assistant engineer in charge of construction on the Intercolonial Railway, and later, resident engineer on the construction of the Prince Edward Island Railway. He was afterwards engineer of public works in Newfoundland. In 1874 he was appointed Superintendent of the Observatory at McGill University, and in 1883 Professor in the Faculty of Applied Science of that institution. In 1908 he was elected Vice-Dean. He is a Fellow of the Royal Astronomical Society, and has been responsible for many valuable contributions to technical and scientific literature.

Ernest Marceau, Montreal.—Treasurer.

Among the names of those who may justly be described as the mainstays of the institution, that of Ernest Marceau is written large. The present Treasurer of the Canadian Society of Civil Engineers was born at Danville, P.Q., in December, 1852. He mastered the general rudiments of education at the primary school

from 1858 to 1866. In the latter year he started upon an eight-year classical course at Montreal College. He entered the Ecole Polytechnique, Montreal, in 1874, graduating with honors in civil engineering in 1877.

In August of the latter year he became identified with the Federal Government as assistant engineer on the Grenville Canal



Mr. E. Marceau, Montreal.

enlargement. Three years later—in 1880—he was made assistant to the superintending engineer of the Ottawa River Canals. In 1893 he was appointed Superintending Engineer of Canals for the Province of Quebec, which position he still holds.

Mr. Marceau's connection with the Canadian Society of Civil Engineers dates back to 1887. He has served on the Council of the Society from 1897 to the present date. From Councillor he became Vice-President (1901-1904) and afterwards President (1905). Since 1909 he has been doing excellent service as Treasurer. In 1901 Mr. Marceau was awarded the Gzowski medal for his paper on the Carillon Dam and Slide. He has done some lit-



Mr. W. F. Tye, Montreal.

erary work in his younger days and is at present one of the directors of "La Revue Canadienne," Montreal. Since 1900 he has been Principal of the Ecole Polytechnique, Montreal.

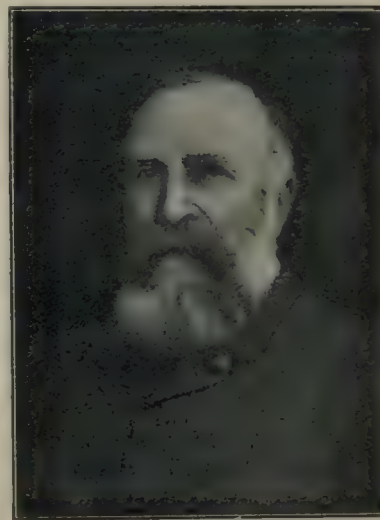
W. F. Tye, Montreal.—Vice-President.

Mr. W. F. Tye, Montreal, who last year was elected a Vice-President of the Society, was born on March 4, 1861, at Haysville,

Ont., and was educated at Ottawa University and the School of Practical Science, Toronto. From 1882 to 1885 he was identified with Canadian Pacific Railway construction as rodman, leveller, transitman and assistant engineer. In 1886-1887 he was employed as transitman and assistant engineer on the Great Northern Railway, and in 1888-1889 as engineer of track and bridges on the Mexican Central Railway. During 1890 he was locating engineer for the Great Falls and Canada Railway, a position which he resigned in 1891 to become division engineer on the Great Northern Railway. In this capacity he remained until 1893, when he accepted the position of engineer for the Alberta Railway and Coal Company. Two years later he was appointed chief engineer for the Kaslo and Slocan Railway, B.C., resigning in 1896 to become chief engineer of the Columbia and Western Railway, B.C. In March, 1900, he was appointed chief engineer of construction by the Canadian Pacific Railway, and in May, 1904, chief engineer of the same road. The last named position he resigned in 1906 in order to engage in private practice. At present Mr. Tye devotes his time to the duties incumbent upon him as President of the Sterling Coal Company and the Dominion Graphite Company. He is also a director of the Home and Foreign Securities Company. Mr. Tye takes a keen and unselfish interest in advancing the interests of his profession generally and in particular those of the Canadian Society of Civil Engineers.

Hugh D. Lumsden, Ottawa.—Past President and Hon. Councillor.

Hugh D. Lumsden may quite properly be described as a member of the "old brigade" of the Canadian Society of Civil



Mr. H. D. Lumsden, Ottawa.

Engineers, having been a member of its Council as far back as 1887. He was its President in 1906.

Born in Aberdeenshire, Scotland, on September 7, 1844, Mr. Lumsden was educated at Bellview Academy, Aberdeen, and Wimbledon School, Surrey, Eng. He came to Canada in April, 1861, in which year he passed his preliminary examination as Ontario land surveyor. The final examination he took after coming of age. For five or six years he practised as a land surveyor at Woodville, Ont., after which he devoted his attention almost exclusively to railway surveying and construction. About 1870 Mr. Lumsden located a portion of the Toronto and Nipissing Railway (now the G. T. R.) from Eldon to Cobocok. A long line of important engagements followed. Among the various roads with which Mr. Lumsden has been prominently identified, may be mentioned the Toronto, Grey & Bruce Railway, Northern Railway, Credit Valley Railway, Ontario & Quebec Railway, C. N. R., C. P. R., and G. T. R.

In August, 1904, Mr. Lumsden was appointed chief engineer of the Transcontinental Railway, fulfilling the duties of that position until June, 1909.



Professor R. J. Durley, Montreal.



Mr. W. J. Francis, Montreal.



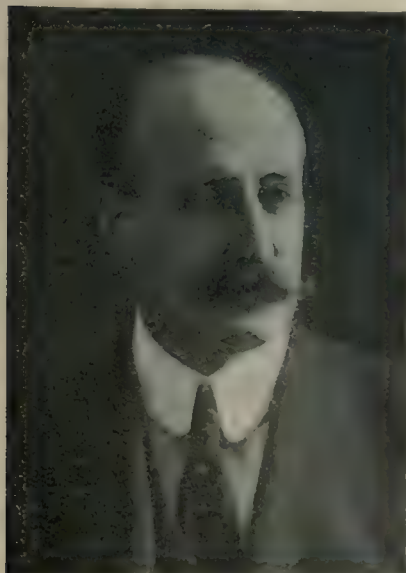
Mr. J. G. Sullivan, Montreal.

J. G. Sullivan, Montreal.—Member of Council.

The Assistant Chief Engineer of the C. P. R., Mr. J. G. Sullivan, Montreal, is a native of Bushnell's Basin, Monroe County, N.Y., having been born at that place on June 11, 1863. From 1884 to 1888 he pursued his studies at Cornell University, from which he graduated with the degree of C.E. Leaving Cornell he entered the service of the Great Northern Railway as rodman. From 1888 to 1890 he was engaged with the Spokane Falls Northern Railway as instrument man and assistant engineer. In the latter year he accepted the post of assistant engineer with the Great Northern Railway, remaining with that company until 1893, when he took a similar position with the Alberta Railway & Coal Company. The following year he was employed as locating engineer for the Butte, Anaconda & Pacific Railway, and in 1895 as principal assistant engineer for the Kaslo & Slocan Railway. In 1896 Mr. Sullivan went into the service of the Columbia & Western Railway as reconnaissance engineer. Two years later he was appointed principal assistant engineer of the same road, resigning in 1900 to become division engineer of construction for the C. P. R. From September, 1905, to January, 1907, Mr. Sullivan was assistant chief engineer on the Panama Canal. In February, 1907, he was appointed manager of construction for the C. P. R., and in September, 1908, assistant chief engineer of the system, the responsible duties of which position he is still fulfilling.

Walter J. Francis, Montreal.—Member of Council.

Walter J. Francis, C.E., of Montreal, a member of the Council of the Canadian Society of Civil Engineers, and one of the best-known consulting engineers in the Dominion, was born at Toronto on January 28, 1872. He is an honor graduate of the School of Practical Science, Toronto (1893), and a member of both the Canadian and American Societies of Civil Engineers. After obtaining his early experience on various engineering works at Toronto, he entered the service of the Grand Trunk Railway in 1894 as assistant engineer to Mr. Edmund Wragge, M. Inst. C.E., on the construction of the Toronto Union Station. After being employed on steel work design and construction for some years, he was engaged by the Department of Railways and Canals to design the 65-foot hydraulic lift locks on the Trent Canal at Peterborough. This position developed into that of principal assistant to the chief engineer of the canal, and included the design and construction of the Kirkfield lift locks. For the description of the hydraulic locks Mr. Francis was awarded in 1906 the Gzowski medal by the Canadian Society of Civil Engineers. In 1906 he left the Government service to take charge of the construction of the 32,000 horsepower plant for the West Kootenay Power and Light Co. at Nelson, B.C., for Messrs. Ross & Holgate. Returning to Montreal on the completion of that work, he took the position of chief engineer and assistant manager of the Dominion Engineering & Construction



Mr. H. H. Vaughan, Montreal.



Mr. C. E. W. Dodwell, Halifax, N. S.



Professor H. E. T. Haultain, Toronto.

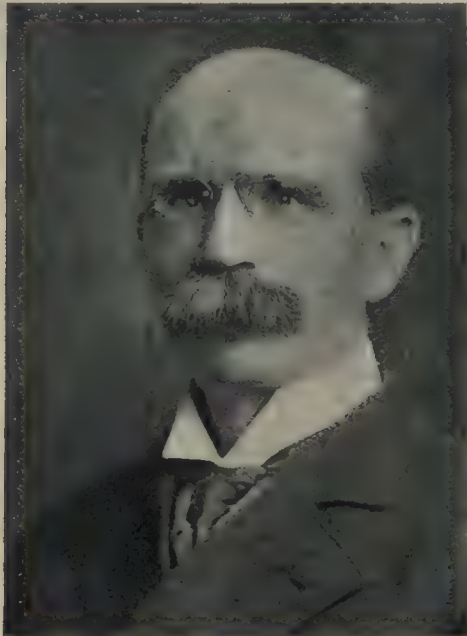
Company, which he resigned at the end of 1907 in order to engage in private engineering practice in Montreal.

Mr. Francis makes a specialty of arbitrations, court work, settlements and reports, and carries on an extensive practice. It will be remembered that his services were retained by the Royal Commission of Inquiry into the Quebec Bridge disaster. As a contributor to the technical press he is widely known. He is Canadian writer for "The Engineer," of London, Eng.

Mr. Francis represents the Canadian Society of Civil Engineers on the committee now revising the building code of the City of Montreal.

C. H. Rust, Toronto.—Vice-President.

Toronto's City Engineer was born in the County of Essex, England, on Christmas Day, 1852. He entered the service of the city in 1877 and was appointed to his present position in February, 1898. Mr. Rust has had an extended connection with the



City Engineer Rust, Toronto.—Vice President

Canadian Society of Civil Engineers. He became a member in 1887 and has served a number of times as Councillor and Vice-President. He is also a member of the American Waterworks Association. In 1902-3 he was President of the American Society of Municipal Improvements. A more detailed sketch of Mr. Rust's career will be found in our issue of August 12, 1908.

H. H. Vaughan, Montreal.—Member of Council.

One of the prominent railroad men on the Council is Mr. Henry Hague Vaughan, whose photo is reproduced herewith. He was born Dec. 28, 1868, at Forest Hill, Kent, England, and was educated at Woodford, Essex. From January, 1885, to January, 1887, he pursued his studies at the Department of Applied Science, King's College, London. In January, 1888, he entered upon a three years' apprenticeship at the Nasmyth Wilson & Company's works at Patrocroft, Lancashire, England.

That Mr. Vaughan had no intention of sacrificing the practical to the theoretical is evidenced by many things incidental to his early professional life. From January to June, 1891, he was employed with the M. S. & L. Railway at Gorton, Lancashire, and with the London and South Western Railway at Nine Elms, Middlesex. Coming to the United States in 1891, he entered the service of the Great Northern Railway, St. Paul, Minn., and remained with that company until February, 1898, progressing respectively through the positions of machinist, draughtsman, assistant engineer of tests, and mechanical engineer. He then accepted a position as mechanical engineer with the P. & R. Railway, Reading,

Pa., a post he resigned in 1899 to enter upon similar work for the Q. & C. Company, Chicago, Ill., with which concern he remained until March, 1902. At that date he was appointed assistant superintendent of motive power with the L. S. & M. S. Railway, Cleveland, Ohio.

Mr. Vaughan's connection with the Canadian Pacific Railway commenced in February, 1904, when he assumed the responsibilities of Superintendent of Motive Power. Promotion came quickly to Mr. Vaughan, and in November, 1905, he was appointed assistant to the Vice-President at Montreal, the post he now holds.

H. E. T. Haultain, Toronto.—Member of Council.

Professor H. E. T. Haultain, of the Faculty of Applied Science and Engineering, University of Toronto, was born in England, and came to Canada at an early age. He was educated at the Public school at Peterborough, Ont., proceeding later to the School of Practical Science, Toronto, where, in 1889, he graduated in civil engineering. He afterwards took post graduate courses at London and Freiberg. His experience has been wide and varied, and it may be truly said that he has an international reputation, for he has held responsible positions in charge of mining operations in Ireland, Austria, South Africa, the Western States, and various parts of Canada.

Mr. Haultain is a frequent contributor to the technical press and retains a consulting practice in addition to his academical work. The degree of C. E. was conferred upon him by the University of Toronto in 1900. He is an associate member of the Institution of Civil Engineers, a member of the Councils of the Canadian Society of Civil Engineers and of the Canadian Mining Institute, and Corresponding Member of Council of the Institution of Mining and Metallurgy.

Duncan McPherson, Ottawa.—Member of Council.

Duncan MacPherson, Assistant Chief Engineer of the National Transcontinental Railway, was elected to the Council of the Canadian Society of Civil Engineers in the early "nineties." He has



Mr. D. MacPherson, Ottawa.

always been an active worker in the Society, of which in 1905 he was made Vice-President.

Mr. MacPherson graduated from the Royal Military College, Kingston, in June, 1880, and in the following year joined the staff of the Canadian Pacific Railway on the construction of that line north of Lake Nipissing. He remained with the company in various capacities on construction and operation until July, 1905. At that time he was division engineer in charge of the maintenance of over 1,500 miles of main line and branches, including building and bridges. This position he occupied for about fifteen years. In

July, 1905, he was appointed Assistant Chief Engineer for the Transcontinental Railway, the position he now holds.

R. W. Leonard, St. Catharines, Ont.—Vice-President.

Reuben Wells Leonard is a native of Brantford, Ont., and a graduate of the Royal Military College, Kingston, winning a silver medal in the class of '83. Since graduating he has followed his profession for the most part in Canada, taking up railway construction, mining, and water power engineering.

For two years following graduation Mr. Leonard was instrument man and engineer in charge of construction on the Canadian Pacific Railway north of Lake Superior. In 1885 he served in the Northwest Rebellion on various staff appointments.

From 1886 to 1890 he was chief engineer for the Cumberland Railway and Coal Company, of Nova Scotia. For the following sixteen years Mr. Leonard has served as engineer and manager of construction on various portions of the Canadian Pacific Railway from Quebec to British Columbia, on the St. Lawrence and Adirondack Railway, on the Rutland Canadian Railway, on the Cape Breton Railway, and as contractor on the Parry Sound Railway.

In water power engineering he has constructed hydro-electric plants at Niagara Falls, Ont., near St. Catharines, Ont., and for the Kaministiquia Power Company at Kakabeka Falls, Ontario.

In 1906 the Coniagas Mines, in which Mr. Leonard has a controlling interest, created no small stir in the mining world, and carried away much of his attention from his civil engineering projects. About this time he built a smelter at Thorold for the refining of silver ores. In 1909 he became actively interested in the copper claims at Bruce Mines, Ont., in which work is being carried on briskly at present.

Mr. Leonard is President and General Manager of the Coniagas Mines, Limited, with its subsidiary enterprises, the Coniagas Reduction Company, at Thorold, and the Redington Rock Drill Company. He is likewise President of the Bruce Mines, Limited. He is Vice-President of the Canadian Society of Civil Engineers, and Vice-President of the Canadian Mining Institute; he is also a Governor of the Kingston School of Mines.

Last spring Mr. Leonard received an appointment to the Board of Governors of the University of Toronto.

J. M. Shanly, Montreal.—Member of Council.

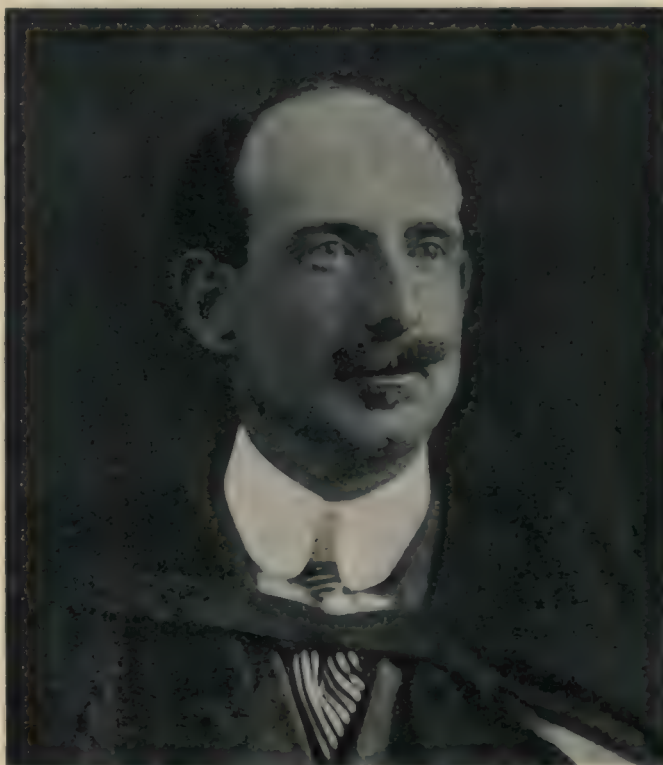
Mr. J. M. Shanly, of Montreal, was born at Waukegan, Ill., on May 7, 1857. He was educated at the Galt Collegiate Institute and the University of Toronto. His early professional experience was obtained in the office of the late Walter Shanly, C.E. In point of experience, Mr. Shanly is eminently qualified, having been chief engineer of the Beauharnois Junction, Montreal and Ottawa, Central Counties, Atlantic and Lake Superior and International of New Brunswick Railways. He was also contractor's engineer on the Great Northern Railway of Canada, while as consulting engineer and expert he has been engaged on a large number of municipal and hydraulic works. Mr. Shanly's office is located at 310 Board of Trade Building, Montreal. He makes a specialty of expert examinations and reports for railways, bridges, water powers and other engineering works. Mr. Shanly is also a member of the American Society of Civil Engineers, but his primary interest is with the Canadian institution in which he holds office.

C. E. W. Dodwell, Halifax, N.S.—Member of Council.

Of the public works engineers of the Dominion of Canada, none has devoted himself more whole-heartedly to the uplifting of his profession and to the improvement of the conditions of Government service, than Mr. C. E. W. Dodwell, of Halifax, resident engineer of the Department of Public Works for Nova Scotia. He has always been particularly active in the Canadian Society of Civil Engineers, having taken part in its formation in 1887. Indeed he was one of the original Montreal committee of nine. Since 1890 he has been elected a member of the Council twelve times, the last occasion being at the Ottawa Convention in 1910. He was Vice-President of the Society in 1904.

Mr. Dodwell is a son of the late Rev. G. B. Dodwell, M.A. (Cantab.), and was born in England in 1853. His early education was received at the New College School, Oxford.

In 1862 Mr. Dodwell came to Canada and entered the Bishop's College School, Lennoxville, where he remained until 1866. He pursued his studies at King's College, Windsor, N.S., from 1866 to 1873, graduating B.A., with honors in mathematics and natural science. For four years he was engaged on the location and construction of the Nova Scotian railways, the Western Counties, Nova Scotia Central and Eastern Extension. From 1877 to 1891 he was Assistant Provincial Engineer on railways, bridges, and so on, for the Nova Scotia Government. In the latter year he joined the staff of the Canadian Pacific Railway, upon which his first works were the preliminary surveys and estimates for the St. Lawrence Bridge at Lachine, carried out in January with Mr. G. H. Massey, M.C.S.C.E. Upon the completion of this work he became identified with the construction of the Ontario and Quebec Railway, first in charge of a district north of Belleville, and subsequently in charge of the construction office at Toronto. He was next resident engineer in charge of that portion of the C. P. R. from Montreal to Vaudreuil, comprising 24 miles. Some heavy



Dr. Louis Herdt, Montreal.

was encountered in this section, notably the stone viaduct entering the city, and the bridges—33 spans of steel—over the Ottawa River, at St. Anne's and Vaudreuil. The latter work was the subject of a valuable paper prepared in 1888 by Mr. Dodwell for the Canadian Society of Civil Engineers (Vol. 2, Part 1).

In 1889 Mr. Dodwell resigned his position with the C. P. R. to engage in partnership with Mr. A. L. Hogg, M.I.C.E., M.C.S.C.E. Among the important works with which Mr. Dodwell was connected at this time may be mentioned the waterworks and sewerage systems at Dartmouth, and the waterworks at Amherst, N.S. In 1891 Mr. Dodwell accepted an appointment under the Federal Government as Resident Engineer of the Public Works Department at Halifax, which position he still occupies. He was elected an associate member of the Institution of Civil Engineers in 1881 and was transferred to the class of members in 1891.

L. A. Herdt, Montreal.—Member of Council.

Dr. Louis Herdt, of Montreal, Macdonald Professor of Electrical Engineering at McGill University, was born in France in 1873. He came to Canada at an early age and was educated at the Montreal High School. Afterwards he entered McGill University, and in 1893 graduated in the Department of Mechanical

Engineering. For a short period he was connected with the Laurie Engine Works, after which he went over to Paris and took a course at the Ecole Supérieure d'Electricité. Later he studied at the Institute Electrotechnique at Liege, Belgium, from which he graduated with first-class honors in electrical engineering. In 1898 he entered the employ of the Thomas Houston Company, at their Paris works, where he remained for two years as electrical designer.

Returning to Canada in 1900, Dr. Herdt became identified with the Electrical Department of McGill University as demonstrator. In 1907 he was made Associate Professor of the Department, and in 1909, on the resignation of Professor R. B. Owens, was appointed to the Chair of Electrical Engineering.

Despite the responsibility of his academic work, Dr. Herdt is actively concerned with practical engineering. It is of special interest at this time to recall that he is consulting electrical engineer for the large hydro-electric development which the City of Winnipeg is now building at Point du Bois, a development of 60,000 h.p., with a transmission line of 77 miles. This work also embraces the sub-stations and distribution systems in the city, in the form of underground conduit construction. Dr. Herdt's work in connection with the electrolysis of water mains in the City of Winnipeg—by the return electric currents of the Winnipeg Street Railway—has been reported upon most extensively by the technical press. In an advisory capacity Dr. Herdt has always been retained at various times by many of the foremost electrical concerns in the country. As the author of many engineering and scientific papers, he has made a wide reputation.

In 1907, at the first meeting of the International Electro-Technical Commission in London, England, Dr. Herdt was the delegate to represent Canada and was a member of the committee which drafted the rules and regulations governing the work of this Commission. He is President of the Canadian Committee of the Commission.

Dr. Herdt has given a great deal of his time and spared no efforts to promote the welfare of the Canadian Society of Civil Engineers, having been President of the electrical section for some years and a member of Council. He is a member of the American Institute of Electrical Engineers, being local Honorary Secretary for Canada for that institution, a member of the Institute of Electrical Engineers, England, and Officier d'Academie, France.

Richard John Durley, Montreal.—Member of Council.

Professor R. J. Durley is chief of the Mechanical Engineering Department of McGill University, Montreal. Born in England, he was educated at Bedford Modern School, at University College, Bristol, and at University College, London, where he had the honor of winning a Gilchrist Scholarship. At a later date he obtained a Whitworth Scholarship, and, on two occasions, was awarded a Miller prize by the Institution of Civil Engineers.

After serving his apprenticeship with Messrs. Earle's Shipbuilding and Engineering Company, Limited, at Hull, England, he entered the firm's technical staff as draughtsman, and obtained a varied experience in the design and installation of marine machinery. He was afterwards appointed Chief Lecturer in Engineering at the Hull Municipal Technical Schools, and then came to Canada as Assistant Professor of Mechanical Engineering in McGill University. In 1899 he was appointed head of the department, succeeding Dr. Nicolson.

During Professor Durley's tenure of his chair his department at the university, like others, has been freely aided by the engineering firms of the Dominion and by the technical departments of the great Canadian railway companies. These have given not only equipment for the college laboratories and workshops, but even more assistance in the form of employment and special apprenticeship facilities for the students.

The author of a well known text book on "Kinematics of Machines," he has also written on a wide range of subjects for technical societies and the technical press.

Professor Durley has made a special study of questions relating to power plant engineering, including heat transmission from

central stations, and heat economy in connection with the ventilation and heating of large buildings. He has frequently acted as technical adviser in connection with power installations and heating and ventilating plants.

The disastrous fires in 1907, which destroyed two of the largest buildings of McGill University, rendered a very large expenditure necessary, and Professor Durley took a leading part in the design of the engineering features of the new Engineering and Medical Buildings, which have now been completed and which replace those destroyed. He has also recently designed and supervised the construction of a 1,000 h.p. central heating and power plant for the service of all the university buildings.

Two years ago the Department of Mines of the Dominion Government entrusted to the Departments of Mining Engineering and



Mr. James A. Bell, St. Thomas, Ont.—Councillor

of Mechanical Engineering in McGill University the conduct of a series of chemical, industrial and engineering tests of five to ten ton samples of coal sent from all the principal mines of the Dominion. Investigations of the calorific value, chemical composition, suitability for washing, and coking properties, are being made in the Mining Laboratories, while Professor Durley, in the laboratories of the Department of Mechanical Engineering has made a complete series of boiler trials, and has tested each coal for at least 24 hours in a gas producer supplying a 40 h.p. engine. For this laboratory work a special producer had to be designed and built, capable of dealing with the very various types of bituminous and lignitic coals submitted. The results of these tests, about to be published, will afford the first definite information as to the qualities of the fuel resources of the Dominion.

Sir Sandford Fleming, Hon. M., Can. Soc. C. E.

Of the honorary members who attended the convention in Ottawa last year, none was received with greater interest than Sir Sandford Fleming, who celebrated his 84th birthday in the Federal Capital early this month. Sir Sandford was born at Kirkecaldy, Scotland, and came to Canada at the age of 18. Devoting himself to railroad engineering, he built a great part of the Intercolonial Railway and the transcontinental line of the C. P. R., one of the great engineering achievements of the century. It would take too long to enumerate the lesser engineering projects with which he has been identified.

His activities have not been confined exclusively to his profession. For thirty years he was Chancellor of Queen's University, Kingston. As an author he is well known, and in addition he is something of a financier, being director of the C. P. R. and the

Hudson Bay Company, and Honorary President of the Canadian Cement Company.

J. E. Hardman, Montreal.—Member of Council.

Mr. J. E. Hardman, S.B., consulting mining engineer, Montreal, made his debut on the Council of the Canadian Society of Civil Engineers at the last annual meeting in Ottawa. He was educated and took his degree as Bachelor of Science at the Institute of Technology in Boston in 1877. From Boston he went direct to Colorado, where he was employed as metallurgist in a silver lead smelter at Leadville, Colorado. In 1880 he was appointed to the United States Geological Survey, and remained with that bureau for one year, at the expiration of which he accepted a position in Canada with the Hibbard Antimony Company, operating mines and furnaces near Lake George, N.B. Here Mr. Hardman succeeded in producing the first metallic antimony ever made in the Dominion of Canada. The product was sold to the Boston Type Foundry and the Meriden, Connecticut, Britannia Works. Upon leaving New Brunswick Mr. Hardman went to the adjoining Province of Nova Scotia, where he engaged in active gold mining and milling on his own account. After some ten or eleven years he was appointed to the chair of Mining and Metallurgy in McGill University (1895-6), but resigned after holding his professorship one year, and opened an office in Montreal as consulting mining engineer. At present he is consulting engineer to the Canada Iron Corporation and the Canadian Exploration Company, as well as President of the Lake Superior Corporation. He is also General Manager of the San Martin Mining Company, Limited, of Mexico.

R. S. Kelsch, Montreal.—Member of Council.

The name of R. S. Kelsch is one of the best known in the Canadian electrical field. Indeed it may be said to be one of



Mr. R. S. Kelsch, Montreal

international reputation by reason of its owner's wide and varied connections. Mr. R. S. Kelsch is a member of the Council of the Canadian Society of Civil Engineers, a Past President of the Canadian Electrical Association, a member of the Executive Committee

of the Engineers' Club, Montreal, and a member of the American Institute of Electrical Engineers and the British Institute of Electrical Engineers.

From 1880 to 1887 he was engaged in telephone and telegraph work in Chicago, Ill., after which for a ten year period he occupied the position of general superintendent and chief engineer of the Chicago Arc Light & Power Company. From 1897 to 1903 he fulfilled the duties of general superintendent and chief engineer of the Lachine Rapids Hydraulic and Land Company, Montreal.

In 1903 the property of the latter company was sold to the Montreal Light, Heat and Power Company, who retained Mr. Kelsch as consulting engineer to consolidate their various properties, consisting of the following companies: Montreal Gas Company, Royal Electric Company, Montreal & St. Lawrence Light & Power Company, Imperial Electric Light Company, Lachine Rapids Hydraulic & Land Company, Standard Light & Power Company, Citizens' Light & Power Company, Temple Electric Company.

These companies were operating a great variety of systems, consisting of direct current of 250 and 500 volts, alternating current at all voltages, and several frequencies.

Since 1903 Mr. Kelsch has continued to act as consulting engineer to the Montreal Light, Heat and Power Company, as well as to many other important concerns in this field throughout the Dominion of Canada and the United States. He has a large clientele amongst commercial corporations using electric power and is regarded with the greatest confidence by the profession.

Comparative Cost of Cantilever and Gravity Retaining Wall

In building a covered platform for the Saco-Pettee Co., at Newton Upper Falls, Mass., it was found necessary to build a retaining wall along one side of the platform to sustain an earth fill 250 ft. long and some 16 ft. deep. The engineers in charge of this work considered both a reinforced concrete wall of cantilever construction and a wall with gravity section and a design for the most economical section of each drawn up.

The following figures give a comparative estimate as to the amount of material and the cost of each wall per lineal foot.

Cantilever Walls.

29.5 cubic ft. (1:2:4) concrete at 23c.....	\$6 79
36.0 square ft. forms at 12c.....	4 32
95.0 lbs. steel at 3c.....	2 85
0.85 cubic yd. extra fill at 25c.....	21

Cost per lineal ft. of wall..... \$14 17

Gravity Wall.

82.0 cubic ft. (1:3:6) concrete at 16c.....	\$13 12
32.0 square ft. forms at 12c.....	3 84

Cost per lineal ft. of wall..... \$16 96

Difference in cost per lineal ft. in favor of cantilever wall. \$2.79.

As the wall in question was 250 ft. long, a net saving of nearly \$700 was effected by using the cantilever wall.—Concrete Engineering.

A reinforced concrete motor boat, 14 feet 9 inches long, has recently been built in Holland. The walls, strengthened by ribs, are only 0.52 inch thick. They were given six coats of waterproofing compound and despite a number of collisions have not leaked.

St. Catharines, Ont., is to be congratulated upon the decision of Steel & Radiation, Limited, to locate in that city. The products of the concern are well known to the building interests, their specialties being hot water boilers and steel products. Mr. S. W. Howard is secretary, and Mr. R. J. Cluff, general manager, of Steel & Radiation.

Quebec Architects' Annual Meeting

Provincial Association's New Officers—Satisfactory Reports Submitted—Recommendations for Revision of Building By-Laws

The twentieth annual meeting of the Province of Quebec Architects' Association took place at the Association's rooms on Beaver Hall Square, Montreal, on Thursday, Jan. 12, when the following officers were elected for the ensuing year: President, Mr. C. Rawson Gardiner; 1st Vice-President, Mr. Ludger Lemieux; 2nd Vice-President, Mr. J. P. E. Dusseault; Treasurer, Mr. W. S. Maxwell; Secretary, Mr. J. E. Vanier; Council—Messrs. Jos. Venne, Hugh Vallance, G. A. Monnette, Jos. Perrault, Stevens Haskell. Mr. T. Raymond, the Past President, was elected in virtue of his late office.

The attendance at the business meeting was small, but more members were present in the afternoon, when two papers were read: "Beauty in Architecture," by Prof. Poivert, and "Ornament in Architecture," by Prof. Nobbs.

The Secretary, in reading the report for 1910, said that there were 125 members. Several attempts, he continued, had been made to induce the city of Montreal to revise the Montreal building laws, and it was satisfactory to note that this work had now been started and a committee of experts appointed. Mr. Jos. Venne would represent the Association on this committee. The following items are regarded by the Association as being desirable:

Building lines on all residential streets.

Minimum size for interior courts with no skylights over them.

Regulation of advertising signs.

Extension of fire limits.

In the reorganization of the Montreal building department the Association recommends a staff to consist as follows:

Superintendent in charge of the whole department.

Chief building inspector.

Four assistant building inspectors.

Engineer in charge of steel work and concrete construction.

Two elevator and fire escape inspectors.

Sanitary inspector's staff.

Boiler inspector's staff.

Clerical staff.

As the electrical inspection is now under the supervision of the fire underwriters, it was decided that a certificate from them would protect the city's interests.

An interesting discussion took place on the suggestion that the Association should keep a record of all historic or old buildings of architectural interest in the Province of Quebec, and members were urged to send in copies of photographs or measured drawings of sufficient interest to file. Those who are acquainted with old buildings of a date prior to the middle of last century, were especially asked to communicate with the Secretary. Mr. Venne proposed offering prizes to the architectural students who submitted the best measured drawings of such old buildings, and Mr. W. S. Maxwell thought that photographs of specially interesting buildings might be enlarged and hung on the walls of the Association's rooms.

It is proposed to hold an "Esquisse" competition in which the subject would be drawn en loge, with five hours allowed for its development.

At the last annual meeting it was suggested that travelling scholarships be offered to students of architecture, and it is now intended to ask the members of the Association to subscribe towards the fund for such scholarships, in order to show their own practical interest in the idea before approaching the Government or public for finances.

The sketching club was reported to be very successful; ten out of the fifteen members submitted designs to the Beaux Arts

Society of New York, and eight of them were awarded mention. This was placed to the credit of Mr. W. S. Maxwell, who devoted much time and energy to the club as "patron."

The year's receipts totalled \$1,820.72, and a balance in the In the evening a banquet was held at the Engineers' Club. bank was reported of \$2,460.07.

Concrete Siphon Under a High Head

A reinforced concrete siphon has been built across the Albelda Valley, Province of Huesca, Spain, which operates under a maximum head of 98½ ft. It is 2,378 ft. long, 13.12 ft. in inside diameter, and has walls 7.87 in. thick, including an interior mortar coat of 0.6 in. The reinforcement, which is varied from point to point in accordance with the head, consists of longitudinal round rods and circular T-irons, all tied by wire at intersections. Under the maximum head the T's measure approximately 2 x 2 x ¼ in. and are spaced about 3¼ in. apart on centers. The 124 longitudinal rods are each ½ in. in diameter. The concrete was mixed in proportions of 1:1¼:2½ and the inside mortar coat in proportions of 1:1. In order that any leakage might not disturb the foundation of the siphon it was laid in a bed of porous concrete which reached to the horizontal diameter and contained on one side a drainage channel. The upper half of the siphon was covered with loose stone, and the seepage was discharged to the channel through holes in the concrete cover over it, and from the other side of the siphon, through pipes in the foundation. This channel has an outlet to a drainage canal at its lowest point. After a year's service the leakage of the siphon is said to be scarcely perceptible.

British Firm Coming

Messrs. James Wood & Co., manufacturers of builders' supplies, Royal Exchange, Glasgow, propose opening a branch establishment in Canada. For twenty years this firm has been engaged in the South African trade and has had slight dealings with Canadian contractors. They intend, however, to make an effort to obtain the Canadian trade, and for this purpose a member of the firm is now on his way to Canada to arrange for the opening of a branch office which, if results justify it, will quickly be followed by a factory.

Mr. C. Amriault has been appointed assistant engineer to Chief Engineer Janin of Montreal.

Mr. H. S. Hancock, Jr., city engineer of Fort William, has tendered his resignation to the city. He recommends his assistant, Mr. Wilson, for the position.

The double tracking of the C.P.R. from Winnipeg to Brandon, commenced last year, will be completed this summer, giving the company 552 miles of double track west of the great lakes.

The Queen Victoria Niagara Falls Park Commission is planning the construction of a number of experimental roads between Bridgeburg and Niagara-on-the-Lake. The work will be carried out under the supervision of Mr. W. A. MacLean, Provincial Highways Engineer.

Mr. F. A. Yerbury, vice-president and managing-director of the Canadian Boving Company, Limited, will leave shortly for Winnipeg to attend the convention of the Canadian Society of Civil Engineers. Afterwards he will proceed on through Western Canada to British Columbia in the interests of his company. Mr. Yerbury is an associate member of the Institute of Civil Engineers of Great Britain. Among the many leading British concerns for which the Canadian Boving Company are agents may be mentioned Frank Pearn & Company, Manchester, reciprocating pumps; Alley & McLellan, Glasgow, steam engines and air compressors; Mirrlees & Day, Stockport, Diesel oil engines; Heenan & Froude, Manchester, railway rolling stock, equipment, etc.

An Example of Progress from Vancouver

Canadian Pipe Company, Limited, and its Development in Recent Years— Brief Description of Up-to-date New Plant — Some Recent Contracts

Vancouver concerns, like those of most other western cities, are noted for their progressiveness. A notable example is the Canadian Pipe Company, Limited, manufacturers of all kinds of machine wire wound wooden water pipe and iron specials for water-works systems. The products of this firm have always attracted much favorable attention, and business increased so rapidly during the last few years that it was found necessary to secure a new factory, views of which are shown herewith. The company's new premises are located on Pacific street, one block east of Granville street. The latter thoroughfare is second only in importance to Hastings street, the principal avenue of commerce at Vancouver,

from the Canadian Pipe Company's plant is 5,000 lineal feet. Among the many large orders received this season may be mentioned the following: C. P. R., 75,000 feet; City of Revelstoke, 25,000 feet; Summerland municipality, 75,000 feet; City of North Vancouver, 28,000 feet; Raymond, Alta., 35,000 feet; Dauphin, Man., 50,000 feet. A view is shown of a carload of 12-inch diameter pipe consigned to Weyburn, Sask.

The manufacture of continuous wood stave pipe is also a specialty of this plant. The company's product is assembled in place and banded with steel bands. It is generally of larger diameter than can be wound by machinery. Nine thousand feet of



Canadian Pipe Company's Fine New Factory on Pacific Street, Vancouver

and consequently there are excellent facilities for rapid transportation and easy access. The company's factory, illustrated herewith, is 112 feet by 250 feet, these dimensions giving an area of 28,000 square feet, as compared with 10,000 square feet in the old premises. A complete double line of machinery of the latest improved type has been installed. Each machine has an independent electric motor. Some idea of the excellent arrangement of the company's plant may be obtained from the interior view published herewith. There is a 20-foot driveway through the centre of the factory between the lines of machinery.

We have alluded above to the growing demand for the company's wire wound wooden pipe. It may be interesting to state in this connection that the average daily output of this material

60-inch diameter pipe was built in the Cariboo district this year for the Quesnelle Hydraulic Gold Mining Co.; also about 1,900 feet of 53-inch diameter pipe for the Canadian Pacific Railway for use in connection with their irrigation system near Calgary.

Additional evidences of this company's success are plentiful. In addition to a number of other important contracts, they are now engaged on one approximating \$140,000 for the commissioners of the Transcontinental Railway at St. Boniface, Man., installing complete about 4½ miles of 42-inch diameter wooden stave pipe, to be used as a force main for the discharge of sewage. The company's success is attributable to the excellence of the various lines manufactured, to business-like methods and expedition in delivery, and lastly, to the spirit of progressiveness aforementioned.



Canadian Pipe Company's Factory — Interior View



A Carload of 12 inch Pipe for Weyburn, Sask.

The Training of the Engineer-Contractor

Functions and Limitations of the College—System, and its Influence on Originality—Value of Experience in Actual Work

Toronto, Jan. 11, 1910.

Editor "Contract Record":

I have read with interest the letter recently published on the above subject by Mr. W. R. Harris and the discussion by Mr. H. Holgate. The question at issue appears to be confined to the amount of practical work that should be taken up in the engineering colleges.

What is the function of the college? Is it to turn out engineers trained in both theory and practice, and equipped with a large fund of useful information? Or is it less utilitarian, and intended to train the mind and develop independence in thought and to equip the student with such implements in the way of science, mathematics, mechanics, etc., as are necessary in working out engineering problems as met in practice? In other words, should the student take up only such subjects as have an immediately seen practical value? Is it how much has been crammed into him, or how he has learned it, and his mental equipment for new and untried fields?

A college cannot think of turning out engineers. It cannot attempt to give the practical side of the work, so that while the young graduate may have learned the theory of design, he is by no means a designer; as he very soon finds out when he takes his first position and is placed at the bottom of the ladder. I believe it is a great mistake for a college to attempt teaching shop work. This can be done better and more economically in a real shop that has to earn dividends. It is feeding students on pap. Let them learn by experience and not depend on being told everything they will have to know. Too much system kills originality. A child never profits by his father's experience.

There are some things that are best learned at college, and others that are best learned in practical work. During the college course it is profitable in more than one sense to take up some engineering work during the vacations. I believe that there are some valuable suggestions in Mr. Harris' letter in the matter of combining the experience of the vacation with the college work. The comparison is a most valuable exercise, and tends to clarify many an obscure theory. Each part of the work should have its due proportion. Don't attempt to build a large structure on another's experience. There is a point, perhaps not readily determined, at which the college part of one's education should give place to the education of life's experience.

The discussion of actual work in the college course might also have a secondary effect in making the professors more practical. No matter how abstruse a subject may be, there is a value in mastering it, but there is greater value in also finding out its application to practical questions. Certainly an engineering course should be a practical one.

Too much must not be expected of the newly-fledged graduate. Don't put a boy at a man's job. At first a student would be of more value on a job if he had given all the time spent at college in outside work, but later on the college training will be more advantageous.

A striking parallel, showing the importance of mental development in the preliminary training of students for research work in science at the universities, is given in an address before the British Association for the Advancement of Science by Principal H. A. Miers, of London. He says:

"I have often heard it asserted that if a boy is capable of taking up at the university a course which is entirely different from his school course, he will generally be found to have come from the classical side and not from the modern side."

Statistics taken at the University of Berlin some years ago

showed that the men of classical schooling, in the latter part of their scientific career at the university, outclassed the men whose schooling was scientific. May we not draw a parallel in the case of the college training for the engineering profession?

While it is highly desirable that this training should be as practical as possible, there is a danger of narrowing the vision to the limits in which an engineering specialist is apt to be confined. A man should have an exact knowledge of one subject and a wide and general knowledge of many. Too much cannot be successfully undertaken in the college course. The question of revision of the curriculum might well receive greater attention from the engineering profession than it does.

I believe Mr. Harris' letter contains valuable suggestions on this line, although I think to follow him fully would mean too early specialization.

Yours truly,

A. W. CONNOR.

Wages at St. John, N.B.

St. John, N.B., Jan. 9, 1911.

Editor "Contract Record":

On page 38 of your issue of December 28 last was published a communication headed "Wages and Compensation at St. Johns, N.B." (This refers to St. John, N.B.) I must take exception to the rate of wages submitted by City Engineer Murdoch. We are large employers of labor, and we never think of giving less than \$1.40 per day to the commonest laborer. Other skilled mechanics get as much as \$5 a day.

Yours very truly,

A. E. HAMILTON, LIMITED.

Canadian Railroad Development.

Ritchie, Ludwig & Ballantyne, Toronto, are to apply to Parliament for permission to build a line of railroad from Toronto to Barrie. The line will probably be operated by electricity.

The Grand Trunk Pacific Railway now has over 2,500 men at work on its grade east of Prince Rupert, B.C. This would indicate that the labor scarcity of last summer has been very much relieved. Sixty per cent. of the grade has been finished from Kitsalas to Hazelton.

The Grand Trunk Pacific Railway system is awaiting the arrival of a shipment of 200,000 cross ties from southern United States ports. A large amount of steel rails have also been contracted for in Sydney, C.B., and that shipment will also be received at the same wharf.

Good progress is being made with the work of clearing the right of way for the branch line of the Temiskaming & Northern Ontario Railway from Kelso to the Porcupine district, and it now looks as though the branch would be completed by July 1. The clearing work is being done by station men.

Steel has been laid on 227 miles of the 400 miles of the National Transcontinental Railway in Quebec now under construction. East of Quebec City 50 miles are completed; 50 miles are complete on the Weymontashene section, which is 197 miles long; 47 miles on the section immediately west of the City of Quebec, and 30 miles of MacDonald and O'Brien's 107-mile contract. M. P. and J. T. Davis have 50 miles ready on their Quebec contract also.

A Grand Trunk Pacific survey party which has spent the season looking over the ground north of Harrison Lake as a route for a railway line into Vancouver, has reached Vancouver. It is understood that the party found the country without insuperable diffi-

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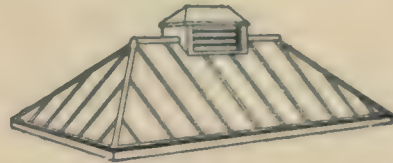


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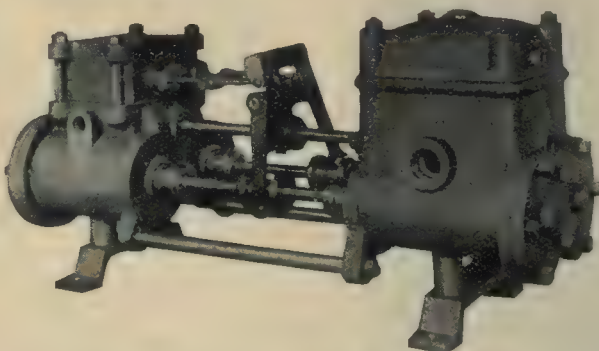
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TORONTO

Pumping Machinery

We manufacture a large line of pumping machinery for special and general service.



The above illustrates the Martin Standard Duplex Pump for boiler feeding and general service. They are specially designed for work where the requirements do not exceed a working pressure of 150 pounds per square inch.

Send for catalogue of our Pumping Machinery.

Martin Pump & Machine Co.

Toronto, Canada

Limited

culties for railway building, and the route is looked upon as a good one. The party was in charge of W. O. Bassett, who was with one of the parties in the field this year doing preliminary work for the proposed line from Fort George to Vancouver. He went in by way of Harrison Hot Springs, and planned to look over 115 miles of country between there and Lillooet, north of which town another survey party was working.

Personal News and Notes

Mr. A. S. Dawson, formerly assistant chief engineer on the C. P. R. irrigation at Calgary, Alta., has been appointed chief engineer.

Mr. A. T. Davidson, of Davidson Brothers, contractors, left Winnipeg recently for Chicago, St. Paul, Minneapolis, New York and other eastern cities.

The City of Ottawa is considering the matter of engaging Mr. W. F. Tye, Montreal, to prepare a report on the entrances of railways into the city.

Cement Age, of New York, and Concrete Engineering, of Cleveland, have been consolidated. Mr. R. W. Lesley becomes editor of the new publication, which will be known as the Cement Age.

Mr. Geo. Lang, A.M.Can.Soc.C.E., and Mr. W. P. Major, A.R.I.B.A., have formed a partnership to carry on a general architectural and engineering practice at Calgary, Alta.

Mr. F. M. Brown has resigned his position as general purchasing agent of the Dominion Steel Corporation to accept the office of general manager and vice-president of the Nova Scotia Car Company, Limited.

Prince Albert, Sask., has passed a by-law providing for the governing of the city by commission. The commissioners appointed were: Mayor Holmes, City Engineer Creighton, and C. O. Davidson, now City Treasurer. Messrs. Creighton and Davidson will receive \$2,700 and \$2,000 a year, respectively, for their services.

Mr. B. E. Chadwick, assistant city engineer, in charge of bridges and docks, Toronto, has accepted a position with the Foundation Company, of New York. Mr. E. L. Cousins, who is now in charge of special work and grade separation, and who was formerly resident engineer for the Grand Trunk, will succeed Mr. Chadwick.

The Ottawa Builders' Exchange have sent a letter to the Board of Control of that city, protesting against the manner of calling for tenders for the work to be done at Howick Hall. The Exchange claims that no plans were submitted for the work, and that the specifications were so indefinite that it was impossible for a contractor to tender from them. They are also drawing the attention of the Board of Control to the manner in which previous work has been done without competition. This, they say, is contrary to the city by-laws.

Sydney Cement Company Wins Action

According to a dispatch from Halifax, N.S., judgment has been rendered in the case of Brownley vs. the Sydney Cement Company by the Supreme Court of Nova Scotia reversing the judgment of Mr. Justice Laurence, which was given in favor of the plaintiff. The Sydney Cement Company, which is the only one in Eastern Canada which was not absorbed by the Canada Cement merger, employs foreign flint pebbles in the grinding process incidental to the manufacture of cement, into which specially treated slag from the Dominion Steel works also enters. The plaintiff Brownley shipped a quantity of flint pebbles from France to the Sydney works, and the dispute arose as to their quality and suitability for the work. Judge Laurence decided against the Cement Company, but the case went before the full bench at Halifax, with the result of a decision in favor of the company. The case was commenced over two years ago. The evidence of the plaintiff was taken in Paris and an expert witness was brought from New York.

Contracts Department

News of Special Interest to Contractors, Engineers, Manufacturers and Dealers in Building Supplies.

Information for insertion in these columns is invited from Architects, Contractors, Engineers, etc.

Waterworks, Sewerage and Roadways

Bowmanville, Ont.

This municipality is considering the installation of waterworks. The proposed source of water supply is from springs seven miles distant. John Lyle, clerk.

Calgary, Alta.

A system of macadamizing streets in the residential portions of the city will be inaugurated this spring.

Camrose, Alta.

The town will install a waterworks system this summer to cost \$100,000. Address M. A. Maxwell.

Cowichan Lake, B.C.

We are informed that the installation of small waterworks for household and power supply is still undecided owing to those tendering not being able to give a figure because travelling expenses was not allowed for investigation. T. L. Stamford, C.E., P.O. Box 107 Victoria, and W. G. Winterburn, 566 Bastion Square, Victoria, were among the tenderers. For further information address 722 Colonist office building.

Esquimault, B.C.

Plans have been prepared for a sewer system to cost about \$250,000. J. H. Mohun, Victoria, is in charge.

Harrison, Ont.

The expenditure of the \$35,000 voted for the purpose of constructing waterworks here is divided as follows; water tower and foundations, \$4,100; driven wells, \$1,000; pumping station, \$1,500; power plant and pump, \$6,000; concrete reservoir, \$2,000; distribution system, \$18,055; real estate, \$5,000; engineering and incidentals, \$1,845. Herbert J. Bowman, consulting engineer, Toronto; A. J. Stewart, clerk.

Montreal, Que.

Considerable alteration to Victoria Square is contemplated by the Board of Control.

Plans are in course of preparation for the establishment of a sewage farm to enable the city to dispose of its sewage without using the river.

The Board of Control in order to avoid delay, will call for tenders at once for all curbstones that may be required. The same course will be followed in regard to the laying of asphalt and other road work.

A charter has been applied for to incorporate the town of Greenfield Park on the south side of the river in order that the residents, numbering about two hundred, can proceed with the necessary improvements such as sidewalks, sewerage, water, and the building and grading of roads. Mr. W. D. Lighthall is in charge of the legal part of the work.

In the details of the scheme for the improvement of the system there are

many elements of expense. The report of the waterworks department sums up the items of expenditure as follows:

Construction of the filtration plant	\$1,687,000.00
Purchase of extra land necessary for said plant.	318,700.00
Completion of work of enlarging aqueduct now in course of execution	675,000.00
To product 7,000 extra h.p. of which 3,000 to pump 50,000,000 gallons more and 4,000 h.p. for other municipal purposes:	
Enlargement of aqueduct	\$1,900,000
Enlargement of tail race (prop.) ..	50,000
Machinery, turbines, pumps, etc.	250,000
Buildings, foundations, weirs, etc.	100,000
	\$2,300,000.00
	\$4,980,700.00

The million and a half that was voted by the City Council is to establish a double filtration plant. It will be capable of filtering fifty million gallons daily. Six acres of filters will be constructed, an dthese basins will be connected with sand washing machines. There will also be included in the plant a sterilization system, and finally a laboratory for the testing of the water. The system will be similar to that of New York.

New Glasgow, N.S.

A conference is to be held shortly in connection with the new water supply of the town of New Glasgow to decide upon the type of pipe to be used, i.e., cement, steel, or wood stave. About seven miles of 16" or 17" pipe will be needed. Mr. C. E. Mitchell, New Glasgow, is the engineer in charge.

Ottawa, Ont.

The City Engineer will shortly call for supplies needed for that department during the year. It is stated that on February 14th tenders will be called by the Board of Control for a large amount of piping, brick, etc.

Tenders are called until February 14th for broken stone, brick, stone, curbing cement, plank and cedar, etc. Newton J. Ker, City Engineer. Advertisement in "Tenders and For Sale Department" this issue.

Tenders are called until February 14th for supply and delivery of brasswork, special pipe castings, etc., in connection with waterworks supplies. Newton J. Ker, City Engineer. Advertisement in "Tenders and For Sale Department" of this issue.

Pembroke, Ont.

Tenders are called until February 13th for all labor in connection with laying about 5,400 feet of 18" lapwelded steel

intake pipe and the construction of a concrete pump well. Specifications, etc., at offices of T. Aird Murray, Toronto, contracting engineer; J. L. Armour, Pembroke, resident engineer. A. J. Fortier, town clerk. Tenders are also called until same date for labor in connection with laying about 5,900 feet of 16" water main, together with fixing valves and hydrants. Advertisement in "Tenders and For Sale Department" this issue.

Point Grey, B.C.

The ratepayers authorized the expenditure of \$350,000 on road improvements.

Porcupine City, Ont.

Plans for sewers and water are already underway by the local officials.

Port Hope, Ont.

This municipality passed the by-law to expend \$13,000 for concrete sidewalks. We are informed that contracts will open about May 1st. J. W. Sanders, town clerk.

Strathroy, Ont.

A. McLachlan, Strathroy, is in charge of the work of installing the new engine and pump required by the water commissioners. By-law carried voting \$5,000 towards this purpose. Under date of last information the above had not been purchased.

St. Thomas, Ont.

The ratepayers of Ross street, south of Wellington, decided at a meeting recently to advertise for tenders for paving that portion of the street. Tenders will be asked in bulk or in part.

Toronto, Ont.

The city will ask the Ontario Legislature for permission to issue debentures and raise the sum of \$626,544 to cover the cost of an additional waterworks intake pipe and new trunk mains, to increase the daily supply.

The City Engineer recommends the construction of the following mains, to relieve the situation, at an estimated cost of \$161,544.

Thirty-six inch main from the main pumping station at Front street, and along Front street to Simcoe.

Thirty-six inch main from Wellington along John street, Grange road and Beverley street, to College street.

Twenty-four inch main on Sumach street, from Queen to Wellesley.

Twelve inch main to feed North Rose-dale.

Twelve inch main on Wilton avenue from River to Broadview.

Victoria, B.C.

The \$150,000 waterworks loan by-law and Sooke Lake by-law both carried.

Winnipeg, Man.

Tenders are being called by the Board of Control until March 1st for supply of asphalt for street paving for this city. Plans, etc., at office of City Engineer. M. Peterson, secretary. For further infor-

mation see advertisement in "Tenders and For Sale Department" this issue.

AWARDED

Pembroke, Ont.

John L. Armour, resident engineer, writes that the contract for supply of 18" intake pipe and 16" water main have been awarded by the Town Council to Messrs. Drummond, McCall & Co., Montreal. T. Aird Murray, consulting engineer.

Winnipeg, Man.

The contract for sewer on Centre street has been awarded to Mr. Newman at \$17,000, by Board of Control.

Railroads, Bridges and Wharves

Brantford, Ont.

City Engineer Jones has condemned the Lorne bridge as unfit in its present condition to carry the proposed line of cars to Port Dover.

Calgary, Alta.

Tenders addressed to N. E. Brooks, division engineer, C. P. R., Calgary, will be received until January 31st for erection of timber trestles, including end and central towers over south fork of Old Man River, etc., maximum height, 137 feet, length 650 feet. Material to be furnished by company.

Edmonton, Alta.

A subway will be constructed at Jasper avenue and not a bridge as at first intended. J. G. Sullivan, C. P. R. Engineer, Montreal, Que., will have charge. F. M. C. Crosskill, Secretary-Treasurer, of Edmonton.

Ottawa, Ont.

Tenders addressed to the Chairman of the Board of Control will be received until January 31st for cleaning and painting St. Patrick and Sussex street bridges. Newton J. Ker, City Engineer.

The council have decided to bring the eminent railway engineer, Mr. W. F. Tye, of Montreal, to Ottawa, to report in conjunction with City Engineer Ker on the railway entrance problem. Noted previously.

The Dominion Government will be asked to put \$75,000 in the estimates this year as its contribution towards the cost of erecting the high level bridge over the Rideau canal at Bank street. The civic street railway extension committee appointed Ald. Carnochan and Brown and City Engineer Ker as the deputation.

Penticton, B.C.

Penticton and Princeton Boards of Trade will co-operate in the construction of a new scenic route through the Osprey Lake district.

Port Arthur, Ont.

It is understood from good authority that the C. P. R. will double track their line between Fort William and Port Arthur at a cost of about \$250,000, and that R. Ferguson, general road master, will be put in charge.

St. George de Beauce, Que.

Tenders will be received on or about February 15th at the office of the council at Providence P.O., Beauce, for the construction of an iron and concrete bridge on the Chaudiere river; tenders to be of two kinds, one for the substructure, and the other for the superstructure. Plans, etc., at the office of Mr. Arthur Godbout,

East of St. Georges de Beauce; Charles Bolduc, secretary-treasurer, C. N. C. B.

Ste. Famille, Que.

Tenders are called by Public Works, Ottawa, for extension to wharf here until February 20th. Plans, etc., at above department; at the offices of the district engineers in Montreal and Quebec; and on application to local postmaster.

Temiskaming, Que.

Hon. Chas. R. Devlin, of the Quebec Government, Dr. Hodgins, M.P. for Pontias, and others waited upon Mr. Pugsley, Minister of Public Works, to urge an increase in the grant for the construction of a bridge at Temiskaming. The sum of \$50,000 is already in the estimates for the bridge here, but the deputation has asked to have this amount increased so that the bridge could be strengthened sufficiently to enable it to be used by the Cobalt and Haileybury tend into the Province of Quebec to the Town of Ville Marie.

AWARDED

Ottawa, Ont.

Michael Carlin & Co. have been awarded the contract for the Vancouver Island section of the C. N. R., \$500,000.

Public Buildings, Churches Schools, etc.

Aldergrove, B.C.

The citizens here are feeling the need of a public building.

Amherst, N.S.

Tenders addressed to R. C. Desrochers, secretary, Department of Public Works, will be received until January 25th for electric light fixtures, wiring, etc., in public building here. Plans on application to the caretaker of the building, Mr. J. H. Chapman, Amherst, N.S. Mr. C. E. W. Dodwell, District Engineer, Halifax, N.S., and above Department.

Bracebridge, Ont.

The Oddfellows' Block was destroyed by fire on the 17th inst.

Brantford, Ont.

Messrs. Taylor & Taylor, architects, are preparing plans for an enlargement of Wesley Methodist Church in Eagle Place; also for a new school at Moyle's.

Calgary, Alta.

Architect McElroy will design the new church for St. Paul's Presbyterian congregation. Estimated expenditure, about \$37,500. It will be carried only as far as the basement at present.

The present incinerators have been condemned and the medical health officer, E. W. A. Brock, of the health department, has submitted several plans of incinerators to the city commissioners. Estimated cost, \$15,000.

Cardston, Alta.

The plans for the 2½-story hospital are prepared. The Dainty Hospital Company, Lethbridge, are behind the project.

Carleton Place, Ont.

The citizens are again considering the erection of a large rink. Plans, site and some capital have already been secured.

Tenders addressed to D. H. McIntosh, M.D., Chairman Building Committee, will be received until February 15th for

erection of Masonic Temple here. Plans, etc., obtained from the above.

It is stated that tenders for erection of new Zion Presbyterian Church will be called shortly. Messrs. Robert McCallum, A. F. Stewart and J. S. Burnie were elected managers. Noted previously.

Collingwood, Ont.

Mr. Wilson, architect, is preparing preliminary plans for the new school for which the ratepayers recently voted \$30,000.

Cumberland, B.C.

Mr. Coulson, mine manager, has asked for a citizens' committee to report on the cost of erection and equipment of a Y. M. C. A. here. Dr. Gillespie, chairman; J. Shaw, secretary.

Edmonton, Alta.

At a meeting of the Exhibition directors it was decided to call for competitive plans for the erection of new stock pavilion from members of the Alberta Association of Architects, who reside in Edmonton and Strathcona. Entries of plans close February 15th. President, Campbell.

Tenders addressed to John Stocks, Deputy Minister of Public Works, will be received until January 28th for supply and delivery of (a) hollow terra cotta partition tile and (b) small angles, required in connection with the new Parliament Buildings. Plans, etc., at above Department or at the branch office, Calgary.

Grimsby, Ont.

The public library board received a grant of \$8,000 towards the erection of a library building. The site has been obtained and plans are being prepared. Jas. Aitchison, secretary.

Halifax, N.S.

Forty acres, estate of late Dr. Robert Murray, have been purchased by Dalhousie University on which a new building will be erected.

Kingsmill, Ont.

The citizens on January 2nd voted to erect a library.

London, Ont.

Ald. Fichter is chairman of the committee appointed to superintend the construction of new city hall.

Markdale, Ont.

The Public Library Board here have received the offer of \$5,000 from the Carnegie Library Fund, providing the town provides a suitable site, etc.

Montreal, Que.

The Calvary Congregational Church have under consideration three or four building sites for their new church. The conditions of sale of the old church leave the congregation in possession until June 1, 1912.

The Engineers' Club Committee has decided to erect a new home. The present building will be removed and a large addition made. The plans have been prepared by Saxe & Archibald and work will be commenced in the early spring. Estimated expenditure, \$100,000.

Newcastle, N.B.

The County Council have declined to provide for building a new court house this year; the cost ranging from \$27,000 to \$40,000.

Ottawa, Ont.

The Exhibition Association Committee have decided to recommend to the City

Council that the new agricultural implement and machinery hall be built this year. The estimated cost is \$75,000. President, T. C. Bate, Messrs. John Graham, C. Ross, Geo. May, F. Heney and City Engineer Ker are members of the committee.

The estimates of the Public Works Department passed last week include: In Quebec Fraserville, Armory, \$5,000; Grosse Isle; quarantine station, repairs, \$7,000, new building, \$50,000; Levis, armory, \$30,000; Maisonneuve, post office, \$19,000; Marieville, public building, \$17,000; Megantic, public building, \$22,000; Montreal, general post office, enlargements, etc., \$140,000; post office, Mile End, enlargement, \$5,000; public building, \$10,000; new barracks, \$100,000; Napierville, public building, \$10,000; Quebec—Custom house, \$70,000; drill hall extension, \$50,000; detention building \$50,000; immigration building, \$80,000; examining warehouse, \$2,000; Quebec Province Immigration buildings generally, \$10,000; Rigaud, public building, \$18,000; Roberval, public building, \$14,000; Rock Island, public building, \$15,000; Shawinigan, public building, \$15,000; St. Henri, post office improvements, \$7,000; St. Jacques de L'Achigan, public building, \$15,000; St. Lambert, public building, \$20,000; Three Rivers, new public building, \$75,000; Westmount, public building, \$50,000.

In Ontario—Athens, public building, \$5,000; Brantford, drill hall, \$900; Chesley, public buildings, \$15,000; Dominion public buildings, repairs, etc., \$20,000; Dresden, public buildings, \$17,000; Dundas, public building, \$15,000; Elora, public building, \$14,000; Essex, post office, \$14,000; Fergus, public building, \$14,000; Fort William, public building, enlargement, \$8,000; Gananoque, post office, addition, \$4,000; Goderich, public building, \$8,000; Harrison, public building, \$15,000; Kingston, post office, addition, \$25,000; Listowel, public building, \$18,000; Midland, public building, \$10,000; Mitchell, public building, \$18,000; Moult Forest, public building, \$18,000.

Sarnia, Ont.

We are informed that the \$45,000 granted by last year's council for new school will not be issued in debentures by present council. Therefore the erection of school cannot be carried out for some time. Noted in December 7th.

Tenders are called until January 31st for the masonry, carpentry, plumbing, electrical wiring, painting, etc., required in the remodelling of Devine Street Methodist Sunday School. Plans at Simpson & Carter's store. Geo. Leach, secretary.

Strathcona, Alta.

The Library Board will apply to council for a site for the library building; also to Carnegie Library Committee for grant of \$25,000 for the erection of building. Ex-Mayor Duggan, chairman; J. H. McDonald, secretary-treasurer.

St. John, N.B.

Tenders were called until January 25th for heating and plumbing in the extension of the St. John Exchange of the New Brunswick Telephone Company, Limited. G. E. Fairweather, architect, 84 Germain street.

Toronto, Ont.

A central site has been purchased in trust for the establishment of a working girls' home for the Catholic women of

Toronto. Mrs. James E. Day, President of the Watch-out Committee of the Catholic Women's Auxiliary; Dr. Amyot, Messrs. A. C. Macdonell, M.P., T. P. Phelan are interested.

The Registry Office has been condemned by the Grand Jury in their report on local institutions.

The congregation of Grace Church, Elm street, have decided to sell their edifice and move elsewhere.

It was announced at the annual meeting of the Presbyterian Church that the old property on the Don Mills Road had been sold and a new site on Broadview Avenue purchased. The church will erect a new Sunday school, costing about \$25,000, as soon as the weather permits. Rev. P. S. Sinclair, pastor.

Truro, N.S.

Dr. Dunbar and Mr. J. C. B. Olive were appointed as members of the committee nominated to report on the question of the establishment of a public general town and county hospital, the report to be ready for the public meeting during the session of the county council in April next. Noted previously.

Vancouver, B.C.

Permit was granted for the erection of moving picture theatre, 2222 Granville street, \$6,500. Messrs. Stark & Crossley will erect it.

The Art, Historical and Scientific Association have announced their intention to undertake the erection of a museum building. Secretary, H. J. de Forest.

At a meeting held recently the Women's Club Building Society was definitely organized with the object of building a women's club in this city, and steps will be taken for its incorporation. It is expected that the building will cost about \$50,000. Mrs. J. H. MacGill, Mrs. Phillips, secretary-treasurer.

Tenders addressed to the Minister of Public Works, Victoria, will be received until February 2nd for erection of an addition to the Court House here. Specifications, etc., at office of the Provincial Timber Inspector, Vancouver, B.C., and at the Department of Public Works, F. C. Gamble, Public Works Engineer, Parliament Building, Victoria, B.C.

The by-law for expenditure of \$115,000 for improvements to exhibition grounds having been carried, an extension to the present grand stand will be constructed; 500 additional feet will give the needed seating accommodation. Work on the central auditorium will be commenced as soon as tenders have been awarded.

The following are the details of the by-laws which carried (noted in issue of last week): School extensions, providing \$572,000 for general building and improvements; school extensions, providing \$100,000 for the purchase of sites on the south side of False Creek; school extensions, providing \$295,000 for the enlargement of King Edward and Britannia High schools; morgue by-law providing \$25,000 for erection of public morgue with second story of building to be used as analyst's laboratory; fire hall by-law, providing \$21,000 for new central fire hall for Mount Pleasant.

Victria, B.C.

Mr. C. E. Watkins, architect, has been instructed by the school board to pre-

pare plans for a new three-story high school and submit them to the board.

Winnipeg, Man.

The Provincial Health Board have granted permission to the city to erect a contagious disease hospital.

The board of management of the Old Folks' Home, Middlechurch, have decided upon the building of an annex which will be planned during this year. Mrs. Geo. Bryce, president.

Yorkton, Sask.

The management of the Exhibition Association have decided to direct all their energy towards a large exhibition in 1912. Recently the board bought an 80 acre site.

Residences

Burk's Falls, Ont.

The building owned by James Mitchell, of Elmsdale, was destroyed by fire recently. Loss, about \$4,000.

Wallaceburg, Ont.

Plans are being drawn by Architect S. G. Kisney, Chatham, for a new brick residence for Mrs. S. A. Miller, of Wallaceburg. It will be built in the spring.

Business Buildings and Industrial Plants

Berlin, Ont.

The L. McBrine Company, trunk manufacturers, and the Art Glass Company are planning to construct large additions to their present factories; the Felt Boot and Rubber Manufacturers intend building a box factory.

Brandon, Man.

Elevator No. 1 of the Maple Leaf Milling Company was destroyed by fire on the 19th inst. Loss, about \$75,000.

Brantford, Ont.

Press reports state that the Bank of Montreal are considering the erection of a large branch building on their present site. Local manager, Mr. Montizambert; architects, Peden & McLaren, Montreal, Que.

Boynston, Que.

The store belonging to Mrs. Bacheldor was destroyed by fire on the 20th inst. Loss, about \$2,000.

Calgary, Alta.

Chas. Webster, secretary, Board of Trade, has received a communication from a large glass manufacturing concern anxious to locate in the west and attracted by the discovery of natural gas in this vicinity.

Carleton Place, Ont.

The Union Bank of Canada have purchased property on Bridge street on which it is stated a new branch will be erected. The C. P. R. is reported to be contemplating the erection of a new passenger station here; Findlay Bros. Stove Company also purpose enlarging. G. H. Balfour, Quebec, General Manager, Union Bank.

Fort Frances, Ont.

P. S. Dainerd, superintendent, will superintend the construction of the new saw mill being built by the Shevlin-Clarke Company.

Hamilton, Ont.

The Magee-Walton Ice & Coal Company have building permit for the erec-

tion of a corrugated iron ice house on Strachan street. Cost, about \$20,000.

The Imperial Bank will, it is stated, erect on their site on James street a new 2-story office.

M. Brennen & Sons, Manufacturing Co., Ltd., this city, are contemplating the erection of a large addition to their sash and door plant during 1911.

Lethbridge, Alta.

The Farmers' Lumber Company has purchased property on which office buildings and lumber sheds will be erected. Whiddington Bros. are in charge of the construction.

Medicine Hat, Alta.

The American Grain Separator Co., of Minneapolis, is looking for a location to establish a branch factory in Canada. This city is being considered. W. L. Searles, sales manager, Medicine Hat.

Mitchell, Ont.

Ford & Murphy, Stratford, have bought 44 feet frontage on Main street and will put up a brick block next summer.

Montreal, Que.

The Canadian Car Corporation is thinking of enlarging its establishment by the erection of a foundry and by completing its unfinished power building at Rockfield.

Plans are now being prepared by the architects, Messrs. Warren and Wetmore, for a first-class modern residential hotel for the Carlton Hotel Company, of Montreal. Contracts will be let about the end of March for the construction of the hotel, which it is expected will be ready by the beginning of May, 1912. Sir Montagu Allen, president; L. W. Just, secretary.

Moose Jaw, Sask.

The publishing plant of the "Daily Times" was destroyed by fire on the 19th inst. Total loss, about \$100,000.

Ottawa, Ont.

The corner block on Clarence and Dalhousie streets, occupied by V. Charron, S. L. Tesky and others, was destroyed by fire on the 22nd inst.

A new office is to be constructed at the works of Jas. MacLaren Lumber Company, Buckingham. The Ottawa Stair Works has the contract. J. P. MacLaren, architect.

Donald Fraser will erect a commercial building at the corner of Albert and Slater, with seven stores and twelve apartments.

The R. H. Millar building, 248 Albert street, has been purchased by a syndicate, whose intention is to build two additional stores on the rear extension.

Phoenix, B.C.

The Queen's Hotel here was destroyed by fire on the 15th inst. Owner of building, David Oxley.

Regina, Sask.

Plans for the new Bank of Ottawa building have been prepared. George Burn, General Manager, Ottawa. Work will probably start in the spring. Noted previously.

It is reported that the Regent Company will be re-organized as the Regina Tractor Company. On the guarantee of sufficient capital a new plant costing about \$100,000 will be built in the spring. The site has been secured and paid for, it is stated. R. G. Thompson is in charge of re-organization.

Rivers, Man.

J. A. Morden has the contract for the heating and plumbing of the new hotel in Transcona.

Sarnia, Ont.

The new plant being erected for A. H. Diver here will be two storeys in height, 80 x 200 feet, of reinforced concrete. Work will commence in the near future.

St. John, N.B.

The grist mill of the Perth Milling Company, Andover, Victoria County, was destroyed by fire on the 22nd inst. Loss, \$8,000.

Three Rivers, Que.

A 40-ton pulp and paper mill is to be erected here by the Union Bag and Paper Company, of Sandy Hill, N.Y.

Toronto, Ont.

Tenders were called until January 23rd for removing stores, Nos. 152 and 154 Yonge street. Messrs. A. R. Denison & Stephen, architects, 20 King street west.

The Ontario Brass Rolling Mills Co. are stated to have tentative plans under considerations for extensive additions to their plant other than those now under construction.

Vancouver, B.C.

Permit was granted to Mr. J. W. Weart, managing director of the Investors' Guarantee Corporation, for the 15-story block, corner of Hastings and Richards streets, \$500,000.

The Bank of Vancouver plans to replace its temporary office on Douglas street by a bank building. The present lease runs three years. W. H. Ronald, acting manager.

The British Columbia Telephone Company have awarded the contract for the construction of its new telephone exchange in Kitsilano to Smith & Sherbourne. Total cost, \$44,000. Construction is to be commenced at once and it is the intention to have the structure in a completed condition by May 1.

The Hudson Bay Company have under consideration the enlargement of their stores. In Vancouver it is proposed to erect at the corner of Granville and Georgia streets a 6-story building of steel structure. H. E. Burbridge, sales commissioner, Winnipeg.

Plans were presented for the 5-story warehouse to be erected by Messrs. Walter & E. C. Taylor on Water street at an estimated cost of \$25,000.

Mr. William Price, general manager of the Western Steel Corporation, is authority for the statement that the steel plant to be reconstructed near Sunbury will be started by April 1st. Jas. A. Moore, president. Noted in last issue.

Plans have been filed by Messrs. Parr & Fee for a twelve-story building to be erected on Granville street for Mr. Dominic Burns, \$400,000. The building will be constructed of steel and faced with brick and terra cotta. Excavation work on the 12-foot basement has been practically completed. A great amount of architectural work will adorn the porticos and stuccowork. There will be three passenger elevators and one freight hoist. The structure will be fireproof in construction and will have a ground area of 50 feet by 120 feet.

Victoria, B.C.

It is reported that plans have taken shape for the immediate erection of a 10-story block on the site of the Spencer

Building, recently destroyed by fire. The proposed structure will cost about \$750,000.

Mr. L. W. Hargraves, architect, is preparing plans for the new 5-story hotel to be erected at the southwest corner of Douglas and Pandora streets for Mr. Lim Bang. Work will start as soon as plans are completed.

Welland, Ont.

The site of three acres for the Canadian Automatic Transportation Company's plant has been purchased. The factory will be of brick and concrete and two storeys high and will be a duplicate of the one in Buffalo. Building plans are ready. B. J. McCormick, Industrial Commissioner. President, W. C. Carr, Buffalo; Secretary-treasurer, Chas. O'Hara Craigie, Toronto.

The deal whereby the Ontario Iron and Steel plant, located here, will become the property of the Canadian Car & Foundry Company, of Montreal, has been closed. It is believed that improvements and additions to the extent of \$1,000,000 will be made to the plant by the present owners.

Winnipeg, Man.

The \$35,000 building permit taken out by the Hudson Bay Company is for alterations and improvements to the stores buildings in connection with the company's extension plans. Mr. Woodman, architect.

Woodstock, Ont.

The agreement between the Ken Knit Co., Ltd. (to be incorporated) and the city, has been arrived at. In return for civic privileges the company will erect and maintain a factory to cost at least (building and machinery) about \$35,000. G. F. Mahon, barrister, of this city, representative of company. Ald. Welford, chairman of industrial committee.

AWARDED

Hamilton, Ont.

The International Harvester Company has awarded to George E. Mills the contract for the erection of their fine office building, \$40,000. Work is to be rushed to completion as speedily as possible. The company will do its own excavating. The building will be 100 feet long and 60 feet wide, and will be two stories high, with a basement. The following have sub-contracts: John Poag, carpenter work; Burton and Baldwin, interior finishings; Adam Clark & Sons, plumbing; John E. Riddell, roofing; Stamp & Son, painting; Electrical Supply Co., wiring and fixtures; Hamilton Bridge Co., structural steel work; Canadian Wire Goods Company, lockers, etc.

Toronto, Ont.

The contract for the Porous Terra Cotta fireproofing of the new Hobberlin building, corner Yonge and Richmond streets, has been awarded to R. Bennett, contractor, 347½ Euclid avenue.

Vancouver, B.C.

Mr. S. Olason took out a building permit for a brick block at 549 Richards street, \$30,000.

Power Plants, Electricity and Telephones

Edmonton, Alta.

Ex-Mayor May, and M. W. Eager, barrister, Edmonton, are endeavoring to se-

(Continued on page 30)

Tenders and For Sale Department

ROCK CRUSHERS

We have a No. 6 and a No. 5 McCully gyratory type with manganese steel head and concaves, suitable for breaking very hard material. Both are new; never set up. Located New York State. Also a 60-ft. elevator and a 48-in. x 12 ft. McCully screen. Will sell separately. Attractively priced. Confer with us.

WILLIS SHAW MACHINERY CO.
171 La Salle St.
Chicago, Ill.

Tenders for Supply of Asphalt

Sealed tenders, addressed to the Chairman, Board of Control, Winnipeg, Canada, for the supply of from 1,000 to 1,500 tons of Asphalt for street paving for the City of Winnipeg, will be received at the office of the undersigned on or before **Wednesday, March 1st, 1911**. Specification and form of tender, together with conditions governing tenders, as prescribed by-law, may be obtained at the office of the City Engineer, 23 James Avenue, Winnipeg, Canada. The Board reserves the right to reject any or all tenders or to accept any bid which appears advantageous to the city.

M. PETERSON, Secretary.
Board of Control Office,
Winnipeg, Jan. 19th, 1911. 4-5

Notice To Contractors

Civic Supplies

Sealed tenders addressed to the Chairman of the Board of Control, City Hall, Ottawa, will be received by the Secretary of the Board of Control, City Hall, Ottawa, up to 4 p.m., Tuesday, February 14th, 1911, endorsed "Tender for Broken Stone, Brick, Stone Curbing, Stone Setts, Cement, Plank and Cedar, Sand, Vitriol Clap Pipe, Asphalt, Castings, or Hardware," as the case may be.

Specifications, form of tender and full particulars may be obtained on application at the City Engineer's office, City Hall, Ottawa.

Any tender received after the above stated time will be declared informal.

The Corporation does not bind itself to accept the lowest or any tender.

NEWTON J. KER,
City Engineer.

Ottawa, Jan. 21st, 1911. 4-5

Cast Iron Water Pipe

Sealed tenders addressed to the City Clerk, Brandon, Man., endorsed "Tender for Cast Iron Pipe," will be received until 12 o'clock noon on Friday, the third day of February next, for from Ten to Twenty Thousand Feet of Six Inch and Four Inch Pipe.

The 6" pipe to be 30 lbs. per foot and 4" pipe 20 lbs. per foot, which must be tested to hydrostatic pressure of 300 lbs.

5,000 feet to be delivered by April the 15th, and the balance not later than the first day of June next.

Specifications may be had from the City Engineer's office, Brandon.

The lowest or any tender not necessarily accepted.

A. D. CATER, R. E. SPEAKMAN,
Chairman Waterworks Com. City Engineer.
Brandon, Man., Jan. 18, 1911. 4-5

Notice To Contractors

Water Works Supplies

Sealed tenders, addressed to the Chairman of the Waterworks Committee, City Hall, Ottawa, will be received by registered post only, up to 4 p.m., Tuesday, February 14th, 1911, for the supply and delivery of Brasswork, Special Pipe Castings, Hydrants, Cast Iron Pipe, Lead Pipe and Pig Lead, Valves or Oils and Grease as the case may be.

Specifications, form of tender and full particulars may be obtained on application at the City Engineer's Office, City Hall, Ottawa.

Any tender received after the above stated time will be declared informal.

The Corporation does not bind itself to accept the lowest or any tender.

NEWTON J. KER,
City Engineer.

Ottawa, Jan. 21st, 1911. 4-5

Town of Pembroke, Ontario

Tenders For

Laying and Jointing Water Mains, etc.

Tenders are required to be delivered on or before Monday, 13th February, 1911, at 2 o'clock p.m., addressed to Mr. E. A. Dunlop, Chairman of Water Committee, Pembroke.

Tenders to include for all labor, etc., in connection with laying about 5,900 feet of 16 inch water main, together with fixing valves and hydrants.

Forms of Tender may be obtained and specifications and plans examined either at the offices of Mr. T. Aird Murray, 303 Lumsden Building, Toronto, or at the office of the Resident Engineer, Mr. J. L. Armour, Pembroke, on or after the 30th inst.

The right is reserved to reject any or all tenders.

By order,
A. J. PORTIER, Town Clerk,
Pembroke.

T. AIRD MURRAY,
Consulting Engineer,
Toronto, Ont. 4-4

Town of Pembroke, Ontario

Tenders for

Laying and Jointing an Intake Pipe

Tenders are required on or before Monday, the 13th of February, 1911, at 2 o'clock p.m., addressed to Mr. E. A. Dunlop, Chairman of Water Committee, Pembroke.

Tender to include for all labor, etc., in connection with laying about 5,400 feet of 18-inch Lap-welded Steel Intake Pipe, and the construction of a Concrete Pump Well.

Forms of Tender may be obtained and Specifications and Plans examined either at the offices of Mr. T. Aird Murray, 303 Lumsden Building, Toronto, or at the office of the Resident Engineer, Mr. J. L. Armour, Pembroke, on or after the 30th inst.

The right is reserved to reject any or all tenders.

By order,
A. J. FORTIER, Town Clerk,
Pembroke.

T. AIRD MURRAY,
Consulting Engineer,
Toronto, Ont. 4-4

DREDGES FOR SALE

A one yard Beatty dredge in first-class shape, within a few miles of railroad station, suitable for dredging or ditching; also a half yard machine with portable oak hull in first-class shape. Apply FRED A. ROBERTSON, Cornwall, Ont.

City of Strathcona (Alberta)

Tenders for

Engine, Boilers and Generators

Tenders addressed to David Ewing, Chief Engineer power house, Strathcona, Alta., for the above machinery, will be received until noon, Wednesday, March 1st, 1911. Specifications may be obtained upon application to the undersigned.

A. J. McLEAN,
City Engineer.

Strathcona, Alta., Jan. 16, 1911. 4-6

Positions Wanted

Advertisements under this heading one cent a word per insertion. Box No. ten cents extra.

WANTED—Position as superintendent or general foreman, railroad work preferred. Twenty years experience. Address, Box 189, Contract Record, Toronto, Ont. 4-4

ARCHITECT, highest qualifications and experience, would take charge of office or consider partnership. The West preferred. Box 200, Contract Record, Toronto, Ont. 4-7

Miscellaneous

Advertisements under this heading one cent a word per insertion. Box No. ten cents extra.

AGENTS WANTED—Large United States Terra Cotta company desires high-class agencies for Canada. Send particulars to W. D. Ward, Tribune Building, New York City. 4-5

THE STEEL SQUARE—For sale—4 copies of vol. 1 and 2 copies of vol. 2 Fred T. Hodgson's book, "Practical Treatise on the Steel Square," 242 pages. Price, only 50 cents a copy. Contract Record, 220 King street west, Toronto, Ont. 4-5

REPRESENTATIVES WANTED—Resolute firm manufacturing complete line of electrical measuring instruments want responsible representatives to handle their lines throughout the whole of Canada. Are prepared to deal separately for Eastern and Western Canada. Box 101, Contract Record, Toronto, Ont. 4-5

REPRESENTATIVES WANTED IN CANADA—British firm of electrical and mechanical engineers manufacturing electric lighting specialties, wants to secure reliable Canadian representatives who will carry a stock in Canada. Write for particulars to Box 199, Contract Record, Toronto, Ont. 4-5

The Vice-President and General Manager of the Monterrey Railway, Light and Power Company, Limited, Apartado (P.O. Box 58), Monterrey, N.L., Mexico, will receive tenders until March 1st, 1911, for erection of gas plant. Plans, etc., at office of the above.

Power Plants, Electricity and Telephones

(Continued from page 28)

cure rights from the Dominion Government to build a dam on the upper Saskatchewan above Edmonton, for the purpose of developing hydro-electric power for the supply of Edmonton and towns in the vicinity.

One of the features of the Provincial Telephone Department for this year will be the strengthening of the long distance lines between Edmonton, Calgary and Lethbridge with new copper wire. There will also be a number of new exchanges and the remodelling of old exchanges. John Stocks, Deputy Minister.

Two important extensions of government telegraph lines into the north country are being planned for this year. One will carry the line northeast along the Athabasca river, to Fort McMurray, a distance of about 200 miles. The other will be down into Grande Prairie from Peace River crossing to where the line was extended last year. Construction of these extensions will probably be commenced on the opening of spring.

Guelph, Ont.

The Light and Heat Commission submitted a plan for new lighting system in which is suggested the placing of two large arcs and a cluster at the street corners in central section and the lighting of balance of city with 800 75 c.p. lights. Mr. Carter, chairman.

Hamilton, Ont.

Steps are being taken to operate the east end sewage disposal works by Hydro power. The return power line from the beach pumping plant to the disposal plant has not yet been built, and that work will have to be undertaken very soon. City Engineer Macallum.

Ottawa, Ont.

The municipal electrical commission is having plans prepared to place all the wires on Sparks street underground. Superintendent, Brown.

Regina, Sask.

The council has instructed the commissioners to meet the Government officials in regard to the steps necessary to the establishment of a municipally owned gas plant.

Tenders marked "Tenders for Street Railway Materials D," addressed to the City Commissioners, will be received until January 31st for supply of trolley poles and railway ties. Particulars upon application to City Engineer, L. A. Thornton.

The Street Railway Commissioners recommended the award of supply as follows: For the overhead work and other equipment: Northern Electric Company—Straight line hangers, \$42 each; line ears, \$26.90 each; double curve hangers, \$56.20, and single curve hangers, \$35.20 each; strain plates, \$33 each; strain ears, \$37 each; left hand trolley frogs, \$270 each; right hand trolley frogs, \$270 each; crossovers, \$410 each.

Dawson and Company—Wood insulators, \$23 each; splicing, \$54; eye bolts, nine inch, \$9.30 each; 10 inch, \$9.80, 11 inch, \$11.20, 12 inch, \$11 each.

General Electric Company—Turnbuckles, \$65 each, and lightning arresters, \$400 each.

In almost every instance the lowest

prices were recommended. The equipment already decided upon by the city engineer and city commissioners does not constitute all that will be required.

The United States Steel Products Company have practically been selected to supply all rails, spikes and bolts necessary at a total cost of \$47,409.90. Of that amount \$46,846.90 is for rails. The tenders for the rails required very little attention as the American firm was practically alone in the field in that respect.

Strathcona, Alta.

At a meeting of council the recommendation of the fire and light committee, based on the information of Electrical Engineer Ewing as to the inefficiency of the power plant (noted in issue of December 28th) that equipment to the value of about \$72,000 be purchased at once, was adopted. The details of this expenditure was given as follows: 600 k.w. generator, \$14,300; accompanying engine, about \$20,000; necessary boilers, \$32,000; provision to be made later for the installation of an exhaust steam turbine engine which would increase the capacity 400 k.w. Chairman Richards stated no time would be lost in securing tenders for machinery supply.

Victoria, B.C.

The electric lighting by-law (\$25,000) was carried; also the underground telephone by-law.

Winnipeg, Man.

Pratt & Ross, Architects, have prepared plans for a turbine power house for the Winnipeg Electric Co., to be erected here at a cost of \$72,000. Wilford Phillips, General Superintendent.

AWARDED

Ottawa, Ont.

The contract for the additional poles required for extending the "white way" to Rideau and Bank streets was awarded to the Canada Foundry.

Miscellaneous

Edmonton, Alta.

The Fire Department estimates for expenditure for 1911 provide for the purchase of a motor driven chemical and hose combination wagon with a capacity of 50 gallons of chemical, estimated to cost \$6,500.

In the estimates for equipment provision will be made also for an aerial ladder truck with 75 feet extension ladder, wall ladders and other equipment, the whole to be horse drawn. This will cost \$6,000.

3,000 feet of cotton rubber lined hose will cost \$3,300. The total capital expenditure for the year is estimated at \$25,085.75. This will include \$1,000 for the purchase of sites for future substations. Chief, Davidson.

Toronto, Ont.

Tenders are being called until January 31 by the Board of Control for supply of travelling crane. G. R. Geary, chairman, Board of Control.

Recent building permits include: W. E. Mackey, 2 pair semi-detached 2½-story brick dwellings, 91-97 Wright avenue, \$10,000; Fairbanks-Morse Canadian Manufacturing Co., 1-story brick and steel addition to foundry, 1369 Bloor street west, \$13,800; 2-story brick foundry cleaning and pattern house, 1469 Bloor

street west, \$7,000; 1-story stucco storage shed, 1363 Bloor street west, \$5,000; Jos. Lavvie, 1 pair semi-detached 2-story brick dwellings, 35-37 St. Clarens avenue, \$4,000; H. S. Mara, 1 pair semi-detached 2-story brick dwellings, Ritchie avenue, \$4,000; D. Schwalm, 2-story brick dwelling, St. Clair avenue, \$4,000; T. J. Bowen, 3 attached 2-story brick stores and dwellings, on south side Dundas street, \$9,000; Canadian Pacific Railway Co., 1-story brick repair shop on west side Keele street, \$20,000; E. B. Shuttleworth, 1-story brick addition to warehouse on southeast corner Victoria and Wilton, \$7,000; T. J. Sharp, 1 pair semi-detached 3-story brick stores and dwellings on east side Roncesvalles avenue, \$7,000; John Logan, 3 1-story brick kilns, north of G. T. R. on east side Greenwood avenue, \$7,500; Dundas Building Co., 1 pair semi-detached 2-story brick dwellings on east side Murray street, \$7,000; Mary C. Horrocks, 1 pair semi-detached 2-story brick dwellings on south side Winchester street, \$5,500; H. J. Rae, 2-story and attic brick dwelling, near Summerhill avenue, east side Glen road, \$4,500; Virginia Cassevoi, 1 pair semi-detached 2-story brick dwellings on 17-19 Ritchie avenue, \$4,500; H. Gingrass, 1 pair semi-detached 2-story brick dwellings on 8-10 Spencer avenue, \$4,000; D. E. Moore, 1 pair semi-detached 2-story brick dwellings, near Harriett on Leslie street, \$4,000; Fred Holt, 2-story and attic brick dwelling, near Heath on Dunvegan, \$8,000.

Vancouver, B.C.

Permits were granted as follows: Provincial Land & Fire Corporation, seven residences, Trafalgar Road, \$18,400; J. Chisholm, 2021 Bismark street, \$2,110; M. Lothian, 56 Eighth avenue east, \$3,000; S. B. Wood, 975 Tenth avenue west, \$6,000; P. Duffy, 1036 Thirteenth avenue east, \$2,000; Mrs. Ward, 752 Richards street, \$5,000; P. Watson, 1218 Fourteenth avenue east, \$3,600; D. B. Carmichael, 1035 Barnard street, \$2,100; F. Wallace, 1549 Charles street, \$2,800; Jefferson & Clapham, 1256 Eighth avenue, \$2,700; John Coleman, 1363 Fourteenth avenue east, \$2,500; J. Morley, 2535 Sixth avenue west, \$2,500; moving-picture theatre at 2222 Granville street, for Messrs. Stark & Crossley, \$6,500.

Victoria, B.C.

Building permits were issued as follows: Mrs. J. Handley for a dwelling on Queen's avenue, \$2,375; John C. Carling, dwelling on Fell street, \$3,000; to David Spencer, alterations to the Driard hotel, \$2,000.

Winnipeg, Man.

Recent building permits include: Lyall Mitchell Company, warehouse, corner Wall and Richard streets, \$11,000; D. Johnson, house, north side of Elmwood avenue, \$2,000; A. Kolbe, house, between Powers and Andres, \$2,000.

Tenders addressed to M. Peterson, secretary, Board of Control, will be received until February 1, 1911, for the supply of labor and material required in the erection of three gateways on Cornish avenue, Armstrong's point. Specifications at office of City Engineer.

AWARDED

Prince Rupert, B.C.

The contract for a new marine depot at Prince Rupert has been awarded to the Pacific Construction Company of Victoria, \$150,000.

Contractors' and Builders' Supplies

Crushed Stone

For Concrete Fireproof Construction, Roadwork and Sidewalks

Rubble, Portland Cement

CRUSHED GRANITE for Floors and Sidewalks

SEWER PIPE

WEeping TILE

FIRE BRICK

FIRE CLAY

Crescent Fire Brick

We are exclusive Distributing Agents for this high grade, hand-made fire brick. Large stock always on hand.

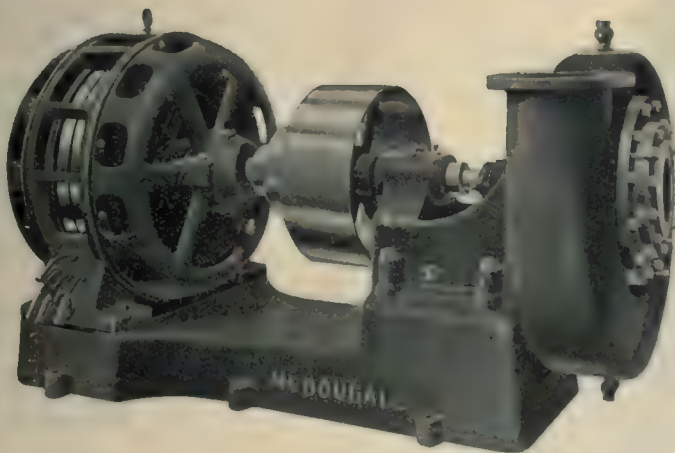
Don't forget our Prompt Delivery Service.

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Sand Dredging Pumps



THE VOLUTE PUMP, HERE SHOWN, IS SPECIALLY DESIGNED TO CARRY A HEAVY PERCENTAGE OF SAND. IT HAS A CAPACITY OF 2,334 IMPERIAL GALLONS PER MINUTE, AND IS ARRANGED FOR EITHER MOTOR OR BELT DRIVE. WE BUILD THESE PUMPS OF ALL CAPACITIES AND OF THE HIGHEST EFFICIENCY.

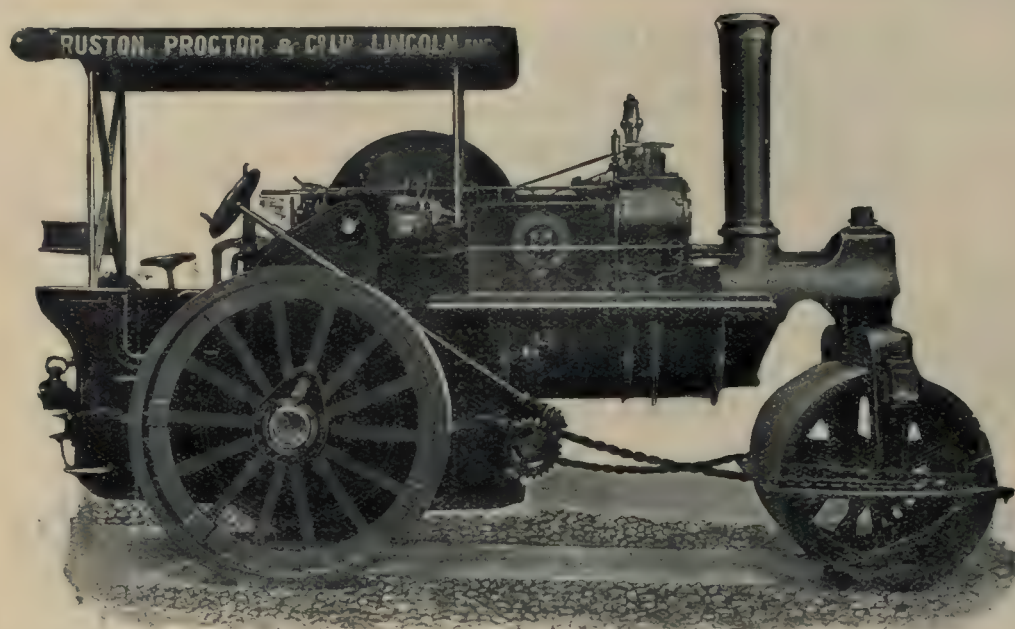
OUR NEW BULLETIN NO. 106, SHOWING MANY APPLICATIONS OF THESE PUMPS, WILL BE SENT ON APPLICATION TO OUR SALES OFFICES, MONTREAL, TORONTO, COBALT, WINNIPEG, CALGARY, VANCOUVER

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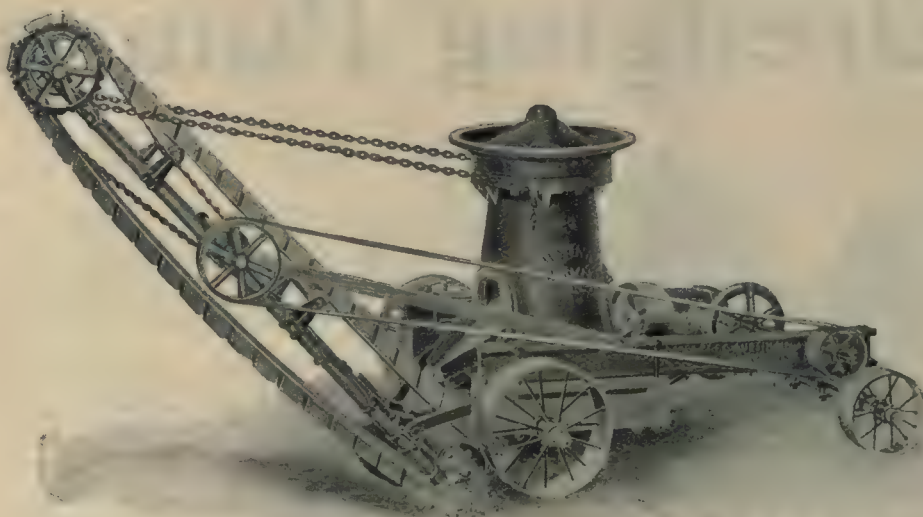
THE JOHN McDOUGALL CALEDONIAN IRON WORKS CO.

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RUSTON STEAM ROLLER



AUSTIN PORTABLE GYRATORY CRUSHER

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G PLANTS

(steam or motor)

NG MACHINES

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LIMITED



AUSTIN REVERSIBLE ROAD MACHINE



LITTLE YANKEE ROAD GRADER



AUSTIN MOTOR ROAD ROLLER

Winnipeg, 259-261 Stanley St.
Calgary, Crown Block.
Vancouver, Mercantile Bldg.

Concrete Finishes

Concrete Floor Dressing prevents abrasion, wear, dust formation, water, oil and grease absorption.

Alkali Proof Wall Size prepares interior plastered walls for highest class decorations.

Waterproof Flat Finishes for highest class interior decoration of plaster, metal and Beaver Board Surfaces.

Waterproof White Finish, washable, sanitary, intensifies the radiation of light for interior or exterior use.

Courts, factories, elevator shafts, etc.

French Caen Stone Finish, a perfect reproduction of French Caen Stone.

GLIDDEN

Waterproofings

Transparent Waterproofing waterproofs concrete, brick, stone, granite and marble without changing color or texture.

Liquid Cement waterproofs and uniforms surface color of concrete and stucco. Bonds plaster to concrete.

Liquid Cement Filler fills cracks and breaks in concrete and stucco surfaces.

Acid Proof Coating and Graphite Acid Proof Coating for iron and steel submitted to **Extreme Corrosive Conditions**.

Liquid Rubber for dampproofing interior surfaces of exposed walls—plaster applied over it—for waterproofing basements.

Liquid Rubber Cement for filling expansion joints.

Booklet covering the above materials and Specifications for use, also samples sent gratis, upon request

The GLIDDEN VARNISH COMPANY, Toronto, Ontario



Block Stone, Dimensions, Random, Head Sills, Shoddy, Stone Sawing

Sackville Freestone Co., Limited, Sackville, N. B.

WRITE US FOR QUOTATIONS

Contract Record

ESTABLISHED 1886

A Weekly Journal of
Building, Contracting, Engineering, Public Works
Municipal Progress, Advance Information

PUBLISHED EACH WEDNESDAY BY

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SUBSCRIPTION RATES

Canada and Great Britain, \$2.00 U.S. and Foreign, \$2.50

Vol. 25

January 25, 1911

No. 4

The Law of Compensation Proportionate to Performance

Among the ten fundamental laws of business management, as formulated by Gillette and Dana in their work on "Cost Keeping and Management Engineering," the most important is the seventh: "All payments for work should be proportionate to work done." There are five ways in which business managers have attempted to follow this law, where they have attempted it at all, namely:

1. By the payment of higher wages or salaries to the most skilful and most intelligent individuals.
2. By payment of a wage with a sharing of profits.
3. By payment per unit of work done.
4. By giving a bonus, commission, or the like, in addition to a regular wage or salary.
5. By a combination of two or more of the foregoing methods.

The first method is a crude attempt to follow the fundamental law of economic management. The degree of its crudity depends upon the conditions of supply and demand in the labor market, the strength or weakness of labor unions, and the variable notions of employers as to the worth of individual employees. The graduated wage method of payment, if we may so designate it, is not without merit, particularly as applied in the payment of managers, superintendents and foremen. In a rough way the employer measures the producing efficiency of such men, and attempts to reward them by higher salaries for increased profits due to their wits or energy. When, however, we come to the compensation that men in the ranks receive under the wage system, we find far less intelligence displayed by employers. Here are large bodies of men, classed almost alike as to wages, regardless of individual ability. Can we wonder at the restlessness of the wage earner under such a system? Can we find fault with him for listlessness? Is he to be blamed for listening seriously to socialistic doctrines? The wage system in its present form is assuredly doomed.

Those managers who abandon it first are the ones most likely to win greater profits for themselves while giving greater income to their employees.

Sharing Profits.

The second system of payment has been widely advocated in years past, but, in spite of frequent trial, has never become strikingly effective. Its drawbacks are many. To be perfectly fair, a profit sharing plan involves its converse—a loss sharing plan. If employees are to receive extra compensation in the fat years, they should suffer a deduction from their wages in the lean years, which none as yet has been found willing to do. Even a more serious objection, however, is that a profit sharing plan violates the law of prompt reward. The average workman lacks enough imagination to work hard to-day that he may receive a profit a year hence. Finally, the profit sharing plan fails miserably, when applied by itself, because it fails to appeal sufficiently to the instinct for individual supremacy. It fails for the same reason that socialism must fail, because it asks the energetic to share with the lazy, the wise with the foolish.

The third method of payment is amazingly effective wherever it can be applied. Unfortunately it is difficult of application except in the payment of managers and employers. The manufacturer, the farm owner, the contractor and the railway owner, are paid per unit of product. The fundamental law of social economics—payment in proportion to performance—is applied in their cases and with results that can leave no doubt whatever about the superiority of creating individual incentive. Yet the very men who are themselves thus driven to work with the greatest energy—the employers—have usually failed to apply to their employees this system of payment per unit of product.

In seeking a reason for this anomaly we need not look far. A contractor, for example, receives 20c per cubic yard for excavation, involving the use of a steam shovel and car plant. His employees are engaged in many different duties—some running the shovel, some on the dirt drains, some on the dump, some laying track, some repairing cars and tools, and so on. It is practically impossible to pay each of these classes of men on the basis of the cubic yard of excavation and do so with any measure of justice. The yardage output secured by the steam shovel gang is dependent not only upon their own efforts, but upon the size and condition of the shovel, the depth of the cut, etc. Yet they might be fairly satisfactorily recompensed on a yardage basis. On the other hand, the crews on the dirt trains perform work that is not closely measurable in terms of the cubic yard at all. Still less so is the work of the track layers and of the repair men thus measureable. Difficulty of apportioning payment on the yardage basis is so great that it is rarely attempted. Even to a greater degree would it be impracticable to pay the employees of a street railway system on the basis of the passengers carried—for that is the unit in which the street railway company itself is paid.

Payment per Unit of Work.

Piece rate payment is a unit price system for the employee in which the unit usually differs from that in which the employer is paid. Avariciousness of employers has doubtless led to the disrepute under which the piece rate plan now labors. Added to this we have the socialistic influence so strongly manifest in most labor unions. Between the employers who constantly seek excuses to cut piece rates as productiveness increases, and the organized employees who aim to secure pay for the poorest workman equal to that of the best, the piece rate sys-

tem has been prevented from attaining the popularity that it really deserves.

Wage Plus a Bonus.

The fourth plan—wage plus a bonus—has been slowly growing in popularity, and seems destined to find a wider application than any other method of compensation, unless we except the fifth plan, which, as yet, has been tried too infrequently to admit of satisfactory comparison with the others. The bonus system was probably first applied extensively in the payment of traveling salesmen, who received a salary plus a commission on sales effected. Perhaps a claim to priority might be raised for the "tipping system" of paying waiters, which is essentially a bonus system wherein the patron pays the bonus. In passing, we may add that the persistence of the tipping system is due to the fact that it secures better service through the stimulus that the tip—the bonus—creates. So long, therefore, as no better application of the bonus system in restaurants and hotels is devised, the tipping system will retain popularity.

A few far-sighted merchants have adopted a bonus system for paying their clerks. Each clerk receives a small commission on the sales that he effects, in addition to his salary. The result is unquestionably more intelligent and more obliging service, which, in turn, draws more custom.

The greatest difficulty that usually arises in attempting to apply the bonus system is the difficulty of finding satisfactory units in which to measure the output of employes of each class, and particularly of individuals. How, for example, shall the work of train conductors be measured? In train-mile units? The train-mileage, however, is only to a degree within the control of the train crew. Yet we believe that any well conceived plan of paying train crews a bonus on train-mileage would aid remarkably in increasing the present average mileage performance, just as certainly as bonus for small coal consumption has effected marked reduction in fuel used on locomotives.

To contractors who adopt the bonus system and apply it justly, even liberally, there will come not only greater profits than they now receive, but the satisfaction of having aided in bettering the condition of their employes.

To engineers who introduce the bonus system in the management of public utilities will come positions of large emolument and the respect of the world. Such engineers will raise the status of their entire profession to a managerial science.—Engineering-Contracting.

Rules for Measuring Concrete and Excavation

A joint committee, consisting of architects, engineers and contractors of the City of Chicago, has recently adopted rules for the measurement of excavation and concrete work. The formulated rules cover all the details of this kind of work and building construction, defining specifically how certain classes of work shall be paid for. The adoption of this set of rules, according to our contemporary, the Contractor of Chicago, is the outgrowth of difficulties in coming to an agreement for compensation, entailing not only disputes and bad feeling between the parties, but litigation as well. It is only natural that a contractor will make claims for extra compensation when his margin of profit is dwindling because he was obliged to go to additional expense in erecting forms of concrete or sheeting in for excavation, which could not be foreseen when he made his estimate. Under the rules drawn up, provision is made for these contin-

gencies and extra compensation is allowed where excavation becomes difficult, or where forms for concrete are complex, so that they require not only more time, but additional outlay for material.

There can be no doubt that the step taken by this committee is in the right direction, and that much resultant good will be the outcome. More than this, it is worthy of imitation and an extension with modifications to suit, into the general contractors' field. Here it would undoubtedly prove quite a factor in solving some of the problems which arise in reference to proper compensation. Most contractors would not require deep research in the repertory of their work to adduce instances of this kind, where, for instance, the encountering of a certain kind of material made the execution of the work a dead loss at agreed prices, which would not have been accepted had the circumstances been foreseen. It is a fact well known to contractors that in many of these cases the solution has to be sought in the arbitrary decision of the engineer, who would or would not allow additional compensation, according to his interpretation of the contract or specifications. In almost every contract instances of this nature arise, and it would seem that a logical solution would be the establishment of standards to cover these contingencies.

As a step toward standardization alone, this Chicago body has marked an advance. A little study of organization proves that the establishment of standards has been the keynote of success for all enterprises, which would apply in this case. It would furthermore promote good feeling between all parties concerned, which in turn would result in better work. Another benefit which would result from this is that the establishment of such rules of measurement in the general contracting field would make a better basis for estimate.

Heavy rail sections are being tested on the Central Railroad of New Jersey on certain lines carrying very heavy and fast traffic over tracks having an unusually large amount of curvature. The 90-lb. rails in regular use wear out rapidly, and the company accordingly decided to try much harder steel, which made it necessary in turn to use a large section in order to keep down the unit stresses. The new rail is 6½ in. high, weighs 135 lbs., and has from 0.9 to 1.10 per cent. carbon. It is made by the open-hearth process, with phosphorus under 0.02 per cent., and is curved at the mill, the rails being numbered after bending to indicate their position in the track. A check on the experiments with these heavy sections will be afforded by the behaviour of over 14,000 tons of 100-lb. rails containing 0.75 to 0.83 per cent. of carbon for open-hearth steel and about 0.65 per cent. for Bessemer steel.

Reinforced Concrete Roof Arches with a clear span of 50 ft. have been used in the building for the Hammersmith Baths, London. The main members are arch ribs with segmental circular intrados and without tie rods, carried with their springing lines about 17 ft. above the piers on which the columns rest. The ribs, as described in "The Builder," London, are approximately 12 ft. 9 in. on centres and carry reinforced concrete purlins for the roof decking. Surmounting the arches is a monitor of concrete construction. Cantilever galleries on both sides are carried on the columns about 7 ft. below the springings. Outside are roofed passageways, constructed monolithically with the main parts of the structure.

Deep Well Drilling in Saskatchewan

Contributed by J. M. Wilson, Assoc. M. Can. Soc. C. E.,
City Engineer of Moose Jaw, Sask.

In a country impoverished in respect to natural water supplies, and remote from the sources of supply of fuel, the natural inclination is to bore into the bowels of the earth, and unfetter if possible pent up supplies of pure water or natural gas. The city of Moose Jaw is at present drilling a test well, 3,000 feet deep, and a summary of the results shown by the first 1,160 feet of drilling may be of interest from a geological standpoint.

The well is located in the S.W. $\frac{1}{4}$ of Sec. 33, Township 16, Range 26, West of the 2nd Meridian, and within the incorporated limits of the City of Moose Jaw. Drilling was started in the Spring of 1910 and has been continued until the present time, a depth of 1,160 feet having been attained.

The following table shows the nature of the strata encountered at different depths:

Depth From	To	Material	Color	Hard or Soft	Remarks
1	5	Clay	Grey	Hard	
5	19	Gravel & Sand			Very fine sand.
19	455	Clay	Grey	Hard	
455	480	Sandy Clay	Grey		Struck water at 468 ft.
480	555	Clay	Grey	Hard	
555	600	Sandy Clay	Grey		
600	777	Clay	Grey	Hard	
777	790	Sandy Clay	Grey		
790	890	Clay	Grey	Hard	
890	910	Sand	Grey		Very fine sand.
					Struck water at 903 ft.
910	920	Sand & Rock	Grey		
		Shale			
920	930	Shale & Clay	Grey		
930	960	Sand & Clay	Grey		
960	1010	Sand	Pepper & Salt		Struck water at 968 ft.
					Flow of 1200 gals. per hr.
1010	1020	Sand & Clay	Grey		increased to 4000 gals. per hr. at 985 ft.
1020	1030	Clay & Shale	Grey		
1030	1160	Clay	Grey	Hard	

The water supply encountered at 468 feet must have been only a pocket, as a pumping test lowered the water permanently. The supply at 985 feet looked very en-



General View of Exterior

couraging and it was decided to apply a pumping test. By lowering the water 80 feet in the casing, the level remained constant for 21 hours and the supply was in-



Interior View showing Reel for Cable and Entrance to Casing, with Drill Suspended

creased to 10,000 gallons an hour, this being the capacity of the pump used.

An examination of this water resulted in the following analysis: Parts in 1,000,000—Suspended solids, 20; dissolved solids, 5,995; loss in ignition of dissolved solids, 370; chlorine, 3,000.

"B" Coli absent and sulphates in very small quantities.

The above analysis points to a spring water highly charged with mineral salts, but uncontaminated with sewage matter. From the appearance of the residue on evaporation, the greater part of the saline matter was probably calcium chloride. Owing to its large chlorine contents, this water was practically unfit for domestic purposes, and certainly unfit for manufacturing purposes and boilers.

The well was started with an 18-inch casing which extended for 150 feet, and then changed to 600 feet of 14-inch, the remainder being 10-inch pipe. The work is in charge of the Wallace-Bell Company, of Montreal, whose contract calls for a price of \$10 per foot for a 3,000 foot well. The work is being pressed to completion, and it is the hope of the municipality that further development will yield an abundant supply of either fresh water or natural gas.

Importance of Party Walls

By Owen B. Maginnis

At the outset of this article the reader might rightfully ask, what is meant by a "party" wall? Webster defines a wall of this kind as "a wall that separates one house from the next," which is correct as far as it goes, but it doesn't go far enough from a

right," that is to say, the right to place the ends of floor beams in the wall without endangering its safety.

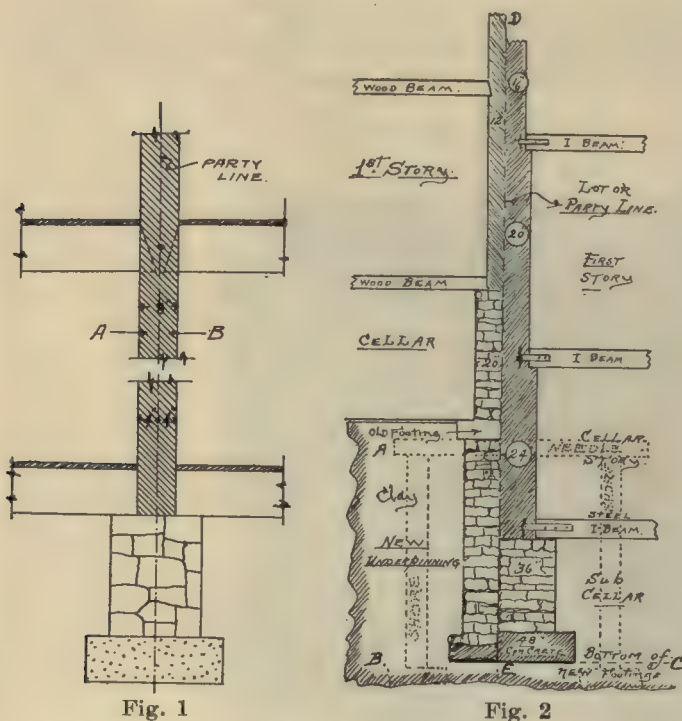
The foundation is of stone, the upper part of 8-inch brick. This thickness of party wall, however, is now a thing of the past, having been mostly used in small one or two storey houses.

The next thickness of party wall we come to is the 12-inch wall, where, of course, the dividing vertical line entitles each party to 6 inches on either side. This thickness of wall is consistent up to a height of 3 stories or perhaps four; but beyond this it is hardly safe. Much depends, however, upon the character of the building and its uses. For example, there is a difference between a wall built of cement and one of lime mortar in bearing capacity, and between a warehouse wall and a dwelling-house wall. Forty feet is about the best limit in height for a 12-inch party wall.

There are some very curious features in connection with party walls which are not known among the general run of builders and with which they should be familiar. For instance, it is not permissible for the owner of one side of a party wall to alter, strain or endanger the same by cutting into it or weakening its structural value in any way, without the consent of the next interested party, and he is liable for damages for so doing. He cannot sell or deed his half without the signature of his neighbor being affixed to the instrument or deed.

To illustrate this let us refer to the sketch, Fig. 2, where the importance of party walls is fully exemplified and the work of which was recently carried out. Originally there existed where these two walls are represented an old 12-inch party wall separating two old business buildings. Both owners were desirous of improving the property, so by mutual agreement "B" sold his entire half to "A," thus moving the line 12 inches east, to the right in sketch as shown, thus nullifying its party value, so the improvements were proceeded with as follows: "A" needed his wall below the bottom stone and underpinned his foundation down to the level of the concrete in "B's" building in the manner seen to the left, doing this for the protection of his own building and to gain a subcellar. When this was done "B" set his concrete footings and commenced the erection of his new building to the entire satisfaction of everybody concerned.

Fire was the means employed to demolish an old 210-foot smokestack at Thirty-second and Walnut streets, Philadelphia. When the final crash came and the forty-five-year old shaft crumbled to earth in a heap the sight well repaid the many hundreds who journeyed to the shop to witness the razing. The Pennsylvania Railroad Company recently purchased the site to enlarge their West Philadelphia freight yards and desired the site cleared quickly. The contractor's foreman examined the stack and its surroundings and reported that the shaft could be "burned down," and several weeks ago began tearing down the small buildings to the east of the stack, and after this work was completed bricks were removed from the eastern base of the big chimney and replaced by wooden shorings until almost the entire weight of the stack was borne up by the timber. Bricks on the west side of the base were left in position. This arrangement, it was calculated, would insure the chimney falling in a heap, practically where it stood. Several gallons of oil were poured on the wooden supports and a match applied. Inside of an hour the stack fell.



constructive standpoint, according to the American Carpenter and Builder.

It is not only owned by different parties, but is, in its utility, fulfilling two functions as a bearing wall, as will be seen in Fig. 1. In this sketch there is represented an 8-inch party wall, one side of which is owned by "A" and the other by "B." "A" owns 4 inches and "B" 4 inches, respectively, and each owner is entitled to what is technically known as "beam

Pioneer Road Making in Saskatchewan

Preliminary Work and Organization—Circuitous Routes to Avoid Expensive Construction—Increased Grants Now Being Made by Government — Satisfactory Outlook

By F. J. Robinson, Deputy Minister of Public Works

The Province of Saskatchewan is one of the two youngest sisters of the Canadian Confederation, having been granted provincial autonomy in 1905, when the Provinces of Saskatchewan and Alberta were organized out of the southern portion of the territory previously known as the Northwest Territories. It may be further explained, in order to emphasize the title of this article, that the territory now comprising these two young and vigorous Provinces was, when the Province of Manitoba, which adjoins Saskatchewan on the east, was organized, not considered worth including in that Province and for some years after the name Northwest Territories, to the residents of eastern Canada, was synonymous with a band of rebellious Indians, a few brave cattle and horse ranchers, a corps of mounted police, and a boundless prairie fit only to produce cactus and alkali water.

Here and there the Hudson's Bay Co. had established fur posts, and between them the only roads, or trails as they were then both in name and reality, extended. These trails usually continued in a general direction between the objective points, but direct roads were sacrificed for the sake of keeping on high, dry lands, diverting in all directions to pass by good water, or to reach fordable crossings of the rivers. These features are so evident while traveling these old trails that one is almost assured that the Hudson's Bay Company's freighters and the police followed the paths of the early Indians, who, in turn, doubtless were led to the good watering places and easiest river crossings by the first monarchs of the plains, namely, the North American buffaloes. So it would appear to the student of nature that the roads, part of which in some places are the main roads of to-day, were located by the buffalo and perpetuated by circumstances, serving in turn the Indians, the traders, the police, the ranchers, the immigrant in search of a homestead, later the same party to market his grain, and finally even the street of the towns and cities, a notable instance of which, though in another Province, is the old Red River trail, now the main street in the city of Winnipeg.

Preliminary Work and Organization.

So long as the settlers left the Northwest Territories to the ranchers, road making was a matter of small import. To improve a hill or throw a little dry earth on a wet spot was all that was considered. The ranchers were, as a rule, content to cross the rivers for supplies at a time when the ice was set or when low water permitted fording, but the settler who grew grain required more service, and bridges ceased to be a luxury. For some time fencing was not carried on to any considerable extent, and the grain growers were obliged to permit the public to continue along the shortest route to the nearest railway station. This, however, could not last long, for the increasing traffic, owing to the land becoming more thickly settled, caused havoc to the crops for rods wide along the principal roads; so by fencing, placing notices and general regard for individual rights, traffic was forced to the road allowances which, in the greater part of Saskatchewan, are 66 feet wide. This produced the consequent necessity of more vigorous road making, filling and raising wet places, always called

"sloughs," grading and placing culverts across ravines, generally known as "coulees," and bridging the streams varying in size from the mere spring freshet creek to the Saskatchewan River. Over this the Government has erected, at Battleford, a bridge 1,850 feet long.

The first provision for public money for roads was a grant by the Federal Government of the Dominion of Canada, which was placed under the control of the Lieutenant-Governor of the Northwest Territories, whose Advisory Council distributed it as best they could where the small amounts available would do the most good to the greatest number. Later the Advisory Council developed into a Legislature whose members were allotted equitable sums to distribute over their constituency. Still later and within a few years of the organization of the Province, the Government was divided into departments, and the Department of Public Works was organized with a staff of engineers and surveyors to supervise the expenditures on public improvements.

The writer joined the staff in 1901 and was stationed at MacLeod, now within the Province of Alberta, where, as in the eastern portion of the Territories, or the present Saskatchewan, the duty of the district engineer was to find a road to market for settlers, or a colony of them, who had gradually become hemmed in by fences or natural obstructions. The funds available for this purpose were limited, so that circuitous routes were resorted to in order that natural obstructions could be overcome by crossing streams at the least expensive points, and private lands were crossed by surveys and the subsequent purchase of the areas required for road purposes.

Road making was not the only channel of expenditure of the Northwest Government, so that only a portion of the Dominion subsidy was available for this service. The increasing settlements were continuing to limit the travel to narrower lines and it was found advisable to levy a tax of 1¼ cents per acre on all occupied lands to assist in the road making operations. This tax was at first collected entirely by the Government and expended under the supervision of the Department of Public Works, but by degrees the more thickly settled districts were allowed to form into improvement districts and by elected Councillors collect and spend taxes within their boundaries, the Government continuing to act as trustee for the funds collected in the sparsely settled portions of the Territories. A similar system prevails now in the Province of Saskatchewan in the parts that have been lately settled, but in the more advanced portions municipalities have been created and the Councils have thereby acquired powers and responsibilities almost equivalent to those enjoyed by the towns and cities.

Increased Subsidies from Government.

Since the organization of the Province the subsidies received from the Dominion Government have been greatly increased, and notwithstanding the fact that large expenditures are required annually for the various other services, a substantial sum has yearly been set aside for the construction of roads and bridges.

As the road system within the area comprising the Province gradually evolved from the trail to the high-

way, so have the expenditures been gradually systematized, from the first patching of bad spots and the subsequent improvement of colonization roads, until now our expenditures are concentrated on main roads, leaving the lateral roads to be improved by the local organizations with moneys collected by them.

The bridges were at one time built by contract. This method was found undesirable owing to the fact that few were equipped to properly carry on the work, therefore Government bridge crews were organized, who, by training and practice, have become experts, and a great saving of money is effected, as well as a superior quality of bridges secured. All classes of bridges are constructed by these crews, the timber for the wooden structures being purchased by the Government from the mills and shipped direct to the station nearest the site of the bridge. The metal for the steel bridges is manufactured according to our standard specifications by bridge companies in eastern Canada and erected by our crews. All the bridges erected during the past three years are designed to carry a 24-ton traction engine under steam.

The road grading was at one time done by settlers living close to the work, who were instructed to engage men and teams at times convenient to themselves and their neighbors. This method for many reasons was found inefficient and savored too much of the old statute labor laws of the older Provinces, where road work days were often considered a semi-holiday. The local foremen were superseded by organized grading gangs, consisting of an experienced foreman, from eight to twenty teams and drivers and the required number of scraper holders and shovelers, all of whom are engaged for the season, equipped with plows, scrapers, both wheel and slush, a road grader and cook outfit. These gangs, like the bridge crews, become experts and set an example to the local Councillors in road making, not only in the class of work, but in the system of carrying it out.

For the past three years we have been encouraging the use of road drags by parties living on graded roads. In order to establish one in each district we offered to pay \$1.25 per mile of road attended, six times over to be the minimum, the drag being sent to some reliable farmer, with instructions how and when to use. The result has been very gratifying, not only from the standpoint of the particular road attended, but also from the fact that the Councillors have realized the advantages of the road drags and are using them on their own account.

During the last ten years the Government has expended by the above methods \$4,427,444.83, of which \$508,522.37 has been collected from the settlers as a road tax. The local organizations have collected during the same period \$2,992,640, making a total of \$7,420,085.27 expended on roads in Saskatchewan, distributed through the years as follows:

	Government funds.	Road tax collected and spent by Government.	Taxes collected and spent by Local Councils.
1900	\$85,445 67	\$5,598 42	Ret. incomplete
1901	82,046 11	33,793 95	\$56,377 90
1902	130,102 41	36,920 92	77,136 18
1903	142,216 56	36,781 24	86,070 98
1904	217,041 40	92,412 38	94,841 22
1905	202,783 48	70,798 72	218,967 19
1906	297,610 65	56,150 62	325,798 97
1907	902,868 98	61,934 83	574,000 00
1908	1,308,879 09	43,139 59	653,000 00
1909	549,928 11	70,991 70	906,448 00
	\$3,918,922 46	\$508,522 37	\$2,992,640 44

This year a slight departure was made, in that,

in addition to about \$700,000 spent by road crews, a sum of \$60,000 was set aside to assist rural municipalities in the construction of main roads. Regulations governing the distribution of this amount were put in force, which were intended not only to protect the public funds, but also to enforce systematic methods of carrying on the business of these rural organizations and to stimulate a main road policy by the improvement of roads which will in the future become trunk highways throughout the length and breadth of the Province. On the whole, the result has been very satisfactory, some \$50,000 of the Government grant has been earned, which means \$100,000 has not only been expended by the municipalities, but for which value has been received on the roads leading directly into the market centers. This, added to the amount expended by the Government crews, makes a fair showing for road expenditure under Government control for a Province just past five years old. This seems an enormous amount, but let me say it is not big enough.

Last year the Province grew over 200,000,000 bushels of grain, divided between the different cereals as follows: Wheat, 90,215,000; oats, 105,465,000; barley, 8,833,000; flax, 4,488,000. It takes on an average 11c per bushel to haul it by rail to the head of the Great Lakes, amounting to \$22,000,000. It is estimated, and I think the estimate is low if in error at all, that it costs one and a half times as much to haul from the thresher to the internal elevator by team as it does to haul from the internal elevator to the terminal elevator by trains, therefore it cost the farmers of Saskatchewan \$33,000,000 to market their crop last year over the rural highway.

Better roads would permit not only larger loads, but more speed. We have not as yet reached the road metal stage in our road making and must be content to grade and drain, with special attention to drains. In a few places we have been obliged to haul clay to make roads through sand beds, and vice versa, but as a rule road metal has not been considered within our reach with so much grading and draining yet to be done. Still we look for road metal at an early date, that we may thereby decrease the cost of marketing the produce of the Province by at least one-third.

The Canadian Pacific Railway is considering the construction of a new connecting line between Nepigon and Savanne, which will give a direct run across from the head of the lakes, 69 miles north-east of Fort William, to a point 72 miles to the north-west. It is estimated that this straightening of the track will save from 40 to 50 miles in the conveyance of coast to coast traffic, the present distance between these two points being 141 miles.

The Annual Statistical Review and Outlook Number of the Monetary Times is one of the most complete and interesting editions of the kind ever issued by this enterprising publication. Among the many noteworthy features of this number calculated to be of interest to readers of the "Contract Record" are the following: Canadian Money Market, by H. M. P. Eckardt; Canada's Pulp and Paper Industry, by E. B. Biggar; Western Wheat Crop Estimates, Business of the Railroads, Canadian Railway Statistics, Government by Commission, Statistics of Growth.

The Ottawa branch of the Civil Engineers' Association has decided to open its lectures to the press. Meetings will be closed only when the lecturer makes a special request to that effect.

A Tall Reinforced Concrete Bridge Pier

General Features of Design and Construction—A Number of Difficult Conditions Involved—Construction and Sinking of Caisson

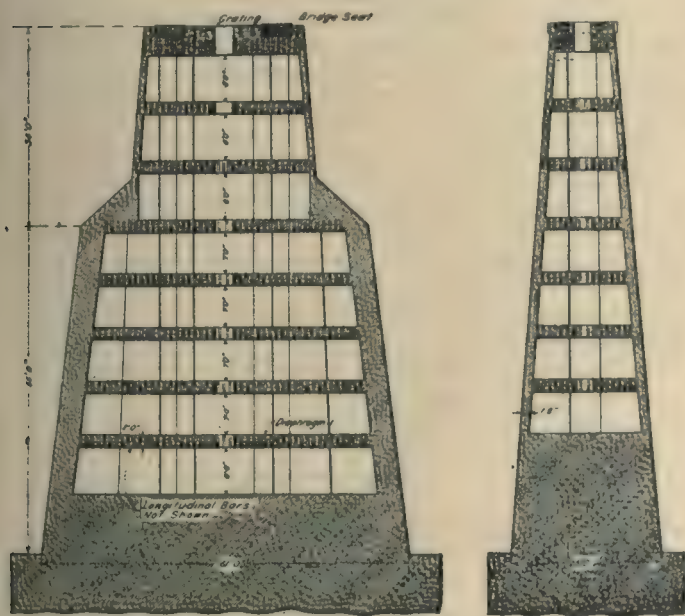
A reinforced concrete bridge pier, 165 feet high, has been built recently in the Willamette River on a branch line of the Southern Pacific Company near Portland, Ore. At the crossing where this pier is located the Willamette River is 570 feet wide and has a depth of 65 feet in the channel at low water, the depth at the pier being 55 feet. The average high water is 25 feet above the low stage, and occasional floods go 8 to 10 feet higher. The bottom of the river at the site consists of coarse gravel to a great depth. The bridge in which the tall pier is included embraces two 300-ft. riveted Pratt-truss single-track spans with inclined top chords. The tall pier carries the shutting ends of the two spans and the shore ends of the spans are on plain concrete piers, one of which is 73 feet and the other 75 feet high.

The general features of the design of the 165-ft. pier are shown in an accompanying drawing. The broad base of the pier is seated on the gravel at a

the bridge seats, with its sides also battered 1 inch to the foot.

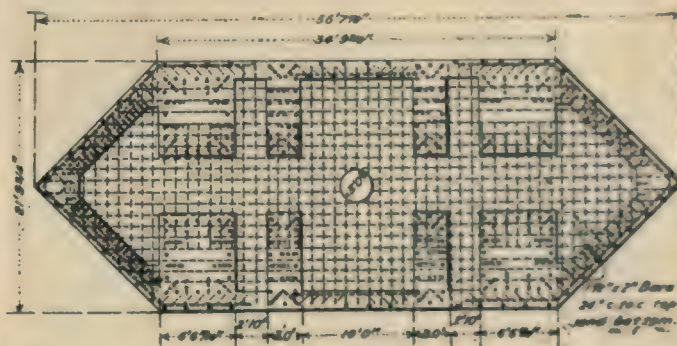
The outside walls of the superstructure are 18 in. thick and are anchored to the substructure by vertical $1\frac{1}{8}$ -in. Kahn cup bars 26 feet in length. These bars extend 16 feet downward into the top of the substructure, while those at the columns are continued up into the latter. The side walls of the superstructure are reinforced as vertical slabs spanning horizontally between the columns and vertically between the horizontal diaphragms, which separate the interior of the superstructure into eight stories. The reinforcement consists of Kahn shear and cup bars placed so a load can be brought on the walls from either side. The end walls are similarly reinforced with additional horizontal rods tying them back into the columns. The pier contains eight reinforced concrete columns extending from the base of the superstructure to the bridge seats. Four of these columns are built in connection with each side wall of the pier, and together with the walls, carry at the top a 5-ft. reinforced concrete slab in which two granite blocks are set as bridge seats.

Between the outside walls of the hollow superstructure are seven reinforced concrete horizontal diaphragms each 2 feet thick, which are designed as flat plates that may be loaded from above or below. The



Longitudinal and Transverse Sections of Superstructure

depth of 55 feet below the lowest point of the river bed. The sides of the pier are battered for a height of 12 feet and above that they are plumb for 64 feet, and to that height the pier is of solid concrete. The lower 72 feet of solid masonry forms a substructure for the hollow reinforced concrete superstructure 93 feet in height. The superstructure is offset at its base from the top of the substructure and has pointed ends the same as the latter. The bottom 10 feet of the superstructure also is of solid concrete, while above this massive base it consists of reinforced concrete walls connected by horizontal diaphragms and with reinforced concrete columns carrying directly the ends of the steel spans. To a height of 55 feet, which reaches above the maximum high water of record, the sides of the hollow portion of the pier are battered 1-inch to the foot. At this height the pier is offset sharply all around to a smaller section, which is continued up to



Plan of Diaphragm.

reinforcement in these diaphragms consists of Kahn shear bars placed alternately near the upper and lower sides. The lower five diaphragms are spaced 9 feet and the upper three 10 feet apart, so the span of the side-wall slabs between them is short. At the center of each diaphragm is a 3-ft. circular hole which permits the free passage of water between the eight stories in the superstructure. In one side of the lowest story is an opening 12 in. wide and the full height of that story so water may rise and fall inside the pier with variations in the stage of the river. The reinforced concrete walls of the superstructure, therefore, are not normally subject to a head of water, but the design provides for any emergency that may occur by including in them reinforcement placed so a head may be brought against the walls and diaphragms from any direction.

The pier was built in an open-timber caisson, 90 feet high, which was designed to meet the difficult conditions involved. The caisson was 40 ft. 10 in. square in plan at the bottom, the same as the base of

the pier, and from its lowest edge its sides were battered the same as the sides of the base of the pier to a height of 12 feet. Above that height the sides and ends were built plumb to the top. The walls of the caisson consisted of 3 x 10-in. plank placed flat and drift-bolted together. The side walls were braced across the caisson vertically at intervals of 5½ feet, by solid 10-in. by 2-ft. 9-in. timber sections built up of 3 x 10-in. plank. Triangular pockets were formed in the corners of the caissons by solid 10-in. walls, and the sides of these pockets also were braced at the same intervals as the caisson by solid sections of 3 x 10-in. plank. A rectangular pocket, 4 ft. 10 in. by 8 in. in plan, was built on both sides of the caisson to provide sufficient space, with the triangular pockets in the later, for the ballast required to sink and hold the caisson in place.

The outside pockets were tied to the caisson by continuing the cross braces of the latter through its solid walls and by connecting the projecting ends of these braces with built-up timbers parallel with the sides of the caisson. Vertical studs were placed inside of the projecting ends of the cross braces and 3 x 12-in. plank nailed on them as lagging for the pockets. The 11 stories of braces in the caisson and in the pockets were tied together by vertical rods, and knee-braces were placed between each story in the pockets. This construction produced a structure that was amply strong under the high head and the swift current to which it was subjected while work on the pier was in progress.

The bottom at the site of the pier was first dredged to a depth of 35 feet by means of an orange-peel bucket swung from a stiff-leg derrick on a barge. Meanwhile, the lower part of the caisson and the ballast pockets were built up on ways on the shore near the work, then launched into the water and towed to place, where the balance of the framing was done in the water. The ballast pockets were filled as the work progressed so as to keep the top of the caisson about 5 feet above the water. Special care was taken to anchor the caisson exactly in position when the lower edge of it approached the bed of the river. As soon as the caisson was seated on the gravel, ballast was added to hold it in place and to sink it as material was excavated from the inside of it. The orangepeel bucket was used through the water to remove the material from the inside so the lower edge of the caisson finally went about 20 feet into the gravel and made the form for the base of the pier.

While the sinking of the caisson was in progress, a concrete mixer plant was set up on a barge. As soon as the caisson was down to the required depth concrete was deposited through the water by means of bottom-dump buckets to fill the caisson uniformly to a height of 72 feet. The water was then removed and the reinforced concrete portion of the pier built in the dry. The walls of the caisson also made the forms for the pier up to the offset in the latter and above that specially framed forms were built inside.

The caisson was constructed and sunk to place in twenty working days; the concrete seal then was poured, the water removed and the pier built with all possible speed, because the time of high water was approaching. By working day and night, practically without interruption, the pier was kept above the stage of water in the river and was completed before the water reached the top of the caisson. Concrete was placed at an average rate of about 200 cubic yards a day, the 7,000 cubic yards in the pier being deposited in 35 days. The forms for the hollow por-

tion of the pier were built and erected as the work progressed, since they involved practically the same conditions as an 8-story building of like size.

Within 25 days after completion of the pier the river began to rise rapidly, and continued until a height of 22 feet above low water was reached. The unusual stage of the freshet resulted in a great number of large logs being brought down, and during the height of it the upper part of the caisson and forms were ripped off by the force of the logs which struck it. The pier stood safely, however, and when the water receded no evidence of damage could be discovered.

City Planning As Seen By Landscape Architects

Strictly speaking, city planning is not a new science; but it is comparatively new in this country. In general, we have to go to the Old World to find cities which have been upheld by the landscape architect. The landscape architect's city is planned after a composite of all that is best in the Old World cities, revised and brought down to date to meet modern requirements.

The fundamental principle of scientific city planning as practiced by the landscape architect of to-day, is first, convenience; second, beauty. Your modern city must be convenient to be successful. The theoretical city would be planned in a circular form, with all points in the outskirts usually distant from a common center, and with radial boulevards in every direction, like spokes of a wheel, connected by encircling drives about the circumference.

Paris, on account of its peculiar situation, being surrounded by three walls of fortification, was forced to adopt a radial and encircling street system to facilitate the handling of troops from the center of the city to the fortifications. Afterwards this was found to be so practical for the ordinary city traffic that other cities, notably Berlin and Moscow in the Old World, followed its example. Thus we established a principle which is being applied, as far as local topography will permit, in the readjusting of our street systems to meet modern traffic conditions.

Let me describe briefly the ideal city of the landscape architect. It is planned in conjunction with engineers, architects, sculptors and landscape gardeners. It is a metropolitan and preferably a harbor city. Its approaches by rail and water are attractive, artistic and imposing. Its traffic is centralized, the railroads entering a union station below grade and the electric systems entering at the same point, also by means of subways. Its business streets are wide, clean and well lighted and paved; the sidewalks are wide; the residential section is well parked; a uniform system of street trees, under the care of a city forester, is to be found. The parks, playgrounds, plazas and parkways are well designed, connected by wide parkways or boulevards shaded by trees and accessible by foot and electric cars.

The entire metropolitan park system should be under the control of an active, wide-awake park commission appointed for a term of years, acting in conjunction with a consulting landscape architect. The commission should be free from political influence and backed with sufficient funds to make their work effective. No really modern harbor city is without a beach reservation for its municipal bathhouse.

Not once in a lifetime does the landscape architect have an opportunity to plan an entirely new city along modern lines, embodying all that is convenient and beautiful. But our newer cities now a-building have

no excuse for making the same old mistake over and over again. There is no excuse for misplacing our municipal buildings. To make an ideal city out of our present American cities would require some changes in our laws, especially those covering excess condemnation proceedings. The best city improvement plan conceived by our civic experts can be completely blocked by a few selfish individuals—witness Baltimore and San Francisco.

The landscape architect's ideal city is not a city improvement plan developed in a month's study, for no city can be comprehensively replanned in less than

sixteen months or two years. To be of value, a plan must first of all be practical; every business interest must be considered; its future growth and present needs must be studied. A comprehensive plan is of the utmost value to a city if only to point out land which must be acquired for its subsequent development. The improvements on this land may be deferred until needed. It goes without saying that no landscape architect plans for city slums, but he seeks to have open spaces for light and air in the poorer quarters where people must necessarily live more closely together.

Cost of Reinforced Concrete Construction

Factors Which Influence Contractors In Bidding Upon Work—Gradual Elimination of Uncertainties—Two Principal Methods Now In General Use

Reinforced concrete construction has developed so rapidly and has been used such a short time that only recently has anything like a standardization of cost been attainable.

In taking bids upon reinforced concrete construction, architects and engineers are finding that the estimates are running closer than formerly—that is, there is not the great variation between the highest and lowest bid that existed five years ago, says M. M. Sloan in *The Building Age*. When reinforced concrete construction became a prominent factor in building work many reinforced concrete contractors started this business as a specialty. Some of these contractors had been contractors for plain cement work, and others were engineers who, owing to their technical knowledge, thought of applying it with the contracting business in this special line. Neither of these types of contractors was any too familiar with nor had much experience in the carpentry work required for the forms, and, in fact, without precedent it would have been difficult for a master builder of any kind to have definitely estimated upon the cost of the forms required in reinforced concrete construction.

Those who have had to do with the estimated cost, either in shop work or the cost of building labor, know the difficulty in placing an estimate upon any particular piece of work and have the final results of the cost ledger for labor agree with the estimated cost. In any instance a labor estimate is not much better than a good guess, and it is impossible to make an accurate estimate of labor cost in every instance with any degree of certainty.

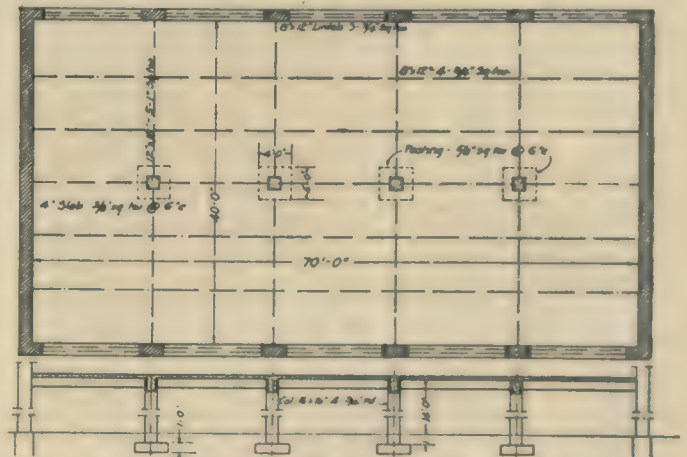
As the cost of the form construction necessary for the construction of reinforced concrete work is a considerable item in the total cost, it was not long before the contractors in reinforced concrete work found that in many instances they had taken the work at too low a price, and the failure of several prominent concrete contractors is directly traceable to their inability to accurately estimate upon the cost of the form construction for large operations.

On the other hand those who survived the first few years in operating with the new construction gradually accumulated data which, when averaged, gives a pretty accurate basis upon which reinforced concrete work may be estimated.

In estimating upon reinforced concrete work two methods generally are employed. The first consists in taking off accurately the quantities of all materials

and separately estimating the labor required for each branch of the work, while the second method is to figure only the quantity of concrete and tonnage of the steel, and, in some instances, the amount of lumber required in the form construction in board feet, and apply to these quantities unit prices which cover the cost of labor and material.

The first method is undoubtedly the surer and most intelligible of the two, though very close approxima-



Plan and Section of Reinforced Concrete Slab for Floor System.

tions to the exact cost may be obtained by the latter method.

The designer of reinforced concrete construction is constantly impressed with the different way in which the several contractors analyze the design with reference to the determination of the cost. Certain contractors will carefully consider the labor of removing and reconstructing the forms and will consequently give a much lower figure on the work, if the same sized columns and beams and girders are used throughout, even though by so doing the quantity of concrete is somewhat increased.

Again, if the contractor is in the habit of figuring the concrete at so much a cubic yard, the designer would not find economy in thickening a floor slab in order to save the same beam and girder spacing and thus utilize the forms used in another floor of the building, whereas the designer would be justified in thickening the floor slab an extra inch or two if he would take into consideration that this extra thick-

ness could be put in a place at a very low unit price from the fact that the plant and equipment justify the change in the thickness of the slab construction.

While the cost of reinforced construction varies with the local prices of labor and materials these are becoming so generally uniform that the cost of reinforced concrete construction is approaching a standard cost for construction of the same type.

The review of an estimate for the usual slab beam and girder construction of a floor system is interesting and may be instructive. The construction shown in Fig. 1 is to be estimated upon and the framing plan and section are shown in the figure with dimensions and not giving the reinforcement complete.

In making estimates a systematic tabulation of the quantities of concrete, reinforcing steel and material for centering greatly helps in avoiding mistakes and is much clearer if future reference has to be made to the estimate.

Referring to Fig. 1 the quantity and labor estimated are as follows:

Concrete.	Cu. Ft.
Concrete in slab, $75 \times 40 \div 3$	1,000
Concrete in beams and lintels, $14 \times 2-3 \times 35$	327
Concrete in girders, $19 \text{ I-}3 \times 1\frac{1}{2} \times 8$...	232
Concrete in column, $15 \times 1 \frac{7}{9} \times 4$	107
Footings, $4 \times 4 \times 4$	64
Total amount of concrete	1,730—64 cu. yds.
Steel.	Pounds.
Slab reinforcement, $75 \times 2 \times 40=7000$ ft., at .498..	3,486
Add for lapping of bars, waste, etc., 10 per cent....	348
Beam reinforcement, 1500 ft., at 1.92	2,880
Add for laps, etc., 75 ft., at 1.92	144
Girder reinforcement, 800 ft., at 3.4	2,720
Lintel reinforcement, 450 ft., at 1.92	864
Secondary reinforcement, $7\frac{1}{2}\%$ of beams and girders	496
Column rods and ties	584
Reinforcing rods for footings	260
Total amount of steel reinforcement	11,782
Lumber for Form Construction.	
(Considering only one floor to be constructed) Ft. B.M.	
$4/4$ matched flooring for slab centering, 75×40 ..	3,000
Add 25% for tongue and groove	750
Add 5% for waste in cutting and handling	150
$1\frac{1}{2}$ dressed plank for side and bottom forms of beams and girders:	
Beams	1,500
Girders	1,200
Lintels	450
Studding, 10,500 ft. 3×4	875
Ledger boards, 1×6 , 1,500 ft.	750
Miscellaneous lumber	500
Total amount of lumber required	9,175

It will be observed that in the above estimate the items have not as yet been priced, and it is in the pricing of the items that the method of estimating principally differs.

For a rapid estimate, one which is pretty sure to be approximately correct, and yet one that could not be so well used in close competition, can readily be made from the above estimate of the amount of materials required by totalling the itemization for each material and taking a unit price, which is the actual cost price for the work completed.

In the eastern part of the country, at least, concrete can be placed in floor construction, with the usual thickness of slabs and the usual size of beams and girders, at a net cost of \$6 per cubic yard. As a general rule, steel can be bought delivered, bent and placed at an average cost of about \$50 a ton, or $2\frac{1}{2}$ cents per pound. In large operations, where the beams and girders are heavily reinforced, this cost may reduce to \$48 a ton, and where the construction is

light and the amount of handling and placing is improporionately large, owing to the peculiarities of the construction, the cost may run as high as \$55 or even \$60 per ton. However, $2\frac{1}{2}$ cents a pound is a good average price for the steel complete in the forms.

In figuring the lumber and form construction the several grades used vary considerably in price, but on an average estimate can be taken at \$25 for the material, plus an equal cost for the labor, or a total cost of \$50 per thousand feet board measure. This unit price may be applied to the totals in the estimate, and the cost estimate for the construction shown in Fig. 1 will then be as follows:

COST ESTIMATED FOR REINFORCED CONCRETE FLOOR CONSTRUCTION SHOWN IN FIG. 1.

Concrete (material and labor), 64 cu. yds., at \$6.00.	\$384.00
Re-enforcing steel (material and labor), 11,782 lbs., at $2\frac{1}{2}$ c.	294.55
Lumber and carpentry work, 9175 ft. B.M., at \$50.00 per M.	458.75

Total actual cost of construction	1,137.30
Profit, charges, etc., 10%	113.73

Total of estimate

\$1,251.03
As a precautionary measure all estimates should be checked in some general way, so that the possibility of a serious omission may be avoided, and it is the practice of some contractors to check their estimates with a unit price per cubic yard for the concrete, which includes the cost of the concrete, reinforcing steel and form construction complete. The actual cost of a reinforced concrete floor system runs from \$20 to \$22 a cubic yard of concrete in place. Applying this approximate estimate to the above itemized estimate, in which there was 64 cubic yards of concrete required, it can readily be seen that the price of \$1,251 is about correct, for 64 yards at \$20 is \$1,280.

In making approximate estimates upon the cubic yard basis, of course, much depends upon the character of design—whether the floor system is in uniform-sized panels or whether it is considerably cut up, with panels of odd shapes and sizes and with numerous stairways, wall openings and other features incidental to a complex building operation. In general, however, the following table is of value in making approximate estimates on reinforced concrete floor construction, and it will be observed that in this estimate the three main items, the concrete, the steel and the form construction, are priced on the basis of a cubic yard of concrete in place, and this table gives approximate net cost without profit added:

Concrete, \$6 per cubic yard.

Form work, two, three and four-story buildings, \$7 to \$8 per cubic yard of concrete.

Form work, eight to ten-story buildings, \$6 per cubic yard of concrete.

Steel reinforcement, \$4 to \$7 per cubic yard of concrete placed.

The average of these items, it can be seen, will add up to from \$18 to \$22 per cubic yard, which agrees closely with the figure given above as the cost of reinforced concrete floor construction per cubic yard of concrete in place.

As previously stated, a very accurate method of estimating the cost of reinforced concrete floor construction is to separately itemize and price the material, and to do the same with the labor. The importance of this can readily be understood from the fact that the cost of materials varies considerably in different localities, and there are not only local advantages in prices, but, as well, the individual contractor is frequently able to obtain special prices. Besides, the cost of labor, as well, varies with locality.

Method and Cost of Finishing Concrete

By Rubbing, Floating and Brushing—Supervision of Mixing and Depositing—Machine Preferable to Hand Mixing—Economical Work Exemplified

By S. M. Klein

In order to give any concrete structure a pleasing, durable and inexpensive surface finish, the most important consideration is to have a good foreman on the work; a foreman who understands how to lay out his work to advantage, who knows how to build forms, who can handle concrete intelligently, and who can train his men. Intelligent inspection and supervision is another important requirement.

Beginning with the form work, I have seen good carpenters construct careless and poor forms, when a little attention by the foreman or inspector could have remedied many defects. It is just as cheap and often cheaper to build the forms well and substantial from the start as to patch, chink and shim later on.

In constructing forms tongue and grooved lumber is not necessary. Hard pine boards, planed on one side or both, $1\frac{1}{2} \times 8$ inches, will best do for face lumber. Boards of this width do not warp so much as wider boards, and do not corduroy the face to the same extent as narrower boards will. Studs can be made 2×4 -in., 2×6 -in., 4×6 -in., and walls 6×6 -in., 6×8 -in., sometimes of 8×10 -in., according to the nature of the work and amount of concrete deposited each day.

It is essential to start all face boards horizontally and keep them horizontal by drawing the board down with a wedge, which also closes all openings and leaves the forms tight, and nail each board securely to every stud. By shimming some boards and nailing others tight, the unsightly fins on the face can be largely avoided.

The same care need not be taken with back forms, and bulkheads; 1-in. boards can be used if securely studded and waled. However, the back forms and bulkheads should be tight to avoid honeycombing.

After the forms are built they should never stand long in the sun and be exposed to the weather. If such is the case they will need relining, shimming and chinking. The boards will shrink and warp and the whole formwork will be twisted out of shape unless kept wet. All forms should be studded carefully to avoid bending of boards between studs. They should be nailed every 5 feet and if possible rodded and not wired. From cost data which I kept I learned that rodding was much cheaper than wiring. Further, it was safer on large structures and, what is very essential, rodding left more working room for dumping buckets and the men to work in the forms. Rules for designing concrete forms are difficult to deduce as every structure has its own peculiarities; the amount of concrete deposited by hand mixing or machine mixing from a board or from dump buckets, all influence the design. I have built forms which were perfectly safe with a dry mixture shoveled off a board, but which began to give and needed rebracing when the concrete was wet and was dumped from buckets.

Care in Mixing Essential.

Great care should be exercised with the mixing and depositing of concrete. Ignorant supervision and inspection are often the cause of careless work. With careful and intelligent supervision and inspection all men co-operate with the foreman and inspector and good work is the result. Concrete should be thor-

oughly mixed and should never look raw when deposited in the forms. Where possible machine mixing is preferable to hand mixing. If hand mixing is used concrete should not be shoveled into the forms until the mixture has a uniform fatty appearance and when struck with the back of a shovel on the mixing board the concrete should be left smooth and the shovel clean. Concrete should never be mixed too wet and the cement drowned out.

On the triple 60-ft. arches built by the Pennsylvania R. R. west of Richmond, Ind., a four pan Haines mixer was used which mixed 1 cubic yard of concrete per batch. When work was started in the morning the foreman used 25 gallons of water per batch until a 6-in. layer of concrete was deposited on the bottom of the forms, then the water was reduced, but to never less than 15 gallons per cubic yard, so that the concrete quaked in the forms but water seldom accumulated on the surface. The foreman used great care in depositing all concrete in 6 or 8-in. layers, following the horizontal marks between two boards and forking the concrete with a potato fork after spading first with a shovel. The forking was carefully done by pushing the fork down into the concrete 8 inches, drawing the fork back from the face slowly to allow the grout to reach the face, then withdraw the fork and repeat the process. The man forking had to tramp around the face tamping the concrete with his feet. Spading was thus done all around, giving a homogeneous, impervious concrete everywhere.

Levelling off when the Day's Work Stops.

Generally 150 cubic yards of concrete constituted a day's work. Expansion joints were arranged in such a way as to facilitate concreting and to finish one or two sections each day. However, if a section was too large or through a breakdown could not be filled and a horizontal joint was required the foreman left the concrete at the end of the day or whenever a stop was made, perfectly level following the joint between the boards. If any excess of water was in the forms the foreman drew it off by boring holes with an auger in the back and plugged the holes the next day. A man washed the face boards with a whitewash brush and water to have them clean next day, then he forked all around the forms and with a shovel or float smoothed the concrete for 6 ins. along the face. The concrete was sound and solid around the face next day and not soggy, dirty and full of mud. At the back the concrete was left about 2 inches lower than in front and 2×12 -in. or 3×8 -in. plank was laid along the back and forced into the concrete. Through the center 6×6 -in. timbers were forced in to form keys for the upper layer and were taken out next day.

By drawing the water off the top before closing a day's work and taking care that no water should accumulate the foreman avoided laitance altogether and never had any trouble after he learned how to avoid the same. Laitance is caused by the very fine impurities, finer than pass a 200 mesh, floating on top of the water and accumulating as the impurities increase. If the water is allowed to stand and to evaporate the impurities seldom if ever set up hard and if not cleaned off will leave a yellow band along the

face, a mark showing ignorance and carelessness by the foreman and by the engineer or his inspector.

Every time a day's work is finished and a horizontal joint is thereby required, forethought should be used to either stop 6 inches below a wale, wiring or rodding, or 6 inches above. If stopped 6 inches below the wires and rods can be tightened and the face boards made to hug the previous day's work, thus avoiding an unsightly lip and a saggy contact which will always show and deform an otherwise good surface. If stopped 6 inches above the rods or wires the weight of the concrete will tighten the wire and draw the wale close to the studs and thus bring the boards tight to face. Should the foreman neglect the above precaution he must shim the boards away from the studs with shims and not just drive them out with the hammer. Unless the boards are shimmed the wet concrete will force them back against the studs and the result will always be an ugly fin.

Finishing the Forms

In finishing the forms the foreman was careful to have them the exact height on the top. He made it a rule to chamfer all sharp corners and copings with a $\frac{3}{4}$ -in. beveled strip of wood. He also inserted a $\frac{3}{4}$ -in. strip vertically at every expansion joint, leaving a notch $1\frac{1}{2}$ ins. wide and $\frac{3}{4}$ -in. deep at every expansion joint, thus doing away with irregular and saggy contact, especially where the forms were built in sections and moved, the whole face and back to construct another section and save carpenter work. In such a case the forms were oiled and cleaned before they could be used over again, and the face was repaired where needed.

The concrete was always filled an inch higher than the finished forms and was allowed to settle. Copings and exposed surfaces were well spaded on the top to bring mortar to the surface and after allowing an hour for settlement were levelled off with a straight edge, then smoothed off with a wooden trowel and stroked with a moist whitewash brush. This gave a homogeneous surface which did not scale. Topping off copings with mortar was not allowed, and better results can be obtained by spading the concrete and then straight edging than by topping off with a layer of mortar which sooner or later will crack off. As soon as the concrete was set the top of all copings was covered with an inch layer of sand and kept wet for ten days to prevent crazing.

Forty-eight hours after the last batch was placed in the forms they were removed whenever possible. If the surface was green and soft, fins were scraped off with the edge of a trowel where noticeable, then the surface was wetted with a whitewash brush with clean water and easily rubbed with a $2\frac{1}{2} \times 2\frac{1}{2} \times 6$ -in., 2 to 1 mortar brick not more than 8 days old. The men rubbed the wall with a circular motion which left spots in places. Next day the wall was moistened and floated all over the surface with a wooden float and after that stroked in one direction up and down with a moist, clean whitewash brush. Two men rubbed and finished a section 10 feet high, 30 feet long and three days old in four hours at $17\frac{1}{2}$ cents per man per hour.

Where the concrete was a week old and older after forms were removed all fins were removed with a bush hand chisel having five blades. The surface was then wetted with plenty of cold water and rubbed with a $2\frac{1}{2} \times 2\frac{1}{2} \times 6$ -in. 1 to 1 mortar brick not more than six days old. One section was rubbed down well, all rod holes were plugged and next day the section

was floated down and stroked with a moist, clean whitewash brush. No cement wash of any kind was allowed. Any broken corners had to be carefully repaired by thoroughly cleaning the surface, wetting the patch down well, then if possible driving 20d nails or railroad spikes into the concrete, putting up a form and grouping the broken place. Several patches were thus made and after finished could never be discovered.

The surface thus rubbed, floated and brushed bleached out uniformly everywhere, showed neither spots nor blemishes and gave the whole face a beautiful smooth dull finish. One foreman at 40 cents per hour and 6 laborers at $17\frac{1}{2}$ cents per hour averaged 25 square yards per man nearly every day rubbing and finishing was done, and they became very efficient at it and took a great deal of pride in their work.

Scotchmen for G. T. P. Construction.

It is stated that the contractors for the mountain sections of the Grand Trunk Pacific propose to bring out five thousand Scotchmen to build the railway. This is the result of the hostility of the people of British Columbia to the use of Asiatic labor. No doubt Scotchmen will have to be paid better wages than Chinamen, and it will cost more to transport them by land and sea to the mountains of British Columbia than it would to carry Asiatics there, but all the competing contractors know the conditions of the labor market and no doubt they were taken into account in making tenders. The Grand Trunk Pacific Company will probably have to pay the contractors considerably more than they would if Asiatic labor could be employed, but on the other hand when the railway construction work is completed the Scotchmen will as settlers make more traffic for the railway than twice as many Asiatics would. Moreover, they will attract other Scotchmen to the localities where they settle, and any district settled by Scotchmen is likely to be prosperous and progressive.

The fact that \$3,000,000 is being included in supplementary Government estimates for deepening the Back River at Montreal, Riviere des Prairies, and the French River is taken to indicate that the Government has at length decided to go ahead with the Georgian Bay Canal. The works mentioned would all be of utility in any event, but they are also on the proposed route of the canal, and in that the significant part of it lies.

Railway development in Western Canada during the past year, is shown by the remarkable increase in the staff of the Canadian Pacific Railway in Calgary. At the close of 1909 the average number of employees in Calgary for the year was 700, and the pay roll, roughly estimated, amounted to \$600,000. Last year the figures were more than doubled. The average number of people employed was 1,700, and the pay roll for the year was over \$1,500,000.

At a meeting of the Structural Bridge Workers' Union last week at Winnipeg it was decided to ask for an increased wage, from 40 to 50 cents an hour, to go into effect May 1st. There are 170 members in the union.

During 1910 the city of St. Boniface, Man., expended \$861,870 on building, compared with a quarter of a million during 1909.

The Successful Preparation of Concrete

Some Observations Upon the Main Principles to be Observed—Maximum Reduction of Voids — Incorporability — Uniformity in Grading*

By Harry Franklin Porter, C. E.

The preparation of concrete is an art requiring every bit as much exact knowledge, experience, skill and painstakingness as the preparation of steel. It is, if anything, a more difficult art than steel-making; for while the latter is carried on under fixed conditions and everything favors reduction of the process to a science, the preparation of concrete seldom takes place under conditions twice alike. In the first place, and from time to time, differing in composition, quality, size, and grading; and in the second place, the assembly of the various materials that go to make up the composition of concrete, and their final deposition as concrete, involves a continual readjustment of the *modus operandi*. To prepare concrete properly, therefore, it becomes very necessary:—

(1) To make a careful investigation of available materials before each and every use, involving an analysis to determine fitness, and a synthesis to fix upon proper proportions to insure the desired results; and,

(2) To see that every reasonable precaution is taken, in the several operations incidental to installation, to insure proper handling of the materials, both before, during, and after intermingling, until the finished product is in place; and thereafter to see that it is left to solidify under the most favorable conditions possible.

In order to undertake successfully—and successfully means intelligently—the preparation of concrete, it is of course first necessary to understand the principles involved.

It may be stated as the chief aim of concrete preparation to secure as dense and homogeneous a mass possible, by which it is meant that there shall be the closest possible contact between particles, and that the particles shall be so sized as to reduce the contained voids to a minimum.

Principles to be Observed.

To secure a dense concrete two things are necessary:

(1) To effect, by the manner of sizing and proportioning the inerts, a maximum reduction of voids; and,

(2) To fill all pores, interstices or voids remaining after the reduction as above with an elastic, insoluble and tenacious substance, which must first have the property of a liquid, so as to flow freely into place, secondly that of a glue, to unite all particles into a homogeneous whole, and thirdly that of becoming itself hard and stone-like.

It is not possible, no matter how carefully and to what extent the grading of inerts is carried, to therewith alone eliminate virtually all voids, any more than it is possible, in the familiar illustration in geometry, to divide a rectangle until there shall be no more to divide. Various inerts, as they come for use in concrete mixtures, have voids roughly as follows: Broken stone, one size, 50 per cent; broken stone two sizes, not greatly differing, 45 per cent.; gravel, one size, 50 per cent.; gravel of indiscriminate sizes as found naturally, 30 to 40 per cent.; natural sands, 30 to 40 per cent.; artificial (crushed stone) sands, 35 to 45. Thus, on the average, inerts—as they come naturally to hand—have from one-third to one-half of their volume air-space, or voids. Ordinarily, by combining broken stone or gravel with sand, in certain proportions, usually about two volumes of the former to one of the latter, it is aimed to reduce these voids, not entirely or even as much as possible or advisable, but only somewhat. This "somewhat" may reach as low as 15 per cent., if haply the finer inerts—the sand—are particularly well graded naturally; more often it is not less than 25 or

30 per cent. The balance, whatever it may be, is then offset, as best may be, with cement. A typical specification for such a mixture would read:

"The voids in the coarse aggregate are to be filled by an equivalent volume of fine aggregate, and enough cement is to be supplied to fill the voids in the fine aggregate with (say) 10 per cent., excess."

Or it might be stated more simply and specifically yet:

"The concrete is to be proportioned one part by volume of cement, to two parts sand, to four parts broken stone."

Of these two specifications, both of which are typical of average practice, the former is the more scientific; but neither is scientific enough to insure consistently good results, the object, presumably, we are after. In the first place, statement of the proportion of cement by volume measurement is exceedingly slipshod, for it ignores the fact that cement dry from the bag, cement packed down, and cement mixed with water, have volumes respectively that differ widely, and that it is the volume of cement with its requisite water that should be taken into consideration; secondly, that there is no accurate or real distinction between coarse aggregates and fine; and thirdly, that actual voids in aggregates is a very variable quantity, differing practically, not only with every job, but from day to day on the same job, even from hour to hour.

It is some improvement to state the proportions, as many engineers are now doing, as one part cement to so many parts aggregate, making no longer a distinction between coarse aggregates. But this even is not enough. A specification to be proper should state, first, the maximum size of inerts allowable; second, the maximum voids; and third, the quantity of cement paste necessary to effect a final filling of the voids and fulfill the requirement of a binder for all particles.

Maximum Size of Inert.

The maximum size of inert, that figures in the mixing of the concrete proper, is fixed usually by the conditions of practice; it is of advantage to have it as large as practical, since the larger the individual volume of the inerts the less, relatively, the superficial surface to be coated with binder. This follows from the fact that, whereas the volume of solids increases as the cube of the diameter, the surface increases only as the square. Three conditions, at least, work to limit the maximum size inerts:

(1) The incorporability; no particles should be used in the mix proper that will not readily merge with it.

(2) The width of members that are to be cast.

(3) The location and spacing of the reinforcement.

By the first consideration the size is limited to about two inches; and by the other two, on occasion, to as fine as $\frac{1}{4}$ -inch, and seldom, in reinforced work is larger than $\frac{3}{4}$ -inch practicable. Two-inch stone, even, are not easy to mix, and it is probable, for best mixing, not larger than 1-inch to $1\frac{1}{2}$ -inch should be used. Other grades of inerts are then to be supplied of such sizes and amounts as to effect a maximum reduction of voids. It is entirely possible to reduce the voids to 10 per cent. and even less; but probably 10 per cent. is a practical minimum. To fill the remaining voids cement must be largely relied upon.

Not many sizes of inerts are needed. Suppose the maximum is fixed at one-inch; then, as it has been found experimentally and as it may be demonstrated analytically, the next size smaller should be, in order to fit easily into the

*Extracted from paper read before the National Association of Cement Users

voids of the maximum size, approximately one-fourth as large, that is, in this case, $\frac{1}{4}$ -inch, and there should be about half as much of them; the next size should be approximately one-quarter of the second—viz., $\frac{1}{16}$ -inch, and a volume of them equal to one-half of the second size or one-fourth the first, and so on, down to impalpable dust; but probably there will be more than four or five grades altogether, the finest grade comparing with cement in fineness, finer than which it is scarcely possible to go. This law of grading, if represented by a curve, would assume the form of a parabola, having its origin at the intersection of zero size and zero proportion, and approaching coincidence with the horizontal at the intersection of the 100 per cent. ordinate and the maximum size abscissa. It will be found of this parabola, that the intersection of the 50 per cent. ordinate and one-fourth maximum size abscissa, and the intersection of the 25 per cent. and the $\frac{1}{16}$ th size, and so on as outlined above, will fall in it or near it.

By use of such a curve, and the separation of a combination of inerts proposed for use into several grades down to dust, jotting the results alongside the standard curve for comparison, the deficiencies can be at once recognized when the extra proportion of any one or more sizes, or the proportion of a size not present, may be readily calculated, and the deficiencies corrected.

If there is an excess of coarse stuff the curve will be too flat; if an excess of fine, too high. An excess of fine is particularly objectionable in that it crowds the cement grains and prevents their working properly; moreover, it requires an excess of cement, over and above a properly graded aggregate. An excess of cement is also required when there is an excess of coarse stuff, but, unlike the other condition, there is no crowding of the grains; the cement still does not function properly, in that it is congested in the large voids instead of being distributed in thin films and fine points, forming as it were an interlacing meshwork, entwining all particles, but this condition is not so bad as the former.

Grading Must be Uniform.

Best results obtain when the grading is uniform, from maximum to dust, but with no more than 10 per cent. of the finest grade, which approximates the cement in size and may be regarded as replacing so much of it as finest filler. The cement, then, when made into a fluid with water, will have only to coat all particles with a thin film and to bridge the few small remaining interstices. Nothing but a liquid can perform this office; this is an important point and will be dwelt upon hereinafter.

Another point: It is well not to have the sizes too close together, as for instance, to have a mixture of 1-inch and $\frac{3}{4}$ -inch stone, for the reason that $\frac{3}{4}$ -inch will crowd the inch, preventing it from assuming the most compact form; in fact, even so large as $\frac{1}{2}$ -inch will crowd the larger size. The desideratum is (1) that the maximum size should be free to assume its most stable configuration, which is when all particles are in as close contact as possible; and (2) that the next smaller size should just be large enough to neatly fill the maximum interstices, and that there should be just enough of this size to fill all these interstices. Similarly, the next smaller size should be such in dimension and amount as to effect a complete filling of the next largest interstices, and so on.

If this law of grading is observed, it will be found that the final total volume about equals the original volume of the maximum size, and that mixture will be the most dense of which this is the nearest true.

This points a practical way to determine upon the best proposition—to wit, to try a number of different combinations of the materials available, and to use that one which gives the least volume, or the one nearest the size of the volume of maximum size particles alone.

Needless to state, almost, the test mixture should be so soft as to quake like jelly, and be ready to flow, for the above indications as to quality to be apparent. Similarly, during the deposition of concrete, if it is of a proper liquid or semi-liquid consistency, the trained eye of the foreman or supervisor can keep track of the quality of the mixture almost as accurately as an automatic proportioner, supposing there were such an instrument. As a matter of fact, there is no satisfactory substitute for the trained eye of the installer, nothing that can detect so quickly and accurately any variations in the composition of the mixture, as occur often many times in a single day on the average concrete job, due sometimes to variations in the material, again to mistakes of the workmen.

Test Accuracy by Weighing.

Another way to gauge the accuracy and sufficiency of the grading is by weighing. That mixture, obviously, which weighs the most relatively is the densest. If the solidity of the concrete were absolute, that is, if the voids were completely filled, its weight would be in the neighborhood of pounds if of limestone, and 180 if of trap. A quartz concrete, thus, that weighed close to 160 pounds, would be about as dense as it would be possible to make it. A few pounds, always, are to be allowed for shrinkage, say two per cubic foot for moderately wet mixtures, so that if measurement and weight are taken wet, this correction should be applied before estimating the density. There will be no less, too, by evaporation, to take into account, if the concrete is to be allowed to harden freely exposed to the air. If wet-blanketed, then there will be practically no loss from this source. A weight of 160 pounds for a quartz-concrete, hardened under favorable conditions of wetness, with shrinkage allowed for, can scarcely be improved upon. It means a solidity of 97 per cent., or a reduction of voids to three per cent. A concrete this dense will be found practically impervious to water, even under considerable head, indeed to the limit of its strength. What more could be asked?

The size of inerts is not necessarily limited to the maximum stated, if conditions permit as large stone as it is convenient to handle may be intermingled with the mass, so long as there is always an abundance of concrete—which in this case may be regarded as a coarse mortar—to completely cover them. Such stones may be called, to distinguish them from ordinary inerts, bulk-swellers.

Bulk-swellers should not be less than four diameters larger than the largest inert, and preferably still larger, in order that there may be no doubt as to the fine material slipping into the voids, in case especially if the volume of bulk-swellers is sufficient to cause the concrete-proper to occupy the relation to the void-filler; but they should in no event be less than four times larger, lest they act merely to displace or crowd the coarsest inerts, rather than an equivalent volume of all inerts. If the bulk-swellers are so sized, a volume of them may be used equal approximately to twice the volume of the concrete-proper. Of course, practically, bulk-swellers being generally added subsequently and individually, relative volumetric considerations scarcely figure, but—as stated previously—coarser particles may be added up to the point where there ceases to be a sufficiency of fine material to thoroughly imbed them.

When large stone are introduced into the mass, great care must be exercised to see that they are well distributed, with a comfortable margin of soft material all around, above and below each piece. The danger is, of course, that the large stone, particularly if regular in shape, will bunch, either across or up and down, introducing thus planes and weakness. It is also important that the stone be clean and thoroughly wetted, lest the adhesion be deficient.

The shape of bulk-swellers is an important consideration likewise; cubical or square-faced blocks are less desirable than irregular or well-rounded ones, for square edges

act like so many wedges, tending to cleave the mass as in hardening it shrinks around them. Rounded stone, on the other hand, imbed themselves more naturally, the mass in shrinking tending to conform to their contour; irregular shapes tend to key themselves in, and to prevent, rather than induce, cracking. Flat stones are less desirable even than cubical ones, as their tendency to induce splitting is still more pronounced. These objections on the score of shape constitute in fact the greatest drawback to the use of large bulk-swellers.

Use of Large Bulk-Swellers.

An interesting example of the use of large bulk-swellers is afforded in the construction of the piers and abutments for the new concrete arch, bridge across the Rocky river, at Cleveland, which outranks the famous Walnut Lane bridge spanning the Wissahickon in Fairmont park, Philadelphia, both in span and in height. In this instance huge chunks of rock, as large as could be swung into place with a derrick, were introduced into the mass at frequent intervals, being first cleaned, dusted and wetted. Advantage was taken of these stone, at the conclusion of any period of operation, when there was to be a break of some little duration, by placing them so that about half protruded, thus providing an admirable key for the subsequent work. It is an interesting fact that, although frequently square-faced stone were used, no unfavorable shrinkage action showed itself; which would indicate that most of the shrinkage must take place while the concrete is still plastic enough to conform to the rigid outline of the contained block without separating. Hence the tendency to induce cracks, as pointed out before, may not be so serious a matter as offhand might be supposed.

There is another advantage in the use of bulk-swellers, of irregular shapes especially, rounded ones less so, namely, that they act also as reinforcement, forming here and there, throughout the mass, so many rigid keys locking the parts together, and in this way enhancing, no doubt, both the compressive and tensile strength—if not very much in the long run—at least an appreciable amount on short time. Of course, just how much strength will be added in this manner depends largely on the character of the stone itself. This enforces the necessity for a good quality of stone, always, for concrete mixtures.

Bearing on this point, investigations made in connection with one of the bridges recently constructed by the city of New York, to ascertain how the strength of concrete might be increased so as to act as an adequate filler and stiffener to some cast pedestals, are of interest. It was found by the addition of a certain number of cut nails or spikes per cubic foot of concrete the crushing strength, and the tensile correspondingly was increased enormously, one series of tests giving results as high as 18,000 pounds per square inch, or nearly eight times the ordinary strength.

Similarly, by the plentiful intermingling of large, irregular shaped, more or less elongated, tough bulk-swellers, to a mass of concrete, it would appear that the strength must benefit no slight amount. In reinforced concrete work, especially, this principle might well be taken advantage of, providing of course conditions are favorable to it, to the end that the concrete act further with the steel to resist tension, thus increasing the actual strength of the whole member. Indeed, it is not at all improbable that, in the no very distant future, reinforcement of this nature, that is, supplying resistance to particles throughout the mass, by introducing here and there short pieces of steel, on the tensile side especially, will come into use, thus making concrete a more truly homogeneous structural material. The same principle might also be taken advantage of in columns, in order to keep down the girth and avoid the necessity of steel cones.

All concrete may be looked upon as a combination of mortar with bulk-swellers. Thus the conventional 1:2:4 mixtures might be regarded as composed of one part 1:2 mortar

and four parts bulk-swellers. The correctness of the rule as to the proportion of bulk-swellers allowable—to wit, a volume of them equal to twice the volume of fine material, is now apparent. What, then, it may be asked, is the practical use of regarding the bulk-swellers separately? Just this, that they play no vital part in the proper balancing of the inerts from coarse to fine to secure a dense concrete—it is the fitness, largely, of the mortar in any concrete that determines its density.

Standard Concrete Mixture Feasible.

This would indicate the feasibility of a standard concrete mixture, one which might be used for any and all purposes, differing only in the proportion and size of the bulk-swellers added. It would be only necessary to agree upon the most suitable and convenient maximum size inert in the concrete-proper. Larger than one-inch would scarcely be possible, as already pointed out; probably one-inch or $\frac{3}{4}$ -inch would best satisfy general requirements. The preparation of good concrete, then, would resolve itself down to the selection of suitable finer grades of material to compare with the maximum grade determined upon, even according to the diagram of grading hereinbefore outlined. Efforts in the direction of economy in this case, instead of expending themselves in such unworthy ways as skimping the cement, would be confined to improving the grading (which truly economizes on the cement by increasing the amount of it required to produce a given result, not to mention the many other advantages of a scientifically graded mixture), and to incorporating with the mass, either during mixing or thereafter, as many and as large bulk-swellers as conditions favor and judgment approves. If bulk-swellers are added during the mixing, they should be held out until the rest of the material is pretty well intermingled. No specific limit need be set as to their amount relative to a stated volume of fine material (as measured mixed), except to rule that no more of them shall be added than can be readily incorporated. An approximate ratio has already been given, but this may not always indicate the true proportion, more or less; judgment on occasion is the best guide.

A Progressive Plaster Products Firm

The Ritchie Contractors' Supply Company, Bower Building, are operating a plaster mill in Vancouver, in which they manufacture "Peerless" prepared plaster, fibred plaster and plaster finishes. They also manufacture gypsum fibred plaster blocks, and plaster boards. The plaster block has been used in the eight-storey Pacific Building (W. M. Somerville, architect), erected for W. A. Bauer, and also on five provincial school buildings; they are likewise supplying blocks for the new Mission Building in this city, and have several large contracts for other buildings in Vancouver, Victoria, and New Westminster. Since the opening date the plant has been in constant operation, as well as the plaster mill. The firm are also installing the Polly system for manufacturing hollow fireproof partition tiles, and as their facilities for shipping are the very best, having rail and water connection, the firm are justified in looking forward to a large demand for their various products. The Ritchie Company's attractive business announcement appears on another page of this issue.

The Artificial Light required in concrete buildings is considerably less than needed in buildings of slow burning mill construction according to the experience of Mr. Leonard C. Wason, of Boston. This is due to better reflection in the concrete buildings, from the white walls, ceilings and columns. The better natural lighting in concrete buildings due to reflection and the large window areas has been frequently commented upon.

Cost of Construction at Ottawa

**No Important Changes Expected this Spring—
Eight Hour Day to be Instituted on May 1st**

Ottawa, January 20, 1910.

The general opinion of the architects is that the building operations will cost about the same this spring as last. So far there are no changes in the prices of materials; brick, cement, lumber and steel all remaining at the same prices as prevailed all last summer. It is not expected that there will be any changes in lumber, although the cheaper qualities may be a little firmer. The only change anticipated in the cost of labor will be in connection with the contractors; the eight-hour day begins on May 1st. The agreement was signed last May for five years, the eight-hour day coming into force this spring. There will then be an increase of two cents an hour, making it 52 cents. It is now 50 cents. This will not make much difference except that the assistants to these trades will also be compelled to work only eight hours, because there would be nothing for them to do for the remaining hours. It is expected that all the other trades will remain at the same wage.

There are considerable workmen unemployed just now as is always the case in mid-winter. However, there is more winter building operations than in other years at this time.

The Ottawa Improvement Commission has a large force of men employed demolishing the buildings along Sussex street which is to be converted into a driveway. The lumber from these will be used for the most part in erecting houses for some of the commission's employes in Rockliffe as well as a large shed which is to be used for storing the commission's machinery, etc. The stone from the buildings will be crushed and put on the roadway. A large quantity of old brick will be sold, probably by tender.

There is still nothing definite with regard to the annexes proposed for St. Luke's and Rideau Street hospitals. The boards of both institutions are seeking to finance such additions, but it is too early to say with what results. In each case the enlargements will cost about \$150,000, as planned.

Whether or not W. F. Tye will be engaged to co-operate with City Engineer Ker to prepare a general plan for railway entrances into the city, still remains undecided. The city council has referred the matter back to the Board of Control and that body has again recommended his appointment.

The Ottawa Builders' Exchange was addressed recently by Mr. E. T. Nesbitt, Quebec, President of the Ontario National Association of Builders. There is every indication that the local exchanges will be well represented at the convention of the Association, which is to be held in Winnipeg, February 15-16. A big delegation is all the more likely as the meeting will be held during the week of the curling bonspiel.

City Engineer Ker, of Ottawa, is reported to have received a tempting offer from Vancouver, B.C. It is understood that the federal capital will do its best to retain his services.

An Ottawa architect stated last week that from the intimations he has already received more large commercial buildings will be begun on Sparks street this season than last year. This is a particularly big statement, because last year was a record for building on this street.

The proposed plaza over the canal between the Grand Trunk station and Chateau Laurier at Ottawa is again being discussed by the authorities and a plan is stated to have been prepared.

An Explanation of Ottawa's Paving Contracts

Ottawa, January 18, 1911.

Editor Contract Record:

In your issue of January 11th, on page 38, there is an article which states that "An Ottawa Alderman declared last week that when the City Engineer wanted to obtain the contract for small blocks of pavement he tendered low, and when he did not want to take contracts for large blocks of pavement, he tendered high."

This statement was made by an Alderman during the recent election campaign, and as the matter is pretty well understood here, no attention was paid to it by me at that time, but when the statement appears in the Contract Record and is published broadcast throughout Canada, it is time to take some recognition of it, and in view of your recent discussion of the day labor question, the following facts may prove interesting to your readers.

In April last tenders were called for the paving of the south end of Bank street and the eastern section of St. Patrick street. These streets are main thoroughfares and compare in their relative location to Yonge and Queen street east in Toronto. Both streets have double street car tracks. Bank street has a four-minute service, that is, a car every two minutes, and St. Patrick street an eight minute service. The car service had to be maintained as well as the vehicular traffic during construction. As the Exhibition Grounds are at the south end of Bank street, it was advisable to have the pavement laid complete for the Exhibition, which opened September 7th. Consequently the penalty for overtime was made \$50 a day on Bank street, the penalty for non-completion in time for St. Patrick street being \$30 a day.

The pavement on both streets was to consist of stone setts on 6 inches of concrete in the track allowance, with 8 inches of concrete under the rails, the sides of the street being paved with 2½ inches of asphalt on 6 inches of concrete, with concrete gutters.

The prices received were as follows:—

Bank Street.

Ottawa Construction Co.	37,989.00
Union construction Co.	47,673.00
Barber Asphalt Paving Co.	\$37,565.00
City Engineer	47,673.00

St. Patrick Street.

Barber Asphalt Paving Co.	45,750.00
Ottawa Construction Co.	49,495.00
Union Construction Co.	50,750.00
City Engineer	59,522.70

You will note the City Engineer's tenders were much higher than the other contractors and considerable comment was made at the time.

What has been the result? The Barber Asphalt Paving Co., an old and experienced company, being the lowest tenderer, were awarded both contracts. Instead of finishing the pavements on time, neither of the pavements were finished when the work was suspended on account of frost in November. They have not been accepted from the contractors, and in my opinion, a considerable section of both pavements will have to be relaid in the spring, for despite the most rigid inspection, the work is not satisfactory to this department or to the ratepayers. Both streets were torn up all the summer, causing considerable loss to the merchants on the street.

The penalty for overtime is at present about \$2,500, while I have it on good authority that the contractors have lost between \$6,000 and \$7,000 on the work. Under these conditions I think my tenders were sane and reasonable, as they provided for good work and prompt completion.

Later on in the season, tenders were called for nine other streets, the three companies and the City Engineer tendering on each, and there was very little difference in the prices. The Ottawa Construction Company were awarded contracts

for four and the Barber Company two, while the City Engineer was awarded three.

Fair prices were put in for the three contracts awarded to this department and the work was carried out promptly on time, giving entire satisfaction to the ratepayers; nor have I heard any criticism from the contractors as to the quality of our work.

The civic asphalt plant was installed in the spring of 1908, to keep in repair the various pavements laid under the day labor system by the city as well as pavements laid by contractors upon which the guarantee has expired, and for the purpose of laying new pavements.

The installation of the plant has resulted in preventing combines and in reducing the cost of asphalt pavements from \$2.50 to \$2.75 per square yard, to \$1.80 to \$2.15 per square yard, according to the type of pavement laid, and in the past three seasons it has paid for itself twice over.

There is no disposition on the part of the engineering department here to cut prices to such an extent that good work cannot be done by the contractors with a fair profit.

Yours ver truly,

Newton J. Ker,
City Engineer.

Victoria City Engineer's Annual Report

The annual report of Mr. Angus Smith, City Engineer, Victoria, B.C., contains a number of items of interest. The report shows that the amount of sidewalk work completed was 25.48 miles, compared with 13.45 in the previous year; 4.65 miles of sewers were laid, as against 6.40, and the amount of curb and gutters laid was 10¾ miles, compared with 3½ miles for the previous year.

Pavements laid—Asphalt pavement laid on St. Charles, Linden, Southgate, Rockland, Fernwood, and Bastion streets, 37,500 square yards, or 2.10 miles; wood block pavement laid on Yates, Douglas, Herald, Belleville, Humboldt and Gordon streets, 37,280 square yards, or 1.20 miles; concrete pavement on Broad and Pandora streets, 4,100 square yards, or one-sixth mile; tar macadam laid on Oak Bay avenue, North Park street and Princess avenue, 1.17 miles; macadam laid on Spring, Catherine, Langford, St. Lawrence, Michigan, Rudin, Fernwood and Gladstone streets, 42,506 square yards, or 2.20 miles.

The following is the actual and estimated cost per square yard of some of these latter pavements:—North Park, tar macadam estimated cost \$1.25 per square yard, actual cost \$1.00; Broad street, concrete, estimated cost \$2.80 per square yard, actual cost \$1.84 per square yard; Herald street, wood block, estimated cost \$3.75 per square yard, actual cost \$3.47 per square yard; Yates street, wood block, estimated cost \$3.75 per square yard, actual cost \$3.31 per square yard; Government street, wood block, estimated to cost \$3.75 per square yard, actual cost \$3.62 per square yard.

With the assistance of the public works department surveys, plans and specifications were prepared and the contract let for the construction of the Dallas road sea wall at an estimated cost of \$75,000. The groins were constructed on Ross Bay beach, for the purpose of protecting the cliff opposite the cemetery. The groins appear to give the protection intended and these are probably the first experiment of the kind on the coast.

The following material was purchased in the year 1910: 12,108 of gravel, 9,291 yards of sand, 21,490 barrels of cement, amounting to \$79,669; also 1,700 yards of crushed rock amounting to \$30,000, making a total of \$110,269.

Mr. W. H. Browne, a prominent consulting engineer, formerly of Montreal, died last week at Brooklyn, N.Y., at the age of 61.

Civic Improvements at Montreal

About Fifteen Million Dollars to be Expended—Building Trade Continues Active—Interesting Comparisons

Office of the Contract Record,

Montreal, January 20, 1911.

Notices were sent out recently for the re-opening of the sessions of the Canadian Society of Engineers with a paper on "Recent Advances in Machine Tool Construction," by Mr. Thomas Reid, of the John Bertram & Sons Company, Dundas, Ont. The cards did not arrive, however, until the morning of the lecture, and this, combined with the inclement weather, caused an attendance of less than a dozen members. It was therefore decided to postpone the reading of the paper until February 9, when it will be read by Col. Bertram, Mr. Reid being in Europe. Col. Bertram will greatly extend the scope of the paper by then, and the great changes which have been made in tools and their manipulation during the past ten years should prove material for an interesting address.

About thirteen million dollars will, it is expected, be spent on civic improvements during 1911, and over two millions on the harbour improvements. Although no official information can be given for at least a month, it is understood that work on the construction of the St. Lawrence tunnel for the new central terminal station will be commenced in March.

Mr. Chausse, the Montreal Building Inspector, is amused at the claims of other cities to show larger building returns than Montreal for the past year. In 1909 Montreal's building permits totalled \$7,800,000. Last year the total of permits issued amounted to \$15,815,859, but this of course was not the actual total of work done.

"Winnipeg claims many other things besides the value of permits," he said this morning. "Suppose we do the same. In the first place, for fear of assessment or for other reasons, people seldom quote the total value when applying for a building permit, and it is permissible to add at least twenty per cent. for these reasons, say three millions. Then outside the actual permits we have the harbour improvements, amounting to four millions, and the railway works—bridges, subways, etc., of not less than two millions. There are two annexed wards which do not have to apply for building permits, but which have spent at least a hundred thousand, and at least a hundred and fifty thousand has been spent on civic buildings. This means a total of over \$25,000,000, without counting municipalities within our boundaries, viz.: Westmount, Outremont, Maisonneuve and Verdun, which between them have spent not less than four and a half millions, bringing the total to over thirty million dollars. Next year this will be greatly increased. 1911 will be the greatest building year in Montreal's history."

Prices keep fairly firm. There is a good market for bricks at \$10, \$15 and \$18 per thousand; cement is steady at \$1.00 f.o.b. Montreal in car lots, with 5,000 barrel orders fetching lower prices; metallic laths are 25c straight and 30c bent. For paints and oils there is a good demand with a fair market; white lead, \$6.50 to \$7.00; linseed oil, high, at \$1.09 raw and \$1.11 boiled, and turpentine fairly steady at from \$1.08 to \$1.10 a gallon.

The building trade is still brisk for the time of year. The foundations for the Dominion Express building are beginning to take form and many other of the new buildings look as though they will be ready well before May, which is the general moving time here.

Mr. W. H. Ford, the genial General Sales Agent of the Canada Cement Co., made a most comprehensive tour of the Maritime Provinces during December, paying a visit to each of the firm's customers. He has now left for a similar trip through Ontario and the West, intending to interview

practically every dealer in Canada. He will therefore be absent from Montreal for a considerable time.

Personal and General

On January 23rd Mr. C. R. Woodruff, secretary of the National Municipal League of America, delivered an interesting address at Montreal under the auspices of the City Improvement League on "Co-operation in City Planning and the Function of Business Bodies in Civic Betterment."

The annual general meeting of the British Columbia Land Surveyors was held recently in Vancouver. The board of management elected for the current year consists of: E. A. Cleveland, president, W. S. Gore, vice-president; S. A. Roberts, secretary-treasurer, and E. B. Hermon, G. H. Dawson, J. H. McGregor, S. C. Green, N. F. Townsend, and (ex-officio) E. B. McKay, surveyor-general, members of the board.

According to a dispatch from Calgary the Exshaw Cement Company's plant was sold last week in the sheriff's office to the Canada Cement Company for upwards of one million dollars.

Mr. William Price, of Seattle, general manager of the Western Steel Corporation, announces that the construction of a \$500,000 plant will be commenced near Sunbury, B.C., by April 1st.

Mr. R. L. Parsons, of the Parsons Construction & Engineering Company, Regina, returned recently to the latter city after a visit to Calgary, where his firm has the contract for a large overhead bridge. The Parsons Company

have in hand some of the largest public works contracts in the west.

The annual meeting of the Architects' Association, of Victoria, B.C., was held last week. The newly formed association numbered about 20 members.

The survey is nearly completed for the new water supply for the town of New Glasgow, Nova Scotia, and an important meeting of the engineers in charge will take place within the next few weeks to decide upon the type of piping most suitable for the conditions. About twenty years ago, when the question of a water supply was first dealt with, a steam pump was installed, but with the growth of the town a larger and better supply of water has been found necessary. It has therefore been decided by the municipality to tap the waters of McLellan's brook at a point about six miles from the town limits utilising a number of small lakes in the district to form a reservoir, and this water will be brought to the town by gravitation. There will be sufficient fall for fire pressure and the old pump will then go out of service with the completion of the new system.

The Trussed Concrete Steel Company of Canada are starting the erection of special buildings at Walkerville for the manufacture of steel sash. The initial capacity of the plant will be 4,000 square feet a day, but provision will be made for doubling this in the near future.

Mr. Geo. E. Bell, the son of Mr. Jas. A. Bell, of St. Thomas, Ont., has been appointed manager of the Dominion Bridge Company's office and plant at Winnipeg. He will have charge of all the company's business in Western Canada. Mr. Bell was educated at the Collegiate Institute at St. Thomas and McGill University, Montreal.

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Roman walls enduring yet,
Advertise down to all time,
What you can do with good lime.

You can build it still today,
Build as well and strong as they,
Build in this or any clime
If you build with Renfrew Lime.

Jamieson Lime Company

Renfrew, Ont.
Lime : Brick : Tile

The Largest Cities and Smallest Towns use

W. E. Seagrave Fire Apparatus

MADE IN WALKERVILLE, ONTARIO

There is a Reason:

The name W. E. Seagrave guarantees the Best, the Lightest, the Strongest, the Most Economical in Operation and Maintenance. No order too large. No order too small. Consult us before buying.

Automobile Fire Apparatus and Motor Driven Vehicles of all kinds, our latest Production.

Contracts Department

News of Special Interest to Contractors, Engineers, Manufacturers and Dealers in Building Supplies.

Information for insertion in these columns is invited from Architects, Contractors, Engineers, etc.

Waterworks, Sewerage and Roadways

Brampton, Ont.

The inspector of the Canadian Fire Underwriters' Association recommended that a reservoir be constructed at the lake to hold 507,000 imperial gallons, to be used in case of fire only.

Calgary, Alta.

On the report of City Engineer Child as to the cost of a municipal paving plant (capacity 800 to 1,000 yards a day) a by-law will be submitted for \$25,000 to authorize the purchase.

Chatham, Ont.

Tenders addressed to W. G. Merritt, clerk, will be received until February 6th for supply of sewer pipe, brick, sand, gravel, lumber and hardware for 1911.

Edmonton, Alta.

The items in the expenditure in the engineer's department for the year are as follows: Plank walk and crossing construction, \$16,000; concrete walks, \$15,000; boulevards, \$30,000; paving, \$125,000; street railway, \$50,000; sewer, \$281,000; watermain construction, \$40,000; bridges, \$165,000; grading, \$4,000; subway, Twenty-fourth street, \$12,000; west end park and nursery, \$6,000; tools and equipment, \$2,500; Second street improvement, \$20,000; Fourth street improvement (unprovided for, cost approximately \$20,000); Fifth street improvement, \$7,500; field engineering estimates, \$1,000; yard and stable, \$35,000; installation of generator, plumbing, \$50,000; sliding bank, further investigation to be made regarding cost.

Hamilton, Ont.

Tenders for supply of concrete pipe for sewers in west end will be called.

London, Ont.

Engineer Van Cleve recommends a storm sewer system for the city. The board of works will take this matter up shortly, and from present indications a by-law will be prepared for submission to the electors in January next.

Montreal, Que.

Mr. James Baillie, Board of Trade Building, Montreal, expects to have the plans ready next week for the Villa Maria sub-division. They are now in the hands of a firm of landscape architects in Boston, and as soon as they arrive contracts will be asked for for the construction of sewers and sidewalks, and the grading and making of roads through the property. All this work will be done before the lots are put on the market, and the estimated cost will be in the neighborhood of \$500,000. It is understood that the whole will be left as one inclusive contract.

Nelson, B.C.

City Engineer G. C. Mackay recommended sewer construction in the south of the city at once at a cost of \$4,703,

and also the purchase of sewer pipe and fittings to the value of \$500.

New Westminster, B.C.

Plans for sewerage systems in the west and east end of the city will be prepared by the city engineer. It is improbable that the work will be carried out this year.

Ottawa, Ont.

A by-law may be submitted to the people shortly to authorize the expenditure of \$195,000 for waterworks purposes. For the completion of the work on the aqueduct \$150,000 is needed and over \$40,000 is required for water main extension on the Glebe.

Regina, Sask.

L. A. Thornton, City Engineer, writes that Regina is making a survey of the spring area with a view to getting definite information as to the supply available. Some repairs are being made to the supply main.

Sarnia, Ont.

Tenders are called until February 4th for supplies for waterworks such as brass service and stop cocks, lead flange couplings. A. A. Kelly, Chairman Fire and Water Committee.

Smith's Falls, Ont.

Tenders will be received until February 6th for \$41,501 30-year and 20-year waterworks and local improvement debentures. J. A. Lewis, town clerk.

St. Lambert, Que.

A by-law will be submitted to the ratepayers to issue \$225,000, local street and sewer improvement debentures.

St. Thomas, Ont.

Tenders addressed to Geo. K. Crocker, Chairman Board of Water Commissioners, will be received until February 13th for the building of a covered reservoir here. For further information see advertisement in "Tenders and For Sale Department" of this issue.

Vancouver, B.C.

Because of the annexation of Hastings Township and D. L. 301, it is thought that an additional amount of \$100,000 will be required to provide this new section with a complete water system. A waterworks by-law for \$400,000 was approved in the beginning of the year before this district was annexed.

Victoria, B.C.

On the recommendation of the water commissioner, the city will purchase 473 Trident water meters of various sizes at a cost of \$7,500; 15,000 feet of 12 in., 10,000 feet of 8 in., 35,000 feet of 6 in., 80,000 feet of 4 in. Mannesman's steel tubes at a cost of \$80,000; and 460 gate valves of various sizes at an estimated cost of \$4,000; and 15 tons of pig lead. These supplies will be used in extensions of the distribution system.

The board of works, at its initial meeting decided upon asphalt as the type of pavement to be utilized in the big street improvement scheme, the cost of which

will aggregate close to \$1,000,000, and instructed the city engineer to take such steps as will enable tenders to be called for almost immediately. The scheme is as follows: Trunk road, \$487,125; passed and reported, \$321,910; passed, not reported, \$399,560; recommended, \$304,790.

Railroads, Bridges and Wharves

Amherstburg, Ont.

Plans are being prepared for the construction of a drydock here and possibly a shipyard. Preliminary estimates place the cost at about \$250,000. A. H. Clarke, Member for South Essex, is interested.

Barrie, Ont.

Tenders addressed to R. H. Jupp, Superintendent County Roads, will be received until February 10th for pile timber and driving same for substructure, abutments and wing walls of Old Fort Bridge across Wye River. Plans, etc., at office of above or at office of County Clerk, Barrie.

Dartmouth, N.S.

The Board of Trade and citizens will ask for a Government wharf to be built here capable of accommodating ocean-going steamers. Mayor Notting, Councillor Douglass and A. C. Pyke are interested.

Digby, N.S.

The C. P. R. propose to build a new bridge here on the location made by the old Western Counties Railway.

London, Ont.

A deputation from Caradoc and Delaware Townships, composed of Messrs. D. C. Brodie, John Stewart and Ephraim Howlett, requested the construction of a bridge at what is known as the Giles site, the matter was referred to the board of road directors to report.

Ottawa, Ont.

The Carleton County Council will build three concrete arch bridges during this summer for which tenders will be called. Chas. MacNab, county clerk.

A new and modern swing bridge will be installed by the G. T. R. at the end of Elgin street to replace the railway structure which at present stands there. Mr. Morley Donaldson.

Quebec, Que.

Surveys are stated to have been completed and work will shortly commence on the 170 miles extension from Matane to Gaspé Basin for the Canada & Gulf Terminal.

The tenders recommended for acceptance in the report of Mr. L. A. Vallee, re bridge over St. Charles River, were as follows: J. H. Gignac, Ltd., \$160,000; Phoenix Bridge Company, \$169,500. Both plans called for the swing bridge type. The Road Committee decided to hold both tenders and also have Government engineer prepare plans for the bascule

type bridge for which tenders will be called.

St. Leonards, N.B.

An act has been introduced in the Maine Legislature, granting a charter to Messrs. Wm. H. Cunliffe, Frank W. Mallett, etc., to build a bridge across the St. John river between Van Buren, Me., and this place.

Township of Barton.

On February 14th a by-law will be voted on to issue \$6,500, 4½ per cent. bridge debentures. A. G. E. Bryant, Township Clerk.

Vancouver, B.C.

The G. T. P. engineers have been making tests for the purpose of locating a solid foundation for piers, etc. When plans are accepted the construction work will commence immediately. The Albion Iron Works, occupying site, have received notice to vacate.

Welland, Ont.

A special committee from the city council and a similar number selected from property owners will meet shortly for the purpose of reporting on the best plans re site, division of cost, etc., in connection with the high level bridge over Welland canal.

Winnipeg, Man.

It is understood that James J. Hill intends to proceed with immediate railway extension into Manitoba. It is believed that he will not only build the line at present projected, but that he will tap the boundary at a number of points in Western Canada.

As a result of a deputation which waited upon the Board of Control in regard to the proposed bridge across the Red River, which the residents of St. Vital are in favor of, plans and estimates giving full particulars for the consideration of the works committee of city council will be prepared. Mr. Mager, Reeve of St. Vital, and Councillor Wilson are interested.

AWARDED

Burk's Head, N.S.

The contract for breakwater has been let to Messrs. A. W. Girroir & Kinsman Sweet, of Antigonish, N.S., \$35,490.

Chapel Cove, N.S.

The contract for the construction of a breakwater has been awarded to Mr. W. J. Landry, of Antigonish, N.S., \$11,148.

Duncan's Cove, N.S.

The contract for breakwater has been awarded to Messrs. A. W. Girroir & Kinsman Sweet, of Antigonish, N.S., \$6,960.

Morris, Man.

Robert Coats, this place, has been given the contract for the construction of two pile bridges here at \$3.13 per foot. Other prices ranged from \$3.70 to \$5.50.

South Ingonish, N.S.

The contract for wharf goes to Messrs. Robert & Barth Musgrove, North Sydney, N.S., \$5,100.

St. Joseph de Letellier, Que.

The contract for wharf goes to Nap. Warren, of Chicoutimi, Que., at \$18,900.

Three Fathom Harbor, N.S.

The contract for beach protection goes to Obed A. Ham, of Mahone Bay, N.S. at \$7,848.

Public Buildings, Churches Schools, etc.

Arelee, Sask.

Tenders were received until February 1st, 1911, for the purchase of materials and the construction of a school house. Fred Strate, secretary-treasurer.

Berlin, Ont.

Reeve Euler and Aldermen Clement and Kranz have been appointed to confer with the Board of Health regarding the erection of Isolation Hospital.

The Board of Health has requested Mr. Beilstein to prepare sketches of three buildings instead of one to be used as Isolation Hospital. Secretary, Miller.

Calgary, Alta.

Tenders were called until January 31st for the purchase and removal of the old city hall buildings. W. D. Spence, city clerk.

The plans for the new St. Andrew's Church were approved at a recent congregational meeting. Pastor, Rev. Mr. Mahaffy.

The congregation of Knox Presbyterian Church decided to purchase property at Fourth street and Sixth avenue and to erect a church not to cost more than \$125,000. Thorburn Allan, treasurer.

The supplementary report of the city commissioners recommended the erection of new fire headquarters and equipment. Estimated cost of building, \$38,000. Total cost, \$75,000. A by-law will be prepared at once.

Carleton Place, Ont.

J. Albert Ewart, Ottawa, is the architect in charge of the erection of the Zion Presbyterian Church here. Size, ground floor, 90 x 72; number of floors, 2; estimated cost of building, \$20,000; cost of equipment, \$5,000. We are informed that contracts will be awarded next month. W. Allen, secretary building committee. Noted in last issue.

Chilliwack, B.C.

We are informed that the tenders for hospital building here were considered too high. None were awarded. R. J. Douglas, secretary hospital board.

Edmonton, Alta.

Geo. E. Turner, architect and building commissioner, is in charge of the erection of 3-story primary school between McCauley and Heimink streets. The school will be built of brick, stone dressings, fireproof floors over boiler room, fireproof staircase wings at an estimated cost of \$100,000, which includes everything but desks and furniture. Under date of last information contracts were not stated to have been awarded.

Fredericton, N.B.

Arrangements are being made to secure figures on the erection of a suitable building for the Exhibition in 1912.

Galt, Ont.

At a meeting of citizens interested in the formation of a Business Men's Club here, it was decided that the first step would be the erection of an up-to-date building. Estimated cost, \$20,000.

Guelph, Ont.

Plans prepared by Architect Cowan for the erection of Children's Shelter have been accepted by the executive committee. Estimated cost, \$10,000.

Kamloops, B.C.

The plans prepared for the new hospital provide for a modern and substantial structure. The building designed has a frontage of 200 feet, and is 144 feet in depth. Estimated cost, \$120,000. Noted in issue of January 4th.

Marysville, N.B.

The Methodist Church here was destroyed by fire on the 20th inst. Estimated loss, \$65,000.

Montreal, Que.

The Homoeopathic Hospital have a committee at work for the purpose of raising \$100,000 for erection of a new building. Dr. J. T. Novinger, secretary.

Orillia, Ont.

Competitive preliminary sketches for proposed new Sunday school for Presbyterian Church are called until February 15th. For further information see advertisement in "Tenders and For Sale Department" of this issue.

Ottawa, Ont.

The Central Canada Exhibition Association have decided to postpone the request for the erection of new machinery hall till next year. Secretary, Mr. McMahon. Noted in last issue.

Peterborough, Ont.

The congregation of Murray Street Baptist Church have decided to build their new church. Estimated expenditure, \$56,500. Chairman Building Committee, Mr. T. F. Matthews.

Regina, Sask.

Work on the first building of the Regina Methodist College will be started in the spring. Dr. W. W. Andrews, president.

Souris, Man.

The school board is preparing to build another school in the spring. It will probably be an eight-room building.

A committee from the hospital board, composed of T. H. Patrick, George Brown, and W. McCulloch, have been to Brandon to consult an architect with regard to a new hospital building.

Strathcona, Alta.

The council granted the request of the Public Library Board for increase of grant and building site. Noted in last issue.

South Vancouver, B.C.

A site in the vicinity of Horne road east of Fraser avenue is being considered for a new school.

Sydney, N.S.

The city council has approved of the granting of \$75,000 for the erection of two brick schools.

St. Boniface, Man.

The Roman Catholic Church have decided to erect a fine building on Aulunea street in this city, as a training school for young priests. Plans are being prepared by a Montreal architect. Estimated cost, \$250,000.

St. Catharines, Ont.

Architect Thomas Wiley, St. Catharines, is preparing plans for an addition to be built to the Rittenhouse school at Jordan Harbor in the spring. Plans call for an extension of two wings of brick.

St. John, N.B.

The Main Street Baptist Church will start a fund for the purpose of erecting a new Sunday school. W. H. White,

treasurer; W. Heathfield, financial secretary.

M. Sullivan, contractor, Kingston, Ont., is calling for bids for purchase and removal of houses on the site of the proposed new drill hall.

Toronto, Ont.

Hon. W. J. Hanna, Provincial Secretary, received a deputation from the Victoria and Alexandra Industrial Schools requesting the Government grant of \$20,000 to the two institutions. It was pointed out that a new school building costing \$15,000, is needed at East Toronto. At Mimico the institution requires a new cottage, to cost \$25,000, as well as a barn and lavatories, \$10,000.

Toronto, Ont.

The Public School Inspectors have asked for the additional accommodation of 92 rooms to be ready for use in September, 1912.

At the annual meeting of the Canadian National Exhibition Association, President Gooderham announced that a Women's Building would be erected this year.

Tenders are called until February 13th by Public Works Department, Ottawa, for alterations to Examining Warehouse here. Plans, etc., obtained at the office of Mr. Thos. Hastings, Clerk of Works, Postal Station F, Yonge street, Toronto, and at the Department.

Tenders, bulk or separate, addressed to G. R. Geary, Chairman, Board of Control, will be received until February 13th for the following trades in connection with the erection of Howland Avenue Fire Hall; concrete, paving, etc., hardware, sliding poles, covers for sliding pole openings, metal weatherstrips, light fixtures, stable fittings. Plans with City Architect. Advertisement in "Tenders and For Sale Department, this issue.

Vancouver, B.C.

The plans for the new church were passed by the congregation of Chalmers Presbyterian Church. Rev. E. A. Henry, pastor.

Competitive plans are invited until February 6th for erection of stock judging pavilion on Exhibition grounds. H. S. Rolston, Secretary, Vancouver Exhibition Association, 319 Pender street.

O. W. Moberg, architect, has submitted plans to the Parks Board for the improvements to Stanley Park, including concert and refreshment pavilions. \$15,000 will be spent. Noted in December 21st issue.

The First Presbyterian Church at their annual meeting discussed building plans for their new church. It was decided to call for further plans before making any decision. Noted in issue of December 21. Dr. Fraser, pastor; Messrs. S. Munson, K. J. Marshall, and Ramage, members board of management.

Victoria, B.C.

The site for the new high school has been purchased.

S. J. Drake was appointed chairman of the management committee which has charge of the financing of the building fund for Knox Church.

D. E. Campbell, President of the Hospital Board, urged the necessity of the complete rebuilding of the Jubilee Hospital on a large scale. Referred to a committee.

At the annual meeting of the First Presbyterian Church it was decided to

take steps toward the erection of a new church building. Messrs. E. J. Martin, McIlvride and Dempster were elected to the board of finance. Rev. Dr. Campbell, pastor.

Tenders for the erection of the comfort station were received from the following: For the plumbing, heating and ventilating, D. R. Menzies & Co., \$6,725; W. Bownass, \$5,000; Victoria Plumbing Company, \$6,904; Colbert Plumbing Company, \$6,897; R. J. Knott, \$6,832; J. H. Warner & Son, \$7,000; Hayward & Dodds, \$6,601; A. Sherret, \$6,865.

Tenders for the erection of the building were received from the following: Dinsdale & Malcolm, \$13,787; Parfitt Bros., \$16,493; Luney Bros., \$14,936; Thomas & Hodgson, \$13,280; Ferris & Barff, \$12,718; city engineer, \$12,893.

Welland, Ont.

The town council are considering the purchase of a site for market accommodation and Carnegie Library.

Winnipeg, Man.

Tenders will shortly be called for the proposed addition of 12 rooms to Strathcona school on McGregor street. J. B. Mitchell, Commissioner of School Board.

The Women's Hospital Aid Society contemplate the erection of a convalescent home to cost about \$30,000. A grant of five acres is expected from the Provincial Government. President, Mrs. E. M. Wood.

Woodstock, N.B.

Under date of last information the contracts for the brick and stone school house (120 x 80), three storeys, had not been awarded. H. B. Connell and Col. Dibblee, trustees, Woodstock; G. Ernest Fairweather, architect, St. John.

AWARDED

Calgary, Alta.

Grant Brothers were awarded the contract for the erection of the school at Mission Bridge, at \$57,000. Marr's Plumbing Company secured the contract for plumbing and heating this school at \$12,934. Total, \$79,934.

The contract for the erection of the five-roomed addition to the high school was awarded to James McPhail at \$32,850. The plumbing and heating in the addition was awarded to Grant Bros., at \$11,616. Total, \$44,466.

Although tenders were sent in for the building of Hillhurst and the Colonel Walker estate schools, the board decided to make the latter a 12-roomed school instead of an eight-roomed school as previously planned. The former school is to be in a locality where it is much more difficult to haul material, therefore the tenders will have to be increased. Those sending in tenders will be allowed to figure again to guard themselves against loss.

It is estimated that each of these schools will cost \$110,000. The plumbing contracts for each were awarded as follows: E. J. Young, for plumbing and heating in the 12-roomed school in Hillhurst, at \$17,745, and W. Head for plumbing, heating and ventilating in 12-room school near Colonel Walker's estate.

Forest, Ont.

The contract for supply of two No. 24 Kelsey generators and ventilation, manufactured by Jas. Smart Co., Brockville, for high school here was given to Scott Bros., this place.

Grand Falls, N.B.

Contract for public building here awarded to Powers & Brewer, Grand Falls, \$17,777.

Montreal, Que.

The contracts for the plumbing, heating and lighting of the new Art Gallery are the chief ones which have not yet been let. Messrs. G. A. Fuller & Co., general contractors, have let the following: Reinforced concrete to Messrs. F. J. Jago & Co., Montreal; excavation, to Messrs John Quinlan & Co., Montreal; marble and granite to The Norcross Bros., Worcester, Mass.

Nanaimo, B.C.

The contract for erection of public building here was awarded to A. Henderson, \$23,441.

St. Henri, Que.

Contract for additions to post office awarded to J. Jacob & Co., Montreal, \$4,890.

Wolfville, N.S.

The contract for erection of Baptist Church here has been awarded to A. W. Allen, Middleton, N.S., \$35,000. C. B. Chappell, architect, Charlottetown.

Victoria, B.C.

The contract for the erection of the public convenience, corner of the Causeway and Wharf street, was awarded to Ferris & Barr, \$11,966.90. The contract for the plumbing, heating and ventilating plant will go to W. Bownass for \$5,000.

Residences

Brockville, Ont.

Tenders addressed to B. Dillon, architect, will be received until February 4th for erection of addition and alterations to the residence of H. A. Stewart, K.C. Plans, etc., at office of above.

Calgary, Alta.

Tenders addressed to A. Pirie, architect, will be received until February 18th for complete construction, including all material, for an apartment block here for O. G. Devenish.

Ottawa, Ont.

The building permits issued recently include: Edward Wentzlaff, dwelling, MacKay street, \$2,500; William Beatty, dwelling, Spadina avenue, \$2,500; Jacob Potowin, dwelling, Bell street, \$3,000.

Port Colborne, Ont.

S. Port, architect, has plans for J. Tuck's new residence; also for extensive alterations to Price farm house, Welland, for J. C. Laughlin.

Business Buildings and Industrial Plants

Alliston, Ont.

Parker Bros. have decided to build a new grist mill, of brick and concrete, to replace the one destroyed by fire recently.

Brantford, Ont.

The preliminary plans for new Bank of Montreal have been prepared and revised. It is likely that the work will be carried on this year. Noted in last issue.

Berlin, Ont.

It is reported that the Merchants Bank is negotiating for the purchase of the Janzen block, on the northwest corner of King and Queen streets. Local manager, W. E. Butler. Building operations

(Continued from page 35)

Tenders and For Sale Department

ROCK CRUSHERS

We have a No. 6 and a No. 5 McCully gyratory type with manganese steel head and concaves, suitable for breaking very hard material. Both are new; never set up. Located New York State. Also a 60-ft. elevator and a 48-in. x 12-ft. McCully screen. Will sell separately. Attractively priced. Confer with us.

WILLIS SHAW MACHINERY CO.
171 La Salle St.,
Chicago, Ill.

Tenders for Supply of Asphalt

Sealed tenders, addressed to the Chairman, Board of Control, Winnipeg, Canada, for the supply of from 1,000 to 1,500 tons of Asphalt for street paving for the City of Winnipeg, will be received at the office of the undersigned on or before Wednesday, March 1st, 1911. Specification and form of tender, together with conditions governing tenders, as prescribed by by-law, may be obtained at the office of the City Engineer, 23 James Avenue, Winnipeg, Canada. The Board reserves the right to reject any or all tenders or to accept any bid which appears advantageous to the city.

M. PETERSON, Secretary.

Board of Control Office,
Dinnipeg, Jan. 19th, 1911. 4-5

Notice To Contractors

Civic Supplies

Sealed tenders addressed to the Chairman of the Board of Control, City Hall, Ottawa, will be received by the Secretary of the Board of Control, City Hall, Ottawa, up to 4 p.m., Tuesday, February 14th, 1911, endorsed "Tender for Broken Stone, Brick, Stone Curbing, Stone Setts, Cement, Plank and Cedar, Sand, Vitrified Clay Pipe, Asphalt, Castings, or Hardware," as the case may be.

Specifications, form of tender and full particulars may be obtained on application at the City Engineer's office, City Hall, Ottawa.

Any tender received after the above stated time will be declared informal.

The Corporation does not bind itself to accept the lowest or any tender.

NEWTON J. KER,
City Engineer.

Ottawa, Jan. 21st, 1911. 4-5

Cast Iron Water Pipe

Sealed tenders addressed to the City Clerk, Brandon, Man., endorsed "Tender for Cast Iron Pipe," will be received until 12 o'clock noon on Friday, the third day of February next, for from Ten to Twenty Thousand Feet of Six Inch and Four Inch Pipe.

The 6" pipe to be 30 lbs. per foot and 4" pipe 20 lbs. per foot, which must be tested to hydrostatic pressure of 300 lbs.

5,000 feet to be delivered by April the 15th, and the balance not later than the first day of June next.

Specifications may be had from the City Engineer's office, Brandon.

The lowest or any tender not necessarily accepted.

ALD. CATER, R. E. SPEAKMAN,
Chairman Waterworks Com. City Engineer.
Brandon, Man., Jan. 18, 1911. 4-5

TENDERS

Sealed tenders, addressed to the undersigned, will be received until noon on Monday, February 13th, for the building of a clear water covered reservoir at the St. Thomas Waterworks. Plans and specifications may be seen at the City Engineer's office, St. Thomas, and blank forms of tender obtained. Tenders must be accompanied by a certified cheque payable to the Treasurer of the City of St. Thomas, for five per cent. of the amount of tender. This cheque will be held until the successful tenderer enters into contract for the due completion of the work.

GEO. K. CROCKER,

Chairman Board Water Commissioners.
St. Thomas, Jan. 23, 1911, 5-5

Notice To Contractors

Water Works Supplies

Sealed tenders, addressed to the Chairman of the Waterworks Committee, City Hall, Ottawa, will be received by registered post only, up to 4 p.m., Tuesday, February 14th, 1911, for the supply and delivery of Brasswork, Special Pipe Castings, Hydrants, Cast Iron Pipe, Lead Pipe and Pig Lead, Valves or Oils and Grease as the case may be.

Specifications, form of tender and full particulars may be obtained on application at the City Engineer's Office, City Hall, Ottawa.

Any tender received after the above stated time will be declared informal.

The Corporation does not bind itself to accept the lowest or any tender.

NEWTON J. KER,
City Engineer.

Ottawa, Jan. 21st, 1911. 4-5



TENDERS

Howland Avenue Fire Hall

Bulk tenders or separate tenders for the several works mentioned below, in connection with the above building, will be received by registered post only, addressed to the undersigned, up to noon on

MONDAY, 13th FEBRUARY, 1911.

1. Concrete Paving, etc.
2. Hardware.
3. Sliding Poles.
4. Covers for Sliding Pole Openings.
5. Metal Weatherstrips.
6. Light Fixtures.
7. Stable Fittings.

Plans and specifications may be seen and forms of tender and all information obtained at the office of the City Architect, City Hall, Toronto.

Envelopes containing tenders must be plainly marked on the outside as to contents.

The usual conditions relating to tendering, as prescribed by city by-law, must be strictly complied with, or tender may not be entertained.

Tenderers shall submit with their tender the names of two personal sureties or the bond of a guarantee company.

The lowest or any tender not necessarily accepted.

G. R. GEARY (Mayor),

Chairman Board of Control.
City Hall, Toronto, 23rd January, 1911. 5-5

TO ARCHITECTS

CASH PRIZES of One Hundred, Seventy-five, and Fifty Dollars are offered for competitive Preliminary Sketches of proposed new Sabbath School building and Church Parlors for Orillia Presbyterian Church, Sketches to be in hands of undersigned not later than February Fifteenth. Full information may be had from J. J. THOMPSON, telephone 261, Orillia.

5-6

T. G. KING, Secretary.

City of Strathcona (Alberta)

Tenders for

Engine, Boilers and Generators

Tenders addressed to David Ewing, Chief Engineer power house, Strathcona, Alta., for the above machinery, will be received until noon, Wednesday, March 1st, 1911. Specifications may be obtained upon application to the undersigned.

A. J. McLEAN,
City Engineer.

Strathcona, Alta., Jan. 16, 1911. 4-8

Positions Wanted

Advertisements under this heading one cent a word per insertion. Box No. ten cents extra

ARCHITECT'S GENERAL ASSISTANT, Toronto, 1st week March; desires situation, any capacity; qualifications, P. A. S. I.; typewriter; any capacity start. SCOTT, 151 Vine street, Lockport, U. S. A. 5-5

ARCHITECT, highest qualifications and experience, would take charge of office or consider partnership. The West preferred. Box 200, Contract Record, Toronto, Ont. 4-7

Miscellaneous

Advertisements under this heading one cent a word per insertion. Box No. ten cents extra

AGENTS WANTED—Large United States Terra Cotta company desires high-class agencies for Canada. Send particulars to W. D. Ward, Tribune Building, New York City. 4-6

THE STEEL SQUARE—For sale—4 copies of vol. 1 and 2 copies of vol. 2 Fred T. Hodgson's book, "Practical Treatise on the Steel Square." 242 pages. Price, only 50 cents a copy. Contract Record, 220 King street west, Toronto, Ont. 4-5

REPRESENTATIVES WANTED — Reliable firm manufacturing complete line of electrical measuring instruments want responsible representatives to handle their lines throughout the whole of Canada. Are prepared to deal separately for Eastern and Western Canada. Box 194 Contract Record, Toronto, Ont. 3-5

REPRESENTATIVES WANTED IN CANADA—British firm of electrical and mechanical engineers manufacturing electric lighting specialties, wants to secure reliable Canadian representatives who will carry a stock in Canada. Write for particulars to Box 199, Contract Record, Toronto, Ont. 4-5

CAPITAL WANTED for interior fitting factory doing a first-class business in bank and store fixtures. Splendid equipment and first-class connection. Preference stock for \$20,000 to be issued. Apply for particulars to Box 207 Contract Record, Toronto. 5-6

The City of Calgary

Tenders will be received by the City Commissioners up to the 19th day of February, 1911, for 210 (more or less) 5-light ornamental lamp posts to be delivered in carload lots as required. All persons tendering will submit their designs, together with full dimensions, weights, etc.

Globes are to be of light alabaster. Each post must be equipped with standard Edison sockets, all complete and ready for wiring up. Tenderer will also submit prices on extra globes which might be required. Tungsten lamps will be supplied by the city. A cheque for two per cent. of the bid must accompany all tenders. The city reserves the right to accept the whole or any part of a tender; the lowest or any not necessarily accepted.

Dated at Calgary, January 27th, 1911.

A. G. GRAVES,
City Commissioner.

Sale by Tenders

In re The

St. John P.Q. Brick Co. Limited In Liquidation.

Will be sold, by tender, the St. Johns P. Q. Brick Plant, situated in the town of St. Johns, P.Q., and being as follows:

Land.—15 acres, more or less, situated between the G. T. R. and the C. P. R. lines, with sidings of both companies in the brick yard. Clay of the best quality.

Buildings.—Office, wood building, 24 x 26 feet. Kiln shed, wood, 58 x 223 feet. Engine building, brick, containing engine, boiler and motor, 23 x 32 feet and attached to this building one small shed for fuel 12 x 23 feet. Building for brick presses, wood, 58 x 125 feet. Another small building 10 x 52 feet. Building with horse stables 34 x 47 feet. Sand house, 12 x 24 feet. Dryers of a capacity of 350,000 to 400,000 bricks.

Machinery and Accessories.—All the machinery and accessories necessary to the brick manufacturing: two brick presses, one clay press of a capacity of 40,000 bricks per day and one cement press of a capacity of 20,000 to 25,000 bricks per day, trucks, wheelbarrows, horse trucks, railway trucks, pallets, etc., etc., and office supplies, safe, typewriter, desks, etc., etc. Plant ready to be operated.

The whole to be sold as it now is and without warranty whatever as to precise measurement, quantity or otherwise.

The tenders shall be sent to the undersigned, by registered letter, on or before February 13th, 1911. Each tender to be accompanied with accepted cheque of 10 per cent. of its amount, the balance payable on acceptance of tender, or special terms of payments if approved by the Superior Court of the district of Iberville. The highest or any tender will not be necessarily accepted.

Further information may be had from the undersigned or his attorneys Messrs. Heneker, Duff and Johnson, advocates, Montreal.

St. Johns, P.Q., January 13th, 1911.

WM. McNULTY,
Liquidator.

5-5

Positions Vacant

Advertisements under this heading two cents a word per insertion

Superintendent wanted for interior fitting factory, manufacturing a high class of fittings, must be able to invest from three to five thousand dollars. Only practical man and a pusher considered. To such good returns guaranteed. Apply with particulars to Box 208, Contract Record, Toronto.

5-6

DREDGES FOR SALE

A one yard Beatty dredge in first-class shape, within a few miles of railroad station, suitable for dredging or ditching; also a half yard machine with portable oak hull in first-class shape. Apply FRED. A. ROBERTSON, Cornwall, Ont.

4-6

Business Buildings and Industrial Plants

(Continued from page 33)

will commence on expiration of lease, in 1912.

Calgary, Alta.

The Dominion Bank received permission to commence tearing down the Bradley & Tuck building on the corner of First street east and Eighth avenue preparatory to the erection of their large block.

Tenders are called until February 16th for the erection of a brick and stone building for Messrs. Beveridge Bros., on corner of Seventh avenue and First street east. Plans, etc., with Hodgson, Bates & Butler, architects, Grain Exchange.

At a special meeting the city council reached an agreement with the C. P. R. whereby the latter will at once proceed with the erection of a hotel in this city, which when completed will cost in the neighborhood of \$1,000,000.

Cornwall, Ont.

The counties of Stormont, Dundas and Glengarry have appointed a special committee to procure plans and ask tenders for the erection of a joint House of Refuge on the site given here. Counties Clerk, A. I. Macdonnell.

Edmonton, Alta.

A modern three-storey warehouse block, 140 by 50 feet, will be erected on the corner of Peace avenue and Seventh street, by Nicholson and Bayne, commission merchants and brokers.

Tenders addressed to H. A. Magoon, architect, Credit Foncier Building, will be received until February 10th for the erection of a brick and stone 90-roomed hotel on Jasper avenue.

Plans are being prepared, it is understood, by representatives of the Houston estate, of which Rev. Dr. McQueen and Wm. Short, K.C., are executors, for the erection of a large business block on Jasper avenue. Estimated cost, \$75,000.

Guelph, Ont.

Alterations costing about \$17,000 will be made to the Bank of Montreal office here. Contracts have been awarded. Work will start in April.

It is understood that plans are under consideration by Mr. Mahoney, architect, for the new arcade which certain parties have under contemplation to run through from St. George's square to Cork street, with offices above.

Gowanda, Ont.

The following buildings were destroyed by fire in the recent fire: Queen's Hotel, Canadian Bank of Commerce, Taylor drug store, etc.

Hamilton, Ont.

Canadian Northern Railway Company are reported to be buying property in the neighborhood of Macnab and Stuart streets. That is taken to indicate the company's intention of building a station near the corner of James and Stuart streets.

Hull, Que.

Mr. Ernest Smith, of Ottawa, representing an American firm, has under consideration the location and erection of a factory to cost about \$100,000.

Lignite, Alta.

Thomas McKelvie, of Lacombe, is erecting a \$20,000 hotel.

Medicine Hat, Alta.

W. P. Hull, Calgary, writes that no plans have been prepared as yet for business block here. Noted in issue of January 18th.

D. Milne, Mayor, writes re erection of large refining plant here that the agreement with city provides that buildings, elevators, etc., will be complete and plant in operation by October. Materials, fireproof, brick and cement. Capacity, 1,000 gallons per day; estimated cost of building and equipment, \$50,000. The company is yet to be incorporated. Noted previously.

Moose Jaw, Sask.

W. A. Kirkwood, secretary, Board of Trade, is in receipt of an enquiry from a firm manufacturing trunks as to the location of a warehouse here.

Middleton, N. S.

The following lost in the recent fire here: Royal Bank, Parsons, Elliott & Co., Marsdens, Sutfners, and Bentley & Co. Loss, about \$120,000.

Montral, Que.

The Montreal Harbor Commission announce the purchase of about 70,000 sq. ft. of land east of the Dominion Cotton Mills which will be used as a harbor yard for repair shops.

Mr. L. W. Just, secretary Ritz-Carlton Hotel Company, 80 Notre Dame west, is arranging for a contract for the tearing down of the buildings now on the site of the new hotel.

Nelson, B.C.

The Hudson Bay Company's store here will be remodelled. E. P. Gigot, manager.

Ottawa, Ont.

The northwest corner of Mosgrove and Rideau streets has been purchased by C. A. Douglas, F. T. Graves and R. McMorran. A six-storey building is one of the propositions reported.

Pembroke, Ont.

The Canadian Box & Barrel Company are considering expansion which will be followed by the building of a factory to construct collapsible boxes and barrels, etc. Mr. Geo. Koss is interested.

Pictou, Ont.

Messrs. Church Bros. will build a new canning factory here. Cost, about \$50,000, corner of Talbot and Main streets.

Port Arthur, Ont.

The contract calls for the removal of the houses on the site for the armory by April 1st. Contractor McKae.

Quebec, Que.

The Hochelaga Bank, it is stated, has purchased the property at the corner of Crown and Desfosses streets.

Regina, Sask.

Under date of last information re the 6-storey steel and concrete faced stone and brick office building, corner 11th avenue and Lorne street, the contracts had not been awarded. M. W. Sharon, architect. Noted in January 18th issue.

Cameron & Heap, wholesale grocers, will erect a large warehouse on Rose

street, \$45,000. Haug Brothers & Neller-moe Company of Winnipeg have undertaken to erect an implement warehouse which will cost at least \$50,000. The Toronto Type Foundry Company, of Toronto, will also erect a warehouse in Regina this summer, \$20,000. Noted previously.

Souris, P.E.I.

The woodworking steam mills of Barnard Creamer were destroyed by fire, \$8,000.

Stewart, B.C.

The Finch-Hickey department store was destroyed by fire on the 27th ulto. Estimated loss, \$20,000.

St. Catharines, Ont.

The ratepayers have authorized the by-law giving civic privileges to the Steel & Radiation, Limited, in return for which the company will erect buildings valued at \$50,000.

St. John, N.B.

Joseph R. Clarkson, manager for the Partington Pulp & Paper Company, is authority for the statement that the new mill will be erected in the near future. Plans are being prepared in England.

Tenders are called until February 13th for the purchase of the brick plant here. For further information see advertisement in "Tenders and For Sale Department" of this issue.

Summerside, P.E.I.

Mr. M. F. Schurman & Company's mill was destroyed by fire recently. Loss, \$7,000.

Sydney, N.S.

The general offices of the Dominion Steel Corporation were destroyed by fire on the 25h ulto. Loss on building, about \$50,000. General Manager, M. J. Butler.

Sarnia, Ont.

The Imperial Oil Company's plant here was damaged last week to the extent of about \$15,000.

Toronto, Ont.

The Dominion Bank will erect a large bank building on the northeast corner of King and Yonge streets. No definite time is stated for construction. General Manager, C. A. Bogart.

The C. P. R. offices, corner of King and Yonge streets, will have a frontage of 85 feet on King street and 100 on Yonge street, will be 15 storeys, of steel, faced with glazed terra cotta at a cost of about \$1,000,000.

Tenders will be received until February 2 for excavation required in erection of 6-storey warehouse, corner King and Parliament streets for the Aluminum and Crown Stopper Co. Architect, F. H. Herbert, 65 Adelaide east.

The Lake of the Woods Milling Company have purchased 100 feet frontage on Dupont street near Kendall avenue, on which a mill will be built. The sale was effected by H. G. Phillips, 206 Dupont street.

Vancouver, B.C.

W. S. Collister & Company announce extensive alterations to their premises.

P. Burns & Co. will build an extension to cost about \$200,000 to their abattoir plant.

Plans and specifications for a three-storey block wanted. For full particulars apply Saskatchewan Land Company, 3127 Westminster road.

Plans are now being prepared by the

engineers of the B. C. Electric Railway Company for extensive freight terminals on the north shore of False Creek. Frontage was purchased several years ago. A permit will shortly be requested for the first of the new buildings at the point, this being a freight shed 80 by 120 feet in size.

Victoria, B.C.

Mr. P. R. Brown has been given a permit for 3-storey block on Broad street, \$40,000. H. S. Griffiths, architect.

Messrs. Finch & Finch have let the contract for the erection of their business building on the site of the Moore & Whittington factory.

Messrs. David Spencer & Co. have had plans prepared for their new departmental store which will cost about \$600,000 and will call for eight storeys. The site is as yet undetermined.

Weymouth, N.S.

G. D. Campbell's pulp mill here was destroyed by fire on the 24th ult. Estimated loss, about \$50,000.

Winnipeg, Man.

Work on the new 3-storey office building for the Mortgage Company of Canada will be commenced in the early spring. Manager, A. Gouzee.

Woodstock, Ont.

The ratepayers will vote on the by-law granting civic privileges to the Ken-Knit Company on February 20th. Noted in last issue.

AWARDED

Guelph, Ont.

Tenders for most of the work of alterations to Imperial Hotel have been let by Architect Mahoney: Geo. Ibbotson, carpentering; Sam. Rundle, stone and brick work; W. Scriven, plumbing.

The contracts for alterations to Bank of Montreal are as follows: Robt. Dunbar, mason work; Geo. Scroggie, carpenter; Geo. Wolcott, galvanized iron; J. J. Mahoney, plastering; Stevenson & Malcolm, electric wiring and lighting; Wm. Scriven, painting; Fred Smith, heating and plumbing; Hamilton Bridge Works, steel and iron work. Estimated cost, \$17,000.

Ottawa, Ont.

W. G. Adamson has the contract for repairing the methylated spirits warehouse, recently wrecked by an explosion.

Peterborough, Ont.

The contract for the building of the new factory of the Lakefield Canoe Building and Mfg. Co., has been let to Messrs. Baptie Bros.

Toronto, Ont.

The Porous Terra Cotta fireproofing contract of the Annette Street School, West Toronto, has been awarded to Robert Bennett, contractor, of Euclid avenue.

Victoria, B.C.

The contract for erection of Mr. P. R. Brown's 3-storey office building was awarded to Messrs. Murray & McKinney. The estimated cost is about \$38,000. H. S. Griffiths, architect.

Winnipeg, Man.

M. Peterson, Secretary Board of Control, writes that the contract for steel work for power sub-station No. 1 King has been awarded to The Manitoba Bridge & Iron Works, Limited, Winnipeg, \$12,413.

Power Plants, Electricity and Telephones

Calgary, Alta.

A by-law is being prepared for the expenditure of about \$300,000 for electric power, which will be spent in transformers and sub-stations and new machinery. In addition to this it will be necessary to provide more underground cabling. Commissioner Graves is interested.

Edmonton, Alta.

Four schemes are submitted in connection with the new 6,000 gallon pump, and the estimates of cost vary from \$26,000 to \$75,000 for the pumping plant alone.

Apart from machinery, the estimated expenditures of the power house department for the year are \$19,830. This sum will cover the cost of a \$10,000 addition to the builder house, the installation of a motor generator, \$12,000.

Edmonton has appointed a city council committee to deal with the International Heating and Lighting representative with regard to a gas franchise. The International company asks for a twenty-five year franchise to supply gas.

The Edmonton Heat and Power Company, in which is included local and eastern capital, propose to produce several hundred thousand horse power by a hydro-electric plant on the Saskatchewan river, sixty miles up from Edmonton, where they have secured rights to construct a dam and other works necessary.

The expenditure for power house department for financial year may vary from \$139,750 to \$298,750, according to the plans accepted by the commissioners. For the 2,000 kilowatt alternator alone, which will increase the capacity of the lighting and power plant, and also for the street railway department, the estimates vary from \$80,000 to \$190,000. Four alternative engines and alternators are estimated upon, giving this wide range of cost.

Iroquois, Ont.

It is reported that M. F. Beach, Iroquois, will develop power on the Madawaska river at High Falls near Calabogie. Engineer McRae, Ottawa, has investigated to some extent.

Prince Albert, Sask.

This city has been granted the La Colle Falls power franchise and the lands that will be flooded by the damming of the river. Noted previously.

Portage la Prairie, Man.

At a meeting of the city council a special committee was appointed to ascertain the possibility of purchasing a central electric light and gas plant with the view of a municipal owned plant to furnish the city with light and power.

Regina, Sask.

Tenders addressed to S. P. Porter, Deputy Minister, will be received until February 9th for supply of insulators, toppins, guy wire, copper sleeves, cross-arms, galvanized iron wire, pole line, hardware, etc. Specifications at Department of Railways and Telephones.

Victoria, B.C.

Angus Smith, city engineer, is authority for the statement that plans and specifications were being drawn preparatory to the calling for tenders for the large amount of street work contemplated. It is hoped that contracts for much of the work will be let within two weeks' time.

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We are exclusive Distributing Agents for this high grade, hand-made fire brick. Large stock always on hand.

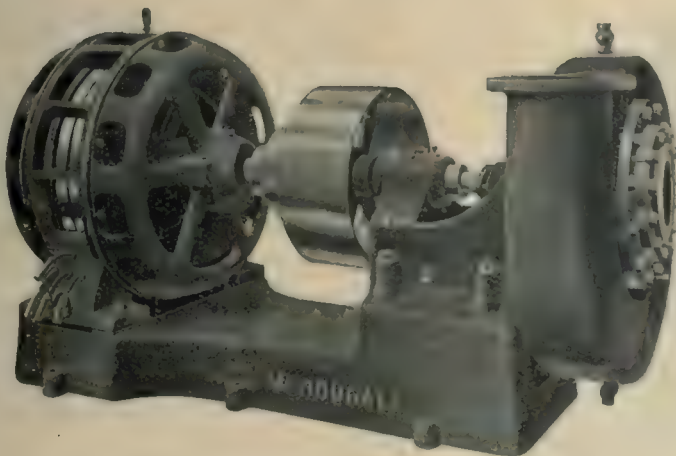
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THE VOLUTE PUMP, HERE SHOWN, IS SPECIALLY DESIGNED TO CARRY A HEAVY PERCENTAGE OF SAND. IT HAS A CAPACITY OF 2,334 IMPERIAL GALLONS PER MINUTE, AND IS ARRANGED FOR EITHER MOTOR OR BELT DRIVE. WE BUILD THESE PUMPS OF ALL CAPACITIES AND OF THE HIGHEST EFFICIENCY.

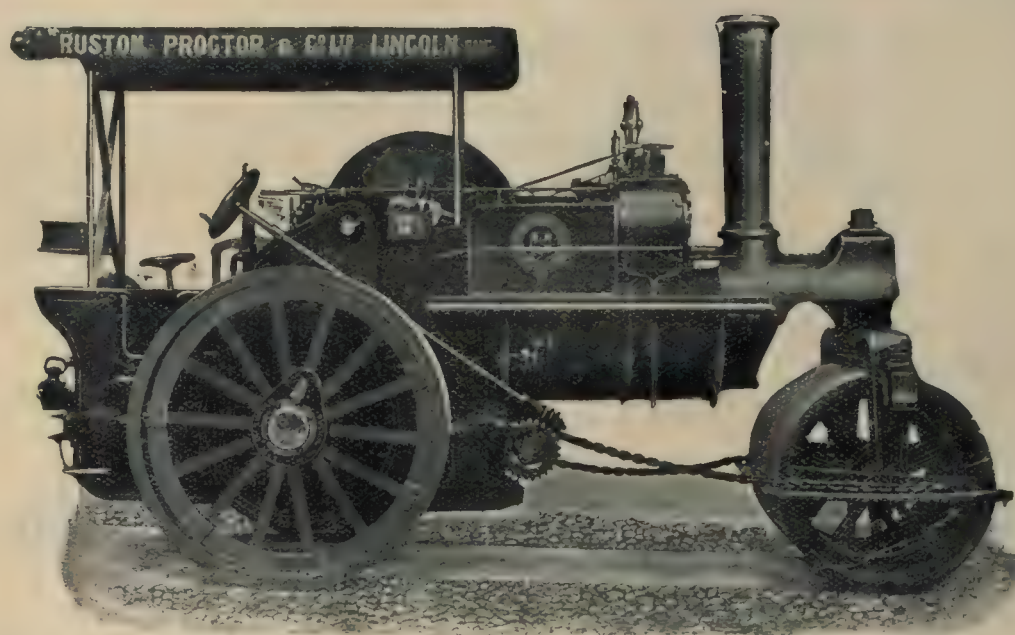
OUR NEW BULLETIN NO. 106, SHOWING MANY APPLICATIONS OF THESE PUMPS, WILL BE SENT ON APPLICATION TO OUR SALES OFFICES, MONTREAL, TORONTO, COBALT, WINNIPEG, CALGARY, VANCOUVER

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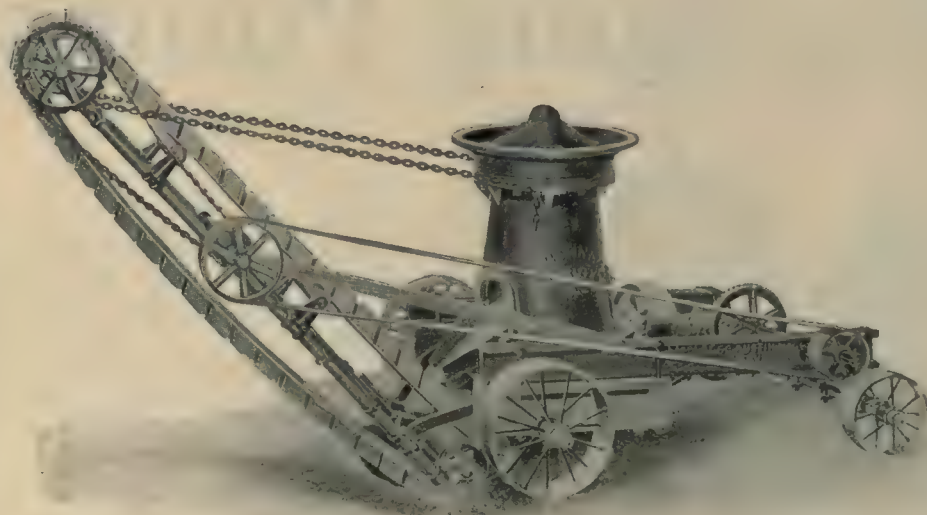
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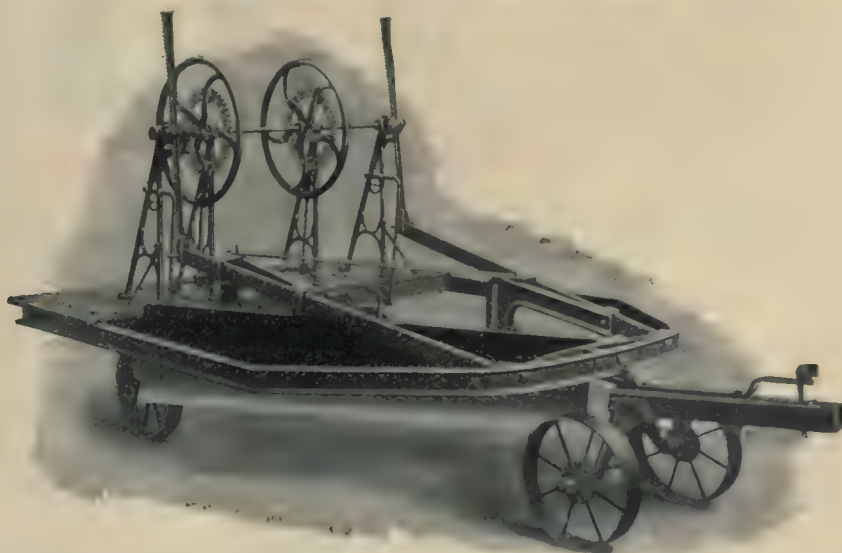
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AUSTIN MOTOR ROAD ROLLER

Winnipeg, 259-261 Stanley St.
Calgary, Crown Block.
Vancouver, Mercantile Bldg.

COMPLETE IRON OR STEEL PIPE LINES. BRUSH WATER TURBINES. <i>Estimates Submitted on Complete Light and Power Plants</i> <i>We can tender on Anything Electrical.</i> <i>Remember The Quartzlite Lamp.</i>	B R U S H ELECTRIC MOTORS GENERATORS FANS AND BLOWERS TRANSFORMERS LAMPS AND SUPPLIES STEAM TURBINES— HIGH SPEED ENGINES
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Contract Record

ESTABLISHED 1886

A Weekly Journal of
Building, Contracting, Engineering, Public Works
Municipal Progress, Advance Information

PUBLISHED EACH WEDNESDAY BY

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SUBSCRIPTION RATES

Canada and Great Britain, \$2.00 U.S. and Foreign, \$2.50

Vol. 25

February 1, 1911

No. 5

The Canadian Society of Civil Engineers

The annual convention of the Canadian Society of Civil Engineers at Winnipeg last week provided further evidence of the rapid development of this institution, of the excellent work which is being carried on by its various committees and of its indispensableness to the profession at large.

Of the many significant things that one might notice in connection with this meeting, the general recognition of the status of the Society is particularly worthy of mention. The members may well feel an appreciable measure of gratification in that their Society is the only one that has been accorded free transportation by a Canadian railroad. Such a concession on the part of the Canadian Pacific Railway truly is a great tribute to the profession and an acknowledgement of its supreme importance in advancing the best interests of the country. Then there was the magnificent reception by the Winnipeg civic officials, a proof that one of the most progressive cities on the continent considered the occasion worthy of its best effort.

An important work which the Society is only just undertaking consists in the preparation of standard specifications governing the various branches of engineering work. In this connection the Society's reports on cast iron pipe and cement are of the greatest value. Standard specifications for steel structures are now under consideration. It is hoped to bring these before the next annual meeting.

The committees on the various branches of transportation have completed portions of their work. An important contribution next year will be a discussion on the relative value to the country of railways and canals as a means of communication between the Great Lakes and the seaboard. Particular regard will be had in this discussion to the much discussed Georgian Bay ship canal, as regards the expediency of the construction of which some engineers, at least, have entertained serious doubts.

A few facts concerning the policy and inside work of the Society may be of special interest at this juncture.

In the first place, the Society aims to develop as a truly national institution and to extend its influence to all parts of the Dominion. The first step in this direction was the establishment of the branches formed in Quebec, Ottawa, Toronto, Winnipeg and Vancouver. In addition to these, branches will be formed at an early date in Halifax and Edmonton, thus establishing a chain around the country and linking up the interests of the profession in a manner that will mean much for its ultimate development. Supplementing this the Society has endeavored to pay adequate attention to important centres outside of its headquarters by holding its annual convention whenever possible at the home of the retiring president. It may be said that in so doing there has been no intention of neglecting Montreal, which will possibly be the seat of the 1912 convention. In pursuance of the same broad idea of development, the council, under the revised by-laws of the Society, must necessarily be representative of the whole country, since three members must reside in the Maritime Provinces, three in the Province of Quebec, three in eastern and three in Western Ontario, three in Manitoba and three west of the last named province. These are in addition to the six councillors residing at headquarters, upon whom devolves much of the Society's routine work.

The chief means which the Society adopts for the advancement of engineering knowledge is the publication of professional papers. Much of the difficulty experienced hitherto in obtaining such papers is expected to be overcome by the more complete co-operation of the branches. It is now arranged that papers may be read at the branches independently or concurrently with headquarters, and that such papers, on the recommendation of the branches, will be published in the Society's transactions. The latter arrangement is regarded as a particularly wise enactment. One of its greatest advantages will be the spirit of rivalry among the branches which it will stimulate, a consideration which is strengthened by the possibility that the medal awarded for the best paper during the year may be presented in this way to a member of one of the branches.

The Canadian Society of Civil Engineers is an institution in which the country should have a national pride. At this stage of our development, engineering occupies perhaps the most important place in the professions and the standing of an engineer in the Society is an indisputable measure of his standing in the community.

Among those who are identified most closely with the work of the Society and who are the most interested in its welfare there would doubtless be a feeling akin to resentment if a special tribute were not paid to Professor McLeod, whose zealous devotion during the twenty-one years that he has been Secretary of the institution has contributed so much to its advancement.

A permit was taken out just before the close of 1910 for what will be the largest office building west of Toronto; to be erected on the southwest corner of Homer and Pender streets. The structure will be 13 stories in height and will contain 308 offices and suites, served by four elevators. In the basement will be located one of the finest cafes on the coast. The building will cost \$650,000.

Over 15,000 cubic yards of rock will be required for the foundation of the new steamship pier being constructed by the C. P. R. on Vancouver harbor front.

The Close of a Notable Life

News of the sudden and tragic death of Mr. J. E. Schwitzer, of Montreal, on January 23rd, was learned with keen regret by railroad and engineering circles in many parts of Canada. Mr. Schwitzer's demise came at the moment when he had just reached one of the highest positions in his profession. He had been chosen three weeks previously to fill the post of Chief Engineer to the entire C. P. R. system. He was attacked by la grippe and was removed to the Royal Victoria Hospital within three days of taking up his new duties. Pneumonia set in and he became steadily worse and passed away after a short illness. The body was taken to Ottawa for interment.

The late Mr. Schwitzer was born in Montreal on April 19th, 1870, and graduated from McGill in 1891 with a degree of B.A.Sc.

His first position was with the Temiskamingue Colonization Railway as a roadman and later he became engineer on location and construction for the



The late Mr. J. E. Schwitzer, Chief Engineer of the C. P. R.

Ottawa and Gatineau Railway. From January to July, 1892, he was engaged in land surveying and engineering at Ottawa and from then until September, 1896, he was assistant engineer on location and construction, of the Parry Sound Colonization Railway and engineer in charge of the Central Counties Railway between South Indian and Rockland for the Canada Atlantic Railway. Then for three months he was busy surveying for the Hull Electric Railway, after which, until July, 1899, he went into private practice as a civil engineer and land surveyor at Rat Portage, of which town he was appointed engineer in 1898.

Mr. Schwitzer returned to railway work in July, 1899, when he was appointed assistant engineer of the C. P. R. in charge of terminal improvements at Rat Portage and afterwards became assistant engineer of maintenance of way at Winnipeg. His next promotion was to the post of resident engineer of district No. 2 of the C. P. R. at Winnipeg and later he became divisional engineer of the Central division of the same road.

In 1905 Mr. Schwitzer was appointed engineer of western lines of the road at Winnipeg and in 1907 as-

sistant chief engineer of the same district. His appointment to the post he held at his death was announced on January 1st of this year; it was a position which had not been held for some time.

Sir Thomas Shaughnessy thought very highly of the late Mr. Schwitzer, and when told of his death said: "It is impossible to put into words the great loss the company has sustained in the death of Mr. Schwitzer but it is even harder to speak of the loss to his personal friends who have watched his progress. Personally and officially I can say that he cannot be replaced."

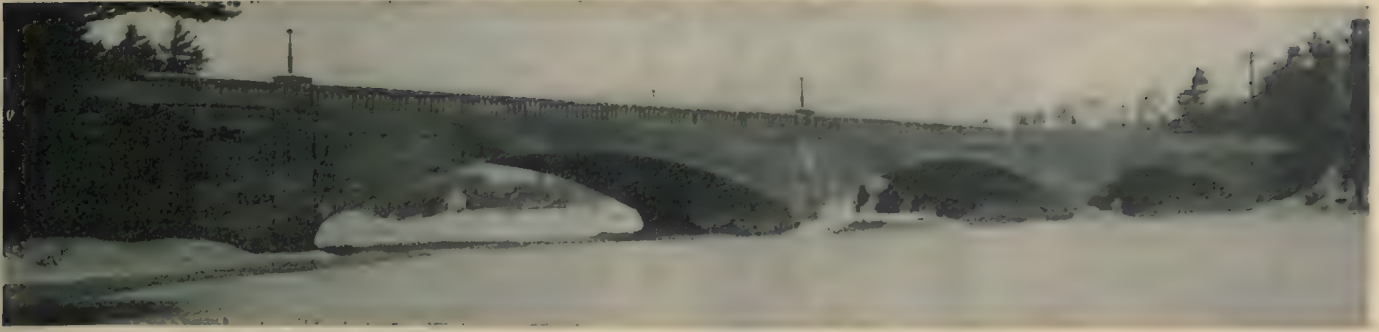
Temporary wooden bridges are being built across the River Po to furnish crossings in the vicinity of the grounds on which will be located the various buildings of the international exhibition which will be held in April to commemorate the fiftieth anniversary of the Kingdom of Italy. The largest bridge, according to "The Engineer," is being built with two levels, the lower one for moving platforms and the upper one for pedestrian traffic. The river at the bridge site is about 650 ft wide and the bridge is slightly less than 1,000 feet long. It has five spans. The roadway is supported by four sets of four piers, each pier consisting of four vertical timbers braced by horizontal pieces. All connections are by iron bolts and plates. The trusses are of the Howe type. The lower roadway is carried just above the lower chord, while the upper roadway is a deck supported above, but not on, the top chord, by posts directly above the verticals of the trusses. On these posts is the usual floorbeam and stringer construction for carrying the decking. The river Po occasionally changes from a quiet stream into a swollen torrent and the bridge construction is necessarily heavy to guard against the possibility of the structure being damaged during a flood period.

The parties behind the scheme to build a scenic railway to the summit of Grouse Mountain, in North Vancouver, B.C., are Messrs. Macdonell & Gzowski, the well-known engineers and railway contractors; Chas. H. Allen, barrister, formerly of Winnipeg, and later of San Francisco; Geo. M. Gibbs, broker, and formerly inspector and later manager at Dawson of the Canadian Bank of Commerce; and Walter E. Graveley & Co. The idea is to build a mountain railway similar to that up Mt. Tamalpas, near San Francisco, and to have an hotel and summer resort on the summit, with cottages for summer residents.

The decision of the C. P. R. Company to transform its coasting fleet gradually into oil burners calls for provision to be made for the storage of oil. A huge tank capable of holding 50,000 barrels will be located on the Inlet foreshore, at the end of Bute street; from this tank pipes will run along the wharves and connect with a smaller tank holding about 20,000 gallons.

The building permits in Victoria for 1910 reached the record total of \$2,371,095, as compared with \$1,773,420 for 1909, and \$1,130,740 for 1908. The expenditure on civic improvements has been large, and the city is being beautified in many ways.

There is a strong probability that the British Empire Bridge Works, of Birmingham, Eng., one of the greatest firms in its line on the globe, will establish an engineering and construction branch near Vancouver, to cost \$5,000,000.



Inverlea Bridge, Peterborough, Ont.—Looking North, January 7, 1911.

A Noteworthy Reinforced Concrete Bridge

Detailed Description of the Inverlea Bridge at Peterborough Ont. — Features of Design and Construction—Cost and other Data

Contributed by T. A. S. Hay, City Engineer, Peterborough.

This bridge spans the River Otonabee in the line of Smith Street in the city of Peterboro, Ont., and replaces a wooden Howe truss bridge.

It consists of three arched spans of reinforced concrete, 100 feet centre to centre, or 94 feet clear, with abutments reaching well into the river banks on both sides and beyond the shore lines, making a total length of structure of 385 feet.

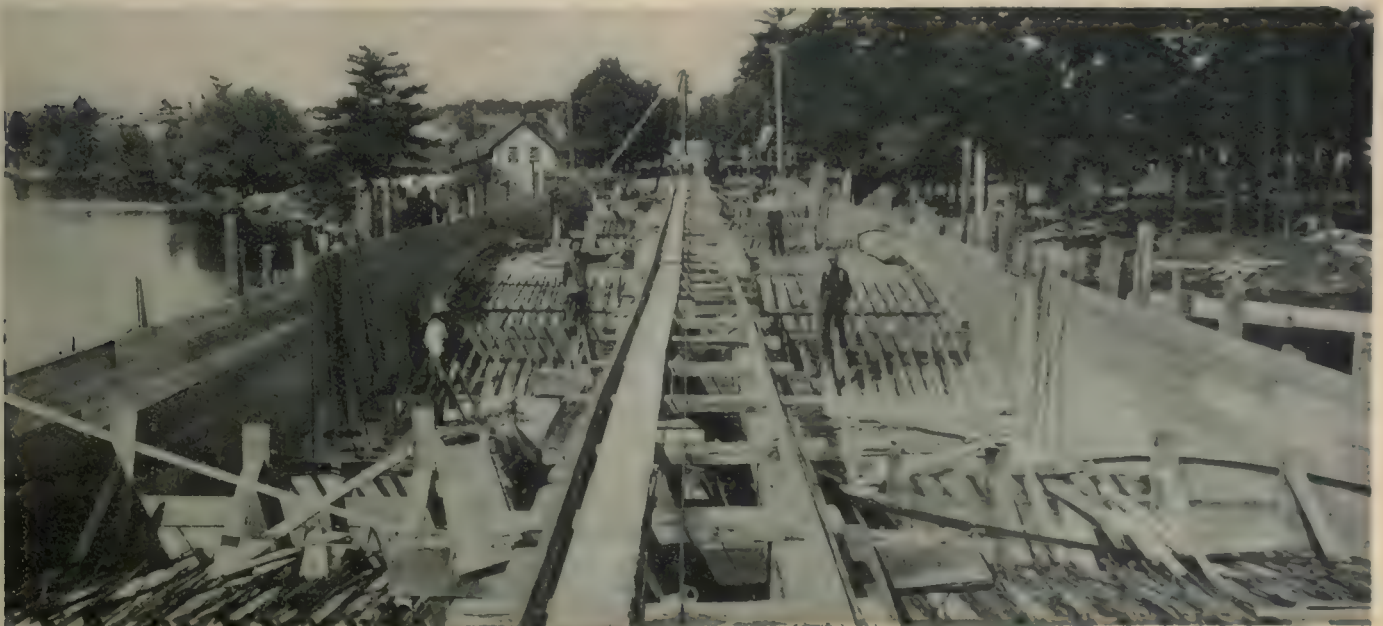
The arches were designed to sustain a maximum live load represented by a 15 ton road-roller. The clear width between railings is 31 feet, sidewalk 5 feet wide on south side, a space 10 feet wide for single track street car line on north side, and 16 feet roadway between. The centre line of the bridge makes an angle of 72 degrees with the channel of the river. The intrados of arch is a two centre curve or 3 feet 9 inches, 120 feet radii and a rise of 12 feet. The extrados is a segment of a circle of 170 feet radius. The arches have a radial thickness of 22 inches at crown to 48 inches at the point of lesser radius, 45 feet from crown.

The west abutment rests on a compact mass of

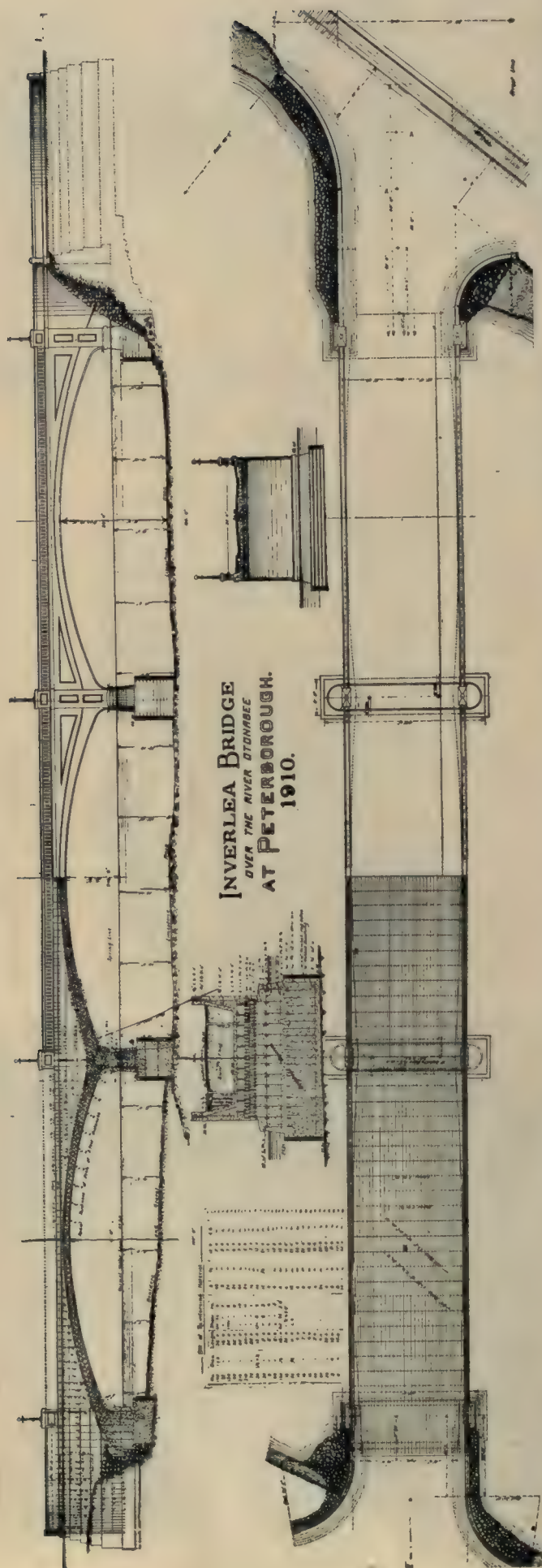
boulders and heavy gravel. The two channel piers and east abutment rest on a heavy bed of limestone rock. The footings of abutments and wing walls are carried up to 3 feet below normal level of water and those of channel piers to 5 feet. The width of footings of the wing walls is 5 feet 3 inches, of the abutments 12 feet, and of the piers 9 feet 8 inches.

The piers above footings are battered 1 in 8 to 6 feet wide at top, with belt course extending 3 inches; bull-nosed ends protected with 5-16 inch plate iron. Owing to the depth of water (6 to 16 feet) and speed of current, unwatering for foundations was not attempted, but the beds for footings were cleared of all loose materials and to a satisfactory bottom. Cribbs of 10x10-inch close fitting timber lined with 1-in. vertical matched sheathing, were lowered into position, weighed down and filled with concrete, deposited through a tube in 6-in. layers, well rammed, in which stone from 6 to 10 pounds weight were embedded.

The footings having been brought up to proper level, permission was obtained to lower the water sufficiently



Constructional View of Inverlea Bridge from East End, July 30, 1910.



to set the forms and build up to belt course. Owing to inconvenience to power plants by loss of head, this part of the work had to be carried on as quickly as possible, as the time allowed for low of level water was limited to 14 days. The concrete in footings consists of one part cement to seven parts gravel and sand, and generally in all parts above footings the composition is the same.

The false work for arches consisted of bents of 10x10 timber placed transversely with centre line of bridge and spaced 8 feet apart, centre to centre, with longitudinal stringers 4 feet apart on top, forming a deck level with spring line of arches. On this deck the centering was erected, consisting of laminated rings of 2-inch plank, bolted together with a section of 10x10 inches, supported on posts braced in both directions. On the rings was laid the lagging of 3-inch pine plank dressed and scribed to the radii of arches, all joints being calked. The concrete in arches consists of one part cement to six parts gravel and sand, built in voissior sections, full width of bridge, commencing at spring of arch and working towards the centre and maintaining full depth.

The concrete in spandrel walls is composed of one part cement to seven parts gravel and stone. They are 18 inches thick at top, battered inside 1 in 4 and panelled outside 2 inches deep. The concrete in wing walls is of the same composition as spandrels. They are 18 inches thick at top, increasing by 9-inch steps at every 3 feet vertically.

The hand rail is composed of concrete one part cement to six parts gravel and sand. The part over arches is a balustrade of 6x8-inch balusters, with 6-inch spaces. That along the wing walls is solid, 8 inches thick. The base of railing is 16 inches wide by 15 inches deep. The cap is 12 by 8 inches. The railing is divided into sections by panelled pediments 2 feet wide by 4½ feet long, projecting 4 inches beyond faces of railing, one over each abutment and pier. The rail is terminated at outer ends of wing walls with posts 18x18 inches.

The faces of walls are relieved by a sailing course on the line of intrados of arch and projecting 2 inches beyond face. The forms for all parts above water, except arches and hand-railings, consisted of 2-inch pine plank, dressed, tongued and grooved, and painted with soft soap, posts and braces being of 4x4-inch pine, 30 inches apart.

All concrete above water was mixed and run as liquid as practicable to ensure filling. Expansion joints, tongue and groove, were made in spandrel walls and railings over each arch.

The reinforcing adopted throughout the structure consists of the Kahn System, manufactured by the Trussed Concrete Steel Company of Canada, Limited. The design conforming to the usual formula for parabolic arches, (although more elliptic than parabolic as designed) each arch is computed to have a rise of only one-tenth of span or 9.40 feet from springing line to the intrados at the crown. The actual rise, however, is 12 feet, thus giving an additional factor of safety which more than takes care of the difference in assuming the arch to be parabolic.

The horizontal component of thrust of one arch is neutralized by that of the adjoining arch and the effect is a downward thrust on the piers. This result is only obtained when the spans are equal and under the same conditions of loading.

Owing to the length of span it would have been practically impossible to have made the longitude steel reinforcing bars continuous throughout each arch. It was therefore important to enquire into the best position for splices in such members. Although it would be pos-



Inverlea Bridge from East Bank, looking up stream, July 30, 1910.

sible to splice two bars, to be embedded in concrete, so that the joint would be as strong as the bar, this is seldom done in practice. For this reason splices should be placed where the tension is least.

The severest loading of an arch of this type occurs when one half (from centre to abutment or pier) is under full load, while the other half is not loaded. Under these conditions the maximum tension occurs in the extrados at a distance of about one third of the span from abutment (or pier) at the unloaded end. This, therefore, is a point where the longitudinal reinforcing bars in the extrados should *not* be spliced. Under a central load, tension may be produced in these bars in the intrados of the arch, which is a point where *no* splicing should occur. In the design of this bridge the splices have been kept as far from these points as possible.

Owing to vibration caused by heavy moving loads, and the variations in stresses under varying conditions of loading, the danger of the reinforcing bars becoming loose in the concrete is provided against by the use of "Kahn" trussed bars. These form a perfect anchorage, having the long shear prongs bent into the body of the arch and attached rigidly to the main tension members.

The reinforcement of arches in intrados consists of 35 "Kahn" bars, 1 x 3 inches, and 12 inches centres, with prongs bent upwards 45 degrees; and in extrados 34 "Kahn" bars, 1 x 3 inches, 12 inches centres, with prongs bent downwards at same angle. These bars are 33 feet long with splices 2½ feet long. They are placed with extreme angle of rib 3 inches from surface of finished concrete.

A row of ½-inch bars 32 feet long and 9 feet apart are placed inside and adjoining intrados bars, with the same for extrados bars, the latter placed over middle of space of lower row. Intrados bars extend to centre of abutment body and cross the corresponding bar of next span over pier and to 8 inches from face of pier. Extrados bars extend to rear of abutment body and cross at piers as with intrados. Over each pier are set 11 saddle

bars, 1x3 inches, 16 feet long, 36 inches apart centres and with prongs downwards.

The total weight of reinforcing steel in bridge is 70 tons. The upper surfaces of arches were painted with asphalt paint laid hot. The total amount of concrete in structure is 2,754 cubic yards. The cement used was "Monarch" brand, manufactured by the Lakefield Cement Company.

The contract prices were \$9.30 and \$11.22 per cubic yard for reinforced concrete in place, including forms,



Putting in Bottom for West Channel Pier.

false-work and removal of same. The centering was struck 60 days after last of concrete (below hand rail) was laid. The gravel used in concrete was first grade clean gravel, with 35 per cent. of coarse, sharp sand, hauled three-quarters of a mile, costing 75 cents per cubic yard delivered.

Gravel filling for roadway was carried up to sub-



Inverlea Bridge, Peterborough.—Coffer Dam for West Abutment.

grade before the centering was struck. This will be topped with crushed stone next season. This gravel was procured from the Corporation gravel pit and was of a coarser grade than that used for concrete. Cost for loading, hauling and spreading was 36 cents per cubic yard, hauled three-quarters of a mile.

Drainage for road is provided for by 6-inch tile running from surface down through gravel filling and discharging vertically at each side of piers. The sidewalk has not been laid yet as it is intended to lay mains, for water and gas, and ducts, for wires, beneath it next season. The bridge is lighted by eight lamps on cast iron posts set on the pediments, the wires for which are conveyed in galvanized iron ducts built into base of railing.

The actual time occupied in erection was ten months, which included the removal of old bridge. The total cost when completed will be \$35,000.

The bridge was designed by T. A. S. Hay, city engineer, and built by Messrs. Conroy Bros., and the construction was superintended by Inspector W. J. Martin, all of Peterborough, Ont.

Improved Municipal Government

Two addresses were given in Montreal last week by Mr. Clinton Rogers Woodruff, secretary of the National Municipal League of the United States, on "The New Municipal Idea," which he elaborated as one in which graft was eliminated and cities secured not only honest but efficient men to run their affairs.

The past twenty years, since the publication of Mr. Bryce's famous book on the American Commonwealth, he said, had marked a new era in national and municipal life in the United States, which had grown from a general pessimism of two decades ago to a spirit of hopefulness to-day. The National Municipal League had been organized in 1891, under depressing circumstances. But to-day they had over a thousand organizations working for the betterment of municipal conditions in all the larger cities.

"Twenty years ago," continued Mr. Woodruff, "a grafter was regarded as a successful and shrewd politician, but to-day publicity and the growth of public opinion makes a recurrence of such a condition difficult, if not impossible. But we want more than that. We want not merely honesty, but efficiency in civic affairs. Civic business, like any other, needs men of ability who will devote their time, energies, and careers to the subject. In Germany this professionalism is recognized to the extent of having professional mayors and it is no infrequent thing to see a municipality advertising for a mayor.

As an example of the growth of the new municipal idea Mr. Woodruff stated that in the United States there were 100 cities under government by commission, while 200 more were seriously considering the matter. What was needed was not the practical politician, but simpler methods of city government.

To-day in most cities the mayor and officials recognized they were servants of the public, and wherever the people gathered to discuss public matters they were to be found. In various United States cities the mayors even went so far as to publish periodical journals, to tell the public what was being done with their money for the public good, while in New York a mayor elected by Tammany had organized a "Budget Exhibition," to show the people in simple manner what was being done. Further than this in the cities governed by commission the idea of party politics had

been cut out, and the ballots did not mention whether candidates were Republicans, Democrats or anything but men anxious to serve the city.

The whole idea of the movement was democratic, to secure for the people honest and efficient government by the people, and he had been much impressed to find this same democratic principle in civic life as strong in Canada as in the United States.

"And here in Montreal," concluded Mr. Woodruff, "if democracy is to be triumphant and successful as in other cities it must be by the co-operation of every man, woman and child within your borders. We cannot depend upon any imposed government. Every one of us must recognize that we have a part in the up-building of the city, and success can only come by each taking his or her particular place in the machinery of civic life."

Concrete piers will be used by the Westholme Company, of Victoria, in constructing the large government wharf at Prince Rupert. At the present time the only other place where the concrete pile is in use is in San Francisco, where it has proven to be a great success. In the great southern port the piles used range from 16 to 20 feet in length, but at Prince Rupert the great depth of water will necessitate a minimum length of 40 feet and a maximum of 100 feet. With their tremendous weight no driving will be required and they are so constructed that once the bottom is reached a firm and solid basis is assured through a suction tube through which all the loose mud and deleterious matter can be drawn to the surface. Each pile is sixteen inches square. The centre is perforated by a steel pipe which runs right through. This is for extracting all the matter between the bottom of the pile and the solid rock. Round the tube are placed four reinforcement girders which play the part of grapples. In order to render them stiff and immovable they are circled by stays at intervals of five feet. Outside these steel ribs is placed a closely latticed network of wire to give the concrete a groundwork. A huge derrick will place the piles in position, a task that will entail a considerable amount of power as the average weight of the piles is about sixteen and a half tons.

The business men and other level-headed citizens of Vancouver rejoiced at the recent announcement that the Vancouver Dry-dock and Shipbuilding Company had definitely undertaken the construction of a huge drydock at Roche Point, on the north shore of Burrard Inlet, some miles east of the city at a cost of \$1,214,154. The dock is to be started within six months and completed by December 1st, 1912. The Dominion government will grant the usual subsidy of 3½ per cent. for twenty-five years on cost of construction providing the stated conditions are complied with. It is likely that the Grand Trunk Pacific Railway Company will apply for a subsidy for a similar dock at Prince Rupert, as the British Columbia fleet of ocean and coasting steamers is increasing so rapidly that two docks will be necessary in the near future.

Next summer Granville street, Vancouver, will be extended and paved clear through to the north arm of the Fraser on the south, making a thoroughfare six miles in length. From the present city boundary the work is being carried through by the Provincial Government and the C. P. R. for the benefit of their Point Grey holdings.

Organization of Road Building in Canada

With Special Reference to the Methods Employed in Ontario— Provincial Aid to County Roads—Success of Prison Labor*

By W. A. McLean, Provincial Engineer of Highways for Ontario

Road building is a matter of admittedly great importance throughout Canada. As with the United States, we have a country of magnificent distances, and adequate provision for transportation is an important factor in national development.

Road construction from the standpoint of climate, topography, material, and traffic shows great diversity. We have moist climate, and dry climate; extremes of cold and heat; the mountains of British Columbia come into close contact with the level prairies of Alberta, Saskatchewan and Manitoba. Through Ontario and Quebec, to New Brunswick and Nova Scotia the country varies from mountainous and forest covered, to fields of rolling fertility. Through the prairies there is a "log drag" area where road metal is non-existent. In other districts the metal available varies from Laurentian granite to limestone or more recent glacial deposits of gravel. Traffic in some cases is that of automobile travel between large cities; in others that of the strictly rural highway; in others the prairie or forest trail, or the mining road over mountains and muskegs. The road question is with us, in all its varying forms.

Road making in Canada, with some exceptions, has been a strictly municipal function until the last decade. In that period practically all provincial governments have adopted some measure of provincial legislation equivalent to state road laws. In some cases it amounts merely to engineering advice and instruction; in others it is a substantial measure of provincial aid. None of these laws are, as a rule, modeled after those of another province, or of another country, but have grown, as it were, from the native soil, according to local requirements and conditions.

Thus the laws of Quebec are framed to harmonize with old French customs, chief of which was that each farmer should be responsible for the road in front of his property. In Nova Scotia the feeling of the people has been trained to accept provincial measures. In Ontario, ideals are more favorable to local government so that the provincial authorities have not moved along the line of provincial aid as fast as would be possible in other provinces and states. The federal government of the Dominion does not give aid to road building, nor does it maintain an office in any way similar to the Office of Public Roads at Washington.

The Ontario System

It is with respect to Ontario that I am best qualified to speak, having charge of the highway division of that province, a branch of the Provincial Department of Public Works. Roads in Ontario are constructed under three different systems or organizations:

1. By townships.
2. By counties.
3. Colonization roads by the provincial government.

To an understanding of these, it is to be explained that the province of Ontario is divided into two almost distinct parts: (1) Southern or Old Ontario, lying south of a line drawn due west from Ottawa to Penetanguishene, covers an area of 35,000 square miles. This district is closely populated and is devoted almost wholly to agriculture. (2) Northern or New Ontario, including the whole of the province north of the line between Ottawa and Penetanguishene comprises an area of over 100,000 square miles. This district is sparsely populated; is for the most part rough and broken, and while

some parts are suitable for agriculture, it is chiefly as yet devoted to mining and lumbering.

Township System in Southern Ontario:—The greater mileage of roads in the older part of Ontario is under the control of the township councils. These township roads are maintained solely by township expenditure raised by direct taxation, supplemented by statute labor. In numerous townships statute labor is commuted or wholly abolished and road construction placed on an entirely cash basis.

In the near future statute labor will undoubtedly be done away with by all townships, as I believe that public feeling is strongly turning toward that end. I have recently shown that township councils spent last year in cash, on purely township roads, over \$1,400,000, and over 1,100,000 days of statute labor, equal at least to \$2,500,000. In the next ten years townships will at this rate spend twenty-five million dollars, and unless better methods are followed there will be little of permanent value from this outlay. Under more efficient methods of managing labor, which I hope to see adopted, such an outlay should produce substantial improvement, and although our people are conservative, it remains to appeal to their good judgment to attain the object looked for—an entire cash system under a permanent road superintendent in each township.

Provincial Aid to County Roads

The distinctly "good roads" work of Ontario, in addition to educational measures, is in connection with county council management. The act to "Aid in the improvement of Public Highways" provides for the establishment of county systems of highways, these to be aided by the provincial government to the extent of one-third of the cost of construction. These roads are built under government regulations, and are subject to government inspection, but otherwise county councils have control of the entire expenditure. The best and more expensive macadam roads in the province are being built under this system.

Under this act, a county council may assume the main roads within the county, usually comprising from 12 per cent. to 15 per cent. of the road mileage in each township. These roads are built in a permanent manner, the work being in charge of a superintendent or engineer appointed by the county. At the end of each year the county treasurer transmits to the Provincial Highways Division a statement of the county road expenditure. One-third of this amount is then paid to the county, through the provincial treasurer. The work is carried on from year to year by the county, and annual payments are made by the province until the county system is constructed in a durable manner.

To the present time about 1,200 miles of road have been built under this act, and the beneficial results are becoming apparent. For \$2,500,000 more permanent results have been accomplished than by township councils in the past twenty years, with an expenditure estimated at thirty millions.

One feature of the provincial grants is that they are not distributed according to any schedule of assessment, population, or area. The only basis is the cost of the roads, and the amount county councils are willing to spend on them. The provincial grant includes one-third of the cost of bridges, so that as compared with some state laws, the Ontario proportion would more nearly equal one-half. Rivers and streams are large and numerous, and the bridges being built are of a substantial type, consisting of reinforced

*Presented at the Annual Convention of the American Road Builders' Association.

concrete arches, reinforced concrete beams with concrete floor; or steel trusses with concrete floors and abutments. To receive the provincial grant, bridges are to be built under the general specifications of the Highways Division.

Roads of Northern Ontario

Colonization roads are constructed under a colonization road act, which is applicable solely to northern Ontario. This act may be divided into two parts:

1. The grants and expenditure made solely by the provincial government under officials and foremen appointed by the provincial government. These are the only roads built solely by the provincial government, and vary in character from well graded forest roads to heavy macadam, well rolled and drained.

2. The second system of procedure under the "Colonization Road Act," is one whereby any organized township in northern Ontario may vote a sum to be spent on a certain road or roads. A provincial grant of from one-third to two-thirds of the township expenditure is made under this plan. The total provincial expenditure on colonization roads and bridges in 1909 was about \$700,000.

Prison Labor on Roads

An especially interesting departure in Ontario at the present time relates to prison labor for road purposes. Each county in the province has a county jail in which are confined short term prisoners. To relieve the county jails, the province maintains a central prison, where convicts with terms of from three months to two years are detained. For terms exceeding two years convicts are sent to the federal penitentiary at Kingston.

The existing provincial prison having become inadequate, the present provincial secretary, Hon. W. J. Hanna, conceived the idea of a prison farm. This, recently purchased, contains 800 acres of land, and was chosen not only for its farming possibilities, but for its value, in part, as a stone quarry, where it is intended to crush stone for use on roads built or aided by the province.

For the past season from 180 to 200 prisoners have been kept in temporary quarters on this farm, cultivating, cleaning up, building workshops and constructing a concrete bridge 148 feet in length. Roads through and around the farm will be among the first works undertaken, in order that as a prison farm, any part can be quickly reached. Railway switches are to be put in, and arrangements for the shipment of crushed stone are proposed in due course, as the permanent buildings needed on the farm become completed.

In northern Ontario, rather than bring men several hundred miles to the central prison, they have been sent into the northern districts to open roads through bush, mining, and as yet sparsely occupied country. Two camps have been maintained of about fifty prisoners each, and four guards with each camp.

Both at the prison farm in southern Ontario and at the colonization road camps in northern Ontario, there are one or two features which have attracted wide attention. The prisoners are given plenty of wholesome and appetizing food such as some of them would not get for a Sunday dinner at home. The guards do not carry a weapon of any kind. Instead of being "guards" in the ordinary sense, they are working foremen, leading and inspiring the men, instead of driving them.

One misses the sullen abject despair that so often characterizes prison life. The prisoners are, as a rule, sent down for minor offenses, more often the result of drink or bad associates than a criminal disposition.

With constant, healthful employment, good food and good leadership, prisoners coming to the farm and the road camps physical wrecks, are sent away at the end of their terms vastly better physically, and, therefore, we believe, better morally. They have been taught how to do an honest day's work.

Without any sentimental view as to the desirability of punishment, it is, after all, results we are looking for. My contact with this work for the past season has been intimate and I am strongly impressed with the belief that experience in Ontario will show that a new era has been reached in the treatment of a large class of prisoners to the betterment of themselves, society, and the roads.

County jails have usually from three to a dozen prisoners confined. A description of our convict work would not be complete were the case of one Ontario county omitted, in which the prisoners are employed in making concrete tile for road culverts. The necessary materials, gravel, cement, collapsible forms, etc., are kept inside the jail yards and pipes up to three feet in diameter are sold at a low rate to the local municipalities or are used on county roads.

To this I must add that public feeling in favor of better roads is fast gaining ground in Ontario, and what the future may bring is hard to foretell. One citizen, Mr. J. C. Eaton, and the company of which he is president, under my direction has spent \$20,000 in building a sample road three miles in length adjacent to Toronto. We have active roads organizations, doing educational work. The city of Toronto has introduced a by-law, which I believe will be ratified, to grant \$100,000 to aid the improvement of county roads adjacent to and radiating from the city.

Comparatively few farmers in Ontario as yet use automobiles but the number is steadily growing. The motor principle is destined to a tremendous application to highway traffic, and in my opinion that day, with the consequent demand for good roads, is approaching so rapidly that it may be doubtful policy to force public opinion too urgently at the present time, as a demand may readily be reached beyond the ability of a government to satisfy.

Exhibit of Engineering Instruments at Winnipeg

The Eugene Dietzgen Company, Limited, had a noteworthy exhibit of engineering instruments at the Royal Alexandra Hotel last week during the convention of the Canadian Society of Civil Engineers. An instrument that received most favorable comment was the Percenter Level, which has been designed to afford a ready means of determining quickly and accurately with but one operation the grade per cent. between any two points, without measuring the distance between the same and without any calculation or reference to tables. The instrument appealed particularly to railroad engineers and road builders on preliminary work.

The railroad dumpy shown was a low priced but serviceable instrument possessing a good quality telescope, length 15 inches, magnifying power 25 diameters, achromatic terrestrial, powerful and of good definition, with a sensitive level vial, weight 7½ pounds.

A new 3-screw transit and a high power telescope were also shown. Additional features were a rail profile machine for determining the wear of any rail within a few minutes without taking out the rail, cutting or distributing the road-bed, and the Noyes draughting machine, which eliminates all lost motion. A general line of up-to-date engineering instruments made up the balance of an interesting exhibit.

At the meeting of the Montreal Art Association last week, the secretary, Mr. J. B. Abbott, stated that in order to obtain the highest possible type of a modern art gallery and school of art, it was decided to appoint Mr. E. M. Wheelwright, of Boston, to pronounce upon the merits of certain plans submitted to him in competition, and to act in conjunction with the successful architect in the preparation of the final plans. The competition was decided in favor of Messrs. Edward and W. S. Maxwell, and as Messrs. G. A. Fuller, Co., Ltd., of New York, were found to be the lowest tenderers the contract for the erection of the whole building in marble for \$301,087, was awarded to them.

Civil Engineers' Convention at Winnipeg

Record Gathering in the Western Metropolis—Enthusiastic Reception by the City—The Proceedings: Reports, Discussions, Papers, New Officers

The twenty-fifth annual meeting of the Canadian Society of Civil Engineers, which was held at the Royal Alexandra Hotel, Winnipeg, January 24-27, was attended by nearly 300 members, a considerable number of whom were accompanied by ladies. Special arrangements had been made for the transportation of members from eastern and western points, and the response to the Society's invitation was a source of much gratification to the indefatigable secretary, Professor McLeod, and the general directorate of



City Engineer Rust, of Toronto, the new President of the Canadian Society of Civil Engineers

the institution. A perusal of the list of members present, published below, will demonstrate the representative nature of the attendance.

Those Present:

H. N. Ruttan, Winnipeg.
C. H. Rust, Toronto.
J. Galbraith, Toronto.
John Kennedy, Montreal.
Wm. Kennedy, jr., Montreal.
W. P. Anderson, Ottawa.
G. A. Mountain, Ottawa.
G. H. Duggan, Montreal.
Duncan MacPherson, Ottawa.
L. A. Herdt, Montreal.
C. H. McLeod, Montreal.
R. J. Durlay, Montreal.
R. F. Uniacke, Ottawa.
W. Chase Thomson, Montreal.
Chas. H. Dancer, Winnipeg.
Edward P. Fetherstonhaugh, Winnipeg.
W. V. Taylor, Quebec.
E. E. Brydone-Jack, Winnipeg.
E. Brandon, Toronto.
F. M. Davis, Windsor, Ont.
Harry B. Miller, Montreal.
C. Loch Trimmingham, Montreal.
A. Don Swan, Montreal.

H. A. K. Drury, Winnipeg.
H. L. Johnston, Winnipeg.
F. G. Earle, University of Manitoba, Winnipeg.
G. W. N. Day, Toronto, Editor Contract Record.
N. B. McTaggart, Winnipeg.
A. L. McDougall, Ottawa.
H. Saltzman, Winnipeg.
J. N. de Stein, Rivers.
W. E. Hobbs, Winnipeg.
Geo. E. Bell, Winnipeg.
S. G. Karlan, University of Manitoba, Winnipeg.
J. R. Reid, Colonsay.
R. G. Saunders, Moose Jaw.
B. S. McKenzie, Winnipeg.
E. F. Chandler (Am. Soc. C. E.), University of North Dakota.
Guy C. Dunn, Winnipeg.
N. E. Brooks, Calgary.
K. S. Patrick, Winnipeg.
J. B. Phillips, Winnipeg.
Newton Wallis, Winnipeg.
F. St. C. Farran, Edmonton.

E. H. Harrison, Winnipeg.
Geo. A. Bayne, Winnipeg.
W. Z. Earle, Winnipeg.
T. C. Irving, jr., Toronto.
A. S. Innes, Winnipeg.
De Gaspe Beaubien, Montreal.
J. A. Strumbert, Montreal.
M. P. Blair, St. Boniface, Man.
J. C. Holden, Winnipeg.
Frank Lee, Winnipeg.
Joseph Labelle, Montreal.
W. G. Chace, Winnipeg.
Matthew Neilson, Montreal.
J. Duchastel, Montreal.
Harold A. Baylis, Montreal.
Henri Dessaulies, Montreal.
F. B. Fripp, Sault Ste Marie, Ont.
J. R. Freeman, Moncton, N.B.
G. E. Howie, Fredericton, N.B.
G. W. Volckman, Ottawa.
G. Ridout, Toronto.
T. Aird Murray, Toronto.
J. Hammersley-Heenan, Montreal.
Donald A. Ross, Winnipeg.
W. Archibald Duff, Winnipeg.
W. H. Munro, Peterborough, Ont.
A. J. McDougal, Ottawa.
F. S. Lazier, Campbellford, Ont.
D. C. Tennant, Montreal.
F. P. Shearwood, Montreal.
H. M. Balfour, Frankford, Ont.
H. B. Muckleston, Calgary, Ala.
J. P. Menard, Montreal.
Arthur W. Sullivan, Valleyfield.
Eugene O'Sullivan, Montreal.
Patrick O'Sullivan, Indian Lorette, Que.
F. J. McIntosh, Winnipeg.
Aurelien Boyer, Montreal.
E. A. James, Toronto, Editor Canadian Engineer.
F. A. Creighton, Prince Albert.
Norman M. McLeod, Toronto.
G. G. Powell, Toronto.
J. M. Wilson, Moose Jaw, Sask.
William Storrie, Toronto.
A. R. Dufresne, Ottawa.
W. Hollingworth, Toronto.
A. E. Jupp, Toronto.
F. A. Wilkin, Winnipeg.
F. Crossley, Winnipeg.
O. F. Fischer, Cochrane, Ont.
Horace Longley, St. John, N.B.
R. H. Cushing, St. John, N.B.
C. W. Archibald, Truro, N.S.
J. T. Bertrand, Isle Verte, P.Q.
E. B. McLean, Moncton, N.B. of Manitoba, Winnipeg.
H. Cashdan, University of Manitoba, Winnipeg.
C. C. Chataway, Winnipeg.
W. B. Young, Winnipeg.

A. J. Papineau, Winnipeg.
W. M. MacPhail, Winnipeg.
W. E. Jenkins, Edmonton.
H. B. Fergusson, Vancouver.
T. R. Deacon, Winnipeg.
Phillip J. Duff, Montreal.
G. W. Goodall, Winnipeg.
Sherman Smith, Melville.
N. S. Tate, Watrous.
H. A. Bowden, Watrous.
H. L. Bodwell, Calgary.
L. H. S. Taunton, Winnipeg.
M. B. Henselwood, Winnipeg.
S. Wilkins, Winnipeg.
W. W. Bell, Fort William.
F. A. V. Cowley, Victoria.
C. W. Hookway, University of Manitoba, Winnipeg.
R. Cruickshank, University of Manitoba, Winnipeg.
J. H. Irvine, University of Manitoba, Winnipeg.
T. W. White, Winnipeg.
James White, Ottawa.
L. R. Gransaul, Wainwright.
Geo. F. Richan, Vermillion Bay.
J. A. Douglas, Winnipeg.
A. R. Greig, Saskatoon.
F. H. Girdlestone, Winnipeg.
W. A. James, Winnipeg.
John Irvine, Vancouver.
J. D. Ruttan, University of Manitoba, Winnipeg.
R. W. Bellhouse, University of Manitoba, Winnipeg.
Wm. D. Knox, University of Manitoba, Winnipeg.
Leslie R. Thomson, University of Manitoba, Winnipeg.
Thos. W. Brown, Saskatoon.
J. H. McKenzie, Superior Junction.
R. F. Howard, Winnipeg.
F. T. Bagshawe, Winnipeg.
R. D. Willson, Winnipeg.
Hugh D. McKinnon, University of Manitoba, Winnipeg.
J. P. Fraser, University of Manitoba, Winnipeg.
W. H. Richardson, University of Manitoba, Winnipeg.
N. L. McLeod, University of Manitoba, Winnipeg.
H. O. Canfield, Point du Bois.
H. I. Morris, University of Manitoba, Winnipeg.
H. A. Bayne, University of Manitoba, Winnipeg.
G. Halstead, University of Manitoba, Winnipeg.
W. L. McIntosh, Winnipeg.
V. H. Tait, University of Manitoba, Winnipeg.
B. S. Johnston, University of Manitoba, Winnipeg.
W. J. Dickson, University of Manitoba, Winnipeg.
C. N. Mitchell, jr., University of Manitoba, Winnipeg.
Wm. C. Fingland, University of Manitoba, Winnipeg.
D. T. Croll, University of Manitoba, Winnipeg.
John R. Black, Winnipeg.
Alex Taylor, Portage la Prairie.

D. M. Mawhinney, University of Manitoba, Winnipeg.
 A. J. Taunton, University of Manitoba, Winnipeg.
 G. L. Shanks, University of Manitoba, Winnipeg.
 T. L. Roberts, Winnipeg.
 C. W. U. Chivers, Winnipeg.
 R. H. O'Reilly, University of Manitoba, Winnipeg.
 L. Easton, University of Manitoba, Winnipeg.
 S. J. Fisher, Montreal.
 Alfred J. Stevens, Winnipeg.
 L. F. Grant, Prince Rupert, B.C.
 M. H. McPhee, Superior Jct., Ont.
 W. W. Mack, Hardwick, Vt.
 C. W. Dill, Toronto.
 Victor Michie, Winnipeg.
 A. J. Riddell, Winnipeg.
 James Riddell, Winnipeg.
 H. J. Lamb, London, Ont.
 W. C. Trotter, St. Johns, P.Q.
 Frederick H. Fay, Boston, Mass.
 A. McGillivray, Winnipeg.
 F. A. W. MacLean, Winnipeg.
 H. A. Bowman, Winnipeg.
 H. A. Alexander, Winnipeg.
 C. Donnelly, Winnipeg.
 J. J. Aldred, Winnipeg.
 E. W. M. James, Winnipeg.
 A. K. Grimmer, Medicine Hat.
 G. H. Burbidge, Montreal.
 J. T. Farmer, Montreal.
 S. S. Oliver, Quebec.
 H. Lumsden, Winnipeg.
 L. B. Elliott, Calgary, Alta.
 G. McPhillips, Winnipeg.
 J. R. Grant, Vancouver, B.C.
 F. F. Busted, Vancouver.
 F. C. Laberge, Montreal.
 S. R. Poulin, Winnipeg.
 S. H. Reynolds, Victoria, B.C.
 F. W. Anderson, Ottawa.
 J. V. Dillabough, St. Boniface, Man.
 E. D. Allen, St. Boniface, Man.
 K. R. Chestnut, Edmonton, Alta.
 F. Sedziak, Winnipeg.
 A. L. Mievill, Winnipeg.
 J. F. Earl, Superior Jct., Ont.
 L. C. Jacobs, Superior Jct., Ont.
 J. G. Legrand, Winnipeg.
 H. F. McDonald, Winnipeg.
 W. H. Jones, University of Manitoba, Winnipeg.
 Herbert Auger, University of Manitoba, Winnipeg.
 J. C. Munro, University of Manitoba, Winnipeg.
 W. S. Wallace, University of Manitoba, Winnipeg.
 W. S. Collins, University of Manitoba, Winnipeg.
 C. B. Sharpe, University of Manitoba, Winnipeg.
 L. Betourney, University of Manitoba, Winnipeg.
 H. R. Urie, University of Manitoba, Winnipeg.
 J. F. Leslie, University of Manitoba, Winnipeg.
 E. A. Childerhose, University of Manitoba, Winnipeg.
 W. T. Mawhinney, University of Manitoba, Winnipeg.
 D. A. Evans, St. Boniface, Man.
 G. A. McCarthy, Calgary, Alta.
 J. W. Harris, Winnipeg.
 W. L. MacKenzie, Winnipeg.
 J. R. C. Macredie, Winnipeg.
 M. C. Burr, Vancouver, B.C.
 A. A. Young, Montreal.
 A. S. Dawson, Calgary, Alta.
 C. M. Arnold, Lethbridge, Alta.
 C. Hoard, Victoria, B.C.
 G. H. Power, Winnipeg.
 J. Chalmers, Edmonton, Alta.
 W. P. Morrison, Maple Creek, Sask.
 W. R. W. Parsons, Regina, Sask.
 R. J. Leckie, Regina, Sask.
 Dr. Martin Murphy, Edmonton, Alta.
 C. Ewart, Edmonton, Alta.
 C. E. Cartwright, Vancouver, B.C.
 E. A. Johnson, Vancouver, B.C.
 W. Muir Edwards, Edmonton, Alta.
 F. DeC. Davies, Winnipeg.
 R. C. Smith, Saskatoon.
 Thomas C. McNabb, Winnipeg.
 M. J. Haney, Toronto.
 E. A. Forward, Winnipeg.
 H. L. Bucke, Port Arthur.
 A. W. McMaster, Winnipeg.
 H. A. Zimmerman, Winnipeg.
 A. J. Dostert, Winnipeg.
 E. R. B. Pike, Winnipeg.
 A. Q. Cavanagh, University of Manitoba, Winnipeg.
 W. W. Dynes, jr., University of Manitoba, Winnipeg.
 C. Shandon, University of Manitoba, Winnipeg.
 D. T. Townsend, Winnipeg.
 L. B. Merriam, Winnipeg.
 W. W. Mack, Hardwick, Vt.
 J. W. Dorsey, University of Manitoba, Winnipeg.
 R. E. Speakman, Brandon, Man.
 Chas. MacIntyre, Editor of Western Can. Contractor.
 F. M. Lawledge, Winnipeg.
 K. J. C. Zinck, Winnipeg.
 M. P. Cotton, Vancouver.
 D. McMillan, Winnipeg.
 G. N. Otty, Fort William, Ont.
 G. S. Roxburg, University of Manitoba, Winnipeg.
 J. Woodman, Winnipeg.
 M. H. MacLeod, Winnipeg.
 C. Harry Fox, Fort William, Ont.
 J. A. Hesketh, Winnipeg.
 A. A. McCoubrey, Winnipeg.
 A. Rimmington, University of Manitoba, Winnipeg.
 John Callaghan, Winnipeg.
 H. F. H. Hertzberg, Winnipeg.
 A. H. Aldinger, Winnipeg.
 W. McCartney, Winnipeg.
 H. A. Woods, Montreal.
 M. C. MacFarlane, St. Boniface, Man.
 E. S. Miles, Lockport, Man.
 Robert I. Lothian, University of Manitoba, Winnipeg.
 William Burns, Winnipeg.
 A. H. O'Reilly, Winnipeg.

noon with the special train from Montreal. The renewal of old friendships and the many reminiscences that were going the round stimulated the spirit of genuine enjoyment that makes the hours fly, and the pleasures of the way alone were commented upon. Montreal and Toronto to Winnipeg in mid-winter is not calculated to inspire one with a great deal of enthusiasm, but had the scenery been of an Alpine character in its impressiveness it is scarcely probable that it would have received much attention. There was so much to be heard and told that the outside world mattered little until the end of the journey. (This, of course, with apologies to the "Fresh Air Brigade," who defied the elements at White River, Schreiber and other historic points along the route).

The eastern delegates arrived at Winnipeg about ten o'clock on Monday morning, January 23, and the majority of the western members put in an appearance the same day.

News of the death of Mr. J. E. Schwitzer was received on the Monday morning and left a feeling of personal loss



Mr. C. E. W. Dodwell, of Halifax, one of the new Vice-Presidents.

with every member of the Society. A sketch of the career of Mr. Schwitzer is published elsewhere in this issue.

At the opening session on Tuesday, January 24, the President, Col. H. N. Ruttan, paid a feeling tribute to the memory of Mr. Schwitzer, and proposed the passing of an official resolution as an expression of the Society's deep regard. This resolution, which is given below, was subsequently introduced by Mr. John Kennedy, of Montreal:

"Be it resolved that the members of the Canadian Society of Civil Engineers assembled in annual meeting in Winnipeg, desire to take the opportunity of expressing their sorrow on hearing of the sudden death of Mr. J. E. Schwitzer, one of the most distinguished of the members of the society. Their sorrow is emphasized by the fact that he had just received promotion to the chief engineership of the Canadian Pacific Railway, which appointment marked the appreciation of a great corporation for one of its most able and devoted officers. Mr. Schwitzer was one of the most manly, loveable, and popular members of the society, and his death is mourned by each member as a personal loss.

"Be it resolved that the society respectfully begs to express its deepest sympathy with Mrs. Schwitzer in her great bereavement, and that a copy of the above resolution be forwarded to her."

The proceedings on the first day were mainly of a routine character. The morning session opened with the reading of the minutes of the last convention by the Secretary, Professor McLeod. These were approved, and after-

The Toronto members left at 9.30 a.m., Saturday, January 21, in a special car attached to the regular Ottawa train. At Carleton Place connection was made late in the after-

wards the reports of the Quebec, Ottawa, Toronto and Manitoba Branches were received in turn and adopted.

Reports of Branches.

The Quebec Branch, which has a membership of 49 corporate members, four Student Members and two Associates, held ten meetings during 1910. The following extract from its report may be of interest:

It is felt that the members of the Society in the Province of Quebec do not enjoy the protection which they are entitled and have a right to look forward to, according to the charter of the Society. In many cases, it has been brought to the attention of the Quebec Branch of the Society, that engineers who do not belong to the Canadian Society of Civil Engineers, have been brought in from foreign countries, to carry on important engineering works, which, it is felt would have been equally as well looked after by Canadian engineers, members of the society.

It is generally felt among the members of the Quebec Branch that stricter measures should be taken to enforce the carrying out of our by-laws, which provide that no engineer, not a member of the Canadian Society of Civil Engineers, although such may be a graduate of some university, is entitled to practice as an engineer in the Province of Quebec without complying with the by-laws.

The Ottawa Branch, at the close of 1910, had a total membership of 228. During the year many interesting papers were given, and the report furnished ample evidence of the enthusiastic manner in which the Branch is supported by its members. The recommendations of special interest contained in this report were as follows:

We recommend that the Council consider if some means may be devised whereby assistance of some kind may not be given to branches to form local libraries in order that members of branches, who will be, under proposed amendments to by-laws, considered as resident members, may derive more of the benefits of resident members in Montreal.

We recommend that papers of merit read before branches should be published in the Transactions of the Society when desired by the Branch, subject to censorship at headquarters instead of compelling authors to read at Montreal first in all cases.

We recommend that the mode of election of officers and council be considered with a view of giving branches representing the various districts some voice in the selection of the members of the Nominating Committee.

The Toronto Branch reported a total membership of 275. Its meetings during 1910 were held at the Engineers' Club, 96 King street west. The new executive will have to secure fresh quarters for 1911, owing to the launching of a new organization, which is to become the successor of the club just referred to. A number of valuable papers were given last year. Addresses are secured from eminent engineers in Toronto and other cities in addition to the usual discussions of papers delivered before the parent society.

The following recommendation contained in the report of the Manitoba Branch was discussed at some length and was productive of a resolution urging the importance of the suggestion upon the incoming Council:

The members of the Branch wish to recommend that the by-laws of the Society be revised so that papers which have been read before the Branches of the Society may be published in the Transactions, providing the Council consider them worthy of publication.

The total membership of the Manitoba Branch is 166. The officers for the current year are as follows: Chairman, C. H. Dancer; Executive Committee: E. P. Featherstonhaugh, J. A. Hesketh, T. Turnbull and Col. Ruttan.

The remainder of the Tuesday session was devoted to the reception and brief discussions of the reports of the special committees.

Discussion on Sewage Disposal.

An interesting discussion ensued upon the presentation of the report on Sewage Disposal, Messrs. Rust, Murray, Kennedy and Col. Ruttan taking part.

City Engineer Rust opposed the adoption of the report on the ground that the principles advocated therein might

be accepted by municipalities as having the sanction and general approval of the Society, whereas with the varying conditions existing throughout the country individual treatment was essential. Concerning the Provincial Boards of Health Mr. Rust was disposed to criticize the formation of these bodies inasmuch as in the majority of cases they were composed of medical men who had not made a special study of sewage disposal. In his opinion, such boards should be supplemented by the appointment of a consulting engineer properly qualified to give reliable advice.

Mr. T. Aird Murray remarked that he was somewhat disappointed in the report inasmuch as the principal adopted therein was the very opposite to that which he had inaugurated in the province of Saskatchewan. The report did not appeal to him as being up-to-date, for it concluded that it was impracticable to so treat sewage that the danger of transmission of typhoid by effluents could be satisfactorily met. For this reason the committee recommended that sewage disposal plans should proceed no further in treatment than that which is covered by the processes of sedimentation and removal of the tendency to putrefaction of the organic matter, and that the onus of removing disease infection from water should be met entirely by those using water mixed with sewage, for purposes of domestic water supply.

Mr. Murray pointed out that the acceptance of such a principle in the report was a practical acknowledgement that sewage disposal was a failure in its most essential requirement—that of eliminating the risk of infecting waters with typhoid bacteria. Further, he pointed out that apart from the larger cities it was impossible or impracticable to install efficient methods of water purification because of the great expenses in first cost and in maintenance. Also, that in many cases the people who suffered from polluted streams were the farmers and isolated rural communities on such streams. In fact, that many epidemics of typhoid were caused in cities by returning the sewage to the city by means of milk from such rural centres, where milk cans were washed by the very water which contained infected city sewage.

The policy adopted in Saskatchewan, said Mr. Murray, was that of not only eliminating from sewage the aesthetic nuisance, but also the sanitary, or pathogenic; therefore, as a final adjunct to any sewage disposal scheme, the hypochlorite method of disinfecting or sterilizing the sewage was insisted upon. He held that it was practical and easy with our newer knowledge of disinfecting processes to procure sewage effluents entirely free from disease infection, and that municipalities and others would be more likely to vote for such complete schemes than for the measures proposed in the committee's report.

Finally, it was decided to defer the adoption of the report on sewage disposal pending further consideration and investigation by the Special Committee.

Complimentary Luncheon, January 24.

A complimentary luncheon given on January 24 by the Mayor (Mr. Sanford Evans) and Aldermen of the City of Winnipeg, was attended by upwards of four hundred members and their friends, and was a most enjoyable function.

In his address of welcome Mr. Evans made a feeling reference to the late Mr. Schwitzer, who, he said, had laid, during recent years, the foundations of the material development of the West. He deplored deeply the early closing of such a notable life.

Mr. Evans, continuing, said that the profession as a whole was playing a most important part in Western Canada and that its members were to be complimented upon the manner in which they had gained the confidence of the public. In Col. Ruttan they had a leader of great personal integrity and efficiency. There were many evidences of Winnipeg's practical interest in industrial development and their

best efforts were being put forth on behalf of technical education. Also, they were endeavoring continually to make Winnipeg clean, sanitary and attractive.

"Throughout the city," said Mr. Evans, "there is an active and intelligent interest in the subject of engineering. We realize the work you can do and the importance of the projects committed to your direction. The city of Winnipeg's work at Point du Bois has been undertaken in order to provide, at the lowest cost, that great fundamental of modern progress—power. The school board of Winnipeg has taken a noteworthy step in advance, in the construction of two properly equipped technical schools, now under erection. The Provincial Government has appointed a commission which is working independently of that appointed by the Dominion Government. We have many undertakings in the West and we have always sought for the best and most modern solutions.

Col. Ruttan, Mr. C. H. Rust and Col. Anderson replied briefly on behalf of the Society.

Col. Anderson, who said that he had some claim to consideration as an "old timer," gave a few interesting reminiscences. He had been a student in Manitoba College in 1873 and the journey west, over the Dawson road, had taken him three weeks. The only other means of approach meant a wagon trip of 500 miles, or steamboat down the winding Red River. He was greatly impressed with the developments of the intervening time. The Colonel dwelt briefly upon the intimate relation of Winnipeg's growth to the prosperity of the whole Dominion.

On Tuesday evening the ladies and members were entertained by the Women's Canadian Club of Winnipeg.

Winnipeg's Great Work at Point du Bois.

On Wednesday, January 25, the majority of the members paid a visit of inspection to the city power plant at Point du Bois, situated 77 miles from Winnipeg. The journey was made in a special train of ten cars provided by the C.P.R. Luncheon was served en route. The work at Point du Bois, a description of which was published in our issue of January 18, is well advanced and the plant is expected to be in operation this summer. Mr. W. G. Chace and several members of his staff accompanied the party and furnished information relating to design, construction and progress. An interesting feature was the method of carrying on the concrete work, the prosecution of which had been accomplished (with the thermometer registering, at times, 34 degrees below zero) by means of a canvas shelter, beneath which the temperature varied from about 3 to 20 degrees above freezing point. At time of writing the concrete roof of the main section of the power house has just been completed. The roof is 53 by 250 feet in area and has been laid with concrete $4\frac{1}{2}$ inches thick. This will be covered with three layers of burlap and asphalt, with a gravel surface. The greatest interest was manifested in the project, and Mr. Chace and his staff, together with Controller Cockburn and the other civic officials who accompanied the party, were highly complimented upon the enterprising and resourceful nature of the scheme. The work will involve a total expenditure of some \$4,000,000, which, as Mayor Evans pointed out at the banquet held in the evening, is a sum greater than that which is being spent by the whole Province of Ontario in its hydro-electric undertaking. The party from Point du Bois returned to headquarters, the Royal Alexandra, shortly after seven o'clock in the evening.

Visits were also paid by some of the members to the St. Andrews Locks and to the G. T. P. shops now under construction at Transcona. The many interesting features of the former work will be familiar to the majority of our readers and we hope to furnish a detailed description of the latter in an early issue. The members were met at the G. T. P. shops by the superintendent, Mr. F. W. Walker, and

Mr. C. J. Maxwell, who is in charge of construction for the railroad.

Annual Banquet, January 25.

This function was one of the most successful of its kind in the history of the Society and reflected great credit upon the entertainment committee of the Manitoba Branch (Mr. W. A. Duff, chairman). In addition to some two hundred members of the Society, those present included the Mayor, Mr. Sanford Evans; Hon. Hugh Sutherland, of the Canadian Northern; Mr. William Whyte, Vice-President of the C.P.R.; Mr. C. C. Chipman, of the Hudson's Bay Company; Hon. J. H. Howden, of the Provincial Government, and many prominently identified with allied professions. Among the latter may be mentioned Mr. D. Atcheson, representing the Architects' Association; Mr. G. A. Bayne, of the Manitoba Land Surveyors, and Mr. F. H. Fay, of the Boston Society of Engineers.

The proceedings from first to last were characterized by a whole-hearted enjoyment always professional in its decorum but enlivened by the college yells so well practised in former days and handed down by the various institutions, such as 'Varsity, McGill and U. N. B., as an indispensable part of their training. "This manifestation of the spirit of the boy is an indication of that of the true man," said Mayor Evans, a little later on in responding to the toast, "Our Guests," proposed by Col. Ruttan. And then His Worship was perforce obliged to pause during the rehearsal of another series of strange staccatos from all corners of the room.

The frontispiece of the menu card contained the following definition:

"A Banquet is an assemblage of men who look slyly at their watches, wishing they were in bed, while loudly proclaiming they are jolly good fellows who won't go home till morning."

This, however, was evidently the exceptional occasion necessary to establish the general truth of the assertion.

Short speeches, interspersed with musical items provided an ideal programme and there was not a dull moment the whole evening.

Mr. Sanford Evans, who was received with much enthusiasm, recited at some length Winnipeg's progressive policy in regard to municipal development and dwelt upon the present importance and future prospects of the engineering profession in this connection. In the economical execution of great works involving large expenditures the engineer had a tremendous responsibility. The status of the profession was continually being elevated to a higher plane. The profession had developed rapidly. It was not so very many years since engineering had been a trade, but now it was a profession in the highest and best sense of the word.

The toasts to the Society and to the retiring President and Council were responded to by President Ruttan and Mr. C. H. Rust, respectively. Messrs. Atcheson, Bayne and Fay replied briefly on behalf of "Sister Societies."

At the resumption of the business session on the morning of Thursday, January 26, a special committee was appointed to report upon the most satisfactory principles of construction and maintenance for road and street work, and to draw up specifications for the same. A resolution was proposed in regard to the conduct of the Vancouver City Council in accepting the City Engineer's resignation without giving him a satisfactory investigation, but no definite action was taken beyond the appointment of a committee to investigate the matter and report the following morning. An interesting paper, which we regret is not yet sufficiently complete for publication, was then read by Professor W. Muir Edwards, of the University of Alberta, Edmonton. At the afternoon session there was an excellent gathering to hear the address of the retiring President, Col. Ruttan, and

an excellent lantern lecture on the Point du Bois construction by Mr. W. G. Chace, who was accorded a hearty vote of thanks for his comprehensive paper. Col. Ruttan's address will be found in another column.

At the closing session on Friday morning, January 27th, the special committee appointed to inquire into the relations between the Vancouver city council and their engineer, reported that it would be inadvisable to make a resolution such as had been proposed the previous day by Mr. White. The matter was submitted to the vote of the assembly whose verdict was in accordance with the feeling of the committee. While there was a general feeling of disapproval at the action of the council in dealing so summarily with the engineer without giving him an opportunity of being heard, it was realized that the Society had no warrantable ground for interfering between the two parties and that as a general principle it had no *locus standi* between employer and employee.

A paper entitled, "Hydro-Electric Power Development of the British Columbia Power Company," prepared jointly by Messrs. N. R. Gibson, S. M. Waldron, and A. L. Mudge, had been printed and distributed among the members and at this session Mr. W. H. Munro, of Peterborough, Ont., gave an interesting lantern talk on the work. Some fifty or sixty excellent slides were shown.

The scrutineers reported that the amendments to the various by-laws of the institution had all carried. Among these measures was one in favor of the formation of a new class of junior members, coming between that of student and associate member. Under this enactment the graduate of a recognized engineering school can only remain as a student member one year after graduation.

Election of Officers.

City Engineer Rust, of Toronto, was elected President of the Society for the ensuing year. The remaining officers were elected as follows: Vice-presidents: Henry Holgate, Montreal; C. E. W. Dodwell, Halifax; Councillors: L. A. Herdt, Montreal; Phelps Johnson, Montreal; H. G. Kelley, Montreal; J. M. Shanly, Montreal; J. G. Sullivan, Montreal; H. H. Vaughan, Montreal; P. S. Archibald, Moncton; F. W. W. Doane, Halifax; R. McColl, Halifax; A. E. Doucet, Quebec; J. T. Morkill, Sherbrooke; P. E. Parent, Quebec; C. R. Coutlee, Ottawa; D. MacPherson, Ottawa; W. J. Stewart, Ottawa; H. E. T. Haultain, Toronto; A. F. Stewart, Toronto; C. L. Fellowes, Toronto; E. E. Brydone-Jack Winnipeg; J. A. Hesketh, Winnipeg; J. G. Legrand, Winnipeg; F. F. Busteed, Vancouver; J. S. Denis, Calgary; J. C. Kennedy, Vancouver.

Votes of thanks were accorded the various bodies that had contributed to the general success of the meeting. These included the C.P.R.—for their generosity in providing free haulage, the G. T. R., the C. N. R., the Mayor and Aldermen of the City of Winnipeg, the Manitoba Club, the Canadian Women's Club and the Street Railway Company. Particular appreciation was shown by the members for the work of the Manitoba Branch, whose enterprise and foresight was reflected in the local arrangements. A hearty vote of thanks to Colonel Ruttan for his energetic work in the interests of the Society during the past year practically terminated the session.

The nominating committee appointed in addition to the three last presidents (Col. Ruttan, Mr. Geo. Mountain and Dean Galbraith) was as follows: J. M. R. Fairbairn, Montreal; E. A. Stone, Fredericton, N.B.; E. Decarie, Quebec; Jas. White, Ottawa; A. C. D. Blanchard, Toronto; J. A. Hesketh, Winnipeg; C. E. Cartwright, Vancouver.

The proceedings of the Society closed with a meeting of the newly elected council, at which work of a purely routine order was transacted.

The eastern members left Winnipeg by special train

shortly after one o'clock on Friday afternoon. A considerable number of the Winnipeg and other western members put in an appearance and cheered lustily as the train drew out. The Toronto and Montreal members parted company on Saturday night, at Sudbury, after the most enthusiastic demonstration of good fellowship. Professor McLeod was given a particularly warm send-off. The Montreal section was due to arrive at about eleven o'clock on Sunday morning.

The Toronto members reached home about 8.45 a.m. Sunday, January 29, after what was unanimously conceded to be the most delightful combination of business and pleasure ever undertaken.

PRESIDENTIAL ADDRESS OF COL. RUTTAN

Engineering and Conservation.

Engineering was some 80 years ago defined by Thomas Tredgold as "the art of directing the great sources of power in nature for the use and convenience of man."

At the beginning of the twentieth century it has become apparent not only to engineers, but to all those who have the interests of posterity at heart, that the great sources of power in nature should not only be directed, but that they should be economically managed and conserved, so that Tredgold's definition may now properly read, "The art of directing and conserving the great sources of power in nature for the use and convenience of man."

Anything approaching an exhaustive discussion on the subject, one on which volumes might be written, is not now intended. It may be pointed out that among the wastes which have been permitted throughout the past are:

- (1) The impoverishment of the lands. The gradual conversion of what were productive areas into barren wastes, examples of which may be seen in older parts of Asia and Europe, and, unfortunately, to an appreciable extent, in North America.
- (2) Following the exhaustion of the soil, and keeping pace with it, has been the destruction of the forests; and
- (3) The unbalancing, and perhaps the lessening, of precipitation, so that rains come when they are not wanted and fail when they are indispensable for successful agriculture.
- (4) The primitive and wasteful manner in which transportation lines are laid and constructed.

It is the last paragraph only with which it is proposed to deal in the present address.

Routes Improperly Located.

The requirements of modern civilization demand not only that people be carried at express speed from one quarter of the globe to another, but that every food and fabric grown and produced be distributed broadcast for the use and convenience of man. The rush to meet these requirements has led to the abnormal development of transportation routes, which, though good in themselves and generally advantageous, have often, with a total disregard of economic arrangement, been improperly located or needlessly multiplied in one section to the inconvenience of another.

The necessary requirements in the initiation and construction of transportation lines may be stated as follows:

- (1) A thorough knowledge of the country to be served, both in its physical features and its capabilities for production.
- (2) That this knowledge be utilized in the location of lines of transportation, so that the greatest service be provided at a minimum ultimate cost against the traffic using the lines.

Before going further it may be well to consider to what extent these requirements are at present met.

A study of the railway systems of any country must lead to the conclusion that no effective system of supervision has been exercised in the locations of the systems to meet the economic requirements above stated.

Much comparatively useless road has been constructed for the purpose of enabling one set of capitalists to take tolls on traffic which could have been easily handled by an existing line.

Instances appear where productive districts, separated by unproductive or partially unproductive country, are connected by lines running full length through the unproductive land, whereas a single line would have served the traffic of several converging railways. All this largely increases the capital, interest, maintenance, and management charges, which must be borne by the traffic.

Causes of Defective Economy.

Some of the causes contributing to the defective economy referred to are:

- (1) Want of knowledge of the country in the construction of the first lines.
- (2) The desire of capitalists to share in profits being earned by favorably situated lines.
- (3) The ease with which charters for so-called competing lines may be obtained.
- (4) The relatively slight interest taken by the public in the location of transportation lines, and the mistaken idea that the construction of any line is advantageous.

This deplorable state of affairs may be remedied in a most simple and inexpensive manner.

Before any companies are given franchises by Parliament, both the public and Parliament should insist upon having before them sufficient information to enable them to judge of the effect upon both public and private property of the proposed works.

Attention is called to the fact that in Canada something should at once be done to arrange for surveys of the country and the preparation of plans similar to the ordnance maps of Great Britain.

A further step forward would be the giving of compulsory running rights over existing lines to companies which may properly participate in the traffic of certain districts, and which cannot do so without heavy expenditure in the construction of parallel lines, which would in themselves be unproductive or which would unnecessarily cut into business which can readily be handled by existing lines.

The remarks on granting charters to railway companies and proposed improvements in procedure apply with equal force to canals, river improvements, and hydro-electric plants.

Though Canada is noted for its magnificent canal system and for the progressive and patriotic policies of its Governments in this respect, the opening up of the country will necessitate in the immediate future a development far beyond any that has yet taken place. It is therefore most necessary that a broad and intelligent view of the whole situation be taken so that duplication of facilities be avoided and expenditure be made in the interest of, and ultimate economy in, capital and operation charges.

Numerous instances might be given illustrating great expenditures which have been made in an ill-considered and extravagant manner in the construction of railways, and of applications to Parliament for charters to construct works, which were both physically and economically impossible to carry out. These have often masked the acquisition by private parties of important assets of the public domain.

Such instances are well known to most engineers. It is therefore not necessary to refer directly to them.

Suggestions Looking to Improvement.

It is not intended in any way to discourage development work in the country, but to point out the haphazard and expensive manner in which undertakings for the public service are often carried out, and to suggest what is considered a business-like and common-sense means of conserving, in this respect, the interest of the people at large. It must be

remembered that eventually the burden falls upon, and must be borne by, the people. If the construction of an unnecessary mile of railway is prevented, or a mile already constructed is made to do the work of two, the country as a whole will be greatly benefitted.

At first it may appear that the suggested changes in initiating and carrying out public works would, if carried into effect, discourage the construction of works needed for the development of the country and its resources. This, however, would not be the case; on the contrary, the care displayed in scrutinizing projects before they were authorized would give confidence to investors by the assurance that, in the opinion of Parliament, the works were such as were reasonable and proper, and would go far, by the confidence inspired, to facilitate the flow of capital into the country.

A charter granted by Parliament under the regulations proposed would be in itself a guarantee that the project was sound and practicable. The criticism called for by these regulations should greatly assist in determining the merits of such projects.

It is, of course, apparent that, in addition to the enormous saving which could be made by the economic location and construction of works for the use and convenience of the public, there are other conditions not less important. For example, the power now possessed by companies to increase capital beyond reasonable limits, and the crude management in operation, now being so much discussed in connection with the claim of the American railways, that rates must be increased to enable them to earn revenue to meet their capital and operation expenses.

In the following conditions the last two are not purely engineering, and need not be further considered at the present time: (1) The economic location and construction of lines of transportation, (2) the limiting of capitalization within reasonable bounds, (3) the scientific and economical operation of all transportation services, will all three have the effect of reducing rates to a minimum.

It is in the first of these that engineers are vitally interested, and their advice to clients will go a long way towards conserving immense sums of capital now wasted in crude and uneconomical locations and constructions. The word economy has no reference to detail, and is used in its broader meaning only. As to economy of designs in detail, there is no fault to be found; on the contrary, all are proud of the bridges, tunnels, and other noted structures which are being constantly turned out by the profession.

In carrying out the proposed system no cumbersome legislative machinery would be required—an amendment to the Railway Act giving the Railway Commission power to make regulations for the necessary surveys and plans, and finally to deal with the matters in question, is all that would be necessary.

Mayor Taylor, of Vancouver, resents the attitude of the Canadian Society of Civil Engineers in discussing the relations between the City Council of Vancouver and City Engineer Clement. Interviewed recently, Mr. Taylor stated that there had been no direct proposal to discharge the City Engineer. At present the city had under consideration the appointment of a supervising engineer. There had been no need for investigation as no charge of incompetency had been made, neither was any personal question involved. Mr. Taylor concluded by stating that Vancouver's engineering department would in any case be reorganized.

A meeting of the representatives of the various municipalities on the Island of Montreal is being called by Mayor Guerin to discuss the practicability of adopting the borough system as used in London, Eng.

Recent Investigations on Sewage Disposal

An Interesting Report on the Question with Reference to the Pollution of Lakes and Streams in Canada—Data from Many Cities

The rivers and streams of a country are the natural drainage channels into which all of the rainfall, not directly evaporated or taken up by plant growth, must ultimately find its way. A portion of it sinks into the ground and reaches the streams in the generally pure form of springs or seepage through their beds or banks. The remainder flows directly into them over the surface, and naturally and inevitably carries with it a considerable quantity of polluting matter, the character of which will depend upon the nature of the drainage area and density of the population.

The surface drainage from an uninhabited watershed will not generally cause any dangerous pollution, but may add to the color and turbidity of the water to an extent as to make it more or less objectionable for domestic purposes. Streams, however, rising in mountainous or other wild unsettled districts usually furnish good and wholesome water near the source of their supply; but where they pass through populated districts, devoted to farming and other industries, they receive from their banks, and from tributary brooks and rivulets, the drainage from farm yard, dairies, dwellings, manured land, and finally the sewage of villages and towns. Much of the objectionable drainage from country districts is more or less purified by natural processes, but on the other hand a considerable proportion often reaches the stream direct. That this is often highly dangerous in character has been demonstrated in several instances, as at Lowell, Mass. This city, which obtains its water supply from the Merrimac River, was visited in the autumn of 1890 by an unusually severe epidemic of typhoid fever. By careful investigation this was traced to an infection of the river water by a few cases of typhoid fever on a small brook which entered it about three miles above the water works intake.

It is impossible, or at least impracticable, to prevent pollution of this kind except in the case of streams with very limited watersheds, where the conditions may be made subject to control. In this connection it is interesting to note the case of Liverpool, England. The water supply is obtained from a stream rising in the mountains of Wales, the watershed of which is owned or controlled by the city. This circumstance is not, however, depended upon to ensure the entire safety of the water, which is filtered through slow sand filters before being delivered to the consumers.

So far as the subject of this report is concerned, the pollution of lakes and streams referred to applies particularly to that produced by large isolated institutions, industrial establishments, etc., or by cities and towns provided with systems of sewers and drains. It, therefore, does not deal with all sources of pollution, but rather is confined to those cases in which impurities are added, in comparatively large quantities, to water which is already more or less impure. It is important that this should be borne in mind when considering the general question of sewage disposal, and the degree of purification which may be deemed practicable or indispensable.

The necessity for the purification of sewage may be considered from two points of view, with regard to the organic matter which it contains, and, second, with regard to its germ content. The inevitable fate of the organic matter is to pass through certain processes of decomposition where natural conditions, this may cause nuisances and conditions

offensive to the senses. The main object of sewage disposal, as it is at present understood and practiced, is to cause this decomposition to take place quickly under controlling circumstances, and at least to such a degree as will prevent it from undergoing further putrefactive changes. All modern methods of treatment are capable of accomplishing this, but without greatly diminishing the number of bacteria present in the raw sewage, where they often occur to the extent of several millions per cubic centimeter. Among them are to be found large numbers of germs from the intestines of man and the lower animals, and these usually include specific germs of disease.

Sewerage Systems

Sewerage systems may be either combined or separate, that is, there may be a single system to carry both the domestic sewage and the street drainage; or the domestic sewage and the street drainage may be kept separate and carried by a system of sanitary sewers and a set of storm water drains. During heavy storms combined sewers will occasionally have to discharge a volume many times greater than the dry weather flow. It is obviously impracticable to attempt to purify more than a small percentage of the storm water discharge. The English Local Government Board requires sewage disposal plants for systems of this kind to have a capacity necessary to provide for six times the dry weather flow. Anything beyond this is discharged without treatment. It is therefore evident that the kind of sewerage system in use, whether separate or combined, will have an important bearing on the question of the disposal or treatment of the sewage, and the pollution of the bodies of water into which it is finally discharged.

Detailed descriptions of the principles of sewage purification, and the different methods by which it may be accomplished, are given in the various published works on that subject. It will be convenient, however, at this point to refer briefly to these methods and to mention a few sewage disposal plants now in operation which illustrate the different processes.

Early Methods of Sewage Disposal

With the introduction of really efficient systems of sewerage which has taken place almost entirely within the last fifty years, the first and most obvious method of disposal was to turn the sewage into the nearest body of water. Incidentally, it may be stated that this is still the practice in the majority of cases in every country with the exception of England. There, the density of the population, the great number of large manufacturing cities, and the small size of the rivers, combined to produce conditions which urgently demanded some measures of relief. The first method employed was Broad Irrigation, or Sewage Farming. The results obtained were in many cases fairly satisfactory, but the difficulty in obtaining the required areas of suitable land, and certain objections from a sanitary standpoint have led to a gradual restriction in their use, and even to their abandonment in Birmingham and several other places.

Many other systems involving chemical treatment of the sewage were attempted, but generally with indifferent success in the way of real purification. The example of England was followed to some extent in other parts of Europe and in the United States. In the latter country intermittent

filtration through prepared beds of underdrained sand and gravel has been used with great success in some of the Eastern States where the natural conditions are favorable. Generally, however, there has been little development until within the last twelve or fifteen years. During this period the newer methods of sewage disposal, or the so-called "biological processes," have been more fully studied and developed, and are now being almost universally adopted.

Modern Methods of Sewage Disposal

These may be said to consist in a general way of two processes, viz.: (1) the separation of the greater part of the suspended matter or sludge, and (2) the oxidation of the remainder and of the organic matter in solution, in artificially prepared beds or filters. The first, or sedimentation process, is accomplished by screening the sewage and passing it through sedimentation, chemical precipitation, and septic tanks, and the deep tanks of the Hampton and Imhoff types.

In the second or oxidation process, there are two general methods employed, viz.: Contact Beds or Percolating Beds. These beds are commonly called filters, though the process is not one of filtration.

Contact Beds are briefly watertight basins, 4 or 5 feet in depth, filled with crushed clinker, coke, coal, broken stone, screened gravel, or any hard substance, broken to the proper size, which is usually from $\frac{1}{4}$ -in. to $1\frac{1}{2}$ -in. The tank effluent is applied to the beds by means of overflowing grooves and troughs and through open jointed pipes. When the bed is filled to within a few inches of the surface, the inflow is stopped and the bed is held full for two or three hours. Next, the effluent valves are opened, allowing the beds to empty slowly and the interstices to fill with air. The beds are then allowed to remain empty for a time, when the entire process is repeated. The time of a complete cycle thus includes the periods of filling, resting full, emptying, and resting empty. Ordinarily, there are three such cycles in twenty-four hours. The beds are usually operated in groups, and the valves are opened and closed at the proper times by automatic devices. In many cases it is necessary to pass the effluent from the first contact beds through a second set.

Percolating Beds are sometimes referred to as Trickling or Sprinkling Beds or Filters. In this instance the materials used are the same as in contact beds, but usually of larger size. The walls need not be watertight, their purpose being merely to support the material of the bed. They are usually from 6 ft. to 8 ft. deep. The sewage is distributed over the surface of the beds in the form of a spray from jets placed at regular intervals, or from travelling distributors usually operated by power. The operation is continuous, the sewage trickling through the material of the bed and carrying the air down with it. The concrete floor of the bed is provided with a system of underdrains through which the effluent discharges.

Efficiency of the Different Processes.

The degree of purification effected by the different methods referred to may be briefly stated as follows:

Sewage Farming.—Where sufficient areas of well drained suitable soil are available, the effluents are usually nonputrescent and often of a comparatively high degree of purity. The percentage reduction of bacteria is also satisfactory both with respect to the total number and to *Bacillus Coli*, which is a representative intestinal germ. In many cases, however, where there is careless management, over dosing, and non-porous subsoil, the purification is inferior and the effluent contains large numbers of bacteria.

Intermittent Filtration.—Under favorable conditions this is the most efficient of all processes, the effluents being uni-

formly non-putrescent and the bacterial contents comparatively low, usually less than 10,000 per c.c. These results are not, however, always attained in practice, especially during the winter and early spring.

Contact Beds.—Treatment by single contact effects a moderate degree of purification, but a second treatment is generally necessary to secure a non-putrescible effluent. The removal of bacteria is imperfect, the effluent frequently containing a million or more per cubic centimeter.

Percolating Filters.—The purification effected by this process is superior to that obtained by double contact. The effluent is ordinarily non-putrescent, but at intervals it contains an unusually large proportion of suspended matter. When the removal of this is necessary it can be readily provided for by small sedimentation basins. The percentage reduction in bacteria is higher than with contact beds, but is still so low as to be of little importance from a sanitary standpoint.

From the experience of the last few years with contact beds and percolating filters on a working scale, and from the results of several series of experiments carried out in the United States, Germany, France, and England, the consensus of opinion seems to be in favor of the percolating filter, and this is the process which is now being adopted in the majority of cases in the United States and Europe. Manifestly the operation of either system during the winter season in cold climates will be attended with special difficulties. Two contact bed installations, one for the sewage of Macdonald College at Ste. Anne de Bellevue, and the other for a small district in Toronto, are reported to be working satisfactorily; and at least two percolating filters are being built in connection with institutions in Quebec.

In the colder parts of Canada no demonstration has yet been made of their possibilities, though several plants are contemplated, or are already in course of construction in Saskatchewan and Alberta.

Dunbar, a German authority on sewage disposal, states that "the object of sewage disposal may be briefly described as an attempt to preserve our rivers in a natural condition, to guard them against visible pollution, and to prevent danger to the health of those living near them."

These requirements can be fulfilled under all circumstances by methods described above. To what degree purification should be carried out, or whether it is necessary at all, will depend on local circumstances, each case requiring separate consideration. In large rivers such as the Ottawa and St. Lawrence, the raw sewage of even large cities can be discharged without sensibly offensive results. The dilution is so great that the organic matter soon disappears under the action of natural processes of purification. The same is, in general, true of large lakes, where the sewage is discharged a sufficient distance from the shore. Where, however, the stream or lake is small and the volume of sewage discharged is relatively large, one or other of the complete processes must be employed, which will produce a non-putrescible effluent. In England, where the conditions are most unfavorable, this is practically the universal requirement; and the same may be said of Germany, France, and the United States.

When the water of a river or lake is to be used for domestic purposes, the aspect of the case is entirely changed. The presence of intestinal bacteria, which cause typhoid and other diseases, undoubtedly constitutes a menace to health; and while their tendency is to die, and eventually disappear, they may persist in sufficient numbers to render the water dangerous for drinking purposes for long distances from the point of discharge. Modern sewage disposal methods do not prevent such contamination. Unavoidable pollution of the same nature from combined sewerage systems, and from

country districts, has already been discussed. Hence the only feasible method of securing complete protection for surface water supplies would seem to be the filtration of the water by the towns and cities using it. In Germany this is required by law for all surface supplies.

There may, however, be special circumstances such as the close proximity of a sewage outfall to a waterworks intake, which would render the filtration of the water unusually difficult or expensive; or where, as in the case of Baltimore, a shellfish industry is threatened. In such cases further treatment for the purpose of disinfecting the effluent, or the removal of the bacteria, should, if possible, be employed. The latter can be accomplished to a greater extent by filtration through sand. Disinfection of effluents and even of raw sewage, by various chemicals, has been practiced in emergencies for some time, but the high cost of the materials, and the large quantities employed, render it generally prohibitive on the score of expense. But within the last four or five years, experiments by Rideal, in England, and Phelps and others in the United States, have shown that filter effluents can be sterilized to the extent of destroying practically all the harmful bacteria by the use of chloride of lime or bleaching powder, and at an estimated cost of from \$1.50 to \$3.00 per million gallons of sewage. Tank effluents and even raw sewage can also be sterilized but at a considerably greater cost. Plants of this kind are contemplated for several places in the Atlantic States where the circumstances warrant their necessity. It should be observed in this connection that chloride of lime has lately been successfully used for the disinfection of water supplies, and at a mere fraction of the cost of treating sewage.

Conditions in Canada

Coming now from the foregoing general survey of the subject to consider more particularly the conditions in Canada, we find that with its large lakes and rivers, and its relatively small population, it has so far suffered less from inadequate methods of sewage disposal than most countries. For the purpose of obtaining definite information, a list of questions was sent to all places with populations of 1,000 or over.

Questions Asked.

1. Is the sewerage system of your city separate or combined (i.e., do the sewers carry domestic sewage only, or do they also provide for street drainage and storm water in the same pipe)?
2. Do your sewers discharge directly into a lake or stream? If so, please give the names.
3. Is the sewage treated or purified in any way? If so, please describe method, giving information as to whether it has been successful and whether any difficulties have been met with in operating it, especially referring to winter troubles.
4. What tests have been made to determine the character of the treated sewage? Please give the results of any such tests.
5. Where is the water supply obtained from? If from a river or lake, please give the name.
6. If water supply is obtained from a stream, is there any considerable discharge of sewage or factory refuse above, or if obtained from a lake, is there any considerable discharge near the point where the supply is obtained?
7. Is the water supply filtered or otherwise purified, and if so, by what means, and are the results satisfactory? Has any analysis of the water been made? If so, give results.

The replies may be briefly summarized where necessary as follows:

Question 1. 64 places report combined systems, 38 separate, and 64 none at all.

Question 2. Of those reporting from the Maritime Provinces, the discharge in every case but one is into the sea coast harbors or tidal estuaries unfit for domestic water supplies.

Quebec reports 8 discharging into the fresh water por-

tions of the St. Lawrence or into the Ottawa, and 13 into smaller rivers.

Ontario reports 20 discharging into the St. Lawrence, or into the Ottawa River, or into the Great Lakes, and 30 into smaller rivers and lakes.

Manitoba reports 5 discharging into the Red and Assiniboine Rivers.

In Saskatchewan, 2 discharge into the Saskatchewan River and 2 into small creeks.

In Alberta, 3 discharge into the Saskatchewan, 5 into smaller rivers.

Question 3. The Maritime Provinces, Quebec, and Manitoba, report no sewage disposal plants.

British Columbia reports 1 place with tank treatment.

In Ontario there are 15 reported, 9 with tank treatment only, 4 with tanks and bacteria beds, 1 intermittent sand filter, and 1 with treatment on land.

Saskatchewan and Alberta each report 1 place with septic tanks and a few others in which the newer processes are contemplated at an early date or are actually under construction.

That is, only 18 places report any kind of purification, and in 12 of these it is limited to treatment in tanks.

Questions 5, 6 and 7. Of the 166 places reporting, 145 have waterworks. Of these, 36 have supplies from underground sources, 44 obtain their supplies from small lakes and streams in practically uninhabited watersheds, 25 from the Great Lakes and the St. Lawrence and Ottawa Rivers, and 40 from lakes and streams liable to some contamination by sewage.

14 places report mechanical filters for the water supply, 1 place a slow sand filter, and 9 natural filtration through river beds. In Toronto and Montreal the water is treated with hypochlorite.

The information furnished by these replies shows that not much has yet been done in Canada, in the way of the purification of either water or sewage. At the same time, it indicates that favorable local circumstances in many cases have so far prevented any serious consequences. Nowhere in Canada do such adverse conditions exist as are frequently met with in other countries, as for example, on the Hudson, Merrimac, Passiac, Susquehanna, and other rivers in the United States. These facts do not detract from the importance of the subject of this report, but rather to emphasize the necessity of taking prompt and effective measures to put an end where possible to any present pollution of the lakes and streams and to prevent it in the future.

In the Maritime Provinces the sewage is in most cases discharged into sea water unfit for domestic supplies, and where the dilution is sufficient to prevent nuisances. In such cases there is no immediate need of sewage purification.

In Quebec and Ontario, many of the towns discharge their sewage into, and obtain their water supplies from, the Ottawa and St. Lawrence Rivers or the Great Lakes. While the dilution is great, the water is, in important cases, unsafe for drinking without previous purification, and sometimes the effect of eddies results in the contamination of the water supply by the sewage of the same place. In such places, at least, thorough purification of the sewage as well as filtration of the water may be necessary.

The need of both water filtration and sewage purification will obviously be greater in the interior sections of these provinces, where the only available source of water supply may be from the smaller lakes and rivers tributary to the St. Lawrence and Ottawa Rivers and the Great Lakes.

In the Northwest Provinces the water supply problem is an unusually difficult one, as it must in many cases be obtained from the rivers which receive more or less directly the discharge from all sewerage systems.

In British Columbia the conditions on the coast are sim-

ilar to those in the Maritime Provinces. Up to the present time the water supplies have been obtained from mountain streams or lakes whose water sheds can be protected. The necessity for sewage purification is therefore far less urgent than in the interior provinces.

Legal

Before submitting our conclusions and recommendations with respect to the subject of this report, it is desirable that some idea should be given of the legislation dealing with this question of sewage disposal, which, after considerable experience, it has been found expedient to adopt in older countries.

In England, the Public Health Act of 1875, and the Rivers Pollution Act of 1876, and subsequent amendments depute to the Local Government Board the supervision of sewage disposal. The 1875 Act requires the sanction of the Board for the raising of loans for the purpose, and gives the Board power to require land treatment in all cases. The 1876 Act prohibits the throwing of any solid or liquid sewage into the streams and the pollution of the streams by sewage and manufacturing refuse, but certain qualifications have rendered these laws more or less ineffective. Such Acts as the Mersey and Irwell Act, and the West Riding of Yorkshire Act, have since been passed, which provide for the formation of joint Committees for the purpose of administering the Rivers Pollution Prevention Act. These committees are given special powers against the pollution of streams by solid matter and domestic and manufacturing sewage, but in the latter case proceedings can only be taken with the sanction of the Local Government Board.

France

In France, plans for sewage disposal after being submitted to the engineers in charge of the body of water into which the effluent is to be discharged (navigable rivers, non-navigable rivers, or the sea), must then be approved by the Department Board of Health if the population of the town is less than 5,000; or to the Conseil d'Hygiene Superieur if it is 5,000 or more.

Germany

In Germany the various Federal States each have their own laws relating to river pollution. As most of the German rivers flow through several states, attempts have frequently been made to obtain Imperial legislation, but the constitution renders this impossible. It, however, places the supervision and legislation concerning measures to be adopted by the Medical and Veterinary Police authorities in the hands of the Imperial Government and hence the Epidemic Diseases Act of June 30th, 1910, stipulates that methods for the disposal of waste shall be supervised by the State. Provision is also made for the formation of an Imperial Council of Health, the work of which, so far as river pollution is concerned, is restricted to those waters which flow by several of the Federal States.

Summary of Conclusions

After a consideration of the various phases of the subject of this report our conclusions may be summarized as follows:

1. None of the methods of sewage disposal, which are feasible and economically applicable on a large scale, are capable of effecting complete purification. Effluents can, however, be produced which are non-putrescible, and which may be discharged into bodies of water without any danger of causing nuisances, or of sensibly impairing the quality of the water, as determined by chemical analysis. The percentage removal of bacteria is often high, but this cannot be depended upon, and even under the best conditions the actual number remaining in the effluent is still very considerable.

2. The distinction between the general surface drainage of a populated district and its urban sewage is one of degree only, and each in itself may render the water into which it discharges, unwholesome, and dangerous for drinking purposes.

3. Since much of the surface drainage cannot be even collected for treatment, and since sewage disposal processes in the present state of the art cannot be depended upon to effect complete bacterial purification, it follows that the raw water of rivers and lakes in populated districts can never be considered entirely safe, and fit for domestic supplies.

4. Experience has shown that water of even a considerable degree of pollution can be rendered pure and wholesome by filtration, and, for practical purposes this is the only reliable means of ensuring the safety of surface supplies from unprotected watersheds.

Towns and cities which take their supplies from suspicious sources should not depend for their safety upon the efforts of others, but should themselves adopt such precautions as are available. To require the purification of the sewage of a large city, in order to afford protection to the water supplies of one or two small places down stream, which could be more effectively accomplished at a much lower cost by filtration, would be at least an unbusinesslike procedure. As a matter of fact each case constitutes a separate problem in itself, and whether sewage purification or water filtration is demanded, or whether both are necessary, are questions which should be dealt with by properly qualified experts.

5. In Canada up to the present time practically nothing has been done in the way of purifying the sewage of municipalities, except in the case of less than half a dozen places in the Province of Ontario. During the last two or three years, however, the importance of the subject has been gaining general recognition. While the climatic conditions are in some parts of the country unusually severe, there is little doubt that the methods which have proved effective in other countries can be employed successfully here, though special provision will be necessary to ensure efficient operation during cold weather.

6. The Public Health Acts of the different Provinces provide in a general way against the discharge into bodies of water of matters which would cause nuisances, or which would endanger the public health. Such laws lack definiteness, and are therefore generally ineffective. A consideration of the legislation on the subject of sewage disposal and stream pollution, indicates that the best laws are those which, instead of attempting to formulate specific rules or regulations which can never have more than local application, require all plans for proposed works to be submitted for approval to the Provincial Boards of Health, or other properly constituted bodies. These should have the power to enforce their recommendations with regard to both sewage disposal and the filtration of water supplies. Such power is very effectively secured by Section 23 of the Saskatchewan Act.

Interprovincial and International rivers should be subject to joint Federal and Provincial control, and it is desirable that all legislation on the subject should be as nearly uniform as possible.

Committee

R. S. Lea, Chairman.	C. H. Keefer.
H. J. Cambie.	John Kennedy.
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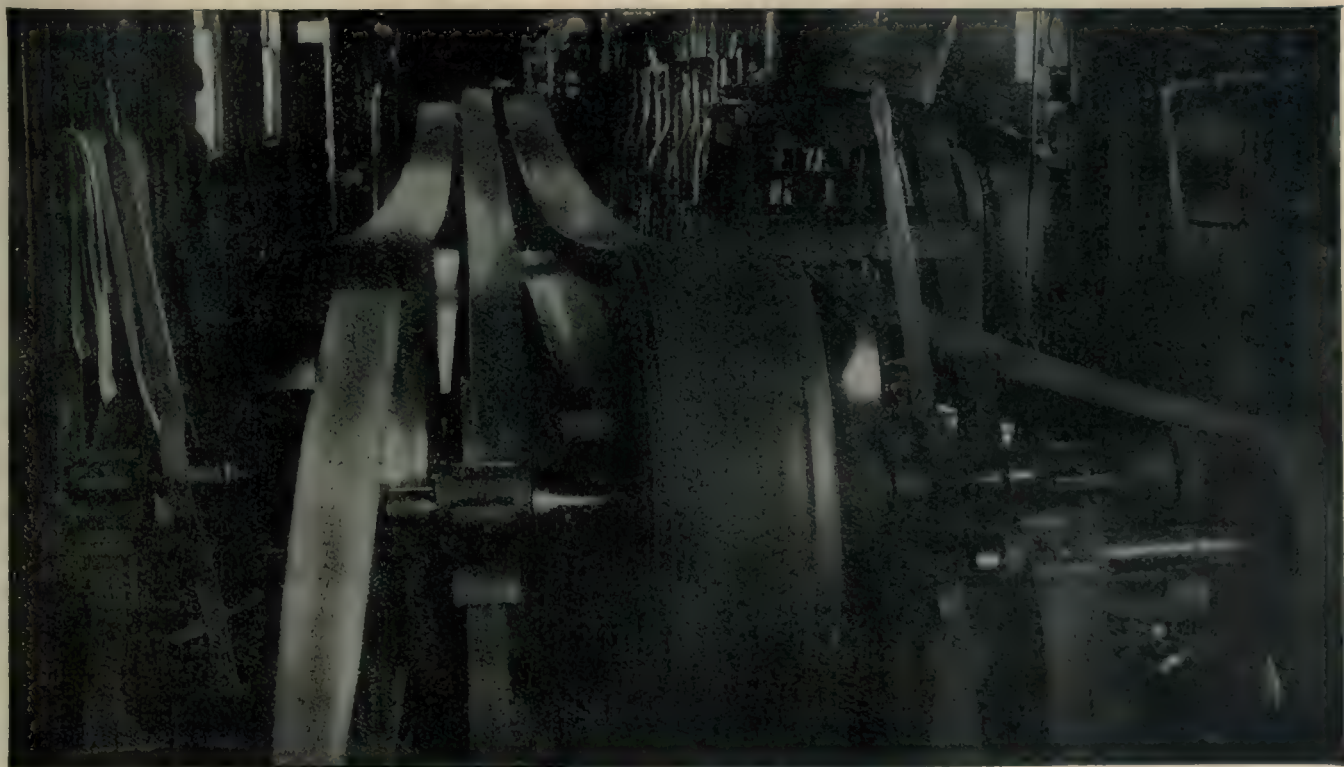
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They have secured the exclusive right in Canada for selling improved corrugated steel pipe for sewers and culverts, made by the Keystone Smooth Bottom Corrugated Steel Sewer Pipe Company. These culverts have been very largely used in municipal and railway work throughout the United States.

In addition to having the exclusive agency for the "Interstate" automobiles manufactured by the Interstate Automobile Company, of Muncie, Indiana, the company are now arranging for the Canadian agency for two leading lines of motor trucks.

They will also handle a complete line of concrete machinery manufactured by the London Concrete Machinery Co., Ltd., London, Ont., as well as "Champion" wire fence and wire for reinforcing concrete.

It is the intention of the company to carry a complete line of contractors' machinery and mining machinery of all descriptions, and they purpose to make their selling organization one of the most complete in the Dominion of Canada.

A magnificent suite of executive offices, and spacious show rooms are being fitted up by the management at 144 Yord street, Hamilton. They will also have branch offices at Vancouver, Calgary, Winnipeg, Cobalt, Toronto, Ottawa, Montreal, Quebec, Fredericton, N.B., St. John, N.B., and Truro, N.S.

Dredge of Latest Design

There will arrive at Vancouver about the first of February, the new Government dredge No. 508, which left Scotland on November 7th for its long journey round the Horn. The dredge, which was built by Messrs. William Simons & Co., Ltd., Renfrew, Scotland, is of the bow well bucket ladder type. It is of steel construction, 199 feet long, 36 ft. 6 in. broad and 13 ft. 6 in. deep, and is designed for dredging 1,000 tons of free material per hour. The driving gear and bucket chain is designed for dredging hard ground; the buckets are 24 cubic feet capacity with solid cast steel backs and links; the cutting lips and all wearing surfaces being of manganese steel. The gearing for driving the chain, which is of cast steel, is arranged to give two speeds which are suitable for the material to be dredged.

The bucket ladder is suspended on an independent shaft, works in an open bow well and is capable of cutting the dredge's flotation and dredging to a depth of 50 feet. Shoots are provided on each side of the vessel to deliver the spoil as required, and are worked by independent steam gear. All the necessary mooring and warping winches are of the most powerful design for dredging in rapid currents. Scotch boilers working at 120 lbs. and two sets of compound surface condensing engines constitute the motive force, the speed on trial trips under deep load conditions being ten knots. The engines are arranged to drive direct on the screw shafting, or to operate the dredging machinery.

The Advance Machine Works, Limited, Walkerville, Ont., furnished an alternating current three-motor electric crane for the Roman Stone Company's plant at Weston, Ont.

Contracts Department

News of Special Interest to Contractors, Engineers, Manufacturers and Dealers in Building Supplies.

Information for insertion in these columns is invited from Architects, Contractors, Engineers, etc.

Waterworks, Sewerage and Roadways

Guelph, Ont.

The Board of Works have under consideration the advertising for tenders from various pavement manufacturers for work on pavement to be done at so much per foot, thus gaining a fair comparison of the various cost of the different pavements on the market.

Gleichen, Alta.

The proposed waterworks will be constructed by day labor under supervision of the John Galt Eng. Co., of Winnipeg, Man.

Laprairie, Que.

The Government will construct a large trunk sewer this year connecting the following municipalities: Laprairie, St. Lambert, Longueuil, Boucherville.

Montreal, Que.

City Engineer Janin denies the report that a new sewage farm is to be constructed by the city. Some alterations are being made to the existing plant, he states, but nothing else.

General Purchasing Agent, Mr. Stanon, has been instructed to prepare specifications in granite paving blocks and chain stone. 25,000 square yards of the former material, and 150,000 lineal feet of the latter will be ordered. Public tenders will be called for, addressed to the Board, and the latter's selection will be referred to Council for approval.

North Vancouver, B.C.

Tenders addressed to City Clerk, will be received until February 13th for supply and delivery of c.i. pipes as follows: 10,000 feet 4-in. standard c.i. pipe, approximate weight, 20 lbs. per foot; 5,000 feet 6-in. standard c.i. pipe, approximate weight 30 lbs. per foot; 19,400 feet 8-in. standard c.i. pipe, approximate weight 45 lbs. per foot; 9,750 feet 10-in. standard c.i. pipe, approximate weight, 50 lbs. per foot; 6,300 feet 10-in. c.i. pipe, weight approximately 75 lbs. per foot; total of about 1,134 tons. Specifications obtained from Geo. S. Hanes, City Engineer.

Oakville, Ont.

T. Aird W. Murray, of Toronto, has prepared preliminary plans for a sewer system, but nothing definite has yet been done. Chas. A. Bradbury, town clerk.

Ottawa, Ont.

Plans have been completed for the new plaza between the Dufferin and Sappers' bridges by Public Works Department. Cost will be around \$80,000.

St. Catharines, Ont.

Tenders are called until February 28th for c.i. pipe and special castings; gate valves and pig lead. Advertisement in "Tenders and For Sale Department" of this issue. Tenders for pipe laying, etc.,

will be invited later. A. Milne, superintendent waterworks.

St. John, N.B.

The committee appointed to consider the question of paving have recommended that tenders be called for the paving of the four streets, Bond, Nelson, Mill and Dock. W. F. Murdock, city engineer.

Vancouver, B.S.

City Clerk McQueen was instructed to call for tenders for supply of brass goods for waterworks department in about three weeks' time.

Victoria, B.C.

Extensive additions to the water distribution system in Saanich municipality will be made this year to furnish about 3,000 feet of 8 in. and 24,000 of 6 in. pipe, at estimated cost of \$30,000.

Wm. W. Northcott, purchasing agent, is calling for tenders until March 3rd, for 350 4-inch, 100 6-inch, and 10 12-inch double gate valves and 15 tons of pig lead. Specifications at office of above.

AWARDED

Fort William, Ont.

The Canadian Iron Corporation were awarded the contract for the supply of pipe for the summer; prices. \$37.50 a ton for ordinary pipe and \$60 a ton for special pipe. The Kerr Engine Co. and the Canadian Fairbanks Co. were awarded the contracts for the valves.

Point Grey, B.C.

The contract for the supply of piping for the waterworks system was awarded to Robertson, Godson & Co.

Strathcona, Alta.

Contract for installing new 18-in. intake pipe, etc., has been awarded to M. S. Caine for \$4,200, this being the lowest tender. The contract calls for the completion of the work in 60 days.

Railroads, Bridges and Wharves

Dauphin, Man.

Tenders are called until February 25th for all labor and material necessary for construction of two reinforced concrete highway bridges. Advertisement in "Tenders and For Sale Department" of this issue.

Edmonton, Alta.

The by-law to raise \$164,000 for new bridge over the North Saskatchewan was carried; also that to raise \$12,450 as city's share of constructing subway on Jasper avenue; also that for further sum of \$10,000 for widening bridge across Groat ravine.

Lanark, Ont.

Tenders addressed to J. Boyd, Caldwell, chairman roads and bridges committee, will be received until March 4th for erection of a reinforced concrete bridge over the Clyde river. Advertisement in "Tenders and For Sale Department" of this issue.

ment in "Tenders and For Sale Department" of this issue.

Paipoonge Tp., Ont.

On February 10th a by-law will come before the ratepayers to issue \$4,000 20 year, 5 per cent. bridge debentures. G. F. Scholfield, Clerk.

Port Stanley, Ont.

Plans will be prepared for a breakwater 1,200 feet long and estimated to cost \$250,000. \$60,000 has already been appropriated for this. Government Engineer, Lamb.

Quebec, Que.

Tenders addressed to J. F. Guay, C.E., Morin Building, will be received until March 2nd for construction of about 56 miles of railway for the Quebec & Saguenay Railway. Advertisement in "Tenders and For Sale Department" of this issue.

Township of Barton, Ont.

On February 14th a by-law will be voted on to issue \$6,500, 4½ per cent. bridge debentures. A. G. E. Bryant, Township Clerk.

AWARDED

Gravenhurst, Ont.

Contract for wharf here awarded by Public Works Department, Ottawa, to D. G. Stewart, Ottawa, \$12,984.

Leitch's Creek, N.S.

Contract for wharf here awarded by Public Works Department, Ottawa, to Robert & Bart, Mosgrove, N. Sydney, \$5,582.

Margaree Harbor, N.S.

Contract for breakwater extension by Public Works Department, Ottawa, awarded to Robert & Bart, Mosgrove, N. Sydney, \$5,300.

Monk's Head, N.S.

Contract for breakwater here awarded by Public Works Department, Ottawa, to Dougald & A. P. McIsaac, Blacksmith, N.S., \$6,255.

Port Burwell, Ont.

The contract for building the breakwater has been awarded to Mr. Hogan, Port Colborne, \$234,000. Work is to be completed in 18 months from January 30.

Quebec, Que.

The contract for the new bridge at the Louis Basin has been awarded by the Harbor Commission to the Dominion Bridge Company, \$26,730. Work will be commenced without delay.

The construction of the first portion of the Quebec & Saguenay Railway will be undertaken at the opening of the present spring. The contract for the line has been awarded to the Bishop Construction Company, of Montreal, from Cap Tourment to Murray Bay, E. A. Evans, construction engineer, Quebec & Saguenay Ry.

Stratford, Que.

Contract for landing pier here awarded by Public Works Department, of Ottawa, to McLaughlin Bros., Ottawa, \$5,797.5.

Vancouver, B.C.

Construction has been started on the section of the C. N. R. between Popkum and Hope, a distance of twenty miles. The contract has been awarded to the Northern Construction Company, which already holds the contract for the first section from Port Kells to Popkum. Engineer Gwyer is in charge.

Public Buildings, Churches Schools, etc.

Alba, Ont.

Tenders addressed to John Cotnam, Alba, Ont., will be received until February 25th for erection of Greenwood Methodist Church. Plans, etc., at residence of the above.

Amherst, N.S.

F. G. Spencer, St. John, N.B., is stated to have definite arrangements made for the erection of an up-to-date theatre here to cost about \$25,000. Tenders will be called within the next two weeks. Hewson & Moore, Moncton, are interested.

Calgary, Alta.

The congregation of St. John's have decided to erect a new church at Eighth avenue. Work of construction will be started at once. Messrs. Lang & Major, architects.

A by-law is being prepared for approval of ratepayers for one, or perhaps two, new Heenan & Froud incinerators. Estimated cost of two, about \$100,000.

Collingwood, Ont.

Under date of last information the contracts for erection of 8-room school here had not been awarded. Estimated cost of building, \$28,000; of equipment, \$2,000. John Wilson, architect.

Davidson, Sask.

On February 10th the following by-laws will be voted on by the ratepayers to issue \$4,000, 20 years, 5½ per cent. Town Hall and \$2,000 20 year, 5½ per cent. debentures. Arthur Jas. Robertson, Returning Officer.

Edmonton, Alta.

The by-law to raise \$175,000 for improving Exhibition grounds and erecting new buildings was carried; also \$3,500 to supplement the \$4,000 already raised for addition to city hall.

Fort Frances, Ont.

Tenders are called until February 15th for the erection of school in S. S. No. 10, Tp. Lash. Plans, etc., at office of B. L. Phillips, Emo F. Anness, secretary.

Galt, Ont.

The congregation of Trinity Church have decided to erect a new Sunday school room. Plans call for an expenditure of about \$10,000.

Grimsby, Ont.

Nothing definite has as yet been done in connection with the Carnegie public library. Jas. Aitchison, secretary library board.

Hull, Que.

The Notre Dame hall will be torn down and an up-to-date hall erected, costing about \$20,000.

London, Ont.

The City Council accepted the offer of \$100,000 from the Royal Bank for the present City Hall.

Tenders addressed to the Director of Contracts, Department of Militia and Defence, Ottawa, will be received until February 15th for construction of magazine building and an explosive store building here. Plans at offices of district officer, London, and the director of engineer services at above department.

Montreal, Que.

A tuberculosis dispensary is to be erected at 369 St. Catherine street east in connection with a Sanatorium at Beloit.

Tenders are being asked for by Messrs. Saxe and Archibald, Beaver Hall Hill, for the alterations to the Engineers' Club.

Mr. Leslie H. Boyd, K.C., is interested in the reported erection of Homeopathic Hospital.

Morewood, Ont.

C. P. Meredith, Ottawa, is preparing plans for continuation school here.

Outremont, Que.

A church sacristy and rectory are to be erected in the parish of St. Viateur, \$125,000.

Peterborough, Ont.

Messrs. Burk, Horwood & White, architects, Toronto street, Toronto, are in charge of the erection of the Murray Street Baptist Church here.

Quebec, Que.

It is stated that plans are being prepared for an athletic club building among the French-Canadians in St. Roch.

Regina, Sask.

The Young Women's Christian Association have taken an option on three lots here as a possible building site. Architects are submitting preliminary sketches for the building, which will cost about \$50,000.

Renfrew, Ont.

C. P. Meredith, architect, Ottawa, is preparing plans for an 8-roomed Separate school for Renfrew. The building will be of brick. Mr. Meredith is also preparing plans for an addition to a convent in Renfrew.

Stratford, Ont.

Tenders addressed to John S. Wahl, Gadshill, will be received until February 15th for erection of school at Gadshill for Union School Section No. 8, North East-Hope. Plans, etc., with above or at office of R. Bank Barber, architect, Stratford.

Thetford Mines, Que.

Tenders are called by Public Works Department until February 14th for additions to post office fittings here. Specifications at above department and on application to local postmaster.

Toronto, Ont.

The plans for the new Broadview Y. M. C. A. are completed and provide for erection of 3-storey building with basement at an estimated total cost of \$75,000. Construction will start in the

spring. Edmund Burke, 28 Toronto street, architect.

Tenders addressed to the Chairman of the Building Committee will be received by the architects, Darling & Pearson, until February 18th for all trades with the exception of masonry, concrete work, structural steel and terra cotta, required for the erection of surgical wing in connection with General Hospital. Plans, etc., at office of the above. Advertisement in "Tenders and For Sale Department" of this issue.

Tillsonburg, Ont.

The Public School Board have decided to build an addition of four rooms to the school. Chairman, T. C. Waller.

Tenders addressed to R. C. Desrochers, secretary, Department of Public Works, Ottawa, will be received until February 28th for construction of public building here. Plans, etc., at office of Mr. H. J. Lamb, district engineer, London, at local post office and at above department.

Vancouver, B.C.

Plans are to be called for at once for the manufacturers' building at Exhibition park. H. S. Rolston, secretary, Exhibition Association, 319 Pender street.

The plans prepared by O. W. Moberg, architect, for pavilion were accepted. Noted in last issue.

Assisting Building Inspector R. Mackenzie is preparing plans for the fire hall to be erected on Quebec street and Twelfth avenue. The by-law recently passed appropriated \$21,000 for this building.

Vernon, B.C.

Tenders are called until February 14th for post office fittings here by Public Works Department. R. C. Desrochers, secretary.

Wallacetown, Ont.

Tenders addressed to J. T. Kerr, secretary-treasurer building committee, will be received until February 18th for all trades required in the erection of church 11½ miles east of here. Plans, etc., at residence of above mentioned, and at office of N. R. Darrach, St. Thomas.

Welland, Ont.

The Presbyterian Church will go on with part of the enlargement this year according to plans adopted last year. A. E. Anderson, treasurer.

The Salvation Army will purchase property on the east side of Cross street, where a fine barracks building will be erected.

Winnipeg, Man.

The plans of William Bruce for erection of public baths have been accepted and tenders will be called.

Tenders for the different trades in connection with the erection of Selkirk Avenue Y. M. C. A. building will be received until February 14th. J. H. G. Russell, architect, McArthur Building.

AWARDED**Amherst, N.S.**

The contract for the new school house on Hickman street was awarded to the Victor Wood Workers, \$14,000. The building will be of brick and stone.

Calgary, Alta.

Messrs. Doyle & Thomas, of Lethbridge have been awarded the con-

tract for erection of Colonel Walker school. Estimated expenditure, \$100,000.

Peterborough, Ont.

Contract awarded by Public Works Department, Ottawa, for erection of addition to public building here to James Rose and H. Hickey, of Peterborough, \$8,200.

Prince Rupert, B.C.

Contract awarded by Public Works Department, Ottawa, for erection of quarantine hospital here to Anderson & McKinnon, Prince Rupert.

Residences

Montreal, Que.

The residence of Mr. A. McGoun was destroyed by fire on the 3rd inst. Estimated loss, \$10,000.

Tenders will be called for this month for a new residence for Mr. Clarence I. de Sola, to be erected on Pine avenue. A four-storey dwelling house is to be erected on McGregor street, and tenders for it are now being received by Mr. Kenneth G. Rea, architect.

Quebec, Que.

Negotiations were concluded on Thursday, by which the house of Browne, of Montreal, takes over the piece of land on Lagauchetiere street, comprising 18,000 square feet. A four-storey apartment house is to be erected on the site, containing 52 apartments.

St. Annes, Que.

Mr. C. B. Gordon is having a residence erected here early in the spring, and tenders will be asked for this month. Messrs. Saxe and Archibald, Montreal, are the architects.

Toronto, Ont.

The residence in course of erection for Mr. J. T. Moore was destroyed by fire on the 2nd inst. J. H. Galloway, architect, 23 Toronto street.

Messrs. J. T. Hutson have secured a site corner of Avenue road and Cumberland street, on which, it is stated, they will erect an apartment house.

Wallaceburg, Ont.

Tenders will be received until February 10th by Mrs. S. A. Milner, 2 Brisco Block, Chatham, for erection of brick tenement building here. Plans, etc., at office of S. G. Kinsey, architect, Merchants Bank, Chatham.

Westmount, Que.

Mr. F. G. Walter will build a semi-detached brick and stone house on Belvedere avenue.

The Osmonde Sharpe Construction Co. will build a pair of semi-detached residences in reinforced concrete and brick on Victoria avenue.

Messrs. Charbonneau Bros., Westmount, are preparing plans for two houses to be erected on Selby street at a cost of \$12,000.

Messrs. Saxe & Archibald have plans in hand for the following Westmount properties and will ask for tenders within the next few days: residence on Forden avenue for S. W. Stevenson, Esq.; Aberdeen avenue, for J. B. Hathaway, Esq.

Winnipeg, Man.

Recent building permits include: E. Noe, two houses on the north side of

Stella, \$6,000; Johnson & Bjornson, dwelling on the east side of Alverstone, \$2,600; Kristjanson & Bjornsson, dwelling, Alverstone, \$3,000.

AWARDED

Montreal, Que.

Contracts have been awarded for the plumbing and tiling of the house of Mr. J. M. Wilson, Ontario avenue; the former to Messrs. W. J. McGuire & Co., and the latter to the Sanitary Tiling Co.

Business Buildings and Industrial Plants

Berlin, Ont.

Under date of last information plans for the brick addition to the plant of The L. McBrine Co., Ltd., had not been prepared.

Brantford, Ont.

Mr. Chester Harris has purchased property on Bridge street on which, it is stated, he will erect a 2-storey brick garage, 64 x 40.

Buckingham, Que.

The Gauthier and Raby and Marwell buildings were destroyed by fire on the 2nd inst. Estimated loss, about \$6,000.

Calgary, Alta.

It is reported that the Hudson Bay Company have purchased a site further west from their present one on which large buildings will be erected.

Dryden, Ont.

The plan submitted to council by the Dryden Timber & Power Co., for the pulp mill, call for a building 400 feet in length, 250 feet wide, and provide for shipping rooms, screens and wet machines, etc.

Guelph, Ont.

It is stated that the new buildings for the Homewood Sanitarium to replace those recently burned, will cost about \$120,000.

Halifax, N.S.

The building occupied by the Merchants Bank of Canada was damaged on the 5th inst. to the extent of about \$150,000.

It is stated officially that the C. P. R. is arranging to have two large modern hotels erected in Nova Scotia, one at Digby, and one at Halifax.

Montreal, Que.

The Holt, Renfrew Co., Ltd., have purchased property adjoining their present premises on which they will construct an 8-storey fireproof block as soon as they come into possession.

Mr. John Thilbin is building a store on St. Catherine street.

Plans for the new Herald building are now being prepared by Messrs. Ross & MacFarlane.

The Gillette Razor Company have purchased land on Alexander street upon which they will erect a \$100,000 factory.

Extensive alterations and additions are to be made to the offices of the Montreal Rolling Mills. Plans are being prepared by Mr. Kenneth G. Rea.

A factory is to be erected at the corner of Duluth avenue and Mitcheson street by the Western Manufacturing Company.

Messrs. Henry Birks & Co., it is re-

ported, will erect an 8-storey fireproof building on the southwest corner of Cathcart street and Union avenue. Plans have not been prepared.

The Colonial Real Estate Company, Montreal, will erect a ten-storey building on St. Catherine street west, extending from Balmoral to Mance streets. The building, which will be of reinforced concrete, faced with terra cotta, is being designed and will be erected by Henry Morgan & Co., Ltd.

Nairn Falls, Que.

Plans have been prepared for the new ground wood mill of the East Canada Power and Pulp Company, Ltd. This company have taken over the limits of the Murry Bay Lumber & Pulp Company and the property of the Labrador Power Company. Engineer in charge, Mr. Geo. F. Hardy, New York City. The intention is to erect a plant which will incorporate the most advanced Swedish and Canadian practises in the manufacture of ground wood. R. Forget, Montreal, president; L. C. Haskell, Montreal, secretary-treasurer.

Sarnia, Ont.

The Imperial Oil Company is said to be acquiring options on land in the vicinity of the refinery here, for the purpose of making improvements and extensions.

Stewart, B.C.

Mr. Perry Finch, 1256 Yates street, Victoria, is authority for the statement that Finch & Hickey will rebuild their departmental store here, destroyed by fire recently.

Strathcona, Alta.

On the 31st ulto. fire destroyed the stores of Bright & Ashbaugh; Cook & Orr and the up-town office of the O'Brien Lumber Company. Total loss, about \$40,000.

P. Burns has purchased additional property in the south end, on which, it is stated, a paving plant costing about \$1,500,000 will be erected shortly.

Toronto, Ont.

Tenders addressed to Curry & Sparling, 90 Yonge street, will be received until February 15th for erection of fireproof building.

The Dominion Bank will build new branches at the following points in Toronto: southeast corner Bloor and Dovercourt; southeast corner Lee avenue and Queen street, southwest corner St. Clair avenue and Vaughan road.

The Canadian Pacific has filed plans for its proposed new freight yards and sheds on the property bounded by Simcoe, Dorset and King streets, including the present site of government house.

Tenders addressed to Geo. A. Mitchell, master of B. and B., room 414 Union Station, will be received until February 13th for the purchase and removal of the following houses, Empress Crescent, 10, 22, 24; Dunn avenue, 57, for the G. T. R.

The Imperial Bank is stated to have secured the adjoining property to the corner of Buchanan and Yonge streets, purchased some time ago, on which a large building will be erected.

Truro, N.S.

Crowe Bros., druggists, were burned out. Loss, \$20,000.

Vancouver, B.C.

Plans have been presented to Building (Continued on page 31)

Tenders and For Sale Department

DREDGES FOR SALE

A one yard Beatty dredge in first-class shape, within a few miles of railroad station, suitable for dredging or ditching; also a half yard machine with portable oak hull in first-class shape. Apply FRED. A. ROBERTSON, Cornwall, Ont.
4-6

TO ARCHITECTS

CASH PRIZES of One Hundred, Seventy-five, and Fifty Dollars are offered for competitive Preliminary Sketches of proposed new Sabbath School building and Church Parlors for Orillia Presbyterian Church, Sketches to be in hands of undersigned not later than February Fifteenth. Full information may be had from J. J. THOMPSON, telephone 261, Orillia.
5-6 T. G. KING, Secretary.

Notice to Contractors

Whole or separate sealed tenders endorsed "Tender for School," will be received by the undersigned at his residence, Gadshill, up to 12 o'clock noon, 15th inst., for the erection of a school house at Gadshill for Union School Section No. 8, North East-Hope. Plans, specifications, etc., may be seen at Gadshill or at residence of R. Bank Barber, architect, Stratford. The Trustee Board do not bind themselves to accept the lowest or any tender.

JOHN S. WAHL.

Gadsaill, February 3, 1911.

6-6

City of Strathcona (Alberta)

Tenders for Engine, Boilers and Generators

Tenders addressed to David Ewing, Chief Engineer power house, Strathcona, Alta., for the above machinery, will be received until noon, Wednesday, March 1st, 1911. Specifications may be obtained upon application to the undersigned.

A. J. McLEAN,
City Engineer.

Strathcona, Alta., Jan. 16, 1911.

4-8

The City of Calgary

Tenders will be received by the City Commissioners up to the 20th day of February, 1911, for 200 (more or less) 5-light ornamental lamp posts to be delivered in carload lots as required. All persons tendering will submit their designs, together with full dimensions, weights, etc.

Globes are to be of light alabaster. Each post must be equipped with standard Edison sockets, all complete and ready for wiring up. Tenderer will also submit prices on extra globes which might be required. Tungsten lamps will be supplied by the city. A cheque for two per cent. of the bid must accompany all tenders. The city reserves the right to accept the whole or any part of a tender; the lowest or any not necessarily accepted.

Dated at Calgary, January 27th, 1911.

A. G. GRAVES,
City Commissioner.

5-6

For Sale—Second Hand

No. 8 Austin Gyratory Crusher.
No. 6 and No. 3 Austin complete plant.
No. 3 Austin and 2 No. 6 Gates and No. 5 "B."
70-ton Vulcan Steam Shovel, 2-yard.
50-ton Bucyrus Steam Shovel, 1 1/4-yard.
Loco. Crane, with 1 1/4-yard Clam Shell.
Little Giant Traction Steam Shovel, 1 1/4 yard.
Hayward Orange Peel Buckets, 1 and 1 1/4-yd.
Concrete Mixers, Steam Rollers, Air and Steam Drills, Air Compressors, Locomotives, Dump Cars, etc.

All our goods we fully guarantee.

Send for our February Booklet.

WILLIS SHAW MACHINERY CO.,
171 La Salle St.,
Chicago, Ill.

St. Catharines Water Works

TENDERS

Sealed tenders addressed to "The Chairman Water Works Commission," endorsed "Tenders for Pipe and Specials"—Gate Valves—Pig Lead, will be received up to noon on Tuesday, February 28th, 1911, for the cast iron pipe and special castings 12-in. to 36-in., Gate Valves 4-in. to 36-in., and pig lead required.

Specifications, forms of tender and full particulars may be obtained at the office of The Commission, City Building.

The Commission does not bind itself to accept the lowest or any tender.

ALEX. MILNE,
Superintendent.

St. Catharines, Ont., Feb. 2, 1911.

6-7

Town of Dauphin Province of Manitoba

Tenders for Reinforced Concrete Highway Bridge

Sealed tenders addressed to the undersigned Town Clerk will be received up to 8 p.m. Saturday, the 25th day of February, 1911, for all labor and material necessary for the construction of two reinforced concrete highway bridges to be constructed in the Town of Dauphin.

Plans and specifications will not be sent out, but may be seen at the Town Clerk's office, Dauphin, Man., or at Provincial Public Works Department, Winnipeg, Man.

The lowest or any tender not necessarily accepted.

H. F. CALDWELL,
Mayor.

A. H. F. STELCK,
Chairman Public Works Committee.

J. W. JOHNSTON,
Town Clerk.

6-8

Positions Wanted

Advertisements under this heading one cent a word per insertion. Box No ten cents extra

ARCHITECT, highest qualifications and experience, would take charge of office or consider partnership. The West preferred. Box 200, Contract Record, Toronto, Ont.

4-7

TENDERS WANTED

The Quebec & Saguenay Railway

Tenders will be received up to March and, 1911, at 5 o'clock p.m., by the undersigned, for the construction of about 56 miles of the above railway, from Cap Tourmente to Murray Bay Wharf, divided up into sections of ten miles.

A certified cheque amounting to \$2,000 for each ten mile section tendered for must accompany each tender.

Forms of tender may be obtained and specifications and plans examined at the office of J. F. Guay, Civil Engineer, Morin Building, Quebec.

The right is reserved by the company to reject any or all tenders.

6-6

(Signed) J. F. GUAY.

St. Augustine's Seminary

Tenders will be received by the undersigned until 12 o'clock noon on Saturday, the 18th inst., for the plastering, roofing, flooring, tiling, painting and glazing and iron stairways required for St. Augustine's Seminary on the Kingston road, near Toronto.

Plans and specifications may be seen at the office of the Architect.

Satisfactory bonds to the effect of one-half of the amount of contract will be required for the faithful performance of the contract.

The lowest or any tender not necessarily accepted.

Arthur W. HOLMES,
Architect.

10 Bloor street east.

6-6

Tenders

Toronto General Hospital

Tenders addressed to the Chairman of the Building Committee will be received by the undersigned up till noon, Saturday, February 18th, 1911, for all the trades, with the exception of masonry, concrete work, structural steel and terra cotta, required for the erection and completion of the Surgical Wing in connection with the General Hospital.

Plans and specifications and all other information can be obtained at the office of the architects,

DARLING & PEARSON,
2 Leader Lane.

The lowest or any tender not necessarily accepted.

6-6

Miscellaneous

Advertisements under this heading one cent a word per insertion. Box No. ten cents extra

AGENTS WANTED—Large United States Terra Cotta company desires high-class agencies for Canada. Send particulars to W. D. Ward, Tribune Building, New York City.

4-6

CAPITAL WANTED for interior fitting factory doing a first-class business in bank and store fixtures. Splendid equipment and first-class connection. Preference stock for \$20,000 to be issued. Apply for particulars to Box 207 Contract Record, Toronto.

5-6

Tenders for Bridge

Tenders will be received by the undersigned up to 6 o'clock p.m., Saturday, the 4th day of March, 1911, for the erection of a reinforced concrete bridge, single span over the Clyde River at a point about 3 miles north of Lanark Village. Bridge about 70 feet long.

Plans may be seen at the office of the undersigned at Lanark, or tenderers may submit their own plans and specifications.

Deposit of ten per cent. to accompany each tender, which will be returned if tender not accepted.

The lowest or any tender not necessarily accepted.

Dated this 2nd day of February, 1911.

J. BOYD CALDWELL,
Chairman of Roads and Bridges Com.
Lanark, Ont. 6-9

Tenders

Foundry and Machine Shop in the Town of Welland, in the County of Welland For Sale By Tender

Foundry and Machine Shop in the Town of Welland, in the County of Welland For Sale by Tender.

Scaled Tenders marked "Tender for The Robertson Machinery Company, Limited," will be received by the undersigned up to twelve o'clock noon on Tuesday, the 21st day of February, A.D., 1911, for the purchase, en bloc, of the assets of The Robertson Machinery Company, Limited, Welland, Ont., which is unusually well situated, being on the Grand Trunk Railway, with switching rights to all other railways, consisting of:—

Land, Factory site, part of Block W., about 4 acres, with right to switch, including building 70 ft. x 112 ft. —besides store rooms, motive power, cupola, line shafting, etc. \$11,290.00
Iron working machinery 3,945.00
Wood working machinery 250.00
Pulley 641.00
Small tools:—
Machine shop \$1,000.00
Foundry 511.00

Hoisting engines and parts 1,511.00
Foundry 1,500.00
Foundry merchandise 632.00
General merchandise 2,500.00
Office furniture and fixtures 275.00

\$23,544.00

An inventory will be mailed upon request. The plant has not been shut down. It is excellently located, and has been doing a good business.

Each tender must be accompanied by a certified cheque, payable to the Assignee, for the sum of one thousand dollars, the balance of the purchase price to be paid within thirty days, without interest, when immediate possession can be given.

Dated this 1st day of February, A.D. 1911.

J. F. GROSS, Assignee,
Welland, Ont.

6-7

Positions Vacant

Advertisements under this heading two cents a word per insertion

Superintendent wanted for interior fitting factory, manufacturing a high class of fittings, must be able to invest from three to five thousand dollars. Only practical man and a pusher considered. To such good returns guaranteed. Apply with particulars to Box 208, Contract Record, Toronto. 5-6

Business Buildings and Industrial Plants

(Continued from page 29)

Inspector Jarrett for a warehouse on Howe and Hastings street.

Welland, Ont.

Tenders for the purchase of The Robertson Machinery Company, Limited,

will be received until February 21st. Advertisement in "Tenders and For Sale Department," this issue.

Col. L. C. Raymond, it is stated, will build a 2-storey brick block on Cross st.

Plans are being prepared for the extension of the Ross block on East Main street. Mr. D. Ross, Welland, is interested.

Weymouth Bridge, N.S.

The Campbell Lumber Company, whose plant was destroyed by fire on January 23rd, will immediately erect a new building. They are undecided as yet whether to install a pulp mill or a power plant, but expect to settle the matter shortly. The building will probably have concrete foundations with steel superstructure and corrugated iron. If the pulp mill is erected it will have the latest improved wet machines, screens, etc. An up-to-date saw mill will also be installed in connection with the pulp mill.

Windsor, Ont.

The Moloney Electric Co., of St. Louis, Mo., will establish a Canadian branch here.

Winnipeg, Man.

The new building for Gowans-Kent Western, Limited, will be eight storeys, of reinforced concrete. Architects, Jas. Chisholm & Son; contractors, Carter-Halls-Aldinger Company.

Mr. Geo. M. Ellis, automobile manufacturer, has secured option on 30 acres of land east of the Seine River as a building site for a factory about which negotiations are being carried on with city council. J. B. Cote, city clerk.

Woodstock, N.B.

The sawmill and factory owned by Mr. Hayden were destroyed by fire on the 31st ulto. No loss stated. Mill will be rebuilt.

AWARDED

Ottawa, Ont.

The Ottawa Car Company is building 20 cars of the pay-as-you-enter type for the Ottawa Street Railway at a cost of \$8,000 each.

John M. Garland, Son & Co. will erect a large addition to their warehouse, corner Queen and O'Connor streets, this spring. The annex will be as large as the present seven-storey building and similar in design.

Quebec, Que.

Mr. J. A. Labouche has received a contract from the Transcontinental Railway Commission for demolishing Champlain Market Hall to make way for the railway terminals.

Regina, Sask

Smith Bros. & Wilson, Regina, were awarded contract for the warehouse here, \$15,000. Owner, Hany Bros. & Nellimore, Winnipeg; architects, Storey & Van Egmond.

Saskatoon, Sask

The contract for the 6-storey hotel has been awarded to Carter-Halls-Aldinger Co., Winnipeg. Estimated expenditure, \$300,000. Architects, Brown & Vallance, Montreal. Hon. Edward Coke, president Saskatchewan Investment & Trust Co., is interested.

Sydney, N.S.

It is stated that the Dominion Steel Corporation will erect a \$150,000 office building, Prince street and Old Victoria

road, to replace the building recently destroyed by fire.

Toronto, Ont.

The Independent Glass Producers, Limited, have a permit for a two-storey brick and metal-clad factory, Carlaw avenue, \$20,000.

Power Plants, Electricity and Telephones

Calgary, Alta.

Tenders are being called by City Commissioner until February 20th for the supply of ornamental lamp posts. A. E. Graves, City Commissioner. Advertisement in "Tenders and For Sale Department" of this issue.

Dundas, Ont.

The council have passed the by-law authorizing contract with the hydro-electric company and raising \$12,000 by debentures for erecting a portion of the necessary distribution plant.

Edmonton, Alta.

Application has been made to the Dominion Government by this city for power rights on the Grand Rapids on the Athapasca River. Plans filed with the application show a maximum power, if all the dams are built, of 60,000 horsepower.

Guelph, Ont.

Tenders are being received by the Street Railway Commission for construction of new branch to be built in St. Patrick's Ward.

Liverpool, N.S.

A scheme is on foot to harness the extensive water powers in this vicinity for the purpose of supplying electricity. Surveying operations under the supervision of Mr. Holgate, Montreal, are being carried on. J. L. McLeod and Geo. S. McLaren, pulp mill owners, Liverpool, are interested.

London, Ont.

At the annual meeting of the London Street Railway directros it was decided to build an up-to-date steam power plant, and abandon the proposals for the use of hydro-electric power from Niagara.

Ottawa, Ont.

The Morrisburg & Ottawa Electric Railway are seeking a franchise to build a railway along Main street to connect with the Ottawa Street Railway. C. M. Willard, Morewood, Ont., president.

Prince Rupert, B.C.

Until March 2nd tenders will be received for \$40,000, 20 year, 4½ per cent., telephone debentures. Ernest A. Woods, City Clerk.

Pincher Creek, Alta.

Tenders are called until February 20th for issue of \$22,000 electric light debentures. G. D. Plunkett, secretary-treasurer.

Renfrew, Ont.

Engineers of the Hydro-Electric Commission are here to visit the upper lakes of Bonnechere River, looking for sites for dams for storage purposes. The town is expending \$150,000 for power development.

Renfrew, Ont.

A report was received from the engineers re the building of reservation

dams on the upper lakes of the Bonnechere to the effect that a 10-ft. dam on the outlet of Lake Clear could raise the water seven feet, thus giving additional power for 100 days during the low water period of the Bonnechere.

Regina, Sask.

The contract for supply of rails, etc., for municipal railway here went to U. S. Steel Products Co., of which the details are as follows: 560 gross tons 80 lb. Lorain sec. 335 rails at \$58.84; 247 gross tons A. S. C. E. 60 lb. rails at \$50.50 620 pair Lorain splice bias at \$3.10 per cwt.; 460 pair A. S. C. E. splice bias at \$2.45 per cwt.; 5560 Lex. head bolts at \$4.50 per cwt.; 6,000 rail spikes at \$2.60 per cwt.; 2200 rail bonds M.P.3 4/0 13 inch c-c at \$46.25 per cwt.; 100 cross bonds C. P. X. 4/0 60 inch c-c at \$91.00 per cwt.; 20 cross bonds C. P. X. 4/0 66 inch at \$98.00 per cwt. L. A. Thornton, city engineer.

The plans of the city commissioners call for the laying of five and one-half miles of street railway track during the present year, at a cost of about \$135,000, and the laying of six miles of track during the year 1912 at a cost of about \$125,000.

The rails necessary for the completion of the work outlined by the city commissioners have been ordered and a considerable portion delivered already.

The total estimated cost of the work during the present year is \$213,000, and for 1911 and 1912, \$402,000. The estimates of the commissioners for the present year provide as follows:

Five and one-half miles track..	\$135,000
Six cars	38,500
Snow sweeper	4,500
Power unit	20,000
Car barns	15,000

\$213,000

For 1912 provision is made for the addition of seven cars.

Sherbrooke, Que.

The ratepayers voted on February 6th on the "Drop Off" Power development by-law.

Winnipeg, Man.

Tenders addressed to Chairman, Board of Control, will be received until February 22nd for the following items, specification No. 63, conduit, 1911; specification No. 64, construction of conduit runs, 1911. Specifications, etc., obtained from power engineers, Smith, Kerry & Chace, Carnegie Library; M. Peterson, secretary.

Winnipeg, Man.

Tenders addressed to the Chairman, Board of Control, will be received until March 3rd for the manufacture of a motor car for use on standard gauge railway track. Specifications, etc., at office of power engineers, Smith, Kerry & Chace. M. Peterson, secretary.

Miscellaneous

Ottawa, Ont.

The Government has called for tenders for the construction of the ten new vessels of the Canadian navy, viz., four Bristols and six destroyers of the latest improved type. The plans and specifications are based on the plans received from the Admiralty last fall and embrace the very latest advances in naval science. The tenders are not publicly

advertised, since following the rule of the Admiralty, details have to be kept secret, and only firms in whom the department has confidence and who might be bona fide tenderers, will have access thereto.

Recent building permits include W. A. and J. B. Lamb, repairs to office building, W. G. Adamson, contractor, \$4,000; William Weston, dwelling Percy street, \$2,900; A. Larocque, dwelling, Blackburn avenue, \$3,500.

Toronto, Ont.

Tenders addressed to the Postmaster-General, Ottawa, Ont., will be received until March 17th for manufacture and delivery at Toronto of one or more motor trucks. Specifications obtained from chief post office superintendent, Room 1 Post Office Building. G. C. Anderson, superintendent mail contract branch.

AWARDED

Bassano, Alta.

The contract for the construction of a great dam on the Bow River here has been let by C. N. R. The contract for the excavation work was let to Jense, McDonnell & Company. The concrete work will be done by Walker, Fisher & Company.

Ottawa, Ont.

The following contracts have been awarded by the Public Works Department: Two dump scows for dredge Mud Lark, British Columbia, Ross and Howard, Iron Works Co. Ltd., Vancouver, B.C., \$10,800; Quinze, Pontiac County, transportation of cement for dam, Geo. H. Rochester, of Haileybury, about \$5,000, and T. Simard, of Ville Marie, P.Q., for about \$3,000; gasoline motor tug to tend dredge King Edward, B.C., to Vancouver Ship-Yards, Ltd., Vancouver, \$6,850; French River, Indian Reserve, dam and sluice ways, J. F. Boyd, Sault St. Marie, about \$13,000.

New Companies

Eastern Paper Company, St. Basile, Que., incorporated, capital, \$100,000. Incorporators, E. R. Pepin, manufacturer, J. O. Collette, foreman, both of St. Basile.

Central Canada Iron and Steel Corporation, Montreal, Que., incorporated, capital, \$500,000. Incorporators, G. V. Cousins and O. B. MacCallum, barristers, S. T. Mains, accountant, all of Montreal.

Standard Chemical Iron and Lumber Company of Canada, Limited, Toronto, Ont., incorporated, capital, \$6,000,000. Incorporators, J. Wood and T. W. Lawson, barristers, both of Toronto.

The Erie Timber and Land Company, Limited, Toronto, incorporated, capital, \$100,000. Incorporators, A. H. Royce and R. B. Henderson, barristers, both of Toronto.

British Canadian Lumber Corporation, Limited, Montreal, incorporated, capital, \$20,000. Incorporators, F. H. Chrysler, C. J. R. Bethune, both solicitors, Ottawa.

The Western Manufacturing Company, Limited, Winnipeg, Man., incorporated, capital, \$250,000. Incorporators: C. M. Boynton, R. T. Ferguson, law clerks, all of Winnipeg.

The Canadian Kellogg Company, Limited, Montreal, Que., capital, \$25,000, incorporated to design, etc., and contract for and deal in pipes, fittings, valves, etc. Incorporators, J. A. Mann, C. G.

Mackinnon and J. T. Hackett, advocates, all of Montreal.

The Brockville, Construction Company, Limited, Ottawa, incorporated, capital, \$2,000,000. Incorporators, John Black, broker, R. T. Mullin, barrister, Montreal, and G. C. Hurdman, lumberman, Ottawa.

The Winnipeg Bridge and Construction Company, Limited, Winnipeg, incorporated, capital, \$60,000. Incorporators, John Frankman, bridge contractor, H. Frankman, bridge contractor; James Frankman, bridge contractor, all of Minneapolis, Minn., U.S.A. Johannes LaCour, civil engineer, Winnipeg.

The Twin Lake Lumber Company, Limited, Nipissing, Ont., incorporated, capital, \$40,000. Incorporators, H. E. Hurlburt and Edward Floyd Armstrong, lumberman, both of Nipissing.

Great Lakes Lumber Company, Limited, Owen Sound, Ont., incorporated, capital, \$40,000. Incorporators, W. A. Rowland, H. E. Rowland, and J. M. Rowland, lumbermen; A. G. Mackay, barrister, all of Owen Sound.

The Louise Lumber Company, Megantic, Que., incorporated, capital, \$20,000. Incorporators, Thos. Malcolm Craig, lumber dealer, Sherbrooke, Que., L. Bolduc, lumber merchant, and E. Huard, merchant, Megantic.

Canadian Quarries and Construction Company, Limited, Ottawa, Ont., incorporated, capital, \$2,000,000. Incorporators, John Black, broker, and R. T. Mullin, barrister, both of Montreal, and S. Bidsky and G. C. Hurdman, lumberman, both of Ottawa.

Central Canada Iron and Steel Corporation, Limited, Montreal, Que., incorporated, capital, \$500,000. Incorporators, G. V. Cousins, and O. B. MacCallum, barristers, both of Montreal.

Quebec Pulp & Paper Company, Limited, Montreal, Que., incorporated, capital, \$15,000,000. Incorporators, C. G. Greenshields and E. R. Parkins, advocates, both of Montreal.

Standard Chemical Iron and Lumber Company of Canada, Limited, Toronto, incorporated, capital, \$6,000,000. Incorporators, J. Wood and T. W. Lawson, barristers, both of Toronto.

The George N. Kernohan Lumber Company, Limited, London, Ont., incorporated, capital, \$40,000. Incorporators, G. N. Kernohan, lumber merchant, and J. M. McEvoy, barrister, both of London.

The Lethbridge Brick Company, Limited, Sault Ste. Marie, Ont., incorporated, capital, \$20,000. Incorporators, W. W. Lethbridge, brickmaker, D. D. McPhail and K. M. Wright, contractors, both of Sault Ste. Marie.

La Compagnie G. Blais, Limitee, S. Euphemie, Que., incorporated, capital, \$45,000. Incorporators, G. Blais, merchant, Z. Cloutier, manufacturer, both of St. Pierre de la Riviere du Sud.

The Brockville Construction Company, Limited, Brockville, Ont., incorporated, capital, \$100,000. Incorporators, W. S. Buell, J. H. Botsford, barristers, both of Brockville.

A. J. Sequin, electrician, Ottawa, is stated to have sold assets.

Finch & Jones, lumber merchant, Corbin, B.C., are stated to have been succeeded by Riverside Lumber Company, Limited.

Contractors' and Builders' Supplies

Crushed Stone

For Concrete Fireproof Construction, Roadwork and Sidewalks

Rubble, Portland Cement

CRUSHED GRANITE for Floors and Sidewalks

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Crescent Fire Brick

We are exclusive Distributing Agents for this high grade, hand-made fire brick. Large stock always on hand.

Don't forget our Prompt Delivery Service.

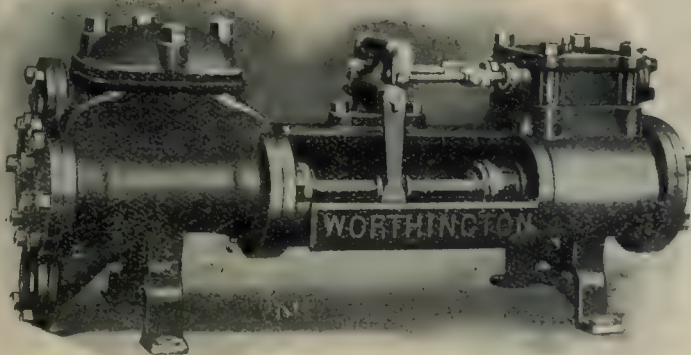
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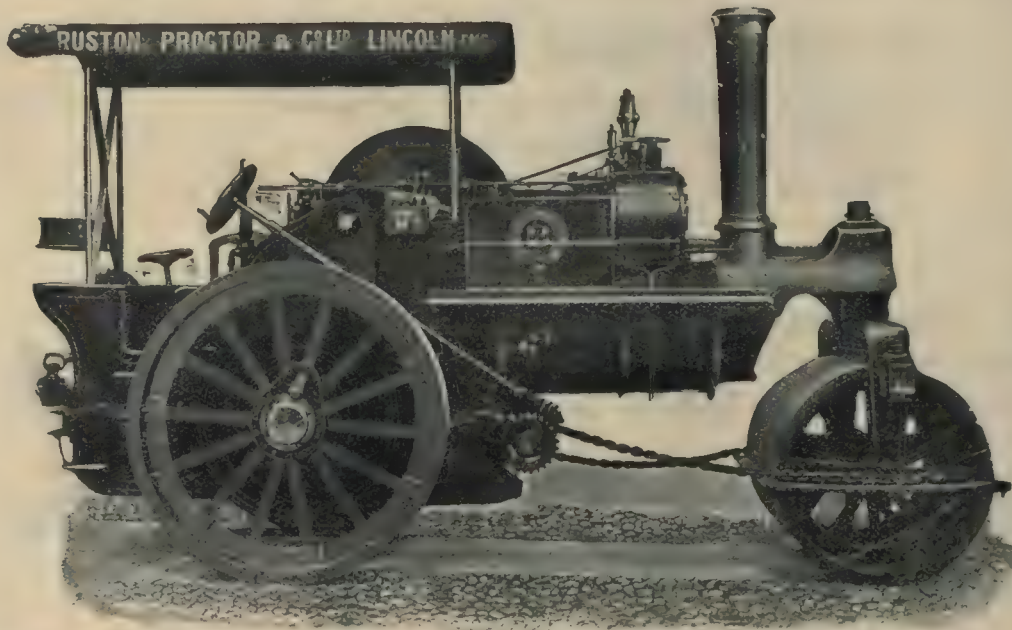
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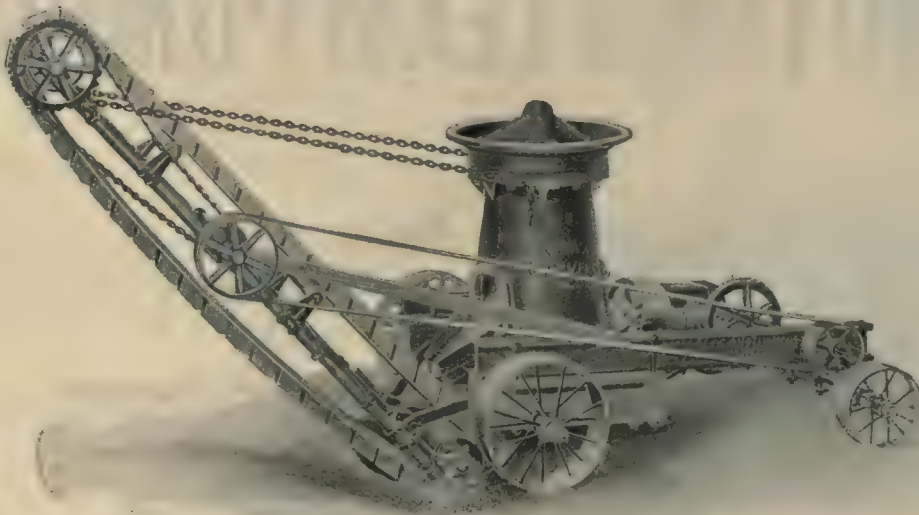
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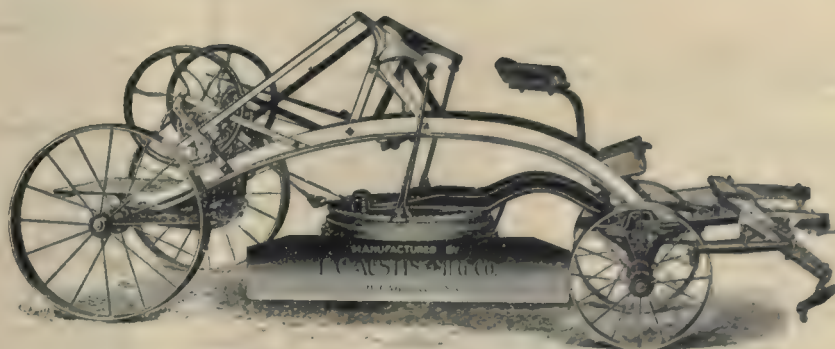
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Concrete Floor Dressing prevents abrasion, wear, dust formation, water, oil and grease absorption.

Alkali Proof Wall Size prepares interior plastered walls for highest class decorations.

Waterproof Flat Finishes for highest class interior decoration of plaster, metal and Beaver Board Surfaces.

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Transparent Waterproofing waterproofs concrete, brick, stone, granite and marble without changing color or texture.

Liquid Cement waterproofs and uniforms surface color of concrete and stucco. Bonds plaster to concrete.

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Liquid Rubber for dampproofing interior surfaces of exposed walls—plaster applied over it—for waterproofing basements.

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Booklet covering the above materials and Specifications for use, also samples sent gratis, upon request

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Contract Record

ESTABLISHED 1886

A Weekly Journal of
Building, Contracting, Engineering, Public Works
Municipal Progress, Advance Information

PUBLISHED EACH WEDNESDAY BY

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SUBSCRIPTION RATES

Canada and Great Britain, \$2.00 U.S. and Foreign, \$2.50

Vol. 25

February 8, 1911

No. 6

Phases of the Tariff Question

While the revised tariff agreement with the United States now under consideration by the Canadian Government is not of particular moment in so far as concerns our building and engineering supply houses, there seems to be a general feeling that the schedule is one which the country can afford to reject; that the prosperity of recent years is a sufficient indication of the success of the old agreement; that in time the United States will come to us in any case, and in short that any change in our fiscal policy at this juncture is not going to help us.

As we have intimated, the changes in so far as this journal is concerned particularly would not be an important consideration. For instance, a reduction of 5 cents a barrel on the duty of cement, from 43 cents to 38 cents, will scarcely make the importation of that article less prohibitive, especially when the question of freight is also taken into account. The brick manufacturers are not affected and no change is scheduled for lime, hard wall plasters, fire brick, etc. A cut of 2½ per cent. on building stone may be overlooked in its effect upon the trade, while a 5 per cent. reduction on vitrified paving blocks will have no far reaching effect. A reduction of 4 per cent. is made in the case of roofing slate, and 2½ per cent. in plate glass. The manufacturers of steamfitters' supplies, paints and oils and a few other lines are not affected.

On looking through the schedule there are a number of items which, to say the least, are amusing. One of these is a cut of 12½ per cent. on Canadian made clocks and watches entering the United States. We wonder whether this is a source of much alarm to the American maker? We were always under the impression that the best watches were made in the old country, a few good ones in the United States and the cheap ones on the continent. Certainly we were not aware that Canada's share in the business amounted to anything. Likewise the apparently heavy concession by the United States in plate glass is a negligible factor, and from the profit made on all the brass band instru-

ments which we shall send out of Canada at a reduction of 22½ per cent., the manufacturers in that line are not likely to devote any considerable portion to philanthropic enterprises, in the way of model roads, public buildings, and so on. We can readily understand that at this juncture anything capable of emitting hot air will have an added value across the border, but for the self-same reason we need those brass band instruments ourselves.

Certainly our own impression is, "Let well alone." Our development during the last decade, to go back no further, has occupied the attention of the whole world, not alone the United States. Our trade has increased beyond the most sanguine predictions, immigration has assumed marvellous proportions, our cities have prospered, the farmers have made money (in spite of their pessimism), and altogether we have every reason to be both gratified and satisfied. Let us do our best for a time at least to keep our trade within the empire, and let us work for any agreement that will enable us, under more favorable conditions, to consign our surplus products to British ports over our own transcontinental railways. We are looking for no concessions from the United States and it is no longer within the power of that country to intimidate us. With our enormous natural wealth we are more than independent. Let us not jeopardize that independence for considerations of temporary advantage.

The Portland cement production in the United States in the year 1910, according to the preliminary estimate made by Mr. E. F. Burchard, of the United States Geological Survey, has set a new high record. His preliminary estimate is based on statistics and estimates received by the Survey from 20 per cent. of the companies manufacturing Portland cement, these companies representing nearly half of the entire output of the country. From these figures he concludes that the production in 1910 was between 73,500,000 and 75,000,000, bbl., as compared with 63,508,471 bbl. produced in 1909. This is an increase of 10,000,000 to 12,500,000 bbl., or 15 to 20 per cent. The figures on which this estimate is based have been received from manufacturers in all parts of the United States, and are therefore considered to be representative of the country at large rather than of any single section or district. Although the average values for 1910 appear, from returns received thus far, to have been slightly higher than in 1909, prices were far from satisfactory, especially to the large manufacturers in the Lehigh Valley district and in certain of the Eastern States. The year 1911 opens with prices cut 5 to 10 cents a barrel lower than those prevailing in 1910. The construction of several new plants has been pushed during the year, and several plants that were under construction in 1909 became producers in 1910, so that the kiln capacity remains far in advance of the demand.

The Province of Quebec has a surplus of nearly a million dollars on the operations of the last fiscal year, according to the report of the Provincial Treasurer, Hon. P. S. Mackenzie. The expenditure estimated for 1911 shows an increase of some \$600,000 over 1910. Of this increase \$175,000 will be devoted to rural roads, making a total grant of \$250,000. This is additional to \$170,000 for colonization roads. The total amount to be spent on highways and roads in the three departments of agriculture, public works and colonization is \$595,000.

The Ontario Good Roads Association

Advance Programme of Proceedings at Forthcoming Convention in Toronto—Addresses by Prominent Engineers and Others—March 1-3

From the general interest taken in the work of the Ontario Good Roads Association and from the excellent results obtained by that body in recent years, there is every reason to expect that the annual meeting of the association, which is to be held at the York County Municipal Building, Adelaide street east, Toronto, March 1-3, will be productive of many things of interest to municipal engineers, contractors and others directly or indirectly concerned with good roads. The complete programme for the sessions has not yet been issued, but from the advance copy published hereunder, which of course is subject to revision, it will be seen that every effort is being made to cover all sides



**Mr. W. A. McLean, Provincial Highways Engineer,
an Enthusiastic Worker for the Association.**

of the question and to make the convention as directly helpful as possible, to the practical man as well as to the engineer. The association is negotiating for special railway rates and it is expected that single fares for the return journey will be secured. All those who attend the convention should obtain one-way tickets and secure the usual certificate from the railway ticket agent. Tickets will be good going from Saturday, February 15th, to March 2nd, and returning, March 2nd to March 6th, but must be presented for signature at the Good Roads Convention upon Thursday, March 2.

All the proceedings of the convention will be open to the public. For further particulars address either the President, W. H. Pugsley, Richmond Hill, Ont., or the Secretary, Col. J. E. Farewell, Whitby, Ont.

Wednesday, March 1st.—Morning Session, 10.30.

Address of Welcome—G. R. Geary, Mayor of Toronto; R. T. Bull, Warden of York; Controller Ward, Toronto.
President's Address—W. H. Pugsley, Richmond Hill.
Secretary's Report—J. E. Farewell, K.C., Whitby.
"Brief Sketch of the Good Roads Movement in Ontario," J. F. Beam, Black Creek.

Afternoon Session, 2 p.m.

Address—Hon. John Morrissey, Minister of Public Works, New Brunswick.

"Why Toronto voted \$100,000 for York Roads," L. H. Clarke, Toronto Board of Trade; W. G. Trethewey, Toronto Board of Trade.

"Good Roads and the Fruit Trade," L. A. Hamilton, Lorne Park.

"The Niagara Boulevard," John H. Jackson, C.E., Superintendent Queen Victoria Park, Niagara Falls.

"Road Management," T. L. Kennedy, Reeve of Toronto Township.

"Road Systems," W. A. McLean, C.E., Provincial Engineer of Highways.

Thursday, March 2nd.—Morning Session, 10 a.m.

"New York State Roads," Geo. C. Diehl, Engineer of Erie County, Buffalo, N.Y.

"Design and Cost of Concrete Bridges," C. R. Wheelock, C.E., Engineer of Peel County, Orangeville.

"Shop Fabrication and Erection of Highway Bridges," L. J. Street, C.E., Toronto.

"Highway Bridges from the Investment Point of View," C. R. Young, C.E., Toronto.

Afternoon Session, 2 p.m.

Address—Hon. J. O. Reaume, Minister of Public Works.

Address—Geo. H. Gooderham, M.P.P., Toronto.

"Cost of Primary Transportation," R. H. Jupp, County Engineer of Simcoe.

County Road Systems," Herbert J. Bowman, C.E., Waterloo County; T. J. Lammiman, County Road Superintendent, Oxford County; W. R. Cummings, Carleton County; John A. Sanderson, Warden, Leeds and Grenville; Geo. M. Fox, Warden of Wellington County; W. B. Russ, Lincoln County; J. L. Taylor, Wentworth County; and other county representatives.

Friday, March 3rd.—Morning Session, 10 a.m.

Address.—A. McGillivray, Highway Commissioner of Manitoba.

"Township Road Methods," Walter Scott, ex-Reeve of Markham; R. W. Longmore, Reeve of Ernestown; J. C. Rose, Clerk of Orillia Township; Thos. W. Allan, Reeve of North Grimsby; Wm. B. Bridgman, Reeve of Saltfleet; F. H. Lowery, Reeve of Niagara Township.

Afternoon Session, 2 p.m.

"Tile Drainage of Roads," Charles Talbot, County Engineer, Middlesex.

"Road Drainage and Drainage Laws," F. J. Ure, C.E., Woodstock.

"Roads of Coleman Township," H. I. Routley, C.E., Haileybury.

Reports of Committees.

Election of officers.

The reconstruction of the Radcliffe viaduct of the Great Northern Railway, England, has involved the substitution of a brick structure for the original one of timber without interrupting traffic. The total length of the viaduct is about 1,254 feet. The new portion consists of 28 spans, 18 of 24 ft. 11 in. and 10 of 25 ft.

7 in. each. The arches, each five rings in thickness, are divided into five sets and are separated by stop piers 10 ft. in width. The reconstruction work was begun by building three stop piers to the springing level of the arches. A trestle was fixed upon each and wedged against the old viaduct, thus dividing the old structure into five parts; the work was then dealt with in sections between the stop piers. The intermediate

piers were carried up to springing level and the centers fixed. The arches were turned in the usual way leaving the piles of the timber viaduct passing through them. When the haunches were filled the weight was transferred to the arches and the tops of the piles sawed off, and the holes which they had occupied filled up. Traffic was carried on one-half of the structure while work was under way on the other.

Master Builders' Convention at Winnipeg

**Enterprising Arrangements made for the Fifth Annual Meeting of the C. N. A. B.
Reduced Railroad Fares, Papers, Discussions, General Business—February 15, 16.**

The annual convention of the Canadian National Association of Builders' Exchanges will be held on February 15-16 in the Assembly Hall of the Builders' Exchange, Winnipeg. The headquarters during the meeting will be at the Clarendon Hotel, Portage avenue. Arrangements have been made with the Grand Trunk Railway for the members of the association to travel under the authorized tariff for club rates. This is a special one-way fare for the return trip, applicable to parties of ten or more travelling from the same point of origin to the same destination. The general programme as prepared by the local committee of arrangements is given below. The association is to be congratulated upon such a business schedule and certainly every member should make a special effort to attend the meeting. To easterners, especially, the occasion should offer an excellent opportunity for visiting the West under very agreeable circumstances and at a very reasonable rate. Mr. J. Herbert Lauer, Eastern Townships Building, Montreal, is general secretary of the C. N. A. B.

Wednesday, February 15.

9.30 a.m.—Delegates and visitors are requested to register at Headquarters, Builders' Exchange, and procure their badges, programmes, etc.

10.00 a.m.—Inaugural Session of the Fifth Annual Convention in the Assembly Hall, Builders' Exchange.

(a) Address of welcome to the delegates by His Worship, Mr. W. Sanford Evans, Mayor of Winnipeg. Response by Mr. E. T. Nesbitt, President of the Canadian National Association of Builders' Exchanges.

(b) Business Session. Call to order.

(c) Address of welcome to the convention, Mr. J. W. Morley, vice-president (Winnipeg).

(d) Response to Address, Mr. Geo. A. Crain, past-president (Ottawa).

(e) Roll call of officers and accredited delegates.

(f) Minutes of the Fourth Convention, London, 1910.

(g) Reports of officers: (1) president; (2) vice-presidents; (3) secretary and treasurer.

(h) Appointment of committees—(1) Resolutions; (2) Legislation.

1.00 p.m.—Civic reception and luncheon at the Royal Alexandra Hotel.

2.30 p.m.—Automobile trip "Seeing Winnipeg" to principal places of interest.

8.00 p.m.—Theatre party, drama or vaudiville, tendered by the Winnipeg Exchange.

Thursday, February 16.

9.30 a.m.—Convening Committee on Resolutions.

10.00 a.m.—Open session of convention. Open to all in the building trades.

(a) "Technical Training," by Mr. T. R. Deacon.

(b) "Ethics of the Master-Builder," by Mr. Geo. W. Murray.

(c) "Contracting from a General Contractor's Standpoint," by Mr. W. A. Irish.

(d) "Impressions and Reminiscences of the Master-Builder," by Mr. P. Mackissock.

(e) "Organization," by Mr. J. W. Morley.

General Debate.

1.00 p.m.—Adjournment.

2.30 p.m.—Open session of convention.

(a) "Reinforced Concrete," by Mr. C. A. P. Turner.

(b) "Architectural Jurisprudence," by Mr. Isaac Campbell, K.C.



Mr. J. H. Lauer, Montreal, General Secretary C. N. A. B.

(c) "Contracting 30 years ago," by Alderman E. Cass.

General Debate.

4.30 p.m.—Convention business session, for delegates only.

(a) Communications and reports.

(b) Prospective legislation.

(c) Ways and means.

(d) Election of officers.

(e) Choice of place of next annual convention, 1912.

(f) New business and good of the association.

8.00 p.m.—Banquet tendered to delegates at Manitoba Hall, 293 Portage avenue, by the Winnipeg Builders' Exchange.

The death occurred recently at Sussex, N.B., of Mr. Thomas Heffer, a well-known brick manufacturer. The late Mr. Heffer was in his 88th year.

For Sanding Slippery Sidewalks

An ingenious device has been patented by Chief of Police Gibeau, of Verdun, Que., for sanding slippery sidewalks. Like most useful implements it is extremely simple. A hopper is mounted in the front of a pair of runners. At the bottom is a screen connected with a rod attached to a crank. The crank is in the centre of a live axle which revolves with the spiked wheels at either side of the runners, and thus moves the screen backwards and forwards, sifting the sand close down to the ground in strips of about a foot wide, leaving about three inches between each sanded portion. Being close to the ground no dust flies about as is the case when the ordinary method of throwing sand from a shovel is employed. There is also no waste, as the machine is made the width of the cement sidewalk and just lays the sand or ashes where it is wanted.

The Verdun council thought so highly of the idea when the plans were shown them that they gave the inventor the facilities of their municipal workshop to make a trial machine. It is now working satisfactorily in the town, covering 26 miles of sidewalks in about two days. It requires one man and one horse to operate it and although the ashes from the boiler house have been used in the past, sand is to be used in future on account of its more cleanly properties. One filling of the hopper will at present cover $1\frac{1}{8}$ miles of sidewalk, but it is proposed to increase the size. It has been worked out so that when the man starts out to sand the streets he finds a carter waiting with fresh sand at about the point the hopper is empty. Mr. Gibeau has not yet decided whether to sell his rights in the machine or manufacture it himself.

The Architectural Element in Steel Bridges

While it is conceded by most engineers that there is considerable room for improvement in the architectural treatment of steel bridges and that many common types of construction employed in this branch of engineering are obviously incapable of artistic treatment, there are, however, several matters about which, when viewed from an aesthetic standpoint, widely varying opinions are held, says The Engineering Record. Authorities generally agree that to produce the most pleasing steel bridge some form of arch must be used, but whether the type should be the plate girder solid rib, the crescent-shaped trussed rib or the trussed rib with parallel chords is still an unsettled question. Evidently the spandrel-braced rib cannot be made beautiful. One great difficulty in constructing these pleasing forms is that appropriation for bridges are generally so small as to exclude consideration of anything more than the mere utilitarian requirements, although there is now a faint demand for more artistic bridges, and it is acknowledged that the community which builds an ugly structure is certainly not making the most of its opportunities.

England and the United States are far behind France and Germany in this matter although something has been done here. The Washington Bridge over the Harlem River in New York and the West Boston Bridge over the Charles Basin in Boston are among the most beautiful structures in the United States. An analysis of them easily reveals the causes of their superiority. The first and greatest is their evident fitness for duty. Unless a bridge is designed to meet this requirement it cannot be an artistic success no matter how much merit it may otherwise possess.

It is this that makes the arch so eminently pleasing for long-span bridges. The observer cannot help seeing that a simple arch rib, as in the Washington Bridge, carries the loads downward and outward at the abutments, which is a direct transfer of load that commends itself to the layman. In this respect a truss of the Pratt Howe type is woefully lacking in apparent efficiency, because the loads are carried to the supports along devious paths, first vertically, then diagonally, until, after sufficient repetitions, the abutments are reached.

Symmetry, grace, simplicity and truthfulness are essential elements in a bridge of architectural merit. Truth is a prime requisite, and when a steel bridge or a concrete bridge is tricked out to represent stone the result is a dismal failure. One material must not be made to represent another; each must be used for the purpose and in the manner to which it is peculiarly adapted. It is probable that the two arched bridges above mentioned owe their charm as much to the proper combination of steel and stone as to the graceful lines upon which the steel spans are built. This is also seen in many German structures, where the stone piers and abutments are usually carried upward, at least to the roadway surface, and often even higher so as to form towers or triumphal arches. For an illustration of the effect of this feature, contrast the Washington Bridge in New York or the Eads Bridge in St. Louis with the Fairmount Park Bridge in Philadelphia. In the first two structures the piers extend up to the roadway, while in the last they end just above the water level, far below the roadway. The combination of masonry and steel as employed in the former is very pleasing.

Washing Gravel in Perforated Wheelbarrows

A novel scheme for washing gravel has been in use at Bangor, where construction has been under way for some time on a new mechanical filtration plant, which is being built by the New York Continental Jewel Filtration Company, to replace the existing water purification works. The concrete aggregate is delivered in piles near the work and carried from them to the mixer in wheelbarrows. The gravel contained a certain amount of loam and it was considered necessary to wash it before incorporating it in the concrete. To accomplish this holes were punched in the bottoms and sides of the wheelbarrows, converting them practically into sieves. Between the mixer and the storage piles a water pipe was connected up as shown with a large perforated nozzle at its discharge end. Each wheelbarrow load of gravel on its way to the mixer was rolled under the nozzle and streams of water discharged upon it, the material being churned about with a spade to expose the lower part of the load to the cleansing action of the water. The water and the loam which it flushed out passed out through the perforations in the wheelbarrow and the clean gravel was then carried to the mixer and used.

The new C. P. R. offices to be erected at the corner of King and Yonge streets, Toronto, at a cost of \$1,000,000, will have a ground area of 85 feet on King street and 100 feet on Yonge, 8,500 square feet. The building will be sixteen storeys high, or one storey higher than the Traders' Bank building, which is the highest office structure in the British Empire. It will be of steel faced with terra cotta, similar to the material used in the magnificent Standard Bank head office.

Revelstoke Power Plant Nearly Completed

Municipally Operated System—Plans Laid for Future Extension—Diagrams Show Construction Work—Special Design To Prevent Frazil

About fifteen years ago a private company built the present power plant on the Illecillewaet River, about two miles west of the centre of the city of Revelstoke, generating there 125 kilowatt by water, diverted by means of a timber dam at the head of a canyon, down which a square flume was built for a distance of fifteen hundred feet, about half of which was under pressure, terminating in a steel casing in a wooden power house. On one side of this casing was a 500 h.p. Samson turbine designed to operate under a head of thirty-seven feet. The single phase belt-driven generator was next duplicated on the other side of the turbine and later a three-phase machine of 150 k.w. was installed on the same shaft to carry the power load. This plant was bought by the city in 1903.

On account of severe frazil and slush ice conditions peculiar to this turbulent mountain stream, it was decided, about five years ago, to install an auxiliary gas producer plant with a 125 h.p. engine, belt connected to the same shaft as the turbine. The turbine shaft operated at a speed of 275 revolutions, and the engine at 175.

Conditions on River

In the winter slush ice would sometimes block the Illecillewaet for a distance of three miles to its junction with the Columbia and back into the tailrace, which was connected with the river by a short channel, and about eight feet above low water. The discharge of the river has a very large variation (as far as has been determined to date being estimated as high as forty to one). Owing to landslides and avalanches it is estimated that the discharge has been as high as twelve thousand cubic feet per second for a short time, while its low water flow is estimated to be as low as three hundred. The main line of the Canadian Pacific Railway is built in the north wall of the canyon overlooking the old dam and flume, and any proposed development had to keep the water level at flood at a safe distance below the rails. The scour of water over the old dam had eaten away a large portion of the schistose rock below the dam, undermining the timber apron and carrying away timber crib supports and protection for the flume immediately below the dam.

New Development

In November, 1909, it was decided to construct a new permanent dam at a point about two hundred feet below the old one on a reef in the bottom of the river extending between an overhanging canyon wall on the south and a solid rock point on the north side of the canyon. It was decided to build this dam to a height sufficient to create as large a pool as possible above for handling the frazil ice; to provide sluices to maintain a constant head at a safe distance below the railway, and to connect the power house and old machinery with a new six-foot wooden pipe line replacing the old flume.

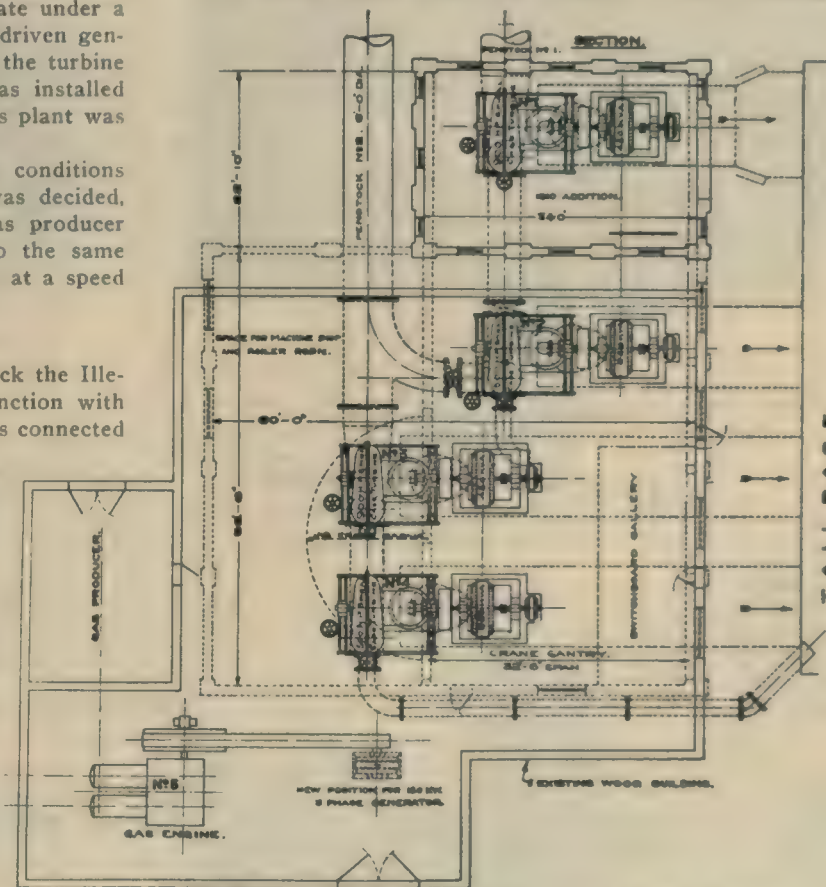
It was later decided to raise enough money at the same time to install a new unit and change from a single phase to three phase current for distribution in the city, remodeling, as far as possible, the distribution system therein.

The accompanying plans show the dam as built with

large construction sluiceway, blow-off for handling silt and anchor ice close to the rack bars, with an intake at right angles to the stream provided with two sets of rack bars and provision for steam heating of same in very severe conditions; together with stoplog sluiceway taking the ice raked from the rack bars.

Power House Layout

The power house layout was designed to meet existing



Showing Present and Ultimate Capacity Revelstoke Power House

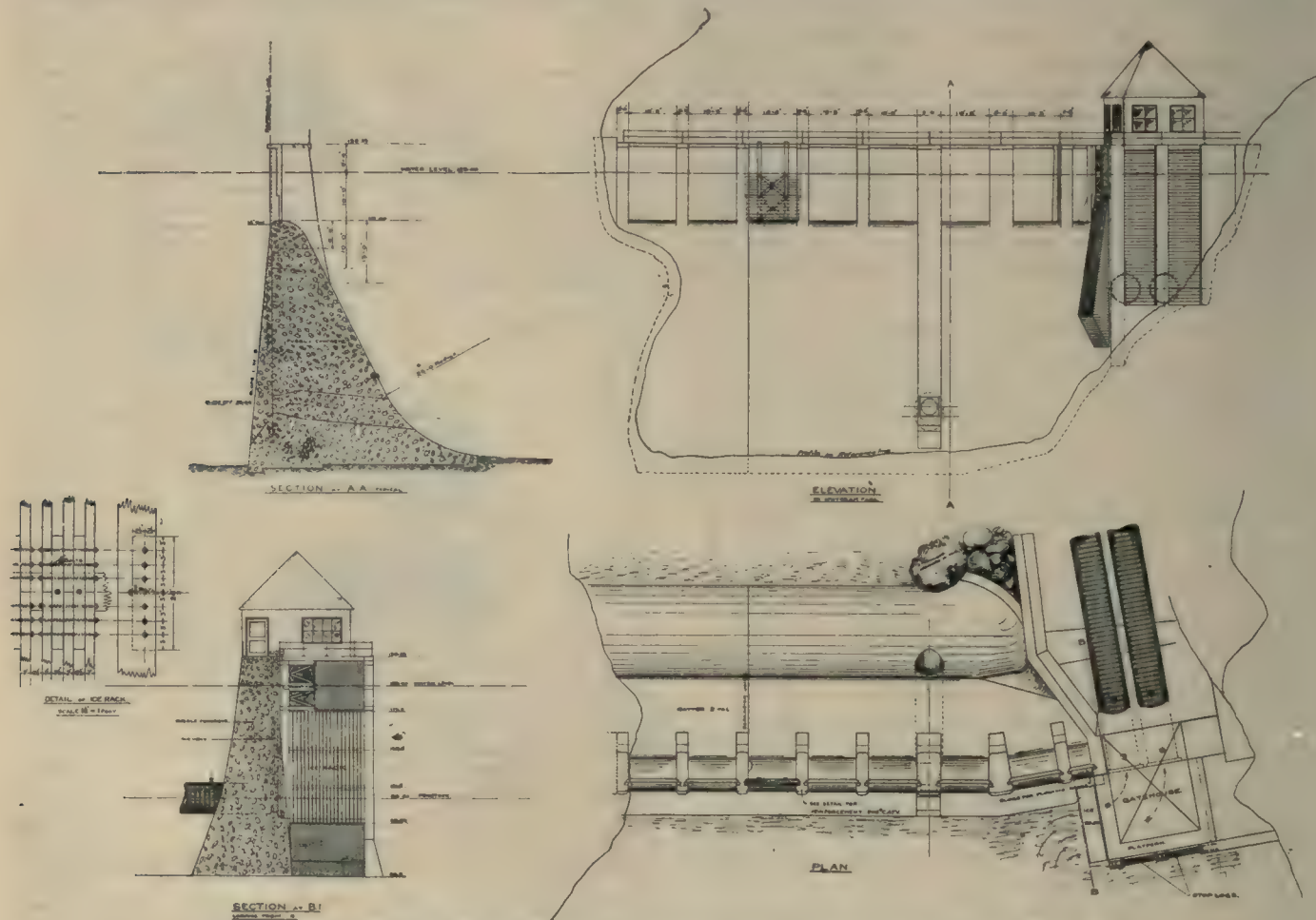
conditions and allow of gradual replacement of old plant without interfering with operation. The illustration shows the proposed development without any reference to the old plant except that the old power house is shown in full lines. The 1910 addition to the power house is of brick on concrete foundation, and the proposed extensions of this to take in the three additional units are shown in dotted lines. Penstock No. 1 was built to serve units No. 1 and No. 2, and the connections were so constructed that the blow-off at the end of the penstock could be moved when No. 2 was installed, and placed at the end of the penstock, while unit No. 2 will be connected to the penstock and No. 1 by 4 ft. pipe and gate valve.

No. 1 is gated from the penstock by 48" horizontal valve. The old flume enters the power house on the line of penstock No. 2 which will replace it and will serve units No. 3 and No. 4, which will be duplicates of one and two; and will, in addition, have a connection to No. 2. The next step in development will be the addition of penstock No. 2 and completion of unit No. 2 and units No. 3 and No. 4

may be added when the load increases. The 150 k.w. generator at present operating from the jack shafts from turbine or gas engine will be finally moved and belted direct to the gas engine as shown on plan. No details in regard to switchboard gallery, machine shop and boiler room have been worked out. Unit No. 1 has been built in a separate building and the new switchboard for it placed therein temporarily.

The old plant had a rated capacity of 400 k.w., 250 k.w. of which was single phase and 150 k.w. three phase. The old casing and turbine are still able to operate from the old flume, and a new 250 k.v.a. three-phase machine has been installed on the old foundations to replace the single phase machine, which will now be sold. Unit No. 1 consists of a 900 h.p. single runner spiral casing turbine, manufactured by The Jenckes

temporary flume through and over the site of the new dam, while the footings were being excavated and concreted in. Added to this, avalanches above, causing sudden rises and falls for which the stream is noted, and unusually high water during the winter, were a constant menace to the progress of the work. Water was diverted by coffer dam to the south side of the expansion joint and the central part of the dam built up to an elevation of one hundred feet between the expansion joint and the power and diversion flumes. These were built on the slide rock from the railway cutting above, and it was a difficult problem to carry them over the dam site. A concrete cut-off wall under the unwatering flumes was built on the line to the north wall. It was found impossible to complete this portion of the dam further, until the last thing in the spring, after the footings on the south side had been obtained by diverting the water



Sectional Plans showing Large Sluiceway, Special Rack Design for Handling Frazil, etc.

exciter operating at a speed of 600 r.p.m. This unit was designed to operate under a head of seventy-three feet and carry the full lighting and power load. With overload this would carry the normal increase of the city lighting, and some additional power, for another year or two. The balance of the plant was designed to operate as an auxiliary until the old flume was useless, at which time penstock No. 2 would be built and connected up with a new turbine to 250 k.v.a. unit, which will then complete unit No. 2. The other extensions have already been explained.

Construction of Plant

The construction of the dam in the canyon was interesting and difficult owing to the fact that the work had to be done during low water in the winter time with only limited time for completion, and the difficulties which obtain, due to necessity for keeping the present power plant running and carrying that water and additional water diverted by

by a second coffer dam into the 8 x 12 sluice above mentioned. Serious delays when this stage of the work had been reached caused grave apprehension that it would not be possible to complete the dam before high water; and it was necessary to carry on the work with this possibility in view so as not to jeopardise the safety of the supply of power for the city until high water had subsided. A short shut down of the power plant was necessary when the power flume was cut, and the footings under the lower rock slide, immediately below the railway track on the down stream side of the dam, were being excavated and concreted. This work it was necessary to push forward in the early spring, night and day. Twice the water rose in the river filling the 8 x 12 sluice and threatening to get beyond control. Finally the new penstocks were built in and the north and south sides raised alternately to the level of the central completed portion. The gate-house was under construction

when a flood, the result of hot weather, caused a rise of twenty feet in the water against the dam in one day, brought down a large amount of old crib and loosened the old power flume. This driftwood was forced against the incompleting gate-house pier, bending the steel and rendering its completion before the floods doubtful. The water poured over the incompleting dam to a depth of three feet, and it will be remembered that at this time the 8 x 12 sluice was under a head of thirty-five feet, and the large 18" timber-gate, de-

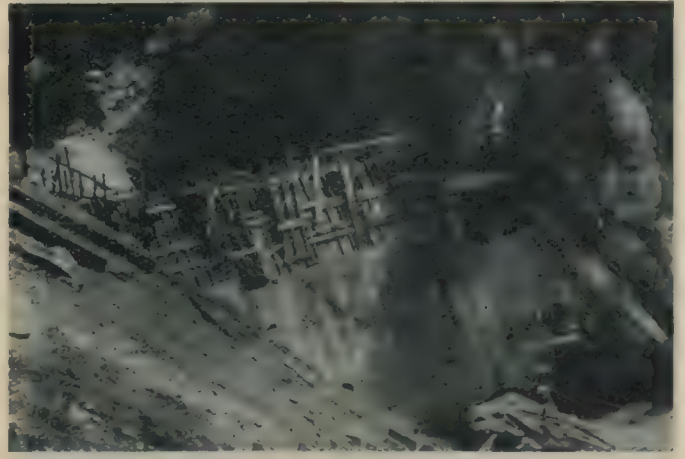
and it is expected that the gate-house will be completed, the bulkhead again put in place and the full head be put on the dam by the time this article appears.

On account of the location of the 6-ft. wooden stave pipe-line, above the old flume along the foot of the railway embankment, its construction, without interfering with the operation of the old flume, was difficult and expensive. On it there are a number of sharp curves, as shown in the illustration, one of which is less than one in fourteen. The



Concrete Construction Work—Revelstoke, B.C.

signed to close it and turn the water over the top of the dam, had not yet been placed in the groove which was prepared for it. This was an anxious time for everyone concerned, and when the water subsided on the second day, gradually falling again to within six feet of the top of the sluiceway, it was decided to endeavor to force the bulkhead into place. This was accomplished by loading it with rails and letting it go with a run. It fell to within eighteen inches of the bottom of the opening and the water was successfully turned over the top of the dam. This it had been decided to leave for the summer incomplete, but sufficiently high to



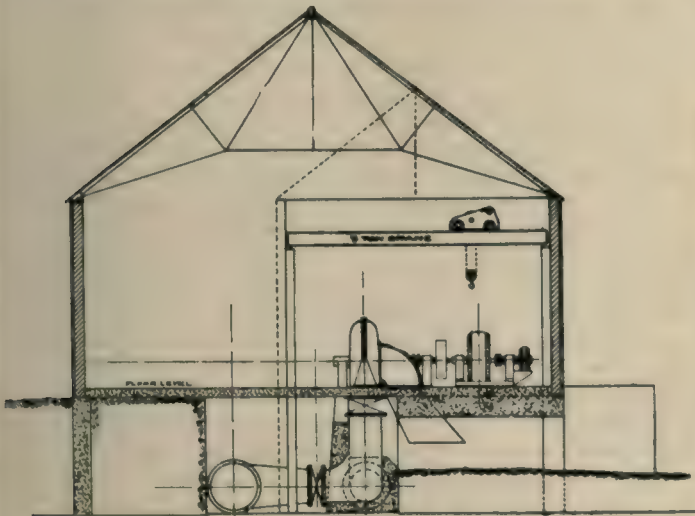
The River Banks are of Solid Rock

timber in the flume is Douglas fir, kiln-dried, and is of the very best quality. Both it and the sills are painted with preservative coat of asphaltum paint. This part of the work was done by day labor.

On the pipe-line are one-way poppet valves, a man-door at the lower end, and a relief valve on the turbine casing just outside of the power house, discharging into the tail-race.

Design of the Dam

The design of the dam is interesting, in view of its location upon a micaceous schistose rock on the north side, which was seamed with quartzite and very treacherous and faulty, which in the centre of the stream came in contact



Present and Ultimate capacity of Power House

take the water through the new penstock, which was then connected with the old flume, and operation under water power again resumed. It was unfortunate that it was found impossible to complete the gate-house at that time, and the gate to the 8 x 12 sluiceway had to be blown out during the next low water period and the gate-house foundations built in the dry. The dam withstood the summer floods, in spite of its incomplete condition and flat crest, showing little sign of wear. The crest and piers have since been added,



Construction Work—Revelstoke, B. C.

with a later intrusion of more evenly laminated layers of diorite. This south wall of the canyon was precipitous, its top overhanging the base about twelve feet. The dam was located on the roof connecting the two walls and given the form of an arch upstream by the bend in the dam near the north end. In this way, and taking advantage of the position of the wall on the south side, it was possible to lighten the section of the dam, to take the penstock out at right angles to the abutment and at the same time obtain

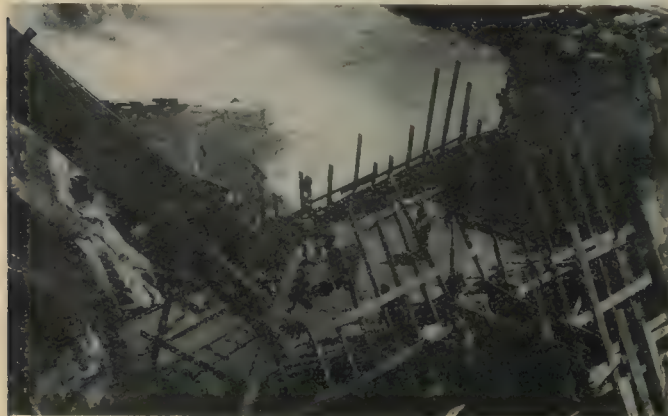
a suitable angle for the rack bars in reference to the current.

The structure was built with the least expenditure possible and to this end the favorable location in reference to gravel and rock and ability to handle these by a compact and overhead traveller, were advantages not often obtained. The Illecillewaet is one of the most difficult streams of the province to handle in flood, due to the immense amount of silt carried in suspension, and the large quantities of logs



Pipe Line Running parallel with Flume

which come down the canyon. It is intended to handle these latter by booms in the pond above. The most difficult problem in design was to obtain satisfactory sluices at a minimum cost which would satisfactorily permit of quick operation and maintain a constant head during flood. The location of the dam in the canyon so situated in reference to the railway track and with no possibility of enlargement of spillway area, without tunnelling on the south side, had to be met by construction of gates which could be lifted clear—were not too large—and yet would permit of passage of drift through them over the crest. The piers, therefore, had to be made as small as consistent with strength and are heavily reinforced with the best steel obtainable. The



Construction Work on Dam—Revelstoke, B. C.

full head in low water will not be required for some years, and until that time the sluice-gates will not be installed in all of the openings.

The handling of the frazil ice was, as above indicated, one of the chief points in design, and the gate-house with the rack bars will indicate the method adopted. Water is taken in between eight and twenty-five feet below the surface, and the rack bars are situated so as to take advantage of a minimum amount of water to slush the accumulated

ice through the 4.5 ft. sluiceway. The blow-off is situated at the foot of the rack bars under a head of forty feet and



New 6-foot Penstock on Right

will handle small amounts of anchor ice and keep them clear of silt.

Unit No. 1 is now in operation under a head of sixty feet.

The Government has appointed Mr. H. W. Hodge, of New York, one of the best known engineering experts on the continent, and Mr. M. J. Butler, ex-Deputy Minister of Railways and Canals, and now General Manager of the Rominion Iron & Steel Company, to finally settle the differences of opinion among the board of engineers in charge of the construction of the Quebec bridge. Several designs, involving basic principles of bridge engineering have been under consideration for months past by Messrs. Modjeska, Vautelet and Macdonald, the engineering experts entrusted with the carrying out of the work. They have been unable to agree on some vital questions relating to the plans for the long central span. On the decision of Messrs. Hodge and Butler will depend the solution of problems in which bridge engineers the world over are interested.

Messrs. Geo. Anderson & Co., engineers and ironfounders, of Carnoustie, Scotland, and Montreal, have opened a branch at 504 Builders' Exchange, Winnipeg, for the purpose of looking after their western trade. They have already met with the most encouraging success. The Canadian Manager, Mr. W. Furniss Clarke, has just returned to Montreal with several large orders for cut stone plants, which indicate bright prospects for the firm's specialties. They manufacture the famous Anderson Circular Diamond Saw, gang saws, patent planers, marble machinery, carborundum machinery, rubbing beds, polishers, electric and hand overhead travelling cranes, locomotive cranes, and derricks of all sizes and kinds. They will be glad to meet their western friends in the Winnipeg office, as this branch is intended to deal fully with the western business.

A most prosperous state of affairs was disclosed at the annual meeting of the Canada Paint Company, Limited, held recently in Toronto. The managing director, Mr. Robert Munro, of Montreal, reported that the business of the past year had been a record year as regards the volume of trade. The manufacturing plants in Montreal, Toronto, Winnipeg and St. Malo were all in excellent shape and running to their fullest capacity. Various extensions will continue to be made to keep pace with the continued development, and a heavy trade has already been booked for 1911 shipment.

An Instructive Report on Ties*

Your Committee would beg leave to report as follows: In their report, presented to the Society in January, 1909, it was pointed out that some twelve million ties were being used annually in Canada, which number was being continuously and largely increased, so that probably, within the next 40 years, the consumption will be about one hundred and twenty millions, or equal to the present annual consumption in the United States.

Assuming the following data—average cost of untreated ties at point of shipment at 50c.; freight and putting in track, 15c.; total, 65c.; average life, 8 years. Initial cost of treated tie the same as above; cost of treatment, including extra handling, 25c.; total, 90c.; average life, 16 years. Then, if twelve million untreated ties are being used annually, and their average life is 8 years, there must be about ninety-six millions in use, and the capital necessary to place these ties in the track and provide for their renewal every 8 years, on a 4 per cent. basis, would be \$2.41 per tie. The capital necessary to place treated ties in the track and provide for renewal every 16 years would be \$1.93 per tie. The total capital necessary:

Ties.

equals $96,000,000 \times \$2.41$ equals \$231,360,000 for untreated ties.

$96,000,000 \times \$1.93$ equals \$185,280,000 for treated ties.

Total difference in capital. \$46,080,000.

\$46,000,000 at 4% equals \$1,843,200 equals eventual annual saving.

As the cost of untreated ties and the numbers used are increasing very rapidly, and the cost of treatment is likely to be reduced, surely no more need be said to prove the urgent necessity of at once beginning the introduction of treated ties at all points where their capitalized values will show a fair saving on the investment, even if the question is only viewed from the standpoint of economy for the railways.

When the broader view of conserving our supplies, for fear of depletion, is considered, it assumes enormously greater importance.

Preservation Not Considered Sufficiently

Tie preservation by creosoting or otherwise has not hitherto received the attention it deserves in Canada, but it doubtless soon will, as the railway companies are becoming alive to this really vital subject. The American Railway Engineering and Maintenance of Way Association have, however, taken the matter up vigorously, and valuable information can be found in their Proceedings, vol. x, part 1, for 1909, and subsequent volumes. In co-operation with this association, Purdue University made a series of tests to determine whether or not treatment of tie timber had any injurious effect on the strength of the material. The conclusions arrived at, from these tests, are briefly summarized as follows:

(1) No weakness was shown by treated ties, as compared with natural ties, either in rail-breaking or spike-holding strength, except in the case of ties treated with crude oil, and, even with that treatment, the weakening in rail-bearing was of a temporary character.

(2) The average stress under the rail at the elastic limit on the various woods was as follows: Red oak, 1,131 lbs. per square inch; short leaf pine, 642 lbs.; long leaf pine, 690 lbs.; red gum, 830 lbs.

(3) The extremes of atmospheric temperature have an appreciable effect on the strength of wood, especially when green. The warm timber was from 9 per cent. to 17 per cent. weaker than the very cold timber.

(4) The direct pulling resistance of common spikes in

the various woods was as follows, in their natural state: Red oak, 7,639 lbs.; short leaf pine, 4,359; long leaf pine, 3,955; red gum, 3,883.

(5) The lateral resistance of common spikes in the various woods was as follows, loads at elastic limit, in lbs.: Red oak, 2,026; red gum, 1,704; long leaf pine, 1,650; short leaf pine, 1,619.

The lateral resistance of screw spikes depends on the diameter and length of shank under the head, elastic limit of the metal, and character of the wood.

(6) The screw spike had from 1.7 to 3.8 times the strength of the common spike against direct pull, and from 1.2 to 2.4 times the strength of the common spike against lateral resistance. The smaller screw spikes gave greater lateral resistance per lb. of weight than the larger spike.

The strength of the common spike against withdrawal is increased when driven to follow a bored hole. The shape of the point of a common spike, however, leads it to drive out of a bored hole, and the resistance to withdrawal is thereby lowered.

A very interesting paper on the economic comparison of railway ties of different materials, written by Neil M. Campbell, appears in the Engineering News of September 22nd, 1910. The results are summed up in a table giving the order of merit of different kinds of wood treated by the three processes, zinc chloride, creosote, and Rueping, as compared with untreated ties, taking into consideration the first cost in the track and the average life.

Strange to say, the first in order of merit is untreated catalpa wood, but, as the writer does not give the value of treated ties of the same wood, this does not prove that it might not be still more valuable if treated.

The second in order of merit is cypress, also untreated, for which a life of 10 years is claimed, and initial cost in track 54c. The same wood, when treated with creosote, comes 19th in order of merit, having a life of 17.5 years and first cost of 95c. When treated by the Rueping process, the order of merit is 6, life 15 years, and cost in track 81c.

Oaks, untreated, come 30th in order of merit, 23rd when treated with zinc chloride, 15th when creosote is used.

Pine, when treated with creosote, comes 3rd in merit, 28th when zinc chloride is used, and 29th when untreated.

Tamarac, treated by the Rueping process, comes 10th in order of merit, but no mention is made of untreated tamarac or cedar.

Different woods require different treatments. The Rueping process is a creosote treatment, and is fully described in the Railway and Engineering Review of October 15th, 1910. It differs from ordinary creosoting in that the timber is first put under air pressure sufficient to fill all the wood cells with air. The creosote fluid is then forced in at higher pressure, and the theory is that, after the greater pressure is released, the expansive force of the air throughout the interior of the timber will expel part of the fluid from the cells, leaving the walls of the cells painted with creosote instead of having the cells filled with it.

The cost of treating ties, of course, will vary largely, and will depend, to a great extent, on the numbers treated, the efficiency of the plant, and the nature of the treatment, but the Atchison, Topeka & Santa Fe Railway, who have used the Rueping creosote treatment pretty extensively, report that the cost of treating inferior pine ties is 20 cents.

Mr. Kelley, a member of your committee, reports satisfactory personal experience with the Burnettizing process at a cost of from 15 to 20 cents.

With regard to size of ties, the 8 ft. length, 6 in. to 7 in. thick, with face from 6 in. to 10 in., is in most general use, but it is somewhat difficult to find any logical reason, other

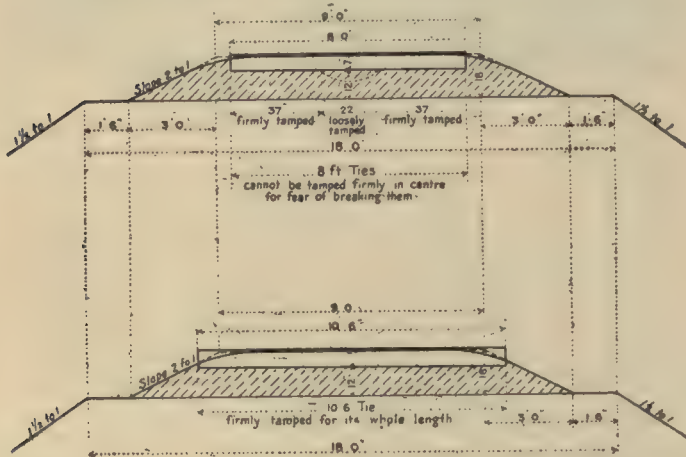
*Extracted from Report of Special Committee of the Canadian Society of Civil Engineers.

than initial cheapness, for adopting an 8 ft. tie for standard gauge track. As this length was adopted, and has been in use for such a long period, it is very easy to understand why the railway companies should hesitate to change, for the transition period would be both troublesome and costly. However, as the weights of rolling stock have more than doubled in the past twenty years, and steel rails have been increased in, roughly, the same proportion, it seems about time to make some corresponding adequate change in tie dimensions.

It is true that the spacing of ties has been, of late years, made slightly closer, but, while the loads have been increased from 200% to 300%, the base of the superstructure to carry these loads, or the base area of the ties under a rail length, has been increased less than 50%. As there is a practical limit to close spacing of ties, on account of the difficulty of properly tamping them when spaced closer than 20 inch centres, the only resource left is to lengthen them, if more supporting area is required.

The 8 foot tie, not only does not give sufficient support, but it is impossible to utilize its whole length for fear of breaking it, owing to the distribution of the loads on track of standard gauge.

The distance from the end of an 8 foot tie to the outer



edge of a 5 inch rail base is about 16 inches, and the best practice is to firmly tamp such ties only 16 inches from the rails each way. The reason for this is that, if fully tamped to the centre of the track, they would give a firmer support, in proportion to the load, at centre than at both ends, and the ties would break. In other words, you cannot utilize much more than 75 per cent. of the bearing capacity of such a length of tie under a standard gauge track, without destroying the tie itself. In order to utilize the full uniform supporting capacity of the tie for its whole length, it should have the same length from the centre of rail to end of tie, as from former point to centre of track, which would make it 10 ft. 8 in.—say 10 ft. 6 in. long.

It is certain that even the best roads would hesitate to make such a radical change, and, of course, your committee would not presume to say that they should make such a change. That strong logical reasons can be given for the use of ties 10 ft. 6 in. long, and such reasons cannot be given for the departure from long-established practice, but the fact remains use of 8 foot ties.

Ties 7 inches thick, 10 ft. 6 in. long, with 9 in. face, would give about 70 per cent. increased support at an increased cost of only 31 per cent. No increased width of ballast section would be necessary for the longer ties, because no shoulder of ballast would be required at the ends of such ties, so that the actual yardage of ballast required would be slightly decreased by the increased space occupied by the ties. This is fully shown on the accompanying diagram, drawn to scale, illustrating how ties 10 ft. 6 in. long may be

used in an ordinary ballast section of 8 ft. ties, without requiring any extra ballast.

Note.—8 foot ties tamped firmly for 16 inches each way from rails only utilize the supporting area of 77 per cent. of tie, equal to 74 inches in length, or 740 square inches for a tie of 10 inch face.

10 ft. 6 in. ties could be used in the same ballast section, firmly tamped for the whole length, giving the maximum supporting area of 1,260 square inches, or equal to 170 per cent. the efficiency of 8 foot ties.

At the present average price of 50c. for 8 ft. ties, they cost about 36 per cent. of cost of 80 lb. rails and fastenings, which would only be increased to 42 per cent. by using the longer ties. The improved condition of track and saving in maintenance of rails and rolling stock would probably soon more than offset the difference in cost of ties.

It has been suggested that longer ties would make drainage more difficult, but, if good ballast is used, there would seem to be no difficulty in that regard, and, if the ballast is inferior, the loose tamping under the centre of 8 foot ties and the shoulder required at the ends of them would form pockets to retard drainage that would be obviated by the use of long ties. Your committee would suggest experimental tests with ties 10 ft. 6 in. long.

The best kinds of wood to use for ties depends upon so many conditions of climate, availability, and cost of timber treated and untreated, that it is very difficult to make definite recommendations.

For general use in our Canadian climate, however, the following woods, if untreated and used with tie-plates, might be recommended, and they are given approximately in their order of merit, having regard to life and initial cost: Cedar, tamarack, oak, yellow pine, hemlock.

For treated ties, used with tie-plates, the order of merit would be about as follows: Yellow pine, tamarac, hemlock, oak.

Rails, Fastenings and Tie Plates*

At the annual meeting two years ago your committee on rails, fastenings, and tie-plates, presented drawings of the various sections of rail used as standard by the railroads of Canada and the United States, and also of some sections which had been proposed and were being placed in service experimentally.

At the last annual meeting your committee reported upon a standard drop testing machine, which received the approval of the society, and which is now in universal use in the mills of both countries.

The experiments with the new sections have not progressed sufficiently for your committee to present a statement of the results in this report, but the use of the new testing machine is proving most satisfactory, and is producing a uniformity of results in the physical tests at the different mills, which is of much value in the collation of statistics.

In considering the subjects for this year's report, it has seemed to your committee, that the next logical step is to consider the service to which a rail is subjected, and the physical qualities requisite for such a rail, leaving for future investigations the consideration of how such physical qualities can be obtained.

With the increasing traffic of railroads, there followed naturally and of necessity an increase in car capacity and of engine weights. From a freight car weighing about 16,000 lbs., with a carrying capacity of 20,000 lbs., there came gradually an increase to cars having a carrying capacity of 40,000 lbs., 60,000 lbs., 80,000 lbs., and finally 100,000 lbs., with an allowable overload of 10 per cent.

In this transition of car weight and capacity, it is interesting to note, that whereas the cars weighing 16,000 lbs. had

*Report presented to Canadian Society of Civil Engineers.

a carrying capacity of 125 per cent. of their empty weight, that the cars of to-day carrying 100,000 lbs., with a maximum empty weight of 40,000 lbs., have a carrying capacity of 250 per cent. of their empty weight.

Freight cars having originally about 36,000 lbs., upon eight (8) wheels, or 4,500 lbs. per wheel, were superseded gradually by cars having, when overloaded 10 per cent., 150,000 lbs., upon eight (8) wheels, or 18,667 lbs. per wheel. Engines having 12,000 lbs. per driving axle, or 6,000 lbs. per driving wheel, gave place to engines having 50,000 lbs. per axle, or 25,000 lbs. per driving wheel.

The original weight of rails varied from 35 lbs. to 45 lbs. per yard, but with the increasing weight of equipment the change was rapidly made to 56 lbs., 60 lbs., 65 lbs., 72 lbs., and finally to as high as 100 lbs. per yard.

The effects of these heavy loads upon track having been investigated both theoretically by mathematical analysis and practically by carefully conducted tests upon the rail and track, under actual train movements.

Allowing 100 per cent. for the impact of rapidly moving trains over the standard track in use in this country, with engine axle loading of 50,000 lbs., we obtain the following, in which the third column would probably be more nearly the correct one theoretically, provided the stresses were due to the effect of the assumed load only.

FIBRE STRESS PER SQUARE INCH (TENSION)

Weight of Rail per yard	Between 3 ties as a continuous girder having stable supports.	Between 3 ties as a continuous girder having an unstable centre support.
60 lbs.	24,878 lbs.	28,000 lbs.
80 lbs.	16,668 lbs.	18,750 lbs.
100 lbs.	11,417 lbs.	12,842 lbs.

The stresses shown in column 3 do not reflect accurately the actual condition to which a rail may be subjected, for there is a reversion of stress of tension to compression like the swing of a pendulum under the passage of every wheel.

In addition, the rail is subjected to a continual series of shocks, due to imperfect counter-balancing of engines, flat spots on wheels, irregularity of track surface, the oscillation and jar of equipment, the tension due to contraction in a falling temperature, and the effect of the tractive force of the engines.

To determine the actual effect upon rails by passing trains, a series of careful experiments were conducted on the New York Central and Hudson River Railroad, with a delicate automatic recording machine, by which the actual deformation of the rail could be measured for each passing wheel of a train, and the actual stresses in the rail determined.

These investigations demonstrated that at speeds of 30 to 40 miles per hour, engines having about 20,000 lbs. upon a driving wheel would produce tension stresses in the bottom flange of 80 lb. rails somewhere in excess of that shown in the third column of the preceding table, but well within the safe allowable limits of unit stress for good rail steel.

Experiments upon joints have also shown that a tensile stress of 12,000 lbs. per square inch could be produced in the unloaded rail due to its construction in a falling temperature, before the grip of the angle bars would permit the rail to slip and relieve itself.

An accumulation of these varied stresses in the lighter sections of rail, might therefore bring the total stress up close to the "Elastic Limit" or "Yield Point" of some of the rail steel.

The question has sometimes been asked, has the weight of the rail section increased as rapidly as the wheel loading? To this may be answered, Yes! In the days when a 60 lb. rail section was a common standard, an engine axle loading of 24,000 lbs. was not infrequent; this loading pro-

duced a tension in the rail under the conditions of column 3 of the table of 13,440 lbs. per square inch, as compared with 12,842 lbs. per square inch for a 100 lb. rail, under an axle loading of 50,000 lbs.

From a study of the preceding conditions it is evident that certain physical characteristics must be secured, in a steel rail, to meet the requirements of modern transportation necessities; briefly these may be recalled as follows:

- (1) The steel must be sound and free from physical defects.
- (2) It must be sufficiently hard to resist abrasion reasonably and also deformation of section.
- (3) It must be of uniform texture, but not brittle.
- (4) It must have a high limit of elasticity and ultimate tensile strength.

The question naturally arises, can such a rail steel be produced? The answer is, that it has been produced in the past, that it is produced to-day, although not uniformly, and therefore, that it should be produced uniformly in the future.

How to produce a rail steel uniformly possessing such qualities, and how to identify positively when such a steel has been produced, is a work, first, for the manufacturers, and second, for the manufacturers and users of rail jointly, and this knowledge must be the basis of a satisfactory specification in the future.

That such a result can be reached is earnestly to be hoped, but it will require the co-operation and serious endeavor of both interests to accomplish this most desired and necessary result.

The City of Montreal is considering its estimates for the coming season. It is proposed to make a grant of \$1,500,000 to the road department and \$1,000,000 for sewer construction. This is exclusive of \$700,000 to be spent solely in the new wards, and also exclusive of the permanent works to be executed in virtue of special loans, viz., the enlargement of the aqueduct, the building of underground conduits and other permanent works.

Mr. Wm. C. Mitchell, formerly superintendent of the Dominion Steel Company, has opened an office in the Canadian Express Building, Montreal, as a consulting engineer. Mr. Mitchell has had extended experience both in America and Europe, and should be well qualified to undertake the design of modern iron and steel plants, as well as to effect economies in existing plants.

A recent visitor to Montreal was Mr. Wm. Beardmore, of the Clyde shipbuilding firm of that name. Mr. Beardmore has come to Canada to look over the situation in regard to Canadian naval construction.

Mr. J. T. Brower, of the Structural Steel Company, Longue Point, Que., has been appointed general manager of the National Bridge Company, Montreal, and will enter upon his duties on March 1st.

Mayor Frazer, of New Glasgow, N.S., was in Montreal recently in connection with the new waterworks system which is being installed in New Glasgow.

Mr. N. R. Darrach, architect, St. Thomas, Ont., returned to that city last week from a combined business and pleasure trip to Regina, Sask.

City Engineer Fellowes, of Westmount, has left for an extended tour through the United States, where he will make a study of good roads.

Notes on the Design of Retaining Walls

Fundamental Principles and their Application—The Avoidance of Excessive Theoretical Calculations — Defects in Prevailing Methods — Cases in Point

BY EDWARD GODFREY *

Retaining walls, like dams, were among the most ancient of engineering necessities. Like dams they are among the most recent to be accorded critical attention in the matter of their design. The design of dams is in such a primitive state that in all the works on dams, so far as the writer can discover, there is not one word concerning the upward pressure of water that may, and as a rule does, work its way into horizontal joints and under the base of the dam—the force that has been the cause of practically all the great failures of masonry dams. The great Austin dam failure was discovered to be due to this eight years after the failure. Colleges are beginning to mention it in their courses after agitation by the writer begun in 1904.

The destructive force that is almost neglected in the case of retaining walls is the effect of frost. Much has been done in the way of working out elaborate formulas for the supposed pressure of earth against the back of a retaining wall. The exact direction and point of application of the forces acting on the back of a wall can be very nicely determined—theoretically. When the real wall is constructed, sometimes the earth will stand vertically with little or no sharing, while the masonry is being put up, this in spite of possible thousands of tons of horizontal force which (on paper) is being exerted.

Of course there is or may be horizontal force exerted against the back of a retaining wall. The writer would not belittle calculations, per se, of the force to arrive at a basis for proportioning the wall. But when the theory of pres-

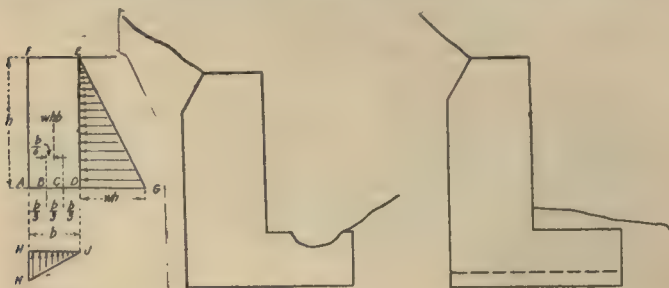


Fig. 1

Fig. 2.

Fig. 3.

ures is founded wholly on assumptions which may at times be erroneous to the extent of the infinite ratio of a finite quantity to zero, the case is one where simplicity is more in keeping with fact than elaborate formulas.

Before the real nature of the planets was discovered, supposed scientists worked out intricate rules to describe the paths of the planets among the stars. There is a great deal of mathematical junk in engineering books that is of no more use to any one than those rules would be to a modern astronomer.

When men want to know at what slope earth may safely lie and not be beaten down by storms and the changes of temperature, they do not take a lump of mud and let it slide down a mud incline to get the coefficient of friction and from this to find the angle of repose. This might be done in such regular and uniform materials as dry sand or grain. But vastly more reliable data are obtained by observation on embankments that have stood the weather or have perhaps been subjected to the partial leveling that nature demands before she will permit them to remain stable and undisturbed.

In the simple matter of the brick walls and windows of a building, if their capability to resist a wind pressure of 40 or 50 lbs. per square foot were a test of their ability to stand, but few would remain standing. Here, too, experience has been the prime factor in determining the proportions.

Many structures admit of exact calculations and exact theories for their stresses are in place, but retaining walls are not among these. Safe proportions for a retaining wall may be arrived at in a manner somewhat similar to the derivation of the rule for the slope of embankments; that is, by observing the proportions of walls that have remained stable. Empirical rules based on such observations point to the fact that if a solid masonry wall has a height about three times as great as its thickness, it will retain ordinary earth with complete stability. The design of a retaining wall would then seem to be a simple matter for such cases, merely the making of a wall of a thickness one-third of its height. But there are other features that must be taken care of, and these are of equal importance with the thickness of the wall.

In order to arrive at a basis for determining the stability of a retaining wall of other than the rectangular shape and avoiding the excessive theoretical calculations so often made use of, it will be assumed that a masonry wall of rectangular cross section and having a height three times its thickness is stable against the pressure of ordinary earth or fill. A fluid pressure will be assumed on the back of the wall, and friction of the fill against the back of the wall will be ignored. For stability the resultant pressure on the base must fall within the middle third. If it falls at B (Fig. 1), the edge of this middle third, there will be no uplift on the base. The shaded triangle H J K will represent the pressure on the soil. Moments around B should then balance; that is, the moment of the weight of the wall will balance the moment of the horizontal force of the backing. For a foot of length of wall, if W equal the weight per cubic foot of the masonry and w the equivalent fluid weight per cubic foot, we

$$\text{have: } W h b \times \frac{b}{6} = w h \times \frac{h}{2} \times \frac{h}{3}, \text{ or if } h = 3b, W = 9w.$$

If then the weight of masonry be 150 lbs. per cubic foot and the weight of earth fill be 100 lbs. per cubic foot, the equivalent fluid weight is $16 \frac{2}{3}$ lbs. per cubic foot, or one-sixth of the weight of the fill. It is very much simpler to consider the pressure of the fill as a fluid pressure of say one-sixth or one-fifth of the weight of fill per cubic foot than to use the intricate formula for earth pressure which fail so conspicuously to justify their existence.

A retaining wall of any considerable size is a heavy structure, and heavy structures demand special provision against settlement. Settlement in a retaining wall is tantamount to failure, because it is invariably unequal settlement, disturbing the perpendicularity of the wall, destroying its alignment, and giving rise to cracks. In other structures such as buildings, settlement may take place without serious consequences if that settlement be small, provided the design has been made with a view of making the settlement uniform. This latter can readily be done by the simple expedient of making the areas of the footings proportional to the load. In a retaining wall the greatest pressure will be under the outer edge of the wall; settlement here means that the wall will lean outward. It is also true that the smallest resistance of the soil against pressure is at this

* In Engineering—Contracting.

same outer edge, since soil will resist very much less pressure near its surface than at a point some distance below the surface. Furthermore, the conditions in a retaining wall are unfavorable in the matter of the softening of the ground by the action of the rain at the very place where such softening has the most harmful effect. Ground water at the base of a retaining wall will soften the soil and make it more yielding. Sometimes in railroad work there is even a gutter at the base of a retaining wall. These conditions do not exist in a building where the cellar is kept dry and the surface of the soil that is nearest to the level of the footings of walls does not undergo this softening action.

One way that would suggest itself to overcome the difficulty would be to build the retaining wall deeper. This not only adds largely to the expense but increases the soil pressure, thus defeating to some extent its own end. Another way is to drive piles under the wall near the outer edge of the same, so as to increase the bearing power of the soil at this critical locality. This would no doubt be an excellent and economical method of insuring the stability of a retaining wall in many cases.

Still another method is to use a wide slab for a footing under the wall, as indicated in Figs. 2 and 3. In stone work flags would have to be used. In mass concrete, of course, a concrete slab would be used. A little steel reinforcement would add greatly to the efficiency of the slab. In railroad work the same slab might be made to act as a gutter, carrying the water away that might otherwise act to soften the soil at the base of the wall.

It is seen from Figs. 2 and 3 that by anchoring the wall into the slab at the back, the stability against overturning would be very greatly increased. This cannot well be done in ordinary masonry, but in concrete it could very readily be accomplished.

It is further seen that if the slab projected under the soil at the back of the wall still more stability would result by reason of the fact that the slab would be loaded with a large weight of superimposed earth. A T or L shape is then a logical shape for a retaining wall. Such shapes are not possible in ordinary masonry; that is, they would not have the required strength. In reinforced concrete, however, they are both practicable and economical. The projection at the front of the wall does not need to be very large, except where the soil is particularly soft. At the back the projection should be a large fraction of the height in order to take hold of sufficient earth to give the required stability. The wall will then be L shaped in cross section.

A simple L shape of uniform cross section in a retaining wall would mean that the base slab and the vertical wall would have to act as cantilevers. Cantilever slabs are not economical, and they are difficult to reinforce. Two cantilever slabs meeting at right angles would be specially troublesome to reinforce because of the difficulty of carrying stresses around the corner.

Figure 4 shows a suggested form for an L-shaped wall. Three series of reinforcing rods are used. Rods *a b* would reinforce the cantilever whose critical section is *X X*. Rods *e f* would reinforce the cantilever whose critical section is *Z Z*. Rods *c d* are needed to reinforce the corner. The section *Y Y* could here be used as the critical section. If a single curved rod were used in place of these three from *a* around to *e*, the tendency, when this is under tension, would be for the rod to pull out and break off the overlying concrete. Each rod can in this arrangement run beyond the points *A* and *B* far enough to get the full anchorage value, say 50 diameters. Rods *e f* can further be curved down as indicated to reinforce the projection at the heel of the wall.

In order to make the two slabs of an L-shaped retaining wall act as simple beams and not as cantilevers these slabs

may be joined by ribs or counterforts at intervals in which rods are embedded. An oblique projection of such a wall is shown in Fig. 5, viewed from the rear.

It is an absurdly simple proposition that the rods in the counterfort or rib act merely to tie together the horizontal slab and the vertical slab. The vertical slab is subject to horizontal pressure from the earth back of it. The rods in the ribs resist that pressure, and in order to have something against which to pull they must be anchored down into the horizontal slab, which is able to resist the pull by reason of the weight of earth upon it. In spite of the simplicity of this proposition this three-cornered counterfort is analyzed in books as a beam. Besides this, in nearly all the walls built on this plan rods are thrown in in a most senseless and wasteful manner. In one example of a wall 45 ft. high there are nearly 100 horizontal rods varying from $\frac{3}{8}$ to 1 in. square, besides 22 rods $1\frac{1}{4}$ inches square placed diagonally close to the back, all of this in a single counterfort. In this structure there are tons of steel positively wasted. In other examples there are meshes of horizontal and vertical and

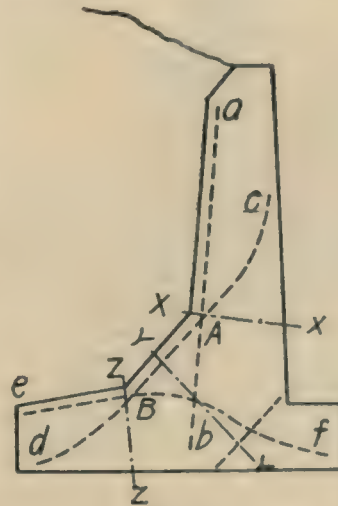


Fig. 4.

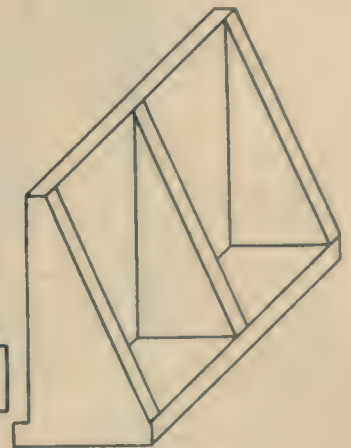


Fig. 5.

diagonal rods that cannot possibly be good for more than a small fraction of their tensile strength.

Figure 6 shows the two ways in which one of these retaining walls could fail. The real strength of all this mass of steel rods is merely the little anchorage value of the short ends that are embedded in the vertical and the horizontal slabs. It is a cardinal principle of good design in reinforced concrete that a short end of a rod is entirely inadequate to anchor it for its full value.

Another glaring fault in the common method of design, illustrated in Fig. 6, lies in the useless intermeshing of the rods. A single curved rod running from the horizontal to the vertical slab and anchored in each would perform all and more than all the duty that a horizontal and a vertical rod, as shown in Fig. 6, can perform. The long rods *A* and *B* are absolutely useless for the greater part of their length. A single short rod from *A* around to *B*, with end anchorage at *A* and *B*, would be far more effectual than these two rods combined.

Another serious fault in this common design lies in the difficulties and uncertainties in the matter of execution. A mesh of rods in any event is a serious menace to the proper placing of concrete. A little misplacement of a rod whose short end is depended upon for anchorage could result in the rod being totally useless. Rods could very readily be omitted, even under the eye of a watcher, where such a large number is called for. It would be extremely difficult to hold 100 loose rods in place during the pouring of concrete and to be sure that none of them have been dislodged in the operation.

The writer has devised and patented a scheme for reinforcing a retaining wall such as that shown in Fig. 5 that obviates all of these difficulties. The design is shown in Fig. 7. It is to be noted that the rods in the ribs, instead of being indiscriminately placed in horizontal and vertical positions, are all placed diagonally. Each rod has an easy curve near the end and is anchored for its full value in both the horizontal and the vertical slab. The office of the rib is here recognized as being merely to protect these rods from corrosion. It is not a beam in any sense and should not be filled with a useless lot of shear rods.

The anchorage for the rods in the design shown is an angle through which the rods pass. The rods have a nut on each side of the metal to hold them in place and in bearing against the metal. The same angle has holes in the other

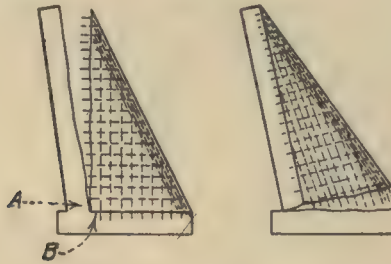


Fig. 6.

flange through which the rods pass that are used to reinforce the slabs. For a wall of this sort to fail this anchoring angle would have to be torn out, and it would pull with it the slab reinforcement. Besides being designed for the actual stresses in the wall and amply capable of resisting them, this reinforcement has many practical advantages.

There is no mesh of rods in the rib to interfere with the flow of concrete. The rods are parallel and almost in the direction of the flow of concrete; they are further in only one plane.

The entire harp-like reinforcement of a rib can be put together on the ground and raised to place as one piece. A few braces will hold the whole in place, and interference with placing the concrete is for this reason also reduced to a minimum.

The small number of rods makes omission of any of them noticeable. Furthermore, such omission would show up in vacant holes in the angles and could readily be detected.

It is almost impossible for any of the rods to be displaced during the pouring of the concrete.

The writer has devised a standard retaining wall with proportions and reinforcement as shown in Fig. 7. The several features will be taken up in order. It will be noted that the height of the wall is 2.4 times the base. It was found by trial using three walls having bases 5, 10, and 15 ft. respectively, and heights 12, 24, and 36 ft. respectively, earth at 100 lbs. per cubic foot and concrete at 150 lbs., that walls of the dimensions shown in Fig. 7 would be stable against a horizontal fluid pressure of about 18 lbs. The stability of these walls would then be equivalent from this standpoint to that of walls of solid concrete having three times their thickness. Furthermore, the stability of the reinforced concrete retaining wall is based on the assumption that there is a plane of cleavage vertically over the back edge of the slab, as only the weight of earth directly above the slab is considered. If the wall should turn over, it would have to lift more than this portion of the backing, so that the reinforced wall has this extra element of stability.

The volumes per bay for the three walls referred to (12, 24, and 36 ft. in height) were found to be 96.6, 452.8, and 1,168.5 cubic feet respectively. Solid masonry walls of the same height and having bases one-third the height would

contain 3.73, 3.39, and 3.14 times as much in volume of masonry, respectively, as the reinforced concrete walls.

The centers of gravity of these three walls were found to be 1.43 ft., 3 ft., and 4.66 ft. respectively, from the heel of wall. The respective volumes of earth over the slab are 332.3, 1,377.2, and 3,206.3 cubic feet. The centers of gravity of these volumes are located at 2.96 ft., 5.97 ft., and 9.01 ft., respectively, from the heel of wall.

One peculiarity respecting these three walls is that the resultant center of gravity of earth and concrete is in each case almost exactly in the center of the slab. This makes it proper to assume that the pressure due to the weight is uniformly distributed over the base, as shown at a, Fig. 7, as the stiffness of the bottom slab is sufficient to give this distribution. The reaction of the earth under the slab will be uniformly varying from zero intensity at the toe of the wall to double the intensity of the uniform load at the heel of the wall, as at b. The difference between these sets of forces shown at c must be resisted by internal stresses in the concrete. On the left half of the bottom slab the forces are seen to be upward. If the construction were a reinforced slab, it would require the principal reinforcement in the upper part. For simplicity of construction it is desirable to avoid this. The close proximity of the vertical wall makes it possible to throw this force directly into the wall by means of the steps at the junction of wall and slab. These steps could of course be replaced by a chamfer or slope, if the latter were found to be simpler of construction.

On the right half of the bottom slab there is a vertical load downward varying in intensity from zero at the middle to an amount at the edge of the slab which may be taken as the weight of superimposed earth and of the slab itself. This is close to $250 \times b$ lbs. per square foot. Taking the effective span of the slab as $7\frac{1}{2}$ feet the bending moment on the extreme right edge is $250 b \times 7\frac{1}{2} \times 7\frac{1}{2}$ divided by 8 equals $1,758 b$. This is in foot pounds per foot width of slab.

In order to give clearance for the angles shown in Fig. 7, the steel rods are placed one-sixth of the depth of the slab

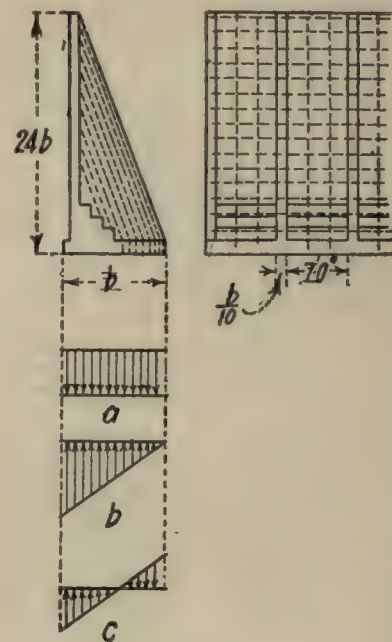


Fig. 7.

from the bottom. Following the method employed by the writer in his book, "Concrete," the effective depth of the slab is found to be two-thirds of its depth out to out. As this latter is $\frac{3}{20} b$, the effective depth (that is, the distance

from the center of steel to center of compression in concrete) is $1/10 b$. For an area of steel equals A , in square inches per foot width of slab and a stress of 12,500 lbs. per square inch we have an allowed bending moment of 12,500 $A \times 1/10 b$ equals 1,250 $A b$ ft. lbs.

Equating this to 1,758 b , found above, we have: $A = 1.406$.

This can be made up of four $5/8$ -in. diameter rods. It is thus seen that for any size of retaining wall $5/8$ -in. round rods, spaced 3 inches apart, will take the tensile stress in the bottom slab at the extreme right edge. The spacing of rods can be increased toward the middle of the slab. It is better to increase the spacing than to use varying sizes of rods, as the ordering of material is simplified. An arbitrary maximum spacing of 12 inches is used here for the left half of the slab to tie the concrete together.

To prevent cracking of the slab due to deflection upper rods are added, as shown in Fig. 7. These are made 5 ft. long and spaced 6 inches apart, thus making their area one-half of the maximum bottom reinforcement. It is the writer's practice to design slabs as simple beams, using the clear span, and to reinforce across the support with one-half of the area required in the slab, so as to prevent cracks and consequent weakening of the slab in shear. Note that the clear span here is not the clear distance between ribs, since the steel angle F and not the rib supports the slab.

As the writer has shown in his book, "Concrete," when the area of steel does not exceed $1/4$ per cent. of that of the concrete in a slab the stress in the concrete will be within safe limits. It is seen that the area A , found above, is $1/4$ per cent. of that of a slab 12 inches wide and 9.4 inches deep. For a base of 5 feet the depth of slab is 9 inches; hence a lower limit of about 5 feet should be adhered to for this standard. For smaller walls the thickness of parts for a wall of 5-ft. base could be maintained and the span between ribs varied to suit the bending moment found. Thus for a wall having $2\frac{1}{2}$ -ft. base (one-half of the standard 5-ft. wall), the load on the slab will be approximately one-half of that on the 5-ft. wall. (The height of this wall would be 6 ft.) A 9-in. wall with the standard reinforcement will be good for a span V_2 times the standard, or 10.6 ft., say 10 ft. clear.

The span of 7 ft. in the standard wall is found as follows: Let $s =$ clear span in feet. The end shear in 1 ft. width of slab is $250 \times \frac{1}{2} s$ equals 125 $b s$. The shearing strength of a slab $3/20 b$ feet deep and 1 ft. wide, at 40 lbs. per square inch on the gross area is $3/20 b \times 12 \times 12 \times 40$ equals 864 b .

Then from the equation 125 $b s = 864 b$, we find $s = 9.91$ ft.

Since this remains true for all sizes of standard walls, it is seen that the shear is taken care of in all walls. In walls of less than 5 feet in base, and having a thickness of slab equal to the 5-ft. standard, shear will also be taken care of, since the slab will have a greater relative depth than in the standard wall.

The reinforcement in the front walls is found as follows: It will be seen in the standard retaining wall that the depth from top of wall to top of steps is $1.9 b$. The intensity of horizontal pressure is therefore $1.9 b \times 1/6 \times 100$ lbs. square foot. This gives a moment on a foot depth of wall $= 223 b$ ft. lbs. The moment of resistance of the reinforced slab, found as above, is 12,500 $A \times$

From 223 b equals 883 $A b$, we have A equals 267 sq. in.

This would be made up by one $5/8$ -in. round rod for every foot of depth of wall. This reinforcement is carried up to the top of the wall and is used as indicated on the lower portion of the wall and on the bottom, though theoretically less reinforcement would be required. The purpose is to tie the wall together. Near the top of wall this extra reinforcement is especially useful in resisting local effects of frost in the ground, which are more intense near the sur-

face. Extraneous load on the backing would also effect the wall the greatest near the surface.

It is well to chamfer off the inner edge of a retaining wall at the top, as indicated in Figs. 2, 3, and 4, so that the effect of the expansion of surface ice will be deflected.

The rods in the rib take the downward force shown at c , Fig. 7, the amount of which at the right edge is at a rate per foot close to $250 b \times 7$ equals 1,750 b lbs. On a retaining wall of 5-ft. base the load in a foot is 8,750 lbs. At 12,500 lbs. per sq. in. this would require four rods $1/2$ in. in diameter. For a 10-ft. base four 11-16-in. round rods are required, etc. By giving these rods the same horizontal spacing at the bottom as those in the bottom slab and varying the rate of spacing in the same manner, the vertical load is taken care of. The rods start vertical and hence the vertical load mea-

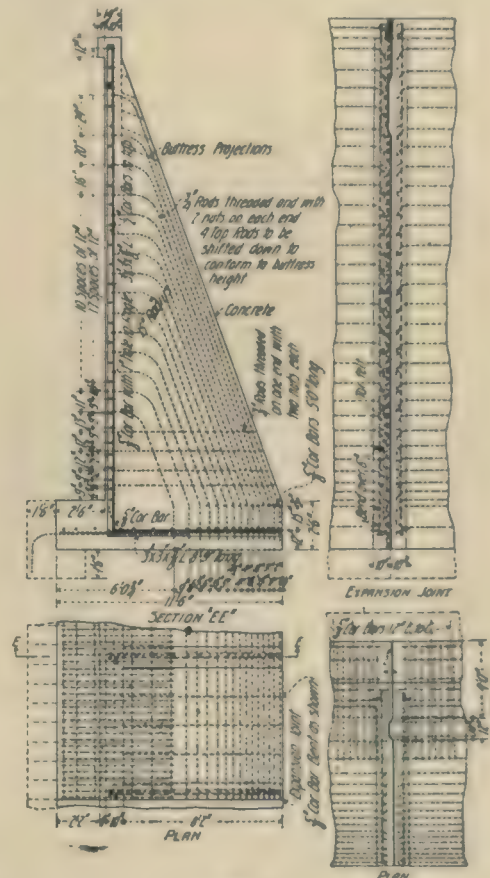


Fig. 8.

sures their stress and not the component in the diagonal direction. Of course straight rods could be used, by employing beveled washers, in which case the stress would be the diagonal components of the vertical load.

The horizontal force against the vertical wall is less than the weight of earth on the slab which is carried by the rods in the counterfort, hence the same rods will be sufficient to resist the horizontal force on this wall.

The work of the steps at the junction of vertical wall and slab is to resist an upward pressure varying from zero at the foot of the steps to a maximum under the vertical wall. Reinforcement is not needed in these steps because of their mass and because they are supported on three sides.

The projection at the heel of wall does not need reinforcement, because its amount is only one-third of the depth. If a large projection were needed here on account of soft soil in the foundation, reinforcement should be used.

Anchors that take the full stress of rods should have their areas about 20 times the section of the rod. This con-

dition would govern the size of the flange of angle to which rods in the rib connect. These angles could vary from about $2\frac{1}{2} \times 2\frac{1}{2} \times 5/16$ in. for small sized walls to $4 \times 3 \times 3/8$ in. for large walls.

The rods in the ribs should be bent with easy curves and not with sharp bends. Sharp bends are totally out of place in rods reinforcing concrete. The radius of the curve of bend should be about 20 times the diameter of the rod.

A retaining wall built on this or any other plan should have the backing well drained. This plan admits of ample provision for drainage by means of weep holes through the slabs. In order that these do not fill with mud, some loose stone should be laid around them.

In a wall built after this plan at Melwood Ave., Pittsburgh, the bottom slab was inclined. This made a pocket, into which drainage could be carried. The maximum height is 64 feet. The anchoring pieces are $5/8$ -in. plates instead of angles. Plates do not afford a ledge or shelf for the concrete slab to rest upon, but in this case this was offset by the fact that the reinforcing rods for the slabs were curved in an arc. However, these rods, where they entered the $5/8$ -in. plate, were bent normal to the plate. This makes the anchoring value of the plate to depend largely upon shear in these rods. Of course adhesion to the side of the $5/8$ -in. plate will help to anchor the plate, but adhesion of concrete to a flat surface is not of very great value, because the element of grip is lacking.

The rods in these ribs may vary from $1\frac{1}{4}$ in. to $1\frac{1}{2}$ in. They have forked loops at the ends and turnbuckles for adjustment. They are connected to the anchor plates by means of cotter pins. The front wall is 18 inches thick, the bottom slab is 2 feet thick, and the rods are 1 foot thick. The spacing of ribs is 10 feet and the maximum width of bottom slab is 29 feet 6 inches. At the highest portion of the wall there is about 2,400 cubic feet of concrete per bay. A solid wall 64 feet high and having a base one-third of the height would have nearly six times this amount of concrete in 10 feet of its length. The economy of this form of retaining wall is therefore manifest.

The accompanying plans, Fig. 8, which were kindly furnished the writer by L. W. Anderson, city engineer, of Grand Rapids, Mich., show part of some extensive flood protection work constructed in Grand Rapids. The writer's design of retaining wall was used in this work. The anchors for the rods in this work consisted of angles, as used in the writer's standard plan. Mr. Anderson states: "There has been no difficulty in rapidly placing the counter for reinforcement as a whole, setting and plumbing the same. The rods are quickly and accurately placed by common help with very little attention on the part of the inspector. Every rod has its proper location, and there is very small chance of rods being misplaced or omitted."

Montreal Builders' Exchange Annual Meeting

There was a good attendance at the 13th annual meeting of the Montreal Builders' Exchange, on January 23rd. The following officers were elected by acclamation: President, Jas. Ballantyne; Vice-President, J. Brunet; Board of Directors, J. P. Anglin (General Contractors); Frank Pause (Carpenters); K. D. Church (Cement and Concrete); W. T. Castle (Painters); J. E. Walsh (Plumbers); E. W. Sayer (Electricians); Thomas Gilday (Roofers); Wm. Rutherford (Lumber); John Quinlan (Masonry and Cut Stone); Alex. Brenner (Builders' Supplies); T. A. Morrison (Brick and Quarry Supplies).

The President, Mr. Jos. N. Arcand, in reading the annual report, referred with feelings of pride to the commercial and industrial supremacy of Montreal and looked forward to the day when the entire island of Montreal would be a city of humming industry.

Referring to the Montreal building regulations, Mr. Arcand said:

"A French insurance expert, recently here, made the statement that Canadian fire losses were twenty times as great as in old France. As a matter of fact, the 'soot bill' in the United States and Canada for 1910 reached the trifling sum of over 234 millions, compared with 202 millions in 1909. In Canada alone the loss for 1910 was \$23,750,000, against \$15,250,000 in 1909. Putting it another way, the fire loss for the two countries equalled twice the whole year's new construction of either Montreal or Toronto. Or, on a cash basis, the loss per capita in the United States and Canada is \$2.30 as against 33 cents per head in Europe. There are no other countries that present such a record. It is made also in face of the fact that on this continent the municipal fire protective services are maintained on a scale, with an efficiency and at a cost greater than elsewhere in the world. Some of the causes are evident on the surface, if any one will take a look at some of the buildings in process of erection in Montreal. That these buildings in design or execution comply with the law is inconceivable. Whether they do or not, their character is enough to explain why fire losses are twenty times greater here than in the old world. Every new fire trap tolerated in Montreal adds to the average fire loss, and therefore adds to the cost of insurance, besides being a grave menace to human life. The fire companies are not in the business for their health, for amusement, or for philanthropic purposes, and none of them are complaining about making too much money. It would require little less than a Niagara to put out a fire, with five minutes' start, in some buildings now going up in Montreal. Neither Fire Department nor Water Department can accomplish impossibilities. The Building Department has been notoriously undermanned, and any systematic inspection a physical impossibility. The time to see and appreciate the ingenuity of a fire trap is in the early stages of building, before the lath and plaster go on. Some of these structures are as surely predestined to the flames, as is an unelect Calvinist. Public sentiment, aroused to action by the disastrous fires in the "Herald" and Bishop St. buildings, demanded a prompt and thorough revision of the Building Code, a movement long advocated by your Executive Board, who heartily endorse the present efforts of the Board of Control to extend the zone of first-class buildings throughout the entire city area. The better the class of building, the better will be the calibre of the contractors. Furthermore, the staff of the Building Inspector's office has been absurdly inadequate; three, all told, when cities of equal size on this continent comprise a staff of 50. The revenue from building permits should be on a basis to make the department self-sustaining."

The meeting concluded with a vote of thanks to the officials who had acted during the past year.

Important Announcement Respecting Georgian Bay Canal

About 300 members of the Canadian Manufacturers' Association participated in the annual banquet of that institution held recently at Montreal. Excellent addresses were delivered by Hon. Rudolphe Lemieux, Hon. R. L. Borden, Sir Edmund Walker (president of the Canadian Bank of Commerce), and Mr. Chas. M. Hayes (president of the G. T. R.).

Hon. Rudolphe Lemieux made a notable statement in respect to the Georgian Bay Canal. The construction of this great work, he felt confident, would be commenced within the next few months.

The announcement of the Minister confirmed a rumor which had been around the city for some time that supplementary estimates were to be presented to the House for the purpose of dredging Riviere des Prairies and the French Rivr sections of the proposed canal.

Good Roads In Manitoba

The Manitoba Good Roads Association held an interesting session at the Winnipeg City Hall last week. Reeve Henderson, of Kildonan, president of the association, occupied the chair.

Letters regarding the use of split log drags for keeping roads in order, received from various points in the province, were read, and in every instance they spoke very highly of the good work that could be done by the use of a split log drag. In the case of the rural municipality of Springfield, the council thought so highly of its capability that they had purchased eight more for use during the present year.

Communications from the Pacific Highway Association were also presented, asking for the co-operation of the Manitoba Association in the furtherance of the national highway from Winnipeg to Vancouver.

Reeve Mager, of St. Vital, submitted a scheme for the consideration of the association, which was, in brief, as follows: "That the work of road building be left to the provincial government and its engineers, and that the government be asked to construct roads radiating for a distance of 100 miles from the cities of Winnipeg and St. Boniface, and that the cost of construction should be covered by the issue of long term bonds, payment of which should be guaranteed by charging it to different zones or districts, and the proportion being charged according to the distance from the centre of the good roads zone." This would leave Winnipeg and St. Boniface to take up about one-quarter of the bond issue jointly, the balance to be divided over the municipalities according to their distance from the centre. It was finally decided, to present the by-law in its present condition to the legislature and see what the government was prepared to do with it.

The following committee was appointed to present the by-law: Reeve Henderson, Controller Waugh and Reeve Haddow, Rosser.

An interesting talk was also given by Highway Commissioner McGillivray, regarding his trip to the Indianapolis good roads convention last December. According to Mr. McGillivray, the good roads movement in the states was far in advance of that in Canada, their ideas being along the lines of a higher grade of construction. In one state 20,000 miles of earth roads were kept up solely by the use of the split log drags, and the Pennsylvania railroad had helped the movement by the free supply of split log drags at every one of its country stations, and also hauled gravel at a cost of 25 cents a yard, to help along the good roads movement.

Revelstoke Power Plant

The power plant nearing completion on the Illecillewaet River near Revelstoke, British Columbia, is an example of a municipally owned plant purchased from a private company, and now forming a valuable asset to a growing city. It also is interesting from a construction standpoint, illustrating the building of a large concrete dam in a narrow canyon, and from a designer's standpoint, on account of the means adopted to handle very severe frazil ice conditions.

The few remarks below on the city of Revelstoke will serve to indicate the reasons on which were based the original decision of the city to control its lighting system, and the later decision to remodel it in accordance with the plans which have lately been carried out at an expenditure of about \$100,000.

The residents of the city have every confidence in its future, and the existence of cheap power, developed, should add very considerably to its prosperity. At the present rates for power and light without any increase of business

the new plant will carry itself, including interest and sinking fund, and leave a small profit; so that all business above the present load, of about 400 h.p., will be largely profit.

Revelstoke is a city of about five thousand people, situated on the main line of the Canadian Pacific Railway at its junction with the Arrow Lakes and the Crow's Nest branch. At this point the Columbia River flows south from the Big Bend and Northern British Columbia districts, and is navigable for about two hundred miles south, including the Arrowhead Lakes, which are in reality a widening of the river, and north about forty miles at present. The city is therefore well situated from a railway standpoint.

Commercially it has been chiefly a railway and lumbering centre, and along these lines will continually increase; besides which a highly mineralized section north along the Columbia River and close to the south in the Lardeau districts may be expected to add to its industries and population.

Agriculturally, climatically, and from a scenic standpoint, the city has many advantages as yet but little recognized, and it is expected that they will add largely to its population in the near future. The winters are mild and equable, about the same as those of the northern Niagara Peninsula, while the summers are in every way ideal.

From a tourist's and hunter's standpoint the city, lying as it does between the Selkirks and the Gold range, in the centre of what is practically an uninhabited district, offers great advantages, which are now becoming better known.

It possesses the climate and fruit growing characteristics of the well known Kootenay country, but the extensive bench lands of the Columbia River adjoining it have not yet been denuded of their heavy growth of timber. As this is cut off, agriculture will play a large part in the future of the city. Additional railway transportation to the north is expected within the near future, and to this country the city will be a distributing centre.

The city owns its hydro-electric and waterworks systems, both of which are being remodelled and extended at present. The hydro-electric plant, which is fully described and illustrated in an article elsewhere in this issue, was designed and built by Messrs. Smith, Kerry & Chace, Engineers, through their Vancouver office, of which Mr. H. J. Haffner is manager. The contract for the dam was let to William Newman & Co., of Winnipeg, and for the power house to E. G. Fromey, of Revelstoke.

The report of Building Inspector Fotheringham, just issued, showed that there were 671 permits of an estimated value of \$3,020,651 taken out last year. This is a decrease from the year before, when there were 683 permits, estimated at \$4,527,590. This, however, does not indicate any decrease in building in 1910, because a number of large permits were taken out in 1909 for which the construction was scarcely started in that year. The permits for 1910 indicate construction of solid brick or stone, \$1,136,325; concrete, \$370,650; brick veneer, \$1,364,350; iron clad, \$68,850; wood or frame, \$82,475.

The Universal Concrete Machinery Company, of Waterloo, Iowa, has recently been reorganized and incorporated for \$25,000, taking over the business of the old company, which has been established and very successfully carried on for fifteen years by Mr. J. L. Shannon. Mr. Shannon is the president of the new company and his past record is a sufficient guarantee of the new concern. Mr. O. R. Taylor, the vice-president and treasurer, is very favorably known throughout the country and will give it added strength. Mr. M. L. Cottrill, the secretary, has had extended experience. The company carries a full line of all kinds and is prepared to fill all orders with promptness and despatch.

Ottawa Sure of Active Season

C. P. R. and Many Manufacturing Concerns have Important Plans—Tenders for Departmental Building

The prospects for building in Ottawa this season are very bright. The plans of the departmental building to be erected on Mackenzie avenue, which were revised, are almost completed. They will be very little different from the original plans for the interior, but a number of changes will be made with the elevations. It is expected that they will be made public and tenders called for very soon.

The Grand Trunk Railway will make extensive changes this year. The yards, round house and machine shops will be considerably enlarged. For some time the company has felt the need of more facilities here and had intended making extensions last year. However, it was not done, partially on account of the strike. This summer the extensions will be made and they will be sufficient to accommodate a great deal of expansion. The company will also erect a new swing bridge across the Rideau canal at the foot of Elgin street. This work will be begun at once.

The Central Canada Exhibition Association has decided to postpone the building of the new machinery hall at Lansdowne Park until next year, and it is proposed that then a new agricultural hall be also built. The estimated cost of the machinery hall is \$75,000. However, there will be a great deal of work done at this park. The lake, which takes up a valuable lot of space, will be filled in. The electric light wires will be placed under ground and the lighting of the grounds will be done in a much more extensive manner. A new roof will be placed on Howick Hall.

The Public School Board will probably build a large brick annex to Mutchmore street school, and the work will be begun early in the spring. There are no new schools anticipated. The Separate School Board has not yet decided whether or not it will build another school this year. During 1910 \$70,624.68 was spent in erecting new schools, and \$8,929.38 in repairs, by the Public School Boards.

During the past year twelve new industries came to Ottawa. These include the Continental Bag and Paper Company, Stronglite Box Company, Dustbane Manufacturing Company, Davidson & Crooks, McLaughlin Paint Works, Wilson's sash door finishings, Kerr's Ornamental Glass Works, Ottawa Specialty Company, Beaver Board Company, Henderson Bros. (hair cloth, etc.), Ottawa Vacuum Cleaner Company, and the Diamond-Arrow Motor Car Company. Of these the Beaver Board Company have purchased a site and expect to build a plant in the spring. The same is the case with Henderson Brothers. The Ottawa Vacuum Cleaner Company is now trying to locate a suitable factory.

The Ottawa Electric Light Company will make extensive changes this summer. It has just completed its large fireproof building on Slater street, which gives great facility for future growth. The construction, line, meter and testing departments, draughting rooms and inspectors' headquarters will be in this building, and on the top floor will be installed a switchboard. Next year this will be a sub-station from which all the electricity for light and power for the central and eastern parts of the city will be distributed. The power will be brought in bulk from the three power houses of the company, underground to this sub-station. Nine vitrified clay ducts will be installed from the power houses to the Slater street station, a distance of about 9,000 feet. For the present, six cables will be run through them which will deliver about 5,000 horse-power to the sub-station. On leaving the station again the wires will travel a distance under ground, coming up along side of poles, one by one, to form aerial lines. This will avoid bunching the wires at

any one point on the poles. The station on Amelia Island will be made the central or main generating station. It has been completely overhauled and most modern machinery installed. The present main station on Head street will be known as the auxiliary hydraulic generating station. By means of ducts all these stations will be tied together underground (they are now overhead), and likewise by ducts to three generating plants of other concerns so that in case of trouble there will be many sources of assistance to rely on, making it almost impossible for the service to be seriously interrupted.

Montreal Builders' Annual Banquet

The annual banquet of the Montreal Builders' Exchange was held on January 18th. Some two hundred guests sat down in the Green room of the Windsor Hotel under the presidency of Mr. Joseph Arcand. Among the guests of honor were Hon. L. P. Brodeur, Minister of Marine; Mr. J. L. Perron, K.C., M.L.A.; Mayor Guerin, Mayor Rutherford, of Westmount; Ald. J. H. Sherrard, Mr. F. Bourbonniere, K.C. (representing Mr. O. S. Perrault, president of the Chambre de Commerce), Mr. Geo. R. Smith, M.L.A.; Mr. J. R. Gardiner (president Architects' Association), Mr. Jas. Bennett (chief inspector, Underwriters' Association), Mr. Cecil Doure (Manufacturers' Association).

The toast of "Our Country" was proposed by Mr. James Ballantyne, who said that the builders had their share in the upbuilding of the country by erecting buildings which were architecturally pleasing and substantial enough to stand for many years to come. It seemed to him that the country was advancing so rapidly that it would be difficult for the builders to catch up, especially in the west. He was pleased to know that the group of buildings in course of erection for educational purposes in Saskatchewan was being built entirely by Canadian contractors and architects.

Hon. L. P. Brodeur delivered an interesting address in reply to the toast. He predicted greater activity in the building industry with the construction of the Canadian navy, the policy of the Government being that the ships should be built in Canada. The ships and shipyards would also benefit a number of allied industries.

Mr. Gardiner, president of the Province of Quebec Architects' Association, referring to the subject of technical education, suggested that workmen should be graded according to ability and paid according to their certificates. Such a system, he thought, would encourage them to seek proper technical training.

Other speakers were Mayor Rutherford, of Westmount, Mayor Guerin, of Montreal, Ald. Sherrard (vice-president of the Manufacturers' Association), and Mr. W. T. Castle.

C. P. R. Western Programme

Mr. Wm. Whyte, vice-president of the C. P. R., states that his company will build nearly 500 miles of track west of the Great Lakes this season. The double track from Winnipeg to Brandon will be completed and there will also be constructed seven miles of double track east of Moose Jaw and sixteen and a half miles west of that city. Three new steel bridges will be built over the Bow river east and west of Calgary.

As for the new work to be carried on by the C. P. R. west of Lake Superior this year, the vice-president said that two lines of 25 miles each will be built south from the main line skirting both the east and west side of Tramping Lake, where a good many new settlers have found farms and a very flourishing part of the country exists. A line will likewise be built 35 miles northwest of Swift Current, and a second 45 miles in extent southeasterly. The track from Moose Jaw southwest will also be extended 35 miles, while 20 miles

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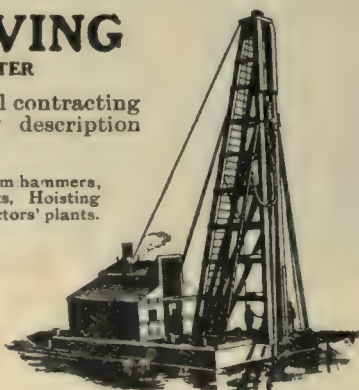
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will be added to the line east of Weyburn. Thirty-five miles will be built northwest of Estevan, while 32 more miles will be built through the Cut Knife district. Twenty miles will be built from Golden to Spilamachine Landing, and later on this will be the chief route uniting the main line of the C. P. R. and the Crow's Nest.

Personal News and Notes

The annual statement of the Canada Cement Company, issued last week, shows cash in hand, \$916,169, and a surplus of over \$2,000,000.

Mr. H. J. Glaubitz, consulting engineer, Toronto, has been appointed head engineer of the Waterworks Department at London, Ont., at a salary of \$3,600 a year.

The annual convention of the Alberta Association of Architects was held at Calgary, January 30 and 31. The members were entertained to a banquet at the Grosvenor Hotel by the local chapter on the evening of January 30.

The City Architect of Toronto has issued a detailed statement of the city's building for 1910, which represented a total value of \$21,127,783. The more important items in order of size are the following: brick dwellings, \$9,907,377; stores and offices, \$1,879,415; hospitals, \$1,186,000; factories, \$1,171,450; rough cast dwellings (brick fronts) \$866,950; warehouses, \$689,595; schools, \$644,590; churches, \$551,300.

A special committee of the York County Council is discussing the question of appointing commissioners to co-operate with the city in the inauguration of the good roads project. It is expected that at least one road building inspector will have a place on the commission.

A by-law looking to the purchase of a \$25,000 paving plant will be submitted to the citizens of Calgary at an early date. City Engineer Child made a report in this connection and estimated the capacity of such a plant at from 800 to 1,000 yards a day. He expects to effect a considerable saving by its use.

The Ottawa Branch of the Canadian Society of Civil Engineers held a banquet on Wednesday, February 1st. Mr. A. A. Dion presided and there were about fifty members present. An informal discussion was held following reports of the members who had attended the recent meeting of the parent society in Winnipeg.

Mr. D. Chene, City Engineer of Hull, Que., returned recently from Paris, France, where he has spent the last four months in a study of bacteriology at the Pasteur Institute. Mr. Chene made a special study of the methods adopted in the European city, where a perfect analysis can be made within 24 hours. During his stay in Paris he was awarded a certificate as a qualified analyst.

The building permits issued by the city of North Vancouver during 1910 represented a total value of \$395,440. In regard to building conditions and prospects, Mr. Thomas Shepherd, City Clerk, writes: "We have entered upon what will assuredly be a year of great progress in the erection of permanent buildings and the carrying out of permanent improvements. The new building by-law came into operation on January 1st. Extensive sewerage work was started on January 16th."

The annual convention of the Alberta Association of Architects was held last week in Calgary under the presidency of Mr. Henderson, of Edmonton. The officers for 1911 are, hon. president, E. C. Hopkins, Edmonton; president, S. M. Lang, Calgary; secretary, L. M. Gotch, Calgary; hon. secretary, R. W. Lines, Edmonton; treasurer, D. S. McElroy, Calgary; examiners, G. M. Lang, W. S. Bates, James Henderson, L. M. Gotch, and R. W. Lines; auditors, A. Pierie and J. J. O'Gara; librarian, R. W. Lines.

Contracts Department

News of Special Interest to Contractors, Engineers, Manufacturers and Dealers in Building Supplies.

Information for insertion in these columns is invited from Architects, Contractors, Engineers, etc.

Waterworks, Sewerage and Roadways

Allanburg, Ont.

Tenders are called until February 28th for construction of concrete sidewalks. Specifications at office of J. F. Hansel, clerk.

Edmonton, Alta.

A. J. Latornell, city engineer, has written that the plans and estimates for Kat Creek sewer were not sufficiently advanced to call for tenders.

Fort William, Ont.

Tenders for supply of piglead addressed to the Chairman of the Utilities Committee will be received until February 16th. J. Wilson, city engineer.

Gleichen, Alta.

Tenders addressed to B. S. Corey, secretary-treasurer, will be received until March 16th for drilling, etc., and supplying of materials for waterworks here. Advertisement in "Tenders and For Sale Department" of this issue.

London, Ont.

The construction of sewers on Elizabeth, Elias and Dean streets have been recommended by the board of health and city engineer.

Moose Jaw, Sask.

At a recent meeting of the city council city engineer Wilson filed plans for a system of sewer and water extensions to serve South Hill.

Nelson, B.C.

The council have decided to spend about \$5,200 in the extension of sewers, work to commence immediately.

Outremont, Que.

Tenders addressed to J. Kruse, secretary-treasurer, will be received until March 2nd for construction of 2 x 3 brick sewer on Bernard avenue, a distance of 489 lineal yards, and on Davaar avenue, a distance of 700 lineal yards. Plans, etc., at Town Hall.

Prince Rupert, B.C.

Preliminary plans for the new sewerage system have been prepared. The work to be done this year will cost approximately \$200,000. Alderman Lynch is interested.

Toronto, Ont.

Tenders were called until February 14th for construction of sewers in several streets here.

The Board of Control have decided to place in the estimates an item of \$65,000 for permanent bituminous macadam pavements in Exhibition Park, and have authorized the city engineer to do the work by day labor. There are 40,000 yards to be laid, and the intention is to have the work completed by July.

Vancouver, B.C.

Tenders addressed to Wm. McQueen, city clerk, will be received until Febru-

ary 22nd for supply of brass goods and galvanized iron pipe. Specifications at office of city waterworks.

Victoria, B.C.

Plans of the new sewer system to cover the entire city, are being prepared by the city engineer. When these plans are ready it is probable that the ratepayers will be called upon to vote upon a by-law to authorize the expenditure of a sum of \$250,000.

Victoria, B.C.

In view of the large expenditure on municipal paving, the following will be of interest:

A standard base of cement concrete must be used in connection with all pavements of an asphaltic nature. The concrete foundation will be 4 in. thick for a light asphalt and 5 in. thick for a standard asphalt pavement. The concrete shall consist of 1 part of cement to three of sand and five of gravel or broken stone. The quality of each class of material must be approved by the city engineer. The work will be let on the unit basis; that is, the contractor will be paid a fixed price per square of pavement, per lineal foot of curb and gutter and per cubic yard of earth excavation and per cubic yard of rock excavation. The amount of earth and rock excavation will be determined by the city engineer and assented to by the contractor before beginning work. The pavement and curb and gutter will each be measured after the work is completed and paid for at the rate fixed. The approximate quantities will be given in the form of tender but such quantities will not be considered except as approximate quantities given with the idea of comparing bids. The quantities used in settlement to be taken and determined by actual measurement.

The contractor will be allowed to submit alternate bids for an asphaltic pavement, which will include such pavements as the Worswick asphalt pavement, the Westrumite asphalt pavement, the El Oso asphalt pavement, and Barber asphalt pavement and other similar pavements. The condition of the specifications for standard asphalt pavement as herein provided and applicable must apply to all alternative pavements.

AWARDED

Hamilton, Ont.

The contracts for supplies for civic department were as follows: The Reinforced Concrete Company, Jackson, Mich., 78-inch concrete pipe at \$7.22 per foot; the Hamilton Foundry Company, castings at \$1.95 per 100 lbs.; the Canada Cement Co., cement at \$1.48 a barrel.

Nelson, B.C.

The tile for the sewer installation recommended by city engineer G. C. Mackay was supplied by Washington Pipe & Tile Co., Spokane, Wash. Noted in issue of February 1st.

Railroads, Bridges and Wharves

Annapolis Royal, N.S.

Tenders addressed to R. C. Desrochers, Secretary Department of Public Works, Ottawa, will be received until February 21st for construction of two ice piers here. Plans, etc., at above department; at the offices of C. E. W. Dodwell, Esq., District Engineer, Halifax, N.S., E. G. Millidge, Esq., District Engineer, Antigonish, N.S., and on application to the local post-master.

Bridgewater, N.S.

The Davison Lumber Co., of this town, propose to build a railway to carry lumber from Caledonia to Port Medway, a distance of 29 miles. If provincial government grants subsidy they are willing to equip it for passenger traffic.

Burk's Falls, Ont.

Mr. Hogarth, provincial government engineer, with others, examined the proposed site for bridge at foot of Yonge street.

Calgary, Alta.

The city is calling for tenders for the substructure of the new bridges across the Elbow.

The plans for the bridge across the Elbow at Twelfth avenue call for a 30-foot bridge with two 100-foot spans, accommodating a single track. This bridge and a similar one on Second street east are included in the estimates. Estimated cost of both, \$55,000. City Engineer Child.

The C. P. R. have under consideration at present the continuation of the double tracking of the line westward from Medicine Hat here. The matter has not been definitely settled, but it is expected that an appropriation for the work will be made soon. The reducing of a number of grades is also under consideration. This will involve an alteration in the course of the line in some places.

Fredericton, N.B.

Tenders are called for up to March 6th by the Department of Public Works, for building the concrete substructure and approaches of Tracy Station bridge over the N. W. Oromocto river, in Gladstone, Sunbury Co. Plans at the store of Ernest A. Tracey, and also at the shop of Mr. A. L. Duplisea at Fredericton Junction.

New Westminster, B.C.

A. C. Powell, Seattle, consulting engineer, has been asked to prepare a report on his recent inspection of harbor facilities. He roughly estimates the cost at \$65,000.

Ottawa, Ont.

County Clerk Macnab, Ottawa, writes re the county bridges to be constructed this summer that one will be in Osgood Tp., and two in Huntley. No plans have been prepared as yet; foundation will be concrete; estimated cost, \$12,000; en-

gineer in charge, R. W. Farley, 158 Nelson street. Superstructure, all concrete.

Owen Sound, Ont.

The plans for the dock are awaiting the approval by the Dominion Government. Mayor Lemon, Mr. E. Box, promoter, are interested.

Point Grey, B.C.

Negotiations are proceeding between the Provincial government, the municipal council of Point Grey, the Canadian Pacific Railway, and the British Columbia Electric Railway, with a view to an agreement between the four bodies interested having for its object the widening of King Edward and Chaldicott roads to 132 feet and their continuation from the point where they meet the city boundary right through Provincial University. If satisfactory arrangements can be made with the companies, a double car track will also be built, with connections from all parts of the city.

St. John, Que.

A delegation from Iberville and St. John's waited upon the provincial government with regard to the proposed new cement bridge across the Richilieu river. The government promised to pay half the balance of the cost after the grant from the federal government had been received, up to the sum of \$60,000.

St. John, N.B.

At the civic elections in April next the ratepayers will vote on a plebiscite as to the advisability of spending \$300,000 on a bridge across the harbor.

Trail, B.C.

Contracts for the steel bridge across the Columbia will be let almost at once.

Toronto, Ont.

Construction is expected to commence in about three months on the Canadian Northern Ontario Railway east from Port Arthur to overcome the gap in the system in New Ontario of 500 miles between Sudbury and Port Arthur. It is intended to conduct the laying of the steel from both terminals. It will take about three years to complete construction and have the line ready for traffic.

Victoria, B.C.

The provincial government and the G. N. R. have completed an agreement settling all outstanding difficulties regarding the False Creek foreshore and tidelflat property. The immediate result will be the commencement of work by the Great Northern in the carrying out of its large plans for improvement and establishment of terminals in the False Creek basin.

AWARDED

Winnipeg, Man.

J. D. McArthur, railway contractor, of this city, has been awarded the contract for building the unfinished portion of the Algoma Central Railway in Northern Ontario, from the present end of the steel land, to a junction with the main line of the C. P. R. near White River. The present contract figures up to \$1,000,000.

Public Buildings, Churches Schools, etc.

Battleford, Sask.

The time for receiving tenders for fittings for public building here has been extended to February 28th. R. C. Des-

rochers, secretary, Public Works Department, Ottawa.

Belleville, Ont.

Tenders are called until March 4th for construction of Y. M. C. A. here. Architect, C. J. Gibson. Advertisement in "Tenders and For Sale Department" of this issue.

Berlin, Ont.

The report of Dr. Bruce Smith recommended the erection of a new wing to the Berlin-Waterloo Hospital. It is stated that steps will be taken at once towards its erection.

Brantford, Ont.

The Buck property on Brant avenue is reported to have been chosen as a prospective site for the new armories.

Brandon, Man.

Plans for the new East Ward School have been prepared and tenders will be called within a week or so. Estimated cost, \$35,000.

The site for the new Normal School has been chosen between Tenth and Twelfth streets. Estimated cost of building to be erected, \$50,000.

Tenders will be called at once for erection of fire hall to take the place of the one on Seventh street. Estimated cost, \$25,000. Interior—reinforced concrete.

Calgary, Alta.

Under date of last information the contract for erection of new St. Andrew's Church had not been awarded. Estimated cost of building, \$20,000; of equipment, \$3,000. D. S. McIlroy, Tribune Block, Calgary, is architect. Rev. A. Mahaffy, pastor.

Chatham, Ont.

The Board of Education will be asked to consider the necessity of the erection of a new school on Park avenue west. Dr. D. E. Russell is interested.

Galt, Ont.

The hospital board have requested the council to submit a by-law to authorize \$30,000 to be spent in erecting an addition, etc., to hospital here.

Havelock, N.B.

Tenders addressed to B. W. Corey, secretary, will be received until February 28th for erection of school house. Plans, etc., with above mentioned.

Joliette, Que.

Tenders addressed to the Director of Contracts, Department of Militia and Defence, Ottawa, will be received until February 21st for the following improvements to the Armoury here: cement sidewalk, roadway, runway for carts over sidewalk, levelling and seeding, ornamental iron fence and wood fence. E. Fiset, colonel.

Kitsilano, B.C.

The Order of Oblates of Mary Immaculate have secured a building site for a building to be used as a parish hall, school and church, plans for which will be prepared at once. Adjacent to this site additional land has been secured for a permanent church in the future.

Listowel, Ont.

Tenders addressed to R. C. Desrochers, Secretary, Department of Public Works, will be received until February 27th for erection of public building here. Plans, etc., on application at the post office, Listowel, Ont., and at the

office of H. J. Lamb, Esq., District Engineer, London.

Monteral, Que.

The Convent of St. Joseph was destroyed by fire on the 8th inst. Estimated loss, about \$80,000.

Tenders are called until February 20th for fireproof construction of a double school for boys and girls. Contract to be divided in four parts. Two private residences for teachers will be built at Cote Visitation Arrond; No. 2 Rosemount. Plans, etc., at office of Alphonse Content, architect, 11 Place d'Armes Hill.

Mitchell, Ont.

Tenders addressed to R. C. Desrochers, Secretary, Department of Public Works, will be received until March 1st for construction of public building here. Plans, etc., at the office of Mr. H. J. Lamb, District Engineer, London, Ont., at the Post Office, Mitchell, Ont., and at above department.

Moose Jaw, Sask.

The congregation of St. Andrew's Presbyterian Church have decided to build a new church. Messrs. W. F. Heal, and A. W. Maybery, are on building committee; Mr. J. A. McPherson, financial secretary.

Montreal, Que.

Tenders are about to be called for the extensive alterations, including the putting on of another storey to the Montreal post office. The building is to be fireproof. Architect, Mr. Theo. Daoust, 90 St. James street, Montreal.

Orillia, Ont.

It is proposed to enlarge the present Y. M. C. A. building, at an estimated cost of \$10,000. President, Mr. G. H. Clark; Mr. J. J. Thompson is interested.

Ottawa, Ont.

Tenders are being called for the erection of Bethany Presbyterian Church, J. A. Ewart, architect.

It is probable that a 6-room addition will be built to the Mutchmor street school, at a cost of about \$50,000.

Peterborough, Ont.

Tenders were called by T. F. Matthews, until February 15th for erection of Murray street Baptist church. Architects, Burke, Horwood & White, 28 Toronto street, Toronto.

Strassburg, Sask.

Tenders are called until February 18th for erection of 4-room school here. Plans, etc., at office of the architects, Messrs. Storey & Van Egmond, Regina.

Stratford, Ont.

Rev. Hugh Ferguson, Sheriff Magwood and others are on the building committee for Children's Shelter.

St. Boniface, Man.

Archibishop Langevin is executive head of the committee appointed in regard to erection of training school for Roman Catholic priests. Noted in issue of February 1st.

St. Catharines, Ont.

Plans for a building to be used as a gymnasium and assembly hall will be received by the Collegiate Institute Board until February 21st. A. E. Coombs, secretary managing committee.

Thorold, Ont.

Tenders are called until February 27th for construction of a complete library

building here. A. E. Nicholson, O. A. A. architect, St. Catharines.

Toronto, Ont.

The committee for Newsboy's Home have purchased 20-22 Pembroke street, which will be altered at an estimated cost of about \$12,000.

Tenders addressed to the Chairman, Board of Control, will be received until February 28th for erection of Women's Building on Exhibition grounds. Plans, etc., at office of Mr. Geo. W. Gouinlock, architect, Temple Building, Toronto. Advertisement in "Tenders and For Sale Department" of this issue.

Permit was issued to the Toronto General Hospital Board for erection of Nurses' Home, \$250,000.

Toronto, Ont.

Tenders addressed to Messrs. Burke, Horwood and White, architects, 28 Toronto street, will be received until February 18th for the various trades required in the erection of the Broadview branch of the Y. M. C. A.

Vancouver, B.C.

Tenders have been called for the excavation of the several schools under consideration.

The time for receiving tenders for erection of court house here has been extended until February 21st by the Public Works Department. F. G. Gamble, public works engineer.

The recently erected Mountain View Methodist Church here was destroyed by fire. Estimated loss, \$20,000. It will be rebuilt. The structure was only completed two months ago.

Verdun, Que.

The Verdun Catholic Church will be built this summer. The basement was constructed some years ago, and is at present being used for services. Sufficient money has now come to justify the completion of the building.

Winnipeg, Man.

Messrs. W. and E. Maxwell, Montreal, are preparing plans for the new country club at St. Giles.

Tenders addressed to the Chairman, Board of Control, will be received until February 23rd for supply of labor and materials for erection of Public Bath House in Selkirk Park. Plans, etc., at office of Mr. William Bruce, architect, 222 McDermott avenue. M. Peterson, secretary.

Residences

Brandon, Man.

The plans are now ready for the new manse for St. Paul's Presbyterian brick church, the contract for which will be let shortly. The building will cost \$8,000, and it is expected will be ready by mid-summer.

Oak Bay, B.C.

Tenders were called until February 7th for erection of residence here. S. Maclure, architect, 19 Green Block, Victoria.

Ottawa, Ont.

J. McFarlane, Bank street, is having plans prepared for a large apartment house on Lisgar street.

Victoria, B.C.

Building permits were issued as follows: Thomas Perkins, \$2,500; A. McCrimmon for two dwellings on Camosun street to cost \$2,800 each.

Winnipeg, Man.

Tenders wanted for the construction of Home on Lot 95, Parish of St. Paul, for Mr. W. B. U. Sterling. Plans, etc., at 413 Somerset Building.

Permits issued recently are: E. Noc, 2 houses on the north side of Stella, \$6,000; Johnson & Bjornson, dwelling, on the east side of Alvestone, \$2,600; Kristjansson & Bjornson, dwelling on the east side of Alverstone, \$3,000.

Business Buildings and Industrial Plants

Brantford, Ont.

The site of the building for the Royal Loan and Brantford Company is being prepared.

Brigden, Ont.

The Dominion Cooperage Company, Limited, whose plant was recently destroyed by fire, will build again. Work will be done by local contractors.

Barrie, Ont.

H. H. Hastings, Toronto, representing a company who intend to manufacture rubber goods, is negotiating with the town in regard to locating here.

Beauport, Que.

The Standard Construction Company, of Montreal, has nearly completed the construction of the stone crushing plant here. The work will have taken three months and will cost about \$35,000.

Calgary, Alta.

The McNair Fruit Company will commence very shortly the erection of a large new building on Ninth avenue. The building will have a frontage of about 50 feet and will cost about \$40,000.

Edmonton, Alta.

Tenders will be called shortly for the 6-storey block to be erected for Robert Tegler. Estimated expenditure, \$100,000. H. A. Magoon, architect.

Colonel Jas. Walker intends building a big block on his property on Seventh avenue. Plans are being made for a large business block to cost \$100,000.

Galt, Ont.

P. W. Gardiner & Son, it is stated, will erect two more additions to their planing mill here.

Ladner, B.C.

The plant of the Jervis Inlet Lumber Company near the mouth of the Fraser river was destroyed by fire on the 1st inst. Loss, about \$20,000.

London, Ont.

The London Foundry Company will erect a large addition to their foundry here. Ald. Mitchell, chairman manufacturers' committee.

It is reported that one of the biggest electrical equipment concerns of England, which secured the contracts for the installation of motors in a number of local factories, is contemplating the establishment of a Canadian branch here.

Millbrook, Ont.

The flour mill owned by Mr. Geo. Needler was destroyed by fire on the 12th inst. Estimated loss, \$12,000.

Moose Jaw, Sask.

We are informed that the firm (leather manufacturers) enquiring about location here from Board of Trade, are J. Eveleigh & Co., Montreal, and that hav-

ing secured suitable premises, it is not probable that they will build for some time.

Montreal, Que.

It is reported that the building on the southwest corner of Peel and St. Catharines streets will be torn down and replaced by a modern structure.

The C. P. R. will shortly call for tenders for timber in connection with the erection of a station here, also for renewal of tracks and extension of terminal buildings.

Permits were issued to the C. P. R. for their new freight sheds, which are to extend from Lacroix street, near the Place Viger station, to Montcalm street, \$100,000.

Ottawa, Ont.

John McFarlane will make extensive alterations to his store on Bank street.

W. J. Spratt is erecting a commercial building on the corner of Bank and Glen avenue. It will be a large brick building with stone front.

W. J. Spratt has begun the excavations for the branch building for the Bank of Ottawa in Ottawa South. Mr. D. M. Finnie, assistant general manager.

Regina, Sask.

M. W. Sharon is preparing plans for the 3-storey building to be erected for Mr. A. Mowat. Construction will start in the spring.

Sherbrooke, Que.

The offices of the Singer Machine Co., etc., were damaged to the extent of about \$10,000 on the 8th inst.

St. Timothee, Que.

The Cotton Print Co., Ltd., have acquired a portion of the town site of the Canadian Light, Heat & Power Company here. The erection of the plant, it is stated, will be started in the early spring.

Toronto, Ont.

Tenders are requested for erection of a freight shed on Yonge street dock. Plans, etc., at office of the Niagara Navigation Company, Traders Bank Building.

The Home Bank of Canada will begin operations early in the spring on the branch to be erected at the northwest corner of Broadview avenue and Elliott street.

Victoria, B.C.

The cost of the proposed office building for the Dominion Trust office building is estimated at about \$135,000. Work will start in about four weeks. W. R. Arnold, general manager, is also planning for the erection of James' Bay building. Noted previously.

Virden, Man.

The flour mill here, owned by Hubbard, Nichols & Co., was destroyed by fire on the 7th inst. Estimated loss, \$25,000.

Winnipeg, Man.

The Confederation Life Association have plans prepared for erection of their building on Main street.

The steam turbine power station noted in issue of January 25th will be constructed of steel, concrete and brick, two storeys and basement, 114 x 122.

Tenders addressed to James Chisholm & Son, architects, Enderton Building, will be received until February 17th for

(Continued on page 37)

Tenders and For Sale Department

For Sale—Second Hand

No. 8 Austin Gyratory Crusher.
No. 6 and No. 3 Austin complete plant.
No. 3 Austin and 2 No. 6 Gates and No. 5 "B."
70-ton Vulcan Steam Shovel, 2-yd.
50-ton Bucyrus Steam Shovel, 1½-yd.
Loco. Crane, with 1¼-yd Clam Shell.
Little Giant Traction Steam Shovel, 1¼ yd.
Hayward Orange Peel Buckets, 1 and 1¼ yd.
Concrete Mixers, Steam Rollers, Air and Steam Drills, Air Compressors, Locomotives, Dump Cars, etc.

All our goods we fully guarantee.
Send for our February Booklet.

WILLIS SHAW MACHINERY CO.,
171 La Salle St.,
Chicago, Ill.

St. Catharines Water Works

TENDERS

Sealed tenders addressed to "The Chairman Water Works Commission," endorsed "Tenders for Pipe and Specials"—Gate Valves—Pig Lead, will be received up to noon on Tuesday, February 28th, 1911, for the cast iron pipe and special castings 12-in. to 36-in., Gate Valves 4-in. to 36-in., and pig lead required.

Specifications, forms of tender and full particulars may be obtained at the office of The Commission, City Building.

The Commission does not bind itself to accept the lowest or any tender.

ALEX. MILNE,
Superintendent.

St. Catharines, Ont., Feb. 2, 1911. 6-7

Town of Dauphin Province of Manitoba

Tenders for Reinforced Concrete Highway Bridge

Sealed tenders addressed to the undersigned Town Clerk will be received up to 8 p.m. Saturday, the 25th day of February, 1911, for all labor and material necessary for the construction of two reinforced concrete highway bridges to be constructed in the Town of Dauphin.

Plans and specifications will not be sent out, but may be seen at the Town Clerk's office, Dauphin, Man., or at Provincial Public Works Department, Winnipeg, Man.

The lowest or any tender not necessarily accepted.

H. F. CALDWELL,
Mayor.

A. H. F. STELCK,
Chairman Public Works Committee.

J. W. JOHNSTON,
Town Clerk. 6-8

Positions Wanted

Advertisements under this heading one cent a word per insertion. Box No ten cents extra

ARCHITECT, highest qualifications and experience, would take charge of office or consider partnership. The West preferred. Box 200, Contract Record, Toronto, Ont. 4-7

Tenders

Bulk tenders will be received by the undersigned until noon of March 4th, for the construction of new Y. M. C. A. building, Belleville, according to plans and specifications furnished by C. J. Gibson, architect, Toronto. Plans may be seen at the Y. M. C. A. rooms, Front street. The lowest or any tender not necessarily accepted.

7-8 J. L. HESS, Secretary.

TENDERS WANTED

The Quebec & Saguenay Railway

Tenders will be received up to March 2nd, 1911, at 5 o'clock p.m., by the undersigned, for the construction of about 56 miles of the above railway, from Cap Tourmente to Murray Bay Wharf, divided up into sections of ten miles.

A certified cheque amounting to \$20,000 for each ten mile section tendered for must accompany each tender.

Forms of tender may be obtained and specifications and plans examined at the office of J. F. Guay, Civil Engineer, Morin Building, Quebec.

The right is reserved by the company to reject any or all tenders.

6-6 (Signed) J. F. GUAY.

Tenders

Foundry and Machine Shop in the Town of Welland, in the County of Welland For Sale By Tender

Foundry and Machine Shop in the Town of Welland, in the County of Welland For Sale by Tender.

Sealed Tenders marked "Tender for The Robertson Machinery Company, Limited," will be received by the undersigned up to twelve o'clock noon on Tuesday, the 21st day of February, A.D., 1911, for the purchase, en bloc, of the assets of The Robertson Machinery Company, Limited, Welland, Ont., which is unusually well situated, being on the Grand Trunk Railway; with switching rights to all other railways, consisting of:—

Land, Factory site, part of Block W., about 4 acres, with right to switch, including building 70 ft. x 112 ft. —besides store rooms, motive power, cupula, line shafting, etc. \$11,290.00
Iron working machinery 3,945.00
Wood working machinery 250.00
Pullies 641.00
Small tools:—
Machine shop \$1,000.00
Foundry 511.00

Hoisting engines and parts 1,511.00
Foundry merchandise 1,500.00
General merchandise 632.00
Office furniture and fixtures 2,500.00
275.00

\$23,544.00

An inventory will be mailed upon request. The plant has not been shut down. It is excellently located, and has been doing a good business.

Each tender must be accompanied by a certified cheque, payable to the Assignee, for the sum of one thousand dollars, the balance of the purchase price to be paid within thirty days, without interest, when immediate possession can be given.

Dated this 1st day of February, A.D. 1911.

J. F. GROSS, Assignee,

6-7 Welland, Ont.

City of Strathcona (Alberta)

Tenders for

Engine, Boilers and Generators

Tenders addressed to David Ewing, Chief Engineer power house, Strathcona, Alta., for the above machinery, will be received until noon, Wednesday, March 1st, 1911. Specifications may be obtained upon application to the undersigned.

A. J. McLEAN,
City Engineer.

Strathcona, Alta., Jan. 16, 1911. 4-8

Town of Gleichen, Alberta Waterworks and Sewers

Tenders are invited and will be received by the undersigned, not later than 16th March, 1911, for the following:—

1. Drilling and casing an eight-inch well.
2. Supplying about 60 tons of cast iron pipes and specials, or alternatively an equivalent quantity of steel pipe.
3. Supplying and erecting an elevated steel tank.
4. Supplying gate valves and fire hydrants.
5. Supplying about 3,400 feet of vitrified tile sewer pipe.
6. Supplying manhole castings.

Specifications, forms of tender and full particulars may be obtained from The John Galt Engineering Company, Consulting Engineers, Winnipeg and Calgary.

The Corporation of the Town of Gleichen do not bind themselves to accept the lowest, or any tender.

B. S. COREY, Secretary-Treasurer..

Gleichen, Alberta, February 15, 1911. 7-7



Tenders for

Exhibition Building

Bulk tenders only will be received by registered post, addressed to the Chairman of the Board of Control, City Hall, Toronto, up to noon on Tuesday, February 28th inst., for the erection and completion of the Women's Building on the Exhibition Grounds, Toronto, immediately south of the Manufacturers' Building.

Plans may be seen and specifications and all information in relation thereto obtained at the office of Mr. George W. Gouinlock, architect, Temple Building, Toronto.

Provisions of City By-laws in relation to tendering must be strictly observed, or the tenders may not be entertained.

The lowest or any tender not necessarily accepted.

G. R. GEARY (Mayor),
Chairman Board of Control.

City Hall, Toronto,
February 10th, 1911.

7-7

For Sale

One second-hand No. 1 Smith Concrete Mixer with engine and boiler complete.
One second-hand 7 x 12 Hoisting Engine, 3 drum d.c. and boiler complete, nearly new.
One 5-ton derrick with cables and sheaves.
One ¾-yard Clam Shell Bucket, nearly new.

Apply to
A. J. CROMER,
Brantford, Ont.

7-8

Tenders for Bridge

Tenders will be received by the undersigned up to 6 o'clock p.m., Saturday, the 4th day of March, 1911, for the erection of a reinforced concrete bridge, single span over the Clyde River at a point about 3 miles north of Lanark Village. Bridge about 70 feet long.

Plans may be seen at the office of the undersigned at Lanark, or tenderers may submit their own plans and specifications.

Deposit of ten per cent. to accompany each tender, which will be returned if tender not accepted.

The lowest or any tender not necessarily accepted.

Dated this 2nd day of February, 1911.

J. BOYD CALDWELL,
Chairman of Roads and Bridges Com.
Lanark, Ont. 6-9

City of Winnipeg

Electrical Distribution System

Tender for Superstructure, Sub-Station No. 1

Sealed tenders on prescribed form, addressed to the Chairman of the Board of Control, Winnipeg, Canada, and marked on the envelope "Tender for Superstructure Sub-station No. 1," will be received at the office of the undersigned up till 11 a.m. on Monday, February 20, 1911, for the building of superstructure of this station on King street near Notre Dame avenue, according to specification No. 57, copy of which, along with plans of building and form of tender, may be obtained by bona fide tenderers at the office of Smith, Kerry & Chace, Poyer Engineers, Carnegie Library, Winnipeg.

Each tender must be accompanied by certified cheque for five per cent. of the amount of tender.

The city reserves the right to reject any or all tenders, or to accept any bid which appears advantageous to its interests.

M. PETERSON, Secretary.

Board of Control Office,
Winnipeg, February 6, 1911.

7-7

Business Buildings and Industrial Plants

(Continued from page 35)

erection of the Sterling Bank Building, corner Portage avenue and Smith street. Plans, etc., with above.

Tenders are called until February 20th for building of superstructure of substation No. 1 on King street. Advertisement in "Tenders and For Sale Department" of this issue. M. Peterson, secretary.

It is announced that the G. N. R. will build its depot on Paulin street between Ross and Pacific avenues and complete it within a year. It is stated that all plans for this are complete and work will commence at once.

Yorkton, Sask.

Architects are invited to submit competition plans to Fred Hukins, secretary-treasurer, for a proposed hotel to be erected here.

AWARDED

St. John, N.B.

The contract for construction of Telephone Exchanges here was awarded to J. H. Dorley, St. John.

Victoria, B.C.

The contract for erection of 2-storey brick building on Fort street has been let to A. H. Mitchell, 2002 Rock Bay avenue. Architects, James & James.

Power Plants, Electricity and Telephones

Edmonton, Alta.

It is stated that a firm having headquarters at the Pacific coast will apply for franchise to supply natural gas from a source some 25 miles from the city.

Eglinton, Ont.

Tenders addressed to W. C. Norman, town clerk, will be received until February 16th for supply of about 1,000 30-ft., 100 35 ft., and 50 40 ft. cedar poles for an electric light line in the town of North Toronto. A. J. Brown, Mayor.

Fort William, Ont.

Tenders addressed to the Chairman of Utilities Committee, will be received until March 2nd for supply of "Line Material." A. L. Farquharson, manager.

Fredericton, N.B.

A company to be known as the St. John River Electrical Power Company will seek legislation for power to erect a dam across the St. John river about 40 miles above here to develop electricity for light, heat and power purposes, etc. Mr. John E. Stewart, Andover, is interested.

Hamiota, Man.

Tenders will be received until February 23rd for \$5,000, 4 per cent., 20-year telephone debentures. J. Andrew, secretary-treasurer.

Hamilton, Ont.

The Board of Control will advertise for tenders from engineers for an estimate of cost of installing a house and street lighting system.

Kingston, Ont.

W. W. Sands, City Clerk, states that about \$13,000 will be expended for improvements to the electric light plant. Engineer, C. C. Folger, of Kingston.

Montreal, Que.

Plans will be ready by the end of March for the new power house for the Saraguay Company. They will include the specifications for two steam turbines of 4,500 maximum h.p. capacity each, boilers and general equipment. Mr. Charles Brandies, civil engineer, is in charge.

Sherbrooke, Que.

The by-law authorizing city council to borrow \$100,000 for the construction of dam and development of the "Drop-off" power near Rock Forest, was carried. Messrs. Ross & Holgate, Montreal, are engineers in charge.

St. Boniface, Man.

The E. B. Reese Engineering Company's offer for supplying this city with

electric energy for light, heat and power purposes, has been practically accepted. The company offers to supply power on a sliding scale of rates, ranging from \$18 a horse-power down to \$15, according to the quantities taken. An additional \$2 per horse-power will be charged if the company installs the step-down transforming station. The contract runs for ten years, subject to renewals and revision of prices and reduction by the city of Winnipeg, thus leaving this city free to compete for contracts with companies that may wish to take power.

Victoria, B.C.

Wm. M. Northcott, purchasing agent, has been instructed by city council to shortly call for tenders for supply of 300 iron standards to be used in the extension of cluster lighting system.

Winnipeg, Man.

Colonel Ruttan, city engineer, is drawing plans for the proposed extension of the street car lines.

AWARDED

Kingston, Ont.

A contract for the supply of cement has been awarded to the Frontenac Lumber & Coal Co., Kingston, Ont., at \$1.59 per barrel of 350 lbs., f.o.b. car, or in their storehouse. Other tenders received were S. Anglin & Co., Kingston, Ont., at \$1.62; and John Corbett, Kingston, Ont., at \$1.64.

Regina, Sask.

The order for supply of two double truck cars, complete with quadruple motor equipment and air brake, and also four single truck cars with double motor equipment (the cars to be built by the Brush Electrical Engineering Co., Ltd., London, Eng.), was placed with the Canada Ford Company, 485 James street, Montreal. This was erroneously reported in issue of January 11th as having gone to the Ottawa Car Company.

Winnipeg, Man.

The Canadian General Electric Company have been awarded the contract for supplying the steam turbines and generators for the new plant of the Winnipeg Street Railway Company on Mill street. Three 3,000 kilowatt Curtis turbines will be installed. Total cost of equipment, \$475,000. Pratt & Ross, 289 Garry street, architects and engineers.

Miscellaneous

Fort William, Ont.

Tenders for lumber will be received by city clerk until March 2nd. Information at office of city engineer, John Wilson.

Tenders addressed to the Chairman of Utilities Commission will be received until March 2nd for supply of 280-35 ft. and 20-40 ft. cedar poles, f.o.b. local tracks. Delivery to be not later than May 1st, 1911. W. I. Farquharson, manager.

Mace's Bay, N.S.

Hon. John Morrissey, Chief Commissioner of Public Works, advertises tenders until the 27th of February, for the construction of a sea protection wall at Mace's Bay, in the parish of Lepreaux, Charlotte Co. Plans for this are open for inspection at the law offices of Hon. Surveyor General Grimmer in St. Stephen. Dr. H. I. Taylor, M.P.P., in St. George, and Mr. T. A. Hartt, M.P.P., in

Saint Andrews, as well as at the office of the Board of Works here.

Ottawa, Ont.

The Board of Control have decided to purchase a combination engine and hose wagon, the engine to have a capacity of 750 gallons. Tenders will be called for.

The following contracts have been awarded in the Public Works Department: Mount Forest, public building, to George A. Proctor, of Sarnia, for \$17,666; Quebec custom house, restoration and addition, to Jos. Gosselin, of Levis, and Emile Dube, of Fraserville, for \$135,369; Elora, Ont., post office fittings, Office Specialty Co., Toronto, for \$775; Lindsay, Ont., post office interior fittings, to Deisenroth Contract Co., Toronto, for \$1,717; Toronto postal station B., interior fittings, to Deisenroth Contract Co., Toronto, for \$1,132; Port Burwell, Ont., breakwater, to M. J. Hogan, of Westmount, for \$157,500; Fergus, Ont., post office fittings, to Office Specialty Co., Toronto, \$775; Lunenburg, N.S., public building, electric lighting, to Empire Electric and Manufacturing Co., Ottawa, for \$863; Shigwake, Que., wharf extension, to Thomas P. Charleston, Ottawa, \$9,385.

Quebec, Que.

Quebec will make a bid for a big shipbuilding plant, and one which is prepared to undertake the construction of the largest warships. Enquiry has been received as to what privileges the city would be willing to grant to a company which would establish a shipbuilding plant at the port of Quebec. It was decided to offer an exemption from taxes for twenty years as a liberal bonus, should the company locate here. Hugh Russell is interested.

Toronto, Ont.

Recent building permits include: H. J. Atkinson, 2½-storey brick dwelling s.w. corner Williamson road and Hambly, \$4,500; Mrs. Florence Hill, 2 detached 2½-storey brick dwellings, on east side Hawthorne, \$7,600; G. Millar, 5-storey brick warehouse on Richmond street east, \$30,000; Dr. Wm. Kerr, 2-storey and attic brick dwelling on east side Lansdowne, \$5,000; David Madely, 1 pr. semi-detached 2½-storey brick dwellings on north side King street west, \$5,500; J. M. Chalmers, 5 attached 2½-storey brick dwellings on Chalmers avenue, \$16,000; J. J. Tracey, 2-storey brick dwelling on west side St. Clarens, \$5,000; The Dominion Bank, 2-storey brick bank, store and office, southwest corner Lee and Queen, \$11,500; The Dominion Bank, 2-storey brick bank and offices, southeast corner St. Clair and Vaughan, \$8,500; The Dominion Bank, 2-storey brick bank, stores and offices, southeast corner Bloor and Dovercourt road, \$13,500; J. E. Johnston, 2 pair semi-detached 2-storey brick dwellings on Queen street east, \$4,500; G. A. McTaggart, 4 pair semi-detached 2½-storey brick dwellings, northwest corner Sherbourne and Wilton crescent, \$20,000; Lankin Bros., 3 pair semi-detached R. C. dwellings, brick fronts, on Curzon, \$9,600; Independent Glass Producers, Limited, 2-storey and metallic siding factory and packing house, near Gerrard, on west side Carlaw avenue, \$20,000; Dr. R. H. Conboy, 2-storey and attic brick dwelling, near Rusholme, on south side Bloor street west, \$5,200; W. H. Edwards, 2½-storey brick dwelling,

on east side Christie (Bracondale), \$5,000; L. E. Price, 1 pair semi-detached 2-storey brick dwellings, on south side Shanley, \$5,000.

Vancouver, B.C.

Building permits were granted as follows: J. G. Wonder, Robson and Broughton streets, \$15,000; W. J. Harrington, 2525 York street, \$7,500; Currie & Wallace, 2315 Sixth avenue west, \$3,600; W. C. Holtz, 1165 Thirteenth avenue west, \$6,000; T. B. Winship, 1736 Seventh avenue west, two houses, \$4,000; G. Ellis, 3263 Second avenue west, \$3,000; H. M. Daly, Cordova street, \$12,000; J. R. Sharp, 765 Thirteenth avenue west, \$2,400; K. Fraser, 1375 Eleventh avenue west, \$4,000; D. McDonald, frame dwelling, 3110 Second avenue west, \$2,800; T. A. Pepine, frame dwelling, 1749 Harris street, \$2,500; Parker & Allen, frame dwelling, 2177 Third avenue west, \$2,500; Wm. Dalby, frame stores and dwelling, 1202 Woodland drive, \$5,000; T. W. Chandler, frame dwelling, 1055 Barclay street, \$3,500; G. E. Hiscock, frame apartment, 638 Prior street, \$10,000; Dissette & Fraser, small residence, 1375 Eleventh avenue west, \$4,000; H. M. Daly, brick stores, Cordova street, \$12,000; Geo. Ellis, frame dwelling, 3263 Second avenue west, \$3,000; T. B. Winship, frame dwellings (2), 1627 Twelfth avenue east, \$4,000.

New Companies

British Canadian Paper Mills, Limited, Montreal, Que., incorporated, capital, \$500,000. Incorporators, Hon. T. H. Berthiaume, publisher; P. Lacoste, advocate; T. Biennu, bank manager, all of Montreal, Que.

Belgo-Canadian Steel, Limited, Montreal, Que., incorporated, capital, \$550,000. Incorporators, E. Van Acker, importer; A. Menager, engineer; F. A. Beique, advocate, and L. J. Beique, all of Montreal.

Superior Construction Company, Ltd., Sault Ste. Marie, incorporated, capital, \$100,000. Incorporators, P. T. Rowland, barrister; W. Calder, estate broker, both of Sault Ste. Marie, Ont.

The Albemarle Zinc Company, Limited, London, Ont., incorporated, capital, \$450,000. Incorporators, C. T. Campbell and S. Wollverton, physicians, C. B. Hunt, manager, and J. C. Judd, all of London.

The Emsdale Lumber Company, Limited, Emsdale, Ont., incorporated, capital, \$40,000. Incorporators, J. F. McDonald, clerk, F. W. Brooks, lumberman, and G. Streatfield, farmer, all of Perry Tp.

The Bromsgrove Guild (Canada) Ltd., Montreal, Que., incorporated, capital, \$100,000. Incorporators, R. O. McMurry, advocate, F. G. Bush, bookkeeper, both of Montreal, Que.

The Climax Good Roads Machinery Company, Limited, Hamilton, incorporated, capital, \$40,000. Incorporators, J. Robinson, manufacturers, W. J. Robinson, drug clerk, both of Hamilton, Ont.

Chapman Brick Company, Limited, Toronto, Ont., incorporated, capital, \$40,000. Incorporators, Chas. Chapman, brick manufacturer, and A. F. Lobb, barrister, both of Toronto.

The Durable Box Company, Limited, Toronto, Ont., incorporated, capital, \$40,000. Incorporators, O. H. King, bar-

rist, T. S. Webb, bookkeeper, both of Toronto.

The Pedlar People, Limited, Oshawa, Ont., incorporated, capital, \$500,000. Incorporators, M. H. Luewig, K.C.; A. W. Ballantyne, and C. F. Ritchie, barristers, all of Toronto.

Electrical Maintenance & Repairs Co., Ltd., Toronto, incorporated, capital, \$40,000. Incorporators, E. R. Lynch, solicitor, E. K. Williams, student, both of Toronto.

The Gravenhurst Hardware Company, Limited, Gravenhurst, incorporated, capital, \$20,000. Incorporators, R. Wade and J. Scott, bank manager, Orillia, Ont.

Business Notes

Edwin Jackson, electrician, Montreal, has registered.

L. Villani, contractor, Montreal, is reported to have assigned.

L. Villanie, contractor, Montreal, Que., is stated to have assigned.

Bouchard & Guilbault, contractors, Montreal, have registered.

Belding Lumber Co., Ltd., Toronto, are reported to have assigned.

The Canada Electric Co., Montreal, are reported to have dissolved.

E. Dufresne, contractor, St. Laurent, Que., is reported to have assigned.

Cadioux & Briard, plumbers, Montreal, are reported to have dissolved.

Twin City Sand Company, Fort William, are reported to have dissolved.

The Eureka Lumber Co., Ltd., Bathurst, N.B., are applying for charter.

The Louisa Lumber Co., Lachute, Que., Arch. McFaul, J. McFaul, H. Morrison and W. Bery, registered.

An English syndicate, with vast capital, is said to be seeking to purchase the Dominion Power and Transmission Company, of Hamilton. It is reported to be willing to pay a sum in excess of the Dominion Company's capitalization, which is \$25,000,000, for the Decew Falls plant, the local distributing plant, the Hamilton street railway and the various suburban lines owned by the company.

The British Columbia Gazette gives notice of the incorporation of the following companies: Victoria-Vancouver Lime and Brick Company, Limited, capital, \$100,000; The Alberni District Electric Light and Power Company, Limited, capital, \$25,000; Consolidated Electric Heaters, Limited, capital \$100,000; Coast Shale Brick Company, Limited, capital, \$100,000; Lillooet Power & Light Co., Ltd., capital, \$50,000.

A big railway project was brought before the Railway Committee of the Commons when a bill was considered to incorporate the British Columbia and Dawson Railway Company, which proposes to build a railway from Lytton, B.C., to Dawson City, crossing the Grand-Trunk Pacific at Fort George and with a branch to Vancouver. The scheme is backed by big capitalists of New York and Chicago, who have already spent over \$80,000 on surveys and who intend to proceed with construction at once. The line would be 1,000 miles in length and although the bill only provided for a capitalization of \$1,000,000, it was pointed out that the general Railway Act set forth a need for a capitalization of \$10,000 a mile and accordingly the capital was made ten millions.

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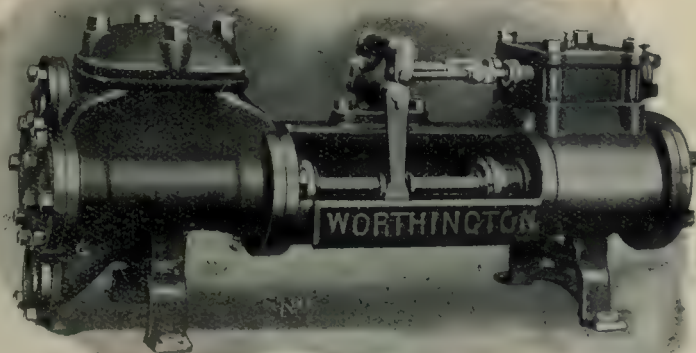
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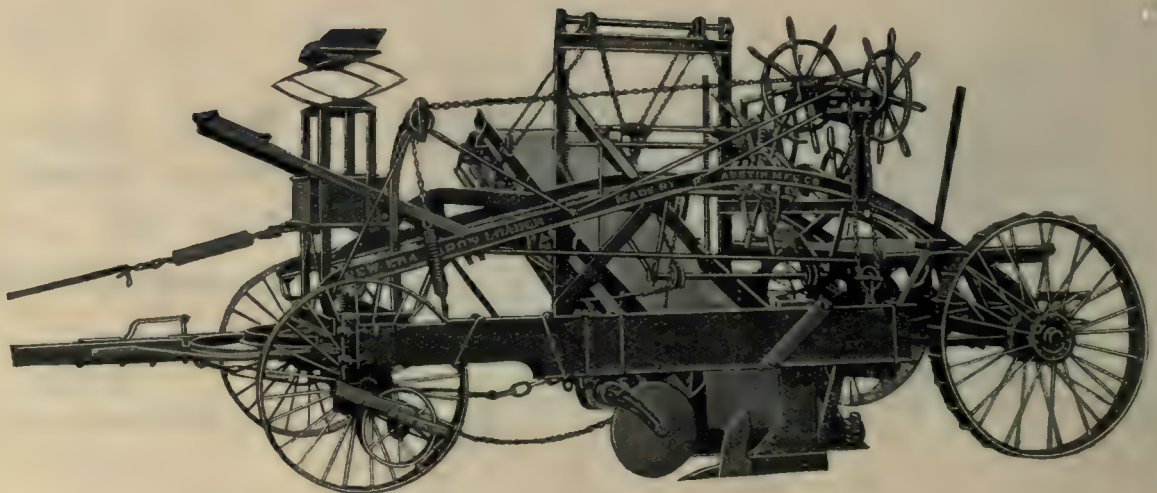
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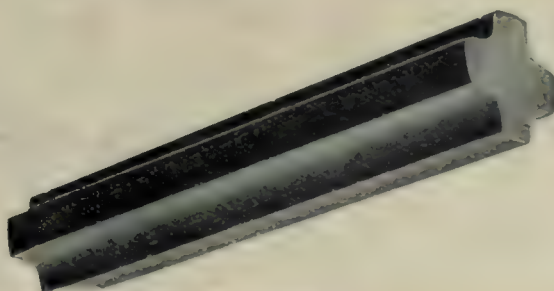
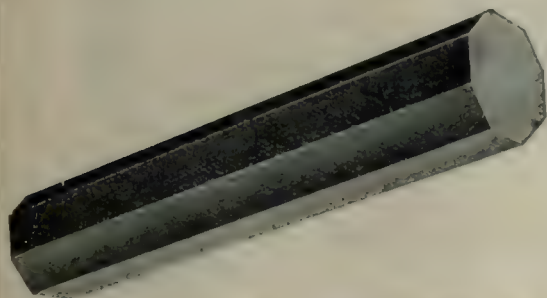
Actual Canadian Records show a cost of \$15.00 for 5 months continuous operation.

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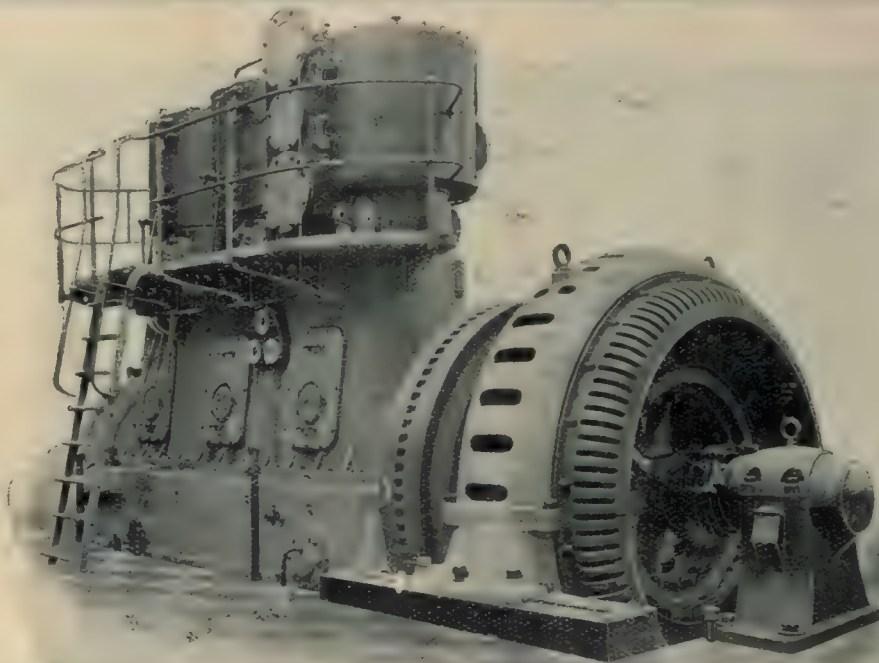
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Vol. 25

February 15, 1911

No. 7

Our National Heritage

An article is contributed to this number by Mr. W. Cowan, of Toronto, who finds it "difficult to understand the wide divergence of opinion on the tariff question." We can sympathize with him, for we have the same difficulty ourselves. It is indeed hard to understand how any good Britisher with the blood of the old stock in his veins can tolerate the idea of endangering Canada's commercial and national independence for selfish motives. We are speaking disinterestedly. We are protectionists because we are loyal Canadians who look and hope for a greater Britain. Were we concentrated entirely in ourselves and in our own particular business, we would take the other view. Five years of free trade and we would have more American money in our pockets than we would know how to handle. We need the money, too, but we would prefer to be poor to taking any share in selling our birthright.

Some people are inclined to smile at anything that savors of patriotism. Let them smile. They are not of the race that raised Great Britain to its present eminence, nor are they of the stock that laid the foundations of Canada's national life.

We have struggled for independence and we are now in a position to wait until the United States is ready to give us what we want on our own terms. What justification can there be for us to endanger the control of our natural resources and to give an alien people the power to dominate our markets? Heretofore we have been prosperous, and prosperity has come to us in spite of, and not because of American influence. Under existing conditions the periodical waves of depression that sweep over the United States are held back at the border. Under the so-called "reciprocity" arrangement we, also, shall have to weather the financial storms—brought about by disturbances in which we shall play no part—and there are indications of some big ones in the brewing.

It is contended that Canada has held her own with the United States in the past, but the transactions re-

corded in history do not support the contention, and our experience in the period of stagnation that followed the treaty of 1854, and the attitude of the American Government subsequently, should not be forgotten at this juncture. Throughout the present negotiations there has been an inclination on the part of those at the helm to arrogate to themselves more power than has been entrusted to them, more influence than they really wield. Let us make no mistake. This is a mighty leap Canada is contemplating and it must be the voice of the nation that shall say whether she is to attempt it.

One last word. What plaint can the farmers make under present conditions? And the tariff is urged in their behalf. Eighty per cent. of the products of the Canadian farmer find a market in Canada. Is it not to his advantage to contribute to the development of Canadian cities rather than help to check that development and so impair his best market. As Mr. Cowan intimates, the farmer is getting consideration beyond his merits and altogether out of bearing to the small proportion he bears to the rest of the community, both in regard to population and vested interest.

Canada can hold her own with any nation or people who are willing to play the game and play it fairly. Such has not been our experience with the United States either in business or in play.

Confidence a Valuable Asset

It is the self-confident man who wins. He who strikes out boldly, who does not wait for time or tide, who does not sit on the stone of Fate waiting for an opportunity to come along, who goes through obstacles and not over or around them, who is not waiting for others to speak, think or act, is the man who is going to win in this new country.

There is a great demand for the self-centred man—the man who is not afraid of himself, who, if he cannot say, "I will," at least says "I will try." Leaders, not followers, original thinkers, not imitators; men with new ideas are being called for loudly in all the important walks of life.—Orison Swett Marden.

Paving Work at Victoria, B.C.

Victoria, B.C., according to a local paper, is being besieged by agents of United States companies attracted by the city's important asphalt paving programme for the year. The city engineer, Mr. Angus Smith, expresses openly his intention of establishing local industries and employing British labor. The experience of other cities with outside firms, he says, has not been favorable. Further, Mr. Smith regards it as being in the interests of the city that the council has decided to obtain from the legislature at its present session an amendment to the Local Improvement Act which will enable the corporation to let its paving contracts this year on the same basis as those which have been let up to the present, the successful bidder leaving 15 per cent. of the contract price in the hands of the city for a period of ten years, the contractor during the life of this agreement to keep the pavement in a proper state of repair, the amount thus held back by the city being forfeited to the corporation in the event of the materials and workmanship being faulty.

Plans and specifications have been prepared and tenders are pending or actually being called for a considerable amount of paving work. The council is setting a good example in paring down the preliminaries and getting this construction under way at the earliest

possible date, thus enabling the contractors to take every advantage of the early spring weather. Too often exactly the opposite is the case. Weeks, and

sometimes months are wasted in trifling disputes over incidental matters, with the result that the work remains uncompleted by late fall.

Reciprocity and what it Means to Canada

Proposed Agreement Inimical to Best Interests of the Country—The Manufacturer's Standpoint and the Imperial Aspect—U.S. Entanglement Undesirable

By W. COWAN, President Luxfer Prism Company, Limited, Toronto

It is difficult to understand the wide divergence of opinion on the tariff question. Truly it appears impossible to get the two extremes together. On the one hand there is the idea of free trade in its broadest application, namely, that of buying the largest amount for the money, and on the other, that of developing our manufacturing and commercial interests and keeping our money within our own borders—even at a slight additional cost on some manufactured goods. A great deal is said upon this subject at the present time, but to my mind there are still a few points worthy of particular attention. I have just read in the *Busy Man's Magazine* an interesting article by Mr. E. C. Drury, which is thoroughly typical of the free trader's standpoint, but which, unfortunately, is wrong. The principles advocated are not the best for the prosperity of this country.

I have heard it said that we are the most prosperous country in the world; that our people have more wealth per capita in land value than any other country in the world. Then, I say, let us lower our tariff, chase our manufacturers out of the country or leave them open to the uneven competition of those on the other side of the line, who have become immensely wealthy and powerful under a high tariff and can consequently sell many of their manufactured goods in any market in the world. Then we will be more prosperous still, as we will have the same country owned by fewer people.

Free Trade Fallacies.

Now I do not think that this is the intention of the free trade party. I believe they are firmly convinced that our manufacturers are banded together for the purpose of extorting high prices for the goods they make for the farmers, who usually consider themselves the sufferers. The farmer, however, is not affected especially and consequently I do not see why he should have special consideration. As a matter of fact the farmer is benefited much more from present trade conditions than the manufacturer. Clothing, furniture, in fact almost all things required for household use, have decreased in price during the last ten years, but the products of the farm have doubled, and in many cases trebled in the same period. Statistics are unnecessary, the above statement being common experience.

The lower rates on manufactured goods are attributable to the manufacturer's knowing his business, having the courage to put his money into it, and to hard work.

The free trade party has an idea that money invested in the manufacturing business is a gold mine. This is not the case. Many manufacturing businesses are successful and the money invested in them is lost. Sometimes the first unsuccessful effort is taken up by someone possibly more adapted to that particular business, who succeeds in making money. Do you grudge him the result of his ability? Again, the large

manufacturing businesses of this country are the outcome of years of development. In many cases there was little encouragement until the population began to increase as a result of our natural resources—of mining as well as agriculture.

Building up the United States.

What is the good, however, of producing wealth and handing it over to our wealthier neighbors? This is what we are doing. Money is pouring into our storekeepers and going over the border at the rate of several hundred million dollars a year, helping to make a wealthy nation wealthier. By a reasonable change in the tariff we could have manufacturers establish works in this country, probably from the United States, that would keep much of this money in the country, apart altogether from the extra employment it would give our people and the resultant activity in other departments of trade.

With these conditions, the farmer would enjoy a better market, as increased population would naturally mean a greater consumption of products. We can never depend on the United States market for our produce. We are far better not to depend on it. They took it from us and now we are supplying our Mother Country, which observed from an imperial standpoint, is better for both Canada and Great Britain. This is an important matter. The Mother Country would be in a bad condition some day if food stuffs were declared contraband of war. We have no difficulty in disposing of all we have to sell and we do not need the proposed tariff agreement.

There are no shrewder dealers anywhere than in the United States, and they make no secret that they wish to effect a better arrangement with us to admit their manufactured goods. In return they will admit our food stuffs on better terms. Now then, every inch we give to them for manufactured goods, which we can manufacture, means that much less business for our manufacturers or for manufacturers whom we should have, and every time we adjust our tariff so that it makes it an object for manufacturers to establish in this country, we save that capital for ourselves, which otherwise goes out of our country.

It is said by free traders that there is a growing desire for a lower tariff in the United States. No doubt there is, and even among some high tariff people, but these people have become so wealthy and powerful that they can compete in the markets of the world. We have many a long day ahead of us before we get to the position of manufacturers in the United States.

Proper Adjustment Needed.

Free trade on its broadest principle will not work for Canada. Therefore, we should try and adjust our tariff on the most equitable lines. There are goods that will not be manufactured in this country for years, and in such cases the tariff might be taken off altogether, e.g., window glass. In other lines an in-

creased tariff would mean a great increase in the producing capacity of this country. I would mention, for instance, iron. At present there are hundreds of cars of iron and steel brought into Canada from the United States every year, and just at the present moment you can buy iron in the United States, pay the duty on it and lay it down here for a little less than you can buy from our own Canadian mills. This is attributable to cut prices following decreased demand in the United States. This is an undesirable condition. An adjustment of the tariff would mean that the United States Steel Company would establish plants on this side of the line.

In 1878 I was brought up to think that the N. P. was a wicked measure put upon the people by Sir John A. Macdonald, but when I grew up to understand the basis of buying, selling and manufacturing goods, I had to change my mind. If we needed a National Trade policy then, we need it more now, because we need to buy more now. We are prosperous, but we do not know what the word means as compared with the United States.

What we need is another Sir John A. Macdonald—I do not speak politically—with his charm of putting things in an attractive manner, and his foresight. This is a business proposition that must be made diplomatically to be successful.

Let us, therefore, join hands to keep our people and our capital on our own side of the line, bearing in mind that the farmers can never make a populous country; because to put another million farmers into Canada would make a big hole in the farming lands, whilst this country is capable of taking care of many times that number of good mechanics if we set our sails right to hold them.

The Design of Retaining Walls

The lack of agreement between the usual theories concerning the pressure of earth on retaining walls and the actual pressures observed in experiments made with small rotating retaining boards recently led Professor William Cain to make a critical study of the subject. This author's monograph on retaining walls in Van Nostrand's Science Series contains an explanation of the so-called sliding-wedge theory of pressure on a retaining wall which differs from Rankine's theory in taking into consideration the angle of friction of the earth on the wall as well as the angle of repose of the earth itself. The results of the recent investigation by Professor Cain, given in an elaborate paper in the January "Proceedings" of the American Society of Civil Engineers, indicate that the lack of harmony between theory and experiment is due to neglecting the influence of cohesion in practical formula. This is expressed by the author as follows:

1. When wall friction and cohesion are included, the sliding-wedge theory is a reliable one, when the filling is a loosely aggregated granular material, for any height of wall.

2. For experimental walls, from 6 to 10 ft. high, and greater, backed by sand or any granular material possessing little cohesion, the influence of cohesion can be neglected in the analysis. Hence, further experiments should be made only on walls at least 6 feet, and preferably 10 feet high.

3. The many experiments that have been made on retaining boards less than 1 foot high have been analyzed by their authors on the supposition that cohesion could be neglected. This hypothesis is so far

from the truth that the deductions are very misleading.

4. As it is difficult to ascertain accurately the coefficient of cohesion, and as it varies with the amount of moisture in the material, small models should be discarded altogether in future experiments, and attention should be confined to large ones. Such walls should be made as light, and with as wide a base, as possible. A triangular frame of wood on an unyielding foundation seems to meet the condition for precise measurements.

5. The sliding-wedge theory, omitting cohesion but including wall friction, is a good practical one for the design of retaining walls backed by fresh earth, when a proper factor of safety is used.

O. A. C. Renews its Offer of Assistance in Drainage

The Ontario Agricultural College is endeavoring to help those in doubt about drainage. Any farmer in Ontario wishing assistance in his drainage problems may have the same by making application to the Department of Physics, O. A. C., Guelph. As soon as possible after receipt of the application a drainage adviser is sent to make a survey of the land, after which he makes a complete map showing the location of the drains, the grade, size of tile, etc. When completed the map is sent to the owner, so that he has an accurate guide to follow in putting in his drains. As in previous years, the only outlay to the farmer is the necessary travelling expenses of one man in connection with the survey. The railways give a rate of a cent a mile for this work, so that the travelling expenses are light.

After one survey in each locality a drainage demonstration is held right in the field surveyed, to which all the neighbors are invited. At this meeting simple methods are demonstrated of making a drainage survey, finding the fall of a ditch, determining the grade, digging to grade, etc.

Those wishing to make application for a survey should write the Department of Physics, O. A. C., Guelph, whereupon regular application forms will be sent.

Paving bricks of destructor clinkers have been in service four years on roads in the Royal Borough of Kensington, England, and an inspection of these highways by a committee of the Sanitary Institute resulted in the award of a bronze medal to Messrs. Goddard, Massey & Warner, Limited, sanitary engineers, of Nottingham, who control the manufacture of the machinery for turning out the blocks. The clinker is ground in a special mill, graded in size by screens, mixed with hot Trinidad asphalt and oil, and pressed into bricks measuring 9 x 4½ x 3 in. After pressing the bricks are automatically placed on a steel belt conveyor in which they are cooled with water. The asphalt is heated by steam supplied by a boiler at about 100 lb. per square in. pressure; the temperature of the steam when it reaches the softening tank is said to be over 300 degrees Fahr. The bricks are said to wear exceedingly well and are not slippery under adverse atmospheric conditions. Another advantage claimed for them is that they are practically noiseless under traffic. The works of the Royal Borough of Kensington, where the bricks are manufactured, has a capacity of 500 paving blocks per hour. The machinery for making the blocks is the invention of Mr. William Warner.

Toronto's Preparations for Cement Show

Many Attractions Scheduled for Annual Meeting of Canadian Cement and Concrete Association—A Noteworthy Event, March 6-11

The annual convention and exhibition of the Canadian Cement and Concrete Association, which is to be held at Toronto in the St. Lawrence Arena from March 6th to 11th, is exciting much attention among the cement interests. Mr. Wm. Snaith, secretary of the association, has been hard at work for months



Professor Gillespie, Toronto, President Canadian Cement and Concrete Association.

perfecting details for the meeting, and judging by available information he is deserving of much congratulation.

The most enterprising arrangements have been made for the accommodation of visitors and their friends, and in this respect the Canadian Association is profiting largely by the experience of the big American organizations. For instance, they have rejected the proposal to have a military band and have decided instead to set aside a central location for a first-class orchestra, with comfortable accommodation for visitors. At the New York show the programmes rendered by Sousa's Band were heard by practically none of those in attendance.

The greatest interest is being taken in the exhibition, and already most of the space has been allotted. A noteworthy feature at this stage is the energetic manner in which American manufacturers have made application for space. With the tremendous development of the industry there will be many novel exhibits and many things of additional interest. Twelve months in the cement industry means a great deal.

Among the most interesting exhibits will be that of the Canada Cement Company, which will take the form of a complete cement plant in operation. The entire process of the manufacture of Portland cement will be shown in detail. The exhibit will not be on a miniature scale, as is evidenced by the fact that the rotary kiln, which in ordinary mills is 60 or 100 feet in length, will be 8 feet long. This proportion is maintained throughout the installation and the whole mill will be quite capable of producing cement of the highest quality.

Another feature of interest at the show will be the cement gun, exhibited by Steel & Radiation, Limited. This is one of the latest inventions and the exhibit itself will be one of two or three complete machines at present in existence. This machine is expected to effect a revolution in some branches of cement work. One of its spectacular possibilities is its capacity to transform a dilapidated wooden structure into fire-proof concrete. We hope to publish a detailed description of the cement gun in a later issue.

The Canadian Inspection Company have arranged to show a complete cement testing laboratory. The exhibit will be replete with every modern improvement known in this important department and will in addition contain a number of unique and valuable features. This laboratory will doubtless receive special attention.

Many important papers are scheduled for presentation at the convention. Among the speakers may be mentioned the following:

W. A. McLean, Provincial Engineer of Highways—"Cement Concrete in Highway Construction."

Robert Cathcart, Glidden Varnish Company, Cleveland, Ohio—"Cement Surfaces and Finishes."

Richard L. Humphrey, President National Association of Cement Users, and Director United States Structural Materials Testing Laboratories, Pittsburg, Pa.—Subject undecided.

R. F. Havlik, Ideal Concrete Machinery Company, South Bend, Ind.—"Concrete Blocks."

Joseph M. Carrere, Blanc Stainless Cement Company, Allentown, Pa.—"The White and the Gray."



Hon. G. P. Graham, Minister of Railways and Canals, Hon. President Canadian Cement and Concrete Association.

C. W. Noble, Consulting Engineer, Toronto, Ont.—"Prevention of Corrosion in Metal Lath."

F. Barber, Barber & Young, Bridge and Structural Engineers, Toronto—"Adaptation of Concrete for Long Span Bridges."

W. M. Kinney, Asst. Inspecting Engineer, Universal Portland Cement Company, Pittsburgh, Pa.—"Manufacture of Portland Cement."

E. A. James, Editor Canadian Engineer, Toronto—"The Necessity for Inspection in Concrete Work."

The names of several others who have consented to read papers are not included as the subjects have not yet been chosen.

An event such as has been planned by the Canadian Cement and Concrete Association should have a most stimulating effect upon the various branches of the industry and should receive their hearty support. Upon the many advantages to be derived from an intelligent interest in the educational work, both at the convention and at the show, it is perhaps unnecessary to expatiate. The industry is at such a comparatively preliminary stage and there is still so much to be learned concerning the uses of cement in constructional work, that no one in any way identified with this material can afford to neglect the opportunity of acquiring additional knowledge.

The president of the association, Professor Gillespie, has been carrying on for many years valuable investigations and tests of the properties of various structural materials. His work in the cement field has gained for him a reputation as an international authority.

The remainder of the directorate is composed of the following: Vice-president, Mr. Wm. Fry Scott, Toronto; T. L. Dates, Owen Sound; Kennedy Stinson, Montreal; D. C. Raymond, Toronto; Ivan S. MacDonald, Toronto; James Pearson, Toronto; A. E. Uren, Toronto; W. H. Ford, Montreal; C. F. Pulfer, London; Gustave Kahn, Walkerville; R. E. W. Haggarty, Toronto; C. R. Young, Toronto; J. R. S. Scott, Toronto.

C.P.R. to Tunnel Under City of Vancouver

The congestion of business along the waterfront, and the holding up of traffic on leading streets by shunting operations, has for long been engaging the serious attention of both the C. P. R. authorities and the council of Vancouver. It is now definitely settled that the trouble will be obviated inside of a couple of years by the construction of a tunnel under the business portion of the city, the plans being now before the management in Montreal. The southern entrance of the tunnel will be at a point near the drill hall on Beatty street, beyond which the railway company has a large section of property. The natural configuration of the ground there will make tunnelling an easy matter, for the railway tracks are already many feet below the level of Beatty street. From that point the tunnel would swing in a semi-circle around toward the north-west and strike Hastings street—many feet under that thoroughfare, of course—at the intersection of Seymour. The tunnel would then run along under Hastings to a point about opposite the end of Burrard street, where the tracks are already forty or fifty feet below the level of the street.

The construction of this tunnel, which would be a little less than a mile in length, would put an end to the use of the tracks which now cross Vancouver at street level, making difficult and hazardous traffic over such down-town streets as Hastings and Powell, which carry double-track car lines. It is suggested that the tunnel scheme is a portion of a big programme of improvements which the Canadian Pacific has in

mind in Vancouver and vicinity—including the enlargement of the depot and other terminal facilities.

Iron Moulds for Concrete Balusters

The concrete balusters for the railing of the Jerome avenue arch bridge, in the Borough of the Bronx, New York City, were at the beginning of the work cast in plaster moulds. These, however, gave satisfactory results only for three balusters and then cracked or lost their sharp lines. Iron moulds were then tried and have given satisfaction. One man with the aid of a laborer part of the day has been able to clean the forms, mix and pour six moulds and finish the six balusters cast the previous day. The balusters are scrubbed to expose the aggregate, and to make the handling easier while scrubbing and prevent breakage are mounted vertically in a frame. A reinforcing rod projecting from top and bottom runs through the center of each baluster, and the bottom of this rod drops into a socket on the work bench, while a ring holds the top. The baluster can thus be rotated as the scrubbing proceeds.

A portable motor-driven pumping outfit was used to handle the water encountered in the cofferdams when building the reinforced concrete arch bridge of the Charles City Western Railway over the Cedar River. The outfit consisted of a 6-in. centrifugal pump bolted between the feet of the two 6 x 6-in. uprights, 24 ft. long, and a horizontal-shaft motor on a platform at the top of these uprights. Automobile gears transmitted power from the motor to a vertical shaft belted to the runner shaft of the pump. The outfit as arranged could be picked up by the cableway and moved to any point in the travel of the latter. The operation of the motor was controlled from a starting box on the shore.

An important extension to the sewer system of Victoria, B.C., is now under consideration. The project involves an expenditure of \$250,000. Preliminary surveys and plans are practically completed.

Messrs. Evans, Coleman & Evans, Vancouver, B.C., have purchased the interests of Raymond & Sons, in Victoria, where they will carry a complete line of builders' supplies.

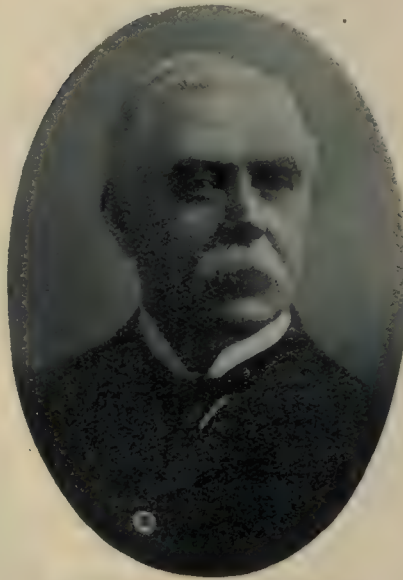
The building permits issued at Toronto last month totalled \$548,580, compared with \$682,088 for January, 1910.

At a recent meeting of the Allied Trades and Labor Council of Ottawa, a committee was appointed to approach the Builders' Exchange with a view to co-operating with that body to urge the council to pass a by-law to tax outside contractors. The reason for this step is given as a desire to prevent the importation of cheap labor.

The construction programme of the city of Edmonton for the coming season provides for an expenditure of nearly \$900,000. The largest individual item in the estimates is \$281,000 for sewer construction. Of this amount, some \$200,000 will be required for the Rat Creek trunk sewer.



Mr. Willis Chipman, 1st Vice-President



Captain Gamble, President



Professor Haultain, 2nd Vice-President

Engineers' Club of Toronto Re-Organized

Annual Meeting Discloses Close Co-operation of Allied Professions—Excellent Facilities Provided at New Club Rooms—Strong Directorate Elected

The success which has attended the reorganization of the Engineers' Club of Toronto must be a source of much gratification to the profession in general and in particular to those who for several months past have been devoting their time and thought to a satisfactory consolidation such as has now been effected. Heretofore the principal function of the club was a purely professional one and membership in the institution was limited to engineers, but the scope of the

headquarters of the club, 90-96 King street west, are a revelation of the possibilities in this direction. The premises have been considerably enlarged and a spacious dining room has been provided on the floor below, which has also been taken in. The mid-day luncheons are particularly well attended, while the cosy billiard room is becoming quite popular.

No effort has been spared in making the library and reading room of real service to the members and



Mr. C. H. Heys, 3rd Vice-President



Mr. R. B. Wolsey, Secretary-Treasurer

club has now been widened to admit allied interests, the success of the broader policy is already apparent. The need for social intercourse was recognized and the facilities that have now been provided at the

means provided for access to all the leading technical publications will be a great advantage.

The technical side of the club will be developed, and special attention will be paid to the presentation

of papers and the discussion of engineering problems.

The annual meeting on February 6th may be regarded as indicative of the club's future. An attendance of nearly one hundred, in the face of the heaviest snow-storm of the season and consequent interference to street car service, must be very encouraging to those who have labored so zealously for the establishment of the club.

The meeting approved of the by-laws, with minor amendments, elected directors and auditors, and disposed of routine business. The entrance fee is \$50 and the annual fee \$30, the latter commutable at \$25 if paid before February 1st of each year.

President Canniff was able to present a report which was unanimously accepted as satisfactory, the financial position being quite as good as could be expected.

The number of members is already in the neighborhood of 400, while the limit, according to the by-laws, is 800. Doubtless in the near future it will be necessary to establish a waiting list.

The officers, directors and committees for 1911 are given below. The club is to be congratulated upon the representative nature of its list of officers.

The Directorate.

Officers—Capt. Killaly Gamble, president; Willis Chipman, first vice-president; H. E. T. Haultain, second vice-president; C. H. Heys, third vice-president; R. B. Wolsey, secretary-treasurer.

Directors—J. J. Ashworth, R. A. Baldwin, C. H. Acton Bond, W. A. Bucke, Edmund Burke, C. M. Canniff, W. E. Douglas, E. A. James, J. L. Street, J. B. Tyrrell, T. S. Young.

Finance Committee—J. J. Ashworth, chairman; W. A. Bucke, C. H. Heys.

House Committee—C. H. Heys, chairman; C. H. A. Bond, W. A. Bucke, C. M. Canniff, Willis Chipman, W. E. Douglas, H. E. T. Haultain.

Library and Papers Committee—H. E. T. Haultain, chairman; R. A. Baldwin, Edmund Burke, E. A. James, L. J. Street.

Admission Committee—Willis Chipman, chairman; R. A. Baldwin, C. H. A. Bond, Edmund Burke, J. B. Tyrrell, T. S. Young.

New Sewage Disposal Plant at Regina

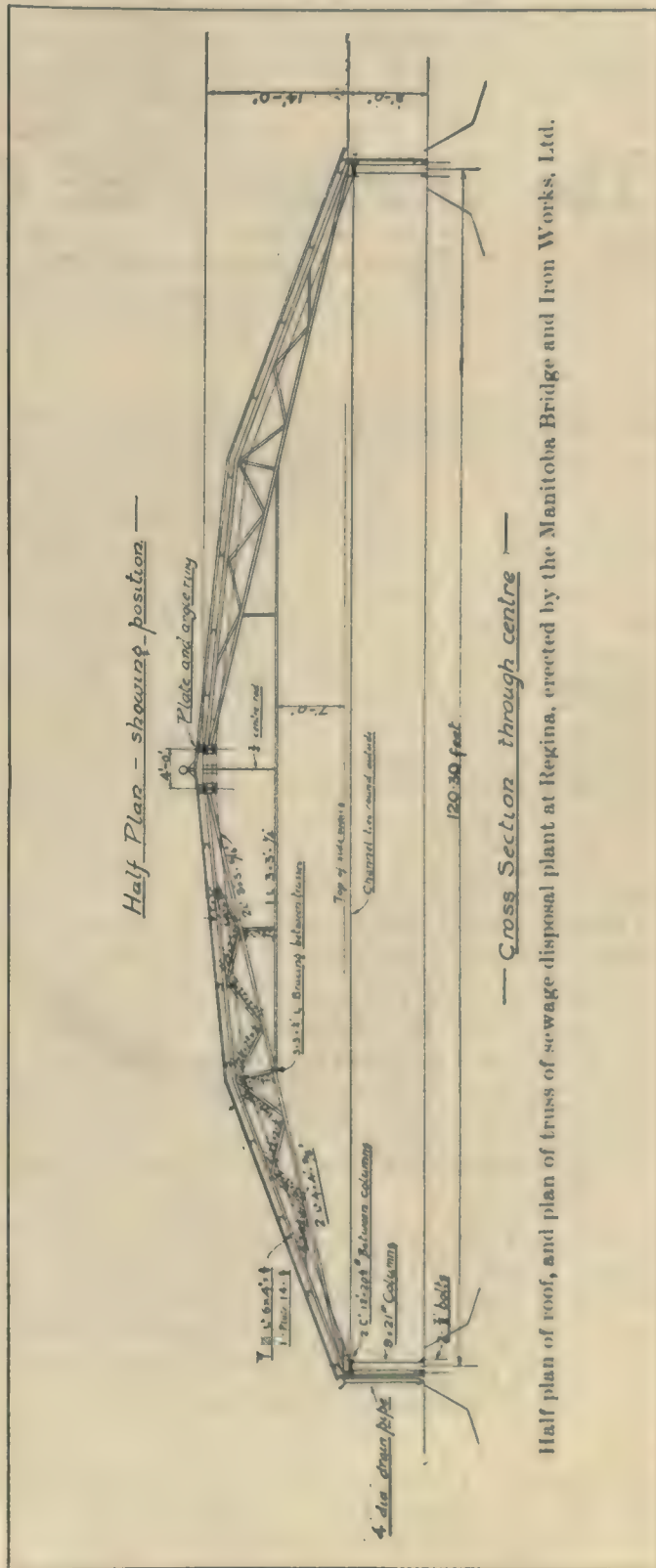
The sewage disposal plant under construction at Regina has several features which are somewhat out of the ordinary and which depart considerably from the usual architectural lines.

In climates where the filtration beds and tanks are apt to freeze it is necessary to have them housed. With a plant of that type at Regina, the covering of the filtration beds presents problems in construction of a somewhat different and complicated nature.

The sedimentation tank effluent is treated by Adams patent revolving sprinklers. The raw sewage from the sewers flows first into an inlet well, where any heavy material which may have gotten into the sewers is deposited. The lighter solids flow through a valve into the liquifying tanks. Here they are broken up into their constituent parts and emerge from the tank in the form of a liquid. This liquid, although a great improvement on the original sewage, has to be further treated in the filtration beds. The level of the filtration beds being lower than the tanks, the effluent is led under a few feet of head through a 4-inch pipe to the centre of the filtration beds. These beds are circular in form and have an outside diameter of 120 feet. The head on the liquid raises it through the Adams patent sewage distributor to the top of the filter bed. It then flows through four revolving sprinkler arms. These arms are construct-

ed of pipe and are perforated on one side. The effluent naturally flows through the holes and the reaction of the liquid starts the arms revolving and as a result ensures an equal distribution over the top of the filter bed. These sprinkler arms are supported by guy lines from the centre of the Adams sewage distributor.

From the above short general description of the process it will be seen wherein lie the difficulties to be overcome in connection with the covering of the tank. The large diameter of the tank and the fact that it is impossible to have any supports inside the tank as



Half plan of roof, and plan of truss of sewage disposal plant at Regina, erected by the Manitoba Bridge and Iron Works, Ltd.

they would interfere with the action of these sprinklers is apparent. These difficulties were overcome as shown in the illustration. Sixteen steel trusses of 59 feet span, radiate from a centre steel ring of 4 ft. 6 in. diameter and 14 in. deep. The outer ends of the trusses are carried on posts. The circular ring is constructed of $12 \times \frac{3}{8}$ in. plate and with 4×4 in. angle top and bottom and with diaphragms of $12 \times \frac{3}{8}$ in. plate and $2\frac{1}{2} \times 2\frac{1}{2}$ in. angles through its centre.

Owing to the conditions described it was necessary to build the trusses as shallow as possible. The top chord is made up of two $6 \times 5 \times \frac{3}{8}$ in. angles and a $14 \times \frac{3}{8}$ in. plate for the bottom half of truss and $5 \times 3\frac{1}{2}$ in. with 14 in. plate for the top half. The bottom chords are $4 \times 4 \times \frac{3}{8}$ angles for their lower section and $3 \times 3 \times 5-16$ for the upper section.

From the centre of the lower chords there run horizontal tie angles, which are connected by an octagonal plate exactly in the centre of the filter. The purlins are of steel channels and angles and the bracing is of angles. The columns on the outside are of I beams, with bracing of channels and angles between them, all as shown in the illustration. All the steel was designed for the usual wind and snow loads. The roof covering is to be of 1-in. shiplap and galvanized corrugated iron. The sedimentation tanks are also being covered with a steel frame 205×108 feet, but this presents no features out of the usual. The whole of the steel work has been designed and fabricated by the Manitoba Bridge and Iron Works for the city of Regina through their chief engineer, Mr. John Marshall.

The Durability of Concrete Construction

Effect of Lime Content of Cement—Necessity for Care in Selection and Proportioning of Aggregate—An Instructive Discussion

By H. S. Spackman

The purpose of this paper is to bring to your attention the discussion on the effect of the high lime content of cement on the durability of concrete construction under special conditions, which has occupied more or less the attention of technical societies and the columns of the technical press, especially in Europe, during the past few years.

This paper is not to be interpreted as questioning the advisability of the use of concrete, or distorted into a prophecy of the failure in the near future of the numerous concrete constructions in existence, for concrete, when properly prepared, is one of the best and most durable of structural materials.

It is desired, however, to emphasize the fact that its durability is not due to the Portland cement content, but to the care in the selection of the aggregate, the proportioning of same, and the workmanship in mixing and placing the concrete. The making of concrete is a manufacturing process, in which the cement is only one of the several raw materials required, and forms but a small proportion of the finished produce. Such being the case, the durability and strength of the finished material depend on the user, and not on the cement manufacturer; and this will continue to be the case until there has been developed a hydraulic cementing material which will alone be capable of resisting the destructive action of water containing sulphates, or other injurious chemicals.

This discussion may be epitomized in the following statements:

1. All Portland cement is, by reason of its high lime content, subject to destructive attack, under conditions favorable to such action, not only from sea-water, but also from acidulous and other saline waters.

2. The resistance of concrete to the disintegrating effect of such waters depends largely upon the impermeability of the mass.

3. That it is essential to the durability of concrete construction under unfavorable conditions that there be developed a hydraulic cement having strength under mechanical test approaching that of Portland and free from the properties which render it liable to destruction by chemical action under such conditions.

Owing to the large use in Europe of cement in maritime construction, where the evil effects of the high lime content is accentuated by exposure to sea-water, more thought has been given in Europe to this particular phase of the question than here, or than to the study of the destructive effect of ground waters, which is equally noticeable, and even more important. Enough work, however, has been done along these lines to show the danger of the use of high lime cements when the construction is to be subjected to waters containing sulphate of lime, which Bied, in his interesting paper "Experiments on the Decomposition of Mortars by Sulphate Waters," read at the Fifth Congress of the International Association for Testing Materials at Copenhagen in 1909, shows to be even more destructive in their effect than sea-water.

The importance to all constructors of the fact that waters containing solutions of sulphate of lime exert a destructive influence on Portland cement concrete, becomes manifest when it is realized that the ground waters of our large cities generally contain considerable amounts of sulphuric acid, which, on contact with the cement, may dissolve the lime and form destructive solutions of sulphate of lime.

Bied says in the article referred to:

The decomposition of mortars, which are exposed to the action of the sea or waters charged with sulphates, has for a long time already occupied the attention of engineers, and experiments have been multiplied in all quarters with the object of discovering some hydraulic binding material which would be free from liability to destruction.

Up to recent years attention has chiefly been concentrated on the injurious action of sea-water, and although the destructive effect of sulphate of lime was not unknown, it was not as a rule taken into consideration.

Having had to inquire into decomposition of mortars by sulphate of lime, observed in 1900, on the line leading from Linarez to Algeria in Spain, and in 1902 on the line St. Girons-Foix, and at the same time in Algeria, we have been induced to submit this problem to a prolonged experimental investigation.

In our researches we have compared materials poor in alumina and aluminiferous mortars, highly calcareous mortars and some of high index.

The action of the diverse saline solutions which were employed is not altogether the same. It may in general be

assumed that the artificial sea-water is 10 or 15 times less active than a 12 per mille solution of magnesium sulphate. Yet certain artificial cements have been decomposed more rapidly in sea-water than in the solution of anhydrous magnesium sulphate solution of 12 per mille.

Water saturated with sulphate of lime appears to be the most active decomposing agent. Constructors must constantly be on the alert in this respect; in fact, waters saturated with calcium sulphate are sometimes met with far from any recognized occurrence of gypsum.

On the other hand, waters which at certain moments do not contain more than 0.1 or 0.2 gram of calcium sulphate may become saturated during periods of drought.

In our laboratory and under the experimental conditions above indicated we have not met with any slow or quick-setting cement, whatever its mode of manufacture and its chemical composition, which has resisted the action of this solution for six years.

Similar destructive effects of the ground water have been noted in the West where the water is charged with a solution of alkaline salts.

Minimum of Lime Increases Durability.

Whether or not the same rule, the lower the lime content, the more durable the cement, will hold good for cements above ground, exposed only to the influences of the atmosphere and the moisture and gases contained therein, I am unable to say, as I cannot recall any careful and systematic investigation and study of the comparative durability and strength over long time periods, where low lime and high cement concretes were tested under like conditions, that is in air, in a dry state under the conditions similar to those occurring in the interior of reinforced concrete construction, and also exposed to alternate wetting drying, as would be the case of the concrete on the exterior of reinforced concrete construction. Such an investigation extending over a period of several years where a number of full-sized beams were tested at yearly intervals, the test pieces being made from the same aggregate with various cements, would be of great value.

It is known, however, that the briquettes of Portland cement stored in air show greater variation and more often retrogression of strength and disintegration than companion comparison sets or briquettes stored in water. It is also known that Portland cement clinker will depreciate with time when exposed to ordinary atmospheric influences, and even in sealed air-tight bottles, and that the higher the percentage of lime in the clinker the more marked is this disintegration. It is also known that only a portion of Portland cement ever hydrates or takes part in the hardening. It is, therefore, not unreasonable to suppose that this unacted upon clinker in the cement will disintegrate with time. Whether the disintegration of briquettes stored in air, or the loss in strength, be due in part to the decrepitation of the coarser particles of cement as above indicated or not, is at present a matter of speculation, but it would seem, in view of the well known action of clinker that it would be desirable to have as little inert material in the cement as possible.

Must Make Impermeable Concrete.

That Portland cement is not of itself sufficient under ordinary conditions to insure impermeability in concrete is evidenced by the rapidly growing use of waterproofing compounds, either mixed with the cement or applied as a surface coating, and it would seem that there should be an endeavor, either by improvement in the quality of the cement used or in the workmanship and proportioning of the concrete, to make an impervious material, as it is unquestioned

by all investigators that the resistance of concrete construction to the attack of acidulous or saline waters, or other destructive influences, is entirely a function of its permeability.

Are constructors justified in the face of these facts in confining themselves almost entirely to the use of Portland cement to the exclusion of the lower lime hydraulic cements, as is evident from the report of the Geological Survey covering the cement industry for 1909, which shows that there were produced and used in the United States in 1909, 62,508,461 barrels of Portland cement against the production of 1,687,925 barrels of hydraulic cements of all other classes?

The impression must not be gained from this paper that Portland cement is, therefore, unsuited for use under such conditions. As evidence that concrete can be successfully used under adverse conditions, we have properly built structures that have been subjected to such conditions for many years.

It is, however, desired to emphasize that great care must be taken in the use of Portland cement. It is evident that the ability of Portland cement to resist such action can be very much improved, and it was for the purpose of directing attention to this fact, and suggesting that the subject be further investigated to determine whether perhaps some of the other classes of cement might not be more suitable for such use that this paper is written.

Not so many years ago all advertising was considered more or less fishy; anyway, the man who advertised lacked commercial dignity. Later, the concern which advertised now and then was doing all that it thought necessary, and all that was expected of it. Now the non-advertiser is in a hopeless minority, and he who has advertised and stops is considered as having "gone out of business." Truly a wonderful change, and a situation which the advertiser who thinks of stopping for a time "to save the expense" would do well to study carefully.—Advertising & Selling.

A Riding Hall floor, recently laid in the arena of the new club house of the Riding Club of Washington, at Washington, D.C., has a construction the details of which may be of value to anyone about to construct such a floor. The arena is on the main floor of the building, and is carried over the basement on a concrete slab. Upon this slab was first laid a thin coating of asphalt, then a layer of small boulders close together and embedded in hot asphalt and then another coat of asphalt to cover completely the boulder layer. Upon this solid base was placed a 6-in. layer of packed clay and finally an 8-in. layer of tanbark, which latter makes the finish coat.

Mr. Frank P. Jones, general manager of the Canadian Cement Company, Limited, is not worried about the proposed cut of 5 cents a barrel on the duty of cement. He states that there is already some pressure in the east owing to the English preference but he does not regard the contemplated change as anything of material significance to the industry.

Messrs. Preston, Coombe & Cliff, Croydon, Eng., cabled last week that they were willing to undertake the extension of the intake pipe, 2,000 feet, for the city of Toronto. They state that they are ready to commence immediately and to complete in a few months.

Factors Governing Engineers' Contracts

Conditions Which Regulate the Furnishing of Labor* and Materials— Three Principal Methods in Use — Economic Considerations*

By Harold Parker

It must be clear to an engineer in charge of construction work of any sort that the various conditions under which the work is to be done shall control his action in making his proposals to contractors, and depending upon such conditions, either one of the three methods would from necessity have to be adopted.

If it is desired that the work shall be completed at a cost not to exceed a fixed sum, and that the estimate previously made by the engineer is to be corroborated, the method defined under "A" would be preferable. This would occur in many instances where public work is involved and the cost of the execution of the work is limited to estimates previously prepared.

In cases such as this there does not appear to be any question as to the wisdom of having the contractor furnish both the labor and materials.

In the practice of all constructing engineers the second method, that is, labor furnished by the contractor and materials by the party of the first part, must frequently be found to be the best, if not the only method in which the work can be done economically and satisfactorily. This method has the advantage that the engineer, desiring to secure in the work certain types of brands of materials, the cost of which he knows, can be perfectly sure before the work is begun just what the final cost will be, and he can also know what particular kind of material will be embodied in the work, as well as the exact cost of that material.

In this case all contractors who bid on the work are placed upon complete equality, and therefore an intelligent and comprehensive offer can be made by all and an intelligent comparison can also be made.

In the construction of concrete bridges, culverts or walls, this may be by all means the best way to do the work, because it very often occurs that the engineer desires certain kinds of rods, placed as he plans them, or certain particular brands of cement or other material, which he particularly wishes to have embodied in the work, and which would prevent the question arising during the work, or at its conclusion, of the use of other brands of material which might justly be claimed to be of equal quality—thus creating a debatable question between the parties to the contract.

At any rate, in cases where it is particularly desired to have a fixed type or character of material, and where there may be doubt in the minds of experts generally as to which is the best, so as to produce uncertainty in the interpretation of the specifications, there can be no question if the materials are furnished by the party to the first part, and the labor alone furnished by the contractor.

This is so true that the Highway Commission of Massachusetts has for many years followed this practice in the construction of its concrete structures, and the reasons for this appear to be good. The Commission at the beginning of each year receives bids for cement to meet certain specifications, which is tested

at different times, in order to see that it comes up to the requirements. The cement is furnished the contractors as it is needed, and the responsibility for the excellency of the cement by them is not a part of the contract. In this way uniformity of material and satisfaction are ensured.

The rods are also furnished the contractor of dimensions determined upon by the engineer, and are placed as the engineer directs. The contractor in this case furnishes only the labor and the gravel or broken stone in the concrete.

Under the third proposition, where both labor and materials are supplied by the party of the first part, the instances where contracts are let can be but few, if indeed it may be said a contract can be entered into where neither material or labor are furnished.

The third method, which must from the nature of things involve no agreement between parties, would be preferable in the performance of work the nature of which is such that it is impossible or impracticable to define in specifications, with sufficient clearness or precision, in order to make an accurate estimate of the cost of the work.

It is also preferable in the performance of work of such nature that special skill and knowledge is necessary that has not been acquired by contractors, or, at any rate, by a sufficient number of contractors to secure fair, competitive bids.

It appears to me from the experience that I have had in Massachusetts and elsewhere, that work under contract should be done under either "A" or "B" of the conditions given. If the "C" or final condition is contemplated at all, it should be when the conditions are such that reasonable bids cannot be obtained, on account of the inexperience of contractors, or for other reasons. Therefore, this head, it seems to me, only contemplates a comparison between contract and day labor.

In order to get economical work by day labor it is necessary that the party of the first part shall have a constant force of laborers and foremen trained to the particular kind of work he has in mind, and constantly employed upon the same type or class of work.

It may be, and, in fact, is found that in the maintenance of certain roads, where the conditions under which a contract could be made are uncertain and involve costs which the contractor's inexperience does not permit him to make a reasonable bid, on account of his uncertainty as to the cost of the work, the "C" method is preferable.

We have found in maintaining our roads in Massachusetts, and especially where oil and tar is used, that we can more economically do the work under this final caption than in either of the other ways, and our work is better done, for the reason that we have organized maintenance gangs, under trained foremen, who have learned all they know under the direction of the engineers of the Commission, and who, from their practice under very careful supervision, have become expert. Consequently, our work is better done and at a less cost than it could be by letting it to any

* Address delivered before American Society of Civil Engineers at New York, in introducing a general discussion.

contractor. Therefore, it seems to me that where the conditions warrant, either one of the three propositions can well be adopted by the party of the first part, and it must be for the party of the first part to determine, after most careful consideration, which of the three is best suited to the work he has in view.

In general, I maintain that, wherever possible, the method under "A", the contractor furnishing all labor and material, is preferable for all construction work, except where reinforced concrete constitutes a large proportion of the work.

The method "B," where the contractor furnishes the labor and the party of the first part the material, or a certain proportion of it, is preferable in construction work where the largest portion is reinforced concrete, or is of an experimental nature, or where a bituminous material of a specified kind is used.

The "C" method, where the party of the first part furnishes both the labor and material, is preferable in cases where the amount and kind of work is difficult to determine, and where the work is of such a nature that the contractors cannot make intelligent estimates of the cost.

Permeability of Concrete and Solubility of Aggregates

Tests on the permeability of concrete and the solubility of aggregates were made during 1909 by the Board of Water Supply of the City of New York, which has published in its latest annual report a summary of the work accomplished. Studies were made of the effects of various fine materials incorporated in the matrix of concrete, in reducing permeability, including clays, hydrated lime, and puzzolan and sand cements, these two cements being more finely ground than Portland cement. The conclusion was reached that concrete, practically impervious under 200-ft. head, can be produced with any of these materials, but that equally good results can be secured by using sufficient Portland cement, the latter method having the advantage of securing concrete of increased strength, while the other materials usually reduce strength.

A series of tests was made on the solubility of various rocks used as concrete aggregates on the work, particularly limestone and others of the more soluble rocks, to determine their fitness for concrete which might be subject to the solvent action of percolating water. Cylindrical specimens of concrete 8 in. in diameter and 6 in. in length were exposed for a period of eleven months to the percolating action of Croton water under a pressure of about 22 lb. per square inch. Each specimen was incased in a neat Portland cement mortar, 2 in. thick, except on the bottom, so as to give the water access only to the full end area and compel the entire flow to pass through it. The upper end, under the mortar cover, was covered with a layer of sand, 1 in. thick, through which the water flowed from the pressure pipe. The bottom was free. The proportions used in the concrete were 1 part Portland cement, 3½ parts crushed quartz and 6 parts broken stone. The proportions were measured by weight.

The outside edges of the metal should not be pushed in by the brooms when trying to get the water and binding over, but instead this should always be left until the driver has got the edges thoroughly down, so that the stones are not so liable to be displaced by the brooms.

To obtain a good finish to the coating I invariably have a slight sprinkling of chippings applied after the

work has somewhat "dried out," but when this is done care should be taken to afterwards pass the roller over the whole surface of the roadway, as such chippings under these conditions are exceedingly dangerous to cyclists and deleterious to all rubber tired vehicles.

In making a new road over treacherous heavy or clayey subsoils I invariably have the excavations made extra deep and a good coat of clinker ashes put down, and then over this it is best to put the largest of the pitching, on which another coat of ashes will do no harm. I have, for instance, used such methods with advantage in taking out "knuckles" on severe gradients where the underlying strata was practically pure clay, which was got out to an average depth of about 3 feet.

Periodic analysis of the water coming through the specimens indicated, by changes in mineral content, a rapidly diminishing rate of solution, the solvent action practically ceasing after five months. Specimens containing granite and quartzite aggregates showed higher rates of solution than any of the limestones, with one exception. A strongly magnesian limestone showed the highest resistance of all in the series. The rate of leakage in all specimens decreased rapidly during the first six weeks and at a slower rate thereafter. The analyses of the percolating water seemed to indicate that whatever solution occurs within a mass of concrete affects chiefly the cement.

Tests of Mortar and Concrete

Permeability tests of mortar and concrete are reported in a recent "Bulletin" of the Engineering Experiment Station of the Iowa State College. In these tests comparisons were made to determine the effectiveness of reground cement and of the addition of clay. The investigators report that the specimens made of Portland cement alone were failures from the standpoint of impermeability, except those made of 1:2 mortar. Clay, contrary to the generally accepted conclusions, they state increased the permeability. Reground cement, on the other hand, gave satisfactory results. Northwestern States Portland cement was used in the tests. The reground cement was made from the ordinary Portland by grinding it for 14 hours in a ball mill; 98½ per cent. of it then passed a No. 200 sieve. The clay was dried and ground until 98 per cent. passed the same sieve. The specimens were made by filling forms of corrugated galvanized iron in the shape of the frustum of a cone, 4 in. in diameter at the top and 3 1-3 in. at the bottom. Some were 3 in. and some 6 in. thick. The pressure was 30 lb. to the square inch at the start, and after 6 hours was raised to 40 lb. This was maintained for 16 hours and the pressure then raised to 60 lb. and held for 7 to 22 hours. The report shows that most of the specimens, when broken open, except those made with reground cement, were largely or entirely saturated. The specimens made of 1:2 plain cement did not leak, but even these were found to be quite fully saturated when broken open. Reground cement was used in proportions of 1:2, 1:3, 1:4 and 1:3:5. All of them showed but very little penetration, and tensile tests of the mixtures indicated greater strength than similar proportions in which plain cement was used. In the tests with clay from 10 to 15 per cent of the cement was replaced by clay.

Mr. W. Maxwell, the Montreal architect, has just returned from a trip through Western Canada.

Features of Design of Infiltration Plants

A System of Water Purification Worthy of Closer Investigation—Preliminary Tests Required—Arrangement of Collecting Units—Cost of Installation

By Philip Burgess, Columbus, Ohio

The infiltration plant as a means of obtaining a public water supply is one of the oldest and possibly the least appreciated methods of obtaining pure water. There are many installations of filter cribs, galleries, etc., which have been in use for numbers of years and in some instances with marked success. On the other hand, there are many such plants that have proved failures in that they do not furnish water of constantly satisfactory quality. It is believed by the writer that many of the failures can be attributed to the lack of an understanding of the engineering problems to be solved in the installation of such plants, and in the following paper it is proposed to review briefly some of the features of design of various infiltration plants in which the writer has from time to time been interested.

Among the essential features which affect the installation of infiltration plants may be included, (1) the existence of a suitable bar of ample area within reasonable distance of the pumping station to which the water is to be carried; (2) the constant submergence of the bar beneath the stream, which much have velocity of flow sufficient to keep the surface of the bar free from deposited silt; (3) the permanency of the bar, which must not be materially shifted by action of the stream; (4) the quality of the ground water in the bar at the collecting system, especially as regards its hardness and iron contents; and finally, (5) the arrangement of the collecting units and the means provided for back-flushing or cleaning the system as it may become clogged from continued use. Lack of information relative to any of the above features may result in the failure of the installation.

The character of the filtering material is, of course, of great importance in determining the success of an infiltration plant. If the material composing the bar be fine or be cemented together, the quantity of water obtained in the collecting system may be too small. On the other hand, if the filtering material be too coarse, the water obtained may be of poor quality. The constant submergence of the bar at the collecting system is also of importance, because there may be marked decrease in the quantity of water obtained during low stages of the stream, especially if the collecting system be uncovered. Notwithstanding the fact that infiltration systems frequently are provided to collect a filtered river water, it is very necessary to know the character of the water which may be obtained from the ground, especially its hardness, which may be objectionably great, and its iron content, which may be sufficient to cause an objectionable quantity of iron in the water supply or to cause a clogging of the system by deposits in the collecting units.

Preliminary Tests Required.

The arrangement and location of the several collecting units comprising an infiltration system are effected largely by local conditions, including the character of the filtering material, the shape of the bar, the quality of the ground water and the means provided for back-flushing the system. Before discussing the arrangement of the collecting units, there will be considered some of the preliminary tests necessary at all places where the installation of an infiltration plant is proposed.

In general these tests comprise the determination of the quality and quantity of water available at the proposed location. The character of the filtering material in a bar is, perhaps, best determined by inspection, while its permanence

may frequently be learned by local or government records. The determination of the quantity and quality of water available is more difficult and requires the installation of test wells at representative points at the proposed location. It is a common thought that the water contained in a bar beneath the river consists of filtered river water and not of ground water, but experience has shown the reverse to be true in most cases. Possibly the best method to determine the quality of the water in the ground is to drive perforated well points to the desired depth and to analyze the water obtained from these points after pumping from them for a sufficient length of time to secure representative results. One of the most striking features indicated by such tests made by the writer along the above lines is the considerable variation in the hardness and iron content of the ground water in the bar at points comparatively near together. Especially at Zanesville, Ohio, and at Parkersburg, W. Va., have there been obtained very striking results which indicated that, at a depth of 5 feet beneath the surface of the bar, and at points less than 50 feet apart, the hardness of the water in the ground varied from 60 to 300 parts per million and its iron content from 0.2 part to 12 parts per million. At Parkersburg, W. Va., most complete preliminary tests of the above nature were made covering a distance of some 3,000 feet in the river bar, along a strip about 200 feet wide located from 1 to 2 feet below extreme low water in the river. Approximately 100 well-point tests were made and, at the final location selected, the ground water was found to be softer than the Ohio River water and of low iron content. In some instances, however, at the location tested the total hardness of the ground water was approximately three times as great as that of the river water, and its iron content occasionally was greater than 10 parts per million.

The installation of an infiltration plant was considered for Sisterville, W. Va., and preliminary tests with well points there indicated a ground water of very unusual quality, containing an average of 1,100 parts of iron (as Fe) per million and 4,500 parts of chlorine per million, at a depth of but 4 feet beneath the surface of the bar. Three points approximately 1,000 feet apart were tested, and showed comparatively little variation. Such results clearly indicate, of course, that the water in the bar beneath the river was from ground sources and not from the river.

Tests with well points made at Newark, Ohio, driven to a depth of approximately 9 feet, indicated a ground water of approximately the same hardness as the maximum hardness of the river, and of a low iron content. Preliminary tests at Owensboro, Ky., indicated considerable variations in the character of the water with increased depths at which the tests were made, particularly as regards its iron content, which was objectionably high at depths greater than 6 feet.

Tests made with well points driven to 9 feet depth at Ironton, Ohio, at the five clusters comprising the collecting system, indicated variations in hardness of from 48 to 263 parts per million at points not more than 300 feet apart, and variations in the total iron content of from 0.1 part to 2 parts per million.

As illustrating the difference of opinion existing even among engineers as regards the source of water in the bars beneath the rivers, may be mentioned a report of two of the engineers employed to investigate the water supply for

Parkersburg, W. Va. In considering the possible use of a well system located along the river bank, the engineers recommended that, in order to increase the capacity of the wells during low stages of the river, the surface of the bar in the river be removed with a dredge boat to a depth of approximately 6 inches, thus allowing the water to flow from the river into the ground toward the wells. Evidence obtained by the well-point tests made in the bottom of the river appears to indicate that the flow, especially during low stages of the stream, is from the ground into the river, and not from the river into the ground.

The well-point tests discussed above are of great value in determining the quality of the ground water available in the bar at a proposed location, but it is also necessary to know the quantity of water available. Tests of the quantity may be made by sinking into the bar to the required depth a vertical well and by measuring the water which may be pumped from the well, which is left open at the bottom. Such tests made at Gallipolis and Newark, Ohio, on wells 4 feet in diameter indicated a flow of approximately 20 gallons per square foot per minute. At Ironton, Ohio, where the bar is comparatively impervious, the rate of flow from a 10-ft. well was approximately 5 gal. per square foot per minute. Approximately similar flows were obtained from the final collecting units installed subsequent to the preliminary tests, a fact which seems to indicate that such tests furnish a reasonably accurate measurement of the quantity of water available in a bar.

Arrangement of Collecting Units.

The character of the water in the ground and the depth of filtering material determine largely the size and general arrangement of the collecting units to be used in an infiltration plant. Generally speaking, the deeper the collecting units the larger the percentage of ground water obtained, and in cases where the ground water at depths of 9 or 10 feet is of satisfactory quality collecting units of large diameter placed in a horizontal position may be used to advantage, while in cases where the ground water at such depths is not of satisfactory quality small collectors at shallower depths are required. At Newark, Ohio, where the ground water is of satisfactory quality to a depth of 10 feet, horizontal perforated collecting units 48 inches in diameter and 12 feet long are placed at a depth of 8 feet beneath the surface of the bar, while at Parkersburg, W. Va., where the deep ground water is of poor quality, the collecting system comprises 5-in. brass Cook strainers placed horizontally 5 feet deep in the bar. At Ironton, Ohio, the collecting system comprises 20 vertical wells 4 feet in diameter, placed at a depth of approximately 9 feet. The maximum capacity of this plant during normally low stages of the river has been approximately 1½ million gallons daily, corresponding to a flow of 4 gallons per minute per square foot of well area. As previously stated, the bar at Ironton is comparatively impervious, a fact which explains the small capacity of the Ironton wells.

Provision for Back-Flushing.

An important feature to be considered in the arrangement of the collecting units is the provision for back-flushing. At Ironton, Ohio, the 20 wells were not divided into groups for separate flushing, but few of the wells were cleaned. Moreover, the water used for back-flushing has washed the material away from the wells, which have settled and broken their connections to the main suction. The plant now under construction at Parkersburg, W. Va., is to comprise 160 horizontal collecting units divided into five groups, each of which may be back-flushed independently. The necessary limitation in the volume of water available for back-flushing and the necessity of obtaining a good distribution of the water during flushing makes desirable the division of the units into as small groups as possible. Such a division, however, tends to increase the cost of installation, particularly

of the suction pipes extending from the collectors to the pumping station. At Parkersburg, W. Va., the five collecting units are to be directly connected to the pumps by five 18-in. cast-iron suctions. The wells at Newark, Ohio, are divided into groups of two each, and gate valves are provided to flush each group independently.

In the above discussion it has been the endeavor to state as briefly as possible some of the features which the engineer must consider in the installation of an infiltration plant. The principal fact which it is wished to emphasize is the proposition under consideration. The many failures of filtration plants are believed to be due largely to lack of efficient engineering supervision during construction.

Cost of Installation.

In conclusion it may be of interest to mention the cost of installation of a few of the water purification plants of the infiltration type, although such figures are of but little value for comparative purposes. The plant at Owensboro, Ky., was installed at a cost of approximately \$20,000 per million gallons daily capacity; that at Parkersburg, W. Va., is of a similar type and will be installed at approximately the same cost per million gallons. The plant at Gallipolis was installed at a cost of approximately \$10,000 per million gallons capacity, and that at Ironton at a cost of approximately \$50,000 per million gallon capacity. The plant at Newark is composed of horizontal collecting wells of large diameter, and was installed at a cost of approximately \$6,000 per million gallons capacity.

The operation of an infiltration plant is generally accomplished at even less cost than that required to pump unpurified water from the stream beneath which the collecting system is located, and in the event that water of good physical and chemical quality is obtained in ample quantity, such a plant should be a marked success. The satisfactory quality of such a supply from a sanitary point of view may be assured by the use of a germicide such as hypochlorite of lime, and it will be of interest to the engineer to note whether or not the continued satisfactory use of such a germicide may lead to the installation of numerous infiltration plants operating with success from a point of view of economy and also of efficiency.

The Canadian Pacific Railway has awarded the contract for the construction of the huge dam on the Bow River at Bassano, in Alberta, which is to be used in connection with irrigating an additional 540,000 acres of land in the eastern section of the company's irrigation block. Messrs. Janse, McDonnell and Company have the contract for the earth work, and the Walker-Fyshe Company the contract for the concrete work. In connection with the work, 800 mules that have been employed at the Panama canal will shortly be shipped to Bassano. A force of about 2,500 men will be organized, and the work will be started at the opening of the spring.

The corporation of British Columbia Land Surveyors have elected the following officers for the ensuing year; President, E. A. Cleveland, Vancouver; vice-president, W. S. Gore, Victoria; secretary-treasurer, S. A. Roberts, Victoria.

A meeting of the Winnipeg unions was addressed last week by Mr. T. R. Preece, Indianapolis, Ind., first vice-president of the Bricklayers, Masons and Plasterers' International Union. It is stated to be the intention to adjust the year's business well ahead of operations so as not to cause any interference with the busy building season.

Mr. John Wilson has been appointed city engineer of Fort William, vice H. S. Hancock, jr., resigned.

Municipal Engineering at New Westminster

J. W. B. Blackman, City Engineer, Furnishes Evidences of Activity—Progressive Policy of Improvement Typical of all British Columbia — An Interesting Report

The annual report of Mr. J. W. B. Blackman, city engineer of New Westminster, B.C., indicates considerable activity in the Royal City during 1910. Plans and specifications were prepared for the Eighth street sewerage system, which consists of over 14 miles of vitrified pipe. The total mileage of sewers in the city is 30.65. Reports have been made and specifications prepared for a considerable amount of street improvement work, which promises well for 1911.

Last year improvements were practically completed on Columbia street at an expenditure of \$104,950. The amount of authorized extras for the city was only \$967. The year witnessed the completion of the First street sewerage system within the amount estimated.

The engineering work has been completed for the Second, Third and Fourth street improvement schemes, which entail an expenditure of \$133,850. The following extracts from Mr. Blackman's report contain several items of interest:

Report on Progress of Laying 25-in. Main.

The contract for laying the new 25-in. water main from Coquitlam Lake to the city was let on June 27th, 1910, to the Municipal Construction Company, of Vancouver. The contractors commenced in August last, and work has been carried on continuously since that date, except for unavoidable delays due to hard weather. Up to the 31st December

one pipe length (22 feet) in one day. All, or nearly all, the most difficult part of the work is now completed, and it is expected that the whole of the upper portion of $5\frac{3}{4}$ miles will be finished in March. This will leave three months to complete the remaining portion of $8\frac{3}{4}$ miles from Westminster Junction to the city, and with two construction camps and no serious difficulties in the way, this should be accomplished. This will call for under 400 feet of pipe to be laid per camp per day, and after making all allowances for bad weather and unavoidable delays there should be no difficulty in completing the whole of the work by the contract date of July 1st, 1911.

Every care is being taken in laying the main. All joints are carefully inspected before being covered in, and the whole of the work is being done in workmanlike manner.

The Lulu Island branch has been laid from the city limits of Lulu Island to within a few hundred feet of the bridge, and on the mainland side, from the bridge to the foot of Royal avenue, making a total of two miles laid on this section, or a grand total of five and two-fifths miles on the whole scheme. Messrs. McDonald, the manufacturers of the steel pipe, have completed all the work on the straight pipe. All the tests that have been placed on these pipes have proved highly satisfactory. Every rivet, and every pipe has been inspected before leaving the shops.

For the work to be done in the city (but not yet started) I estimate the value of the schemes prepared, contracts let, etc., at \$280,000, for which this department should be credited with one per cent. for engineering work, and also with \$1,000 for general city work, such as giving street lines and grades, preparing building by-laws, reports, etc. On making these very moderate deductions I find that the actual work completed in the city this year has cost only two per cent. for engineering expenses and inspection.

Mr. M. B. Logan has recently severed his connection with Siemens Bros. Dynamo Works, Ltd., and has opened up offices with Mr. C. T. Bowring as Consulting Engineer under the name of Bowring & Logan, at 34 Victoria street, Toronto. Mr. Logan, who is well known in Toronto, has for a number of years been connected with Siemens Bros., both in Europe and Canada. Mr. Bowring has had long experience in the United States with the Westinghouse Electric & Manufacturing Co., and been identified with a large number of their installations.

The important water power development now being carried out at Jordan River, Vancouver Island, by the Vancouver Island Power Company, Limited, a subsidiary company of the B. C. Electric Railway Company, Limited, is making excellent progress, about 90 per cent. of the first installation having been completed. During the past summer an average of between 1,000 and 1,500 men have been employed. At this date, owing to the very wet weather, the force is cut down to about 300. Most of the pipe has been received and is now being placed. The majority of the electrical and hydraulic machinery is also being put in position. Owing to the weather conditions it is not expected that it will be possible to finish the first installation until well on in the spring.



Columbia Street, New Westminster, B.C.

a total length of three and two-fifths miles of 25-in. pipe had been laid and completed. A length of four-fifths of a mile had been completed at the upper or lake end of the line, and two and three-fifths miles have been completed from the lower construction camp established about two miles north of Westminster Junction. Very good progress has been made at this camp, nearly one mile of pipe having been laid in a month.

In the Mountain section many difficulties have been met with, these being the cause of the small amounts of pipe completed. The trenches are close to the steep hill slopes, in treacherous clay, the ground being full of water and difficult to excavate. The annual mean rainfall at the lake is as high as 160 inches, and much delay is due to rain and bad weather.

At times it has been found impossible to lay more than

New Plant for Shediac, N. B.

The Shediac Electric Light Company, of Shediac, N.B. started up their new plant on December 1st, 1910. The equipment consists of two 18 inch Kennedy water wheels and a C. G. E. 75 k.w. 2,300 volt, 60 cycle generator. The



75 k.w. Hydro-Electric Plant for Shediac, N. B.

transmission line is $3\frac{1}{2}$ miles long. The street lighting is by series tungstens with Westinghouse regulator. Forty 32 c.p. units have been installed to date. Mr. E. A. Smith is the managing director of the company.

Cost of Tarvia Pavement at Fredericton, N. B.

Tarvia pavement was laid at Fredericton, N.B., during 1910 at a cost of \$1.04½ cents a square yard, according to information furnished by Mr. John L. Feeney, city engineer, who reports as follows:

During the past season two blocks of tarvia pavement were laid on Queen street from St. John to Regent streets and from York to Westmoreland street. The pavement was hardly in use long enough to competently judge of its quality, but it gave ample evidence of being sufficiently durable for the traffic of this city, which was the only thing upon which fears were entertained as to its suitability; moreover, the cost, as can be seen from the following figures, is well within the range of a city the size of Fredericton.

Amount of Pavement Laid.

Queen street—York to Westmoreland—3,080 sq. yards.
Queen street—St. John to Regent—2,502 square yards.
Total amount—5,582 square yards.

Stone.

The road metal used in the construction of these blocks was nearly all $1\frac{1}{2}$ to 2 in. trap rock, though a small amount of sand stone was of necessity used on the lower one. The stone was purchased from the roads and streets department, to whom the permanent street department is indebted for the following amount:

1,603 tons crushed trap rock at \$1.30 \$2,083.90
130 tons sand stone at \$1.00 130.00

Total \$2,213.90

Binder.

The binder material used was Tarvia X, which was applied hot to the road. Two applications of the binder was used on the wearing course and also on the top dressing. This material is manufactured by the Barret Manufacturing Company, of Boston, Mass., and was purchased through that company's Maritime Provinces branch, the Carritte-Pater-

son Company, of St. John, N.B., at a cost of \$5.25 per cask of forty imperial gallons, landed in this city.

The total amount of tarvia procured from this company was 378 casks at a cost of \$1,984.50; of this number 357 casks were used, leaving 21 casks now in stock for next season; of the empty casks 345 were returned to the company, netting the city the sum of \$94.15. Thus the total cost of tarvia used was the cost of the 357 casks, viz., \$1,874.25, less \$94.15—\$1,780.10, which is equivalent to 12.5 cents per imperial gallon.

The amount of tarvia used per square yard was 2.56 imperial gallons (3.07 U. S. gallons), of this amount two gallons were used on the wearing course and 0.56 gallons on the top dressing.

Sand.

This was used on the finished surface of the pavement. The total amount used was: 45 loads at \$1.25 per load, making a total cost of \$56.25. The amount used per 100 square yards was 4.6 cubic yards.

Cost of Pavement.

Since all tar-macadam roads have for their essential features (1) A macadam foundation, and (2) some form of coal tar binder, the following itemized statement shows (1) the actual cost of the macadam road in itself and (2) the actual cost of the tarvia binder and everything incidental to its use.

Statement Showing Cost of Macadam Road.

Broken stone	\$2,213.90
Labor	459.75
Teaming	412.54
Rolling	114.99
Engineering and superintendence	303.78
Sundries	44.33

Total \$3,549.29

Cost per square yard, 63½c.

Statement Showing Cost of Tarvia Treatment.

Tarvia \$1,780.10
Labor incidental to heating, application, etc..... 315.32
Cost of plant, tools, etc. 133.30
Sand 46.25

Total \$2,284.87

Cost per square yard, 41c.

The total cost of the pavement proper was thus \$5,834.16, or a cost per square yard of \$1.04½, which is a very low figure, more especially when consideration is given to the following facts:

(1) That the past season was the first attempt in this city in the construction of tar-macadam roads.

(2) The cost of tarvia in this city was 12.5 cents per imperial gallon, whilst the same product can be procured in New England cities at a cost of ten cents per imperial gallon.

The essential features in the low cost of construction were (1) low cost of crushed stone in comparison with other cities; (2) the short haul; (3) the small amount of excavation necessary.

Mr. Donald S. Barton, formerly manager Quebec Electric Light Company, has been appointed Consulting Electrical Engineer, with special duties, of the Quebec Railway, Light, Heat and Power Company. Mr. C. J. Pigot, formerly Secretary and Roadmaster of the Quebec Railway, Light & Power Co., has been appointed Chief Engineer of the same company, in succession to Mr. E. A. Evans, resigned. Mr. Pigot will have charge of all construction work (except electric) track and roadway, real estate and buildings and general engineering.

Reinforced Concrete for Long Spans for Light Loads

Among the important papers presented at the recent meeting of cement users in Chicago was one by Emile G. Perrot, architect, relating to the above subject, from which we take the following:

While there has been no doubt of the economy and practicality of reinforced concrete for massive construction and where heavy loads are carried, the advisability of its use for light floor loads, especially if the spans are long, has been questioned even by those who favor its use in other instances. The dead weight of the material itself has often operated against its use, especially where the carrying capacity of the soil required the unit pressure to be kept to the minimum, or from other like causes.

We all agree that clear spans of forty or fifty feet in buildings are not usual and are generally avoided on account of their increased cost; hence a description of such a span, with its cost as compared with steel girder construction for the same span, is of interest.

While the author does not wish to take any credit for originality in the design of this floor, as the same general scheme has been used many times before for shorter spans, it is because of the unusual length of the span that its details become an important factor in the design.

The Floor Spans.

The spans in question form the floors over the swimming pool and gymnasium of the Turngemeinde Club House, Philadelphia, and are 53 ft. 1 7/8 in. clear span. There are two floors with these spans, of an area of about 4,700 sq. ft. each, having five girders on the first floor and six on the second floor, spaced 13 ft. 9 in. centers. Those of the first floor are only 36 in. deep below the joist, on account of head room. The top portion or T-head is 5 ft. 4 in. wide and 14 in. thick. These girders are reinforced with twenty-one 1 1/8 in. square twisted bars, and the stirrups are 1 x 1/8 in. flat iron. Great care was taken to place the in the bottom of the moulds on cast cement chairs, while the spacing of the bars and stirrup was maintained by iron rods and the wiring of one bar to the other.

The floor panels between the girders consist of 5 x 12 in. concrete joists, with a 2 in. reinforced concrete slab over same, and 12 x 12 plaster block centers between each joist, thus making a flat ceiling between girders. The joists are reinforced with one 11-16 in. square twisted bars and eight 3/4 in. stirrups. In the top of every third joist were placed two 3/4 in. square twisted bars over the girders to act as tie. These rods were only 5 ft. long, but two were used in each case, lapped in the center so as to project beyond the T-head into the joists. The slab is reinforced with 1/4 in. rods run in both directions, 12 in. on centers or thereabouts.

Girders for Auditorium Floor.

The girders supporting the auditorium floor, on account of the higher ceiling, are 42 in. deep, with T-head, 4 ft. 9 in. wide. The reinforcement in the bottom consists of eighteen 1 1/8 in. square twisted bars, bent the same as for first floor.

Each floor is designed for a live load of 120 lbs. per square foot, as the top floor is an auditorium and the floor below a gymnasium.

There seemed to be some doubt amongst the members of the Building Committee as to the advisability of constructing such long span of reinforced concrete, but in order to obtain the actual difference in cost between steel and concrete, we designed the girders of Bethlehem steel girder sections, reinforced with top and bottom cover plates and properly fireproofed. The size of the steel girders was 30 in. deep, 200 lbs. per foot, with two cover plates on each flange, one 5/8 x 15 in. and one 1/2 x 15 in. We obtained bids from the building contractor for the difference in cost of these girders, we having likewise made an estimate of the difference in cost. The contractor's price for them was \$6,500 additional to his contract price, although our estimate of the dif-

ference was somewhat less, being \$4,664, based on prices obtained from outside sources. Taking our figures as a basis, as there are 5,400 square feet in the two floors, the difference in cost for the structural steel, fireproofed, is 50 cents a square foot more than the reinforced concrete, with no increased advantage.

The weight of the structural steel for a girder, as compared to the weight of reinforcing steel, is as follows:

Total weight of steel girders, with strap iron reinforcement for fireproofing and bearing plate, about 17,000 lbs.

Total weight of reinforcing steel in one reinforced concrete girder, 36 in. deep, 5,500 lbs.

This shows that it takes about one-third the amount of steel for reinforced concrete as compared with structural steel for girders and beams. The amount of saving in concrete would be the overhanging portions of the T-head, which amounts to 2 1/4 yards per beam, when the extra thickness of concrete on the girders is taken into account, due to the wide flanges on the steel girders; likewise there would be additional plaster blocks necessary to take the place of the T-head omitted, the cost of which would have to be deducted from the saving effected by omitting the T-head.

The sub-contractor for the reinforced concrete work gave the cost of the plaster blocks, delivered at the job, as 14c per square foot, and setting of same, including the nailing on of a fine wire screen at each end to prevent the concrete running into the hollow part of the block, as three cents a square foot additional.

The Plaster Blocks.

The plaster block weighs 25 lbs. per square foot, as compared with 40 lbs. per square foot for terra cotta tile, which cost the same price as the plaster block, but which are not as easily handled, being only 12 in. long, whereas the plaster blocks are 3 ft. long and can be sawed to fit any position.

The walls of plaster blocks are about 1 1/2 in. thick, and there are two cells in each block, separated by a vertical wall in the middle, which strengthens the block so that traffic can take place over them before and during the time of pouring the concrete.

Immediately before pouring the concrete it is necessary to thoroughly soak with water the plaster blocks, as they absorb a considerable quantity of water from the concrete if not thoroughly wetted; in fact, the parts of the floor where the blocks occur and where they do not are clearly marked during the earlier stages of the setting of the concrete by the difference in its color, the concrete which does not come in contact with the plaster requiring more time to set.

For moderate spans the use of concrete joists with either the plaster block or tile filler are desirable, where a flat ceiling is sought and the load light.

In the last two years Canada has lost \$47,000,000 by fire. Consul General James W. Ragsdale, of Halifax, says that this means a per capita tax equal to \$3.35 per annum for every man, woman, and child, and if the census ratio of one adult man for every five of population is considered, then it means an annual loss equal to \$16.75 for every Canadian family. This is a loss far greater than that of any other country. In Austria the per capita loss during the same years was 29 cents; Denmark, 26 cents; France, 30 cents; Germany, 49 cents; Italy, 12 cents; and Switzerland, 30 cents.

The contract for the depot to be established by the marine and fisheries department at Prince Rupert, consisting of a reinforced concrete wharf 405 feet long and 50 feet wide with a long approach and eight frame buildings, including a buoy warehouse, power house, offices and residences, and a coal bunker to be erected on the end of the wharf has been awarded to the Pacific Coast Construction Company, of Victoria. The contract price is about \$200,000. The work will be completed by the end of the year.

Stability at Vancouver, B. C.

**Steady Progress the Feature of the Situation
—A New Record for January—Market Prices**

Office of the Contract Record,
Vancouver, B.C., Feb. 9, 1911.

In general, building throughout the city is active and steady. Labor conditions are satisfactory, and material is fairly easy to obtain.

The largest permit of the last few days was one for a 12-storey office building on Granville street for P. Burns & Company. There will be twenty-six offices to the floor. The cost is estimated at \$400,000.

Recent developments point to the vicinity around the southern end of Homer street becoming the wholesale house district of the city. A great many wholesalers have lately built houses in that direction which rival the warehouses of Toronto and Winnipeg. Many buildings are under way and promised, and the demand has doubled property values in that district within a year.

The Canadian Pacific Railway plan the construction of a new depot and steamship wharves, the present buildings being entirely inadequate for the growing needs of traffic. No sums have been mentioned in reference to the cost of these improvements, but it is known that they will run well into the millions.

The many public works sanctioned by the people on election day are now nearly all under way.

January's building permits mounted up to the magnificent total of \$1,412,000. This is the announcement at the city hall by the building inspector. Compared with the figures for the corresponding month of last year there is an increase of \$781,000, or 125 per cent., most creditable figures.

Early in the month the building inspector made the statement that he expected 1911 would see fifteen million dollars of permits issued, and if January can be taken as a basis, he should certainly make good. It is a coincidence that 144 permits were granted in both Januarys, an indication of increasing confidence on the part of the business men.

Work on the quarter million dollar annex of the Vancouver Hotel is proceeding apace. The foundations have just been completed and the erection of steel has been started.

Building material, taken all round, is plentiful. Following are the prices that obtain: Brick, No. 1 dry red pressed brick, \$50 per M.; No. 1 dry buff pressed brick, \$50 per M.; red stock bricks, \$13 per M.; Wire cut bricks for foundation work, \$12 per M.; No. 1 enamelled brick, all colors, \$90 to \$160 per M.

Cement, \$3.25 a barrel; lime, \$1.35 a barrel; sand, 75c. a yard; gravel, \$1.75 a yard; plaster, fibred and unfibred, \$16.00 a ton; sacquet plaster board, 25 cents a yard.

Building papers: Tarred, 90 cents; white, 70 cents; rosin sized, \$1.25. laths, \$2.00 M.

Paints: White lead, 8½ cents. boiled oil, \$1.35; raw oil, \$1.33; mixed paints, \$2.25; turpentine filler, \$1.50; patent dryer, 10c. pound; turpentine, \$1.50 gal.; Barry Bros. liquid granite, \$3.25; Luxbury, \$2.75; flowing coach, \$2.25; hard oil finished, \$2.25; furniture varnish, \$1.00; Japan dryer, \$1.00; black Japan, \$1.25.

Foretastes of Activity at Montreal

Office of the Contract Record,
Montreal, Feb. 10, 1911.

Building permits totalling \$330,365 were issued in January, covering 58 buildings. The Y. M. C. A. contract, which will cost \$300,000, will be included in the February total. The greatest activity prevails in the architects' offices in

connection with residential properties, an idea of which can be gathered from the contracts department. One of the most striking buildings will be the McGregor street house, a feature of which will be a large oval dining room in the center of the first floor and a large billiard room which is to be erected in the basement. Two prominent real estate firms have recently branched out into architectural and construction work, these being the house of Brown and Colonial, real estate, the latter being a branch of the Henry Morgan departmental store. Colonial House, it is stated, will have its own brick manufacturing plant running by the summer.

Considerable extensions are spoken of at the C. P. R. Angus shops, whilst some of the largest engineering firms are looking round for room for expansion to make ready for the increased business expected this year. At the present time it is impossible to find a pessimist in either the local building or engineering circles.

Canadian Railroad Development

Green & Burdick Bros., Victoria, B.C., are securing the right of way for the first 20 miles of the Victoria & Barkley Sound Railway. Already a number of contracts have been entered into with the owners of land, and it is anticipated that the necessary right of way between Victoria and Sooke will have been purchased within a short time. Construction work will commence at the Victoria end of the section, probably some four miles from Victoria.

Among the other railroad matters which will shortly come before parliament, the Hudson Bay, Peace River & Pacific Railway Company will apply for incorporation. This company proposes to build from Port Nelson to Fort Churchill, then westerly to Fort Vermilion on the Peace River, thence southeasterly to Fort S. John, thence westerly to Laurier Pass and on to Port Simpson, also from St. John to Edmonton. The Aisek & Yukon Railway will apply for an extension of time for construction for legislation to expend 15 per cent. of the amount of its capital, for four years, and for completion in seven years. The Dominion Development Company will seek incorporation. It proposes a line to run from the Nass River on the Portland Canal to Fort Churchill and Port Nelson.

There has been a considerable amount of railroad construction during the past year in the vicinity of Moose Jaw, Sask. During the past year the Grand Trunk Pacific has had its line approved from Regina to Moose Jaw, paralleling the main line of the C. P. R. on the north side. Construction work on this line has already started and will be carried on to completion during 1911. An extension of this line is planned running northwesterly from Moose Jaw between the main line of the C. P. R. and the Moose Jaw-Lacombe branch of the Saskatchewan River. The route of this line has not yet been approved by the railway committee at Ottawa. The Canada Northern Railway has also had approved during the past year a line running from Regina to Moose Jaw on the north side of the proposed G. T. P. line to a point in township 17, range 24, w. 2nd, where it intersects the G. T. P. line coming into the city toward the north. This road will be started at an early date. Construction work has been active on the Maryfield extension of the C. N. R., which enters from the south, and this road is graded to New Warren, a point about thirty miles southeast of Moose Jaw. The route of this line has been somewhat diverted since the original survey and instead of coming in close to the C. P. R. at Pasqua, it runs in a more westerly direction. The line has now been surveyed to the city limits, but it has not yet been made public where it will enter the city. The C. N. R. has another proposed line running from Moose Jaw to the south side of Lake Johnston, thence in a northwesterly direction to Swift Current. This route has not yet been approved at Ottawa, but will be under consideration during the present

month. The Alberta Central has also obtained approval for a branch from Red Deer, Alta., to Moose Jaw. This line will approach Moose Jaw from the northwest, crossing the Saskatchewan River at a point somewhat between the Moose Jaw-Lacombe branch and the main line of the C. P. R.

C.N.R. Pacific Terminus Located

The exact location of Port Mann, the Pacific terminus of the C. N. R., has been settled on a site of 4,000 acres, 1½ miles from New Westminster, on the south bank of the Fraser river. The future city will have a river frontage of 2½ miles. Contracts have already been let and 350 men are at work clearing the ground of the standing timber. By the end of May it is expected that every thing will be in readiness to permit of the preliminary surveys being made. Warehouses, elevators and wharves are to be constructed as soon as possible, and it is estimated that when these works are put up, together with the railroad and repair shops, which are also to be erected in readiness for the completion of the British Columbia section of the C. N. R. that they will support a population of 10,000 workers. Large coal docks are to be established for the purpose of handling the shipments from the Dunsmuir collieries at Vancouver Island.

G.T.R. Terminal Construction at Ottawa

Mr. Alex. Gray, resident engineer of the Grand Trunk at Ottawa, in an address before the Ottawa branch of the Canadian Society of Civil Engineers this week, gave an outline of the work already done in the company's terminal in this city. Already it has spent about \$2,000,000. This includes only a portion of the cost of the hotel and station which are only partially completed. The changes will increase the yard accommodation very greatly. The accommodation in the freight yard is increased 50 per cent. and with better facilities than before. The changes in the freight yards alone have cost the company \$45,000.

He stated that it was the intention of the company to build a large train shed at the rear of the new station. It will be 500 feet long and will cover the entire eight tracks. It will be of the Bush type similar to that of the Lackawanna terminal at New York. The roof will be of glass, in iron or steel frames, and will be supported by steel. There are open spaces over the funnels of the engines. It will extend from the baggage annex on the east and the western side will rest on the retaining wall already built by the company along the Rideau canal. Details of the shed have not yet been determined. The platforms between the tracks will be of concrete. The entire width of the sheds will be about 182 feet.

Mr. Gray gave a good description of the building of the big retaining wall along the canal. This wall is 1,079 feet long and average 17 feet in height. It contains 2,880 cubic yards of concrete. There was considerable difficulty in the construction on account of the foundation. It had been expected that the foundation would be all rock. However, at one point it was of boulders and gravel. For this 137 feet the retaining wall is built on concrete piers. These piers are 9 feet 10 inches by 5 feet and are an average depth of 14 feet below the base of the wall. The piers are 14 feet apart from center to center. They are joined together by a concrete slab 2 feet thick which is reinforced with old rails. The wall is designed to carry 5,000 lbs. per foot. The work was started on February 20, 1910, and completed on May 1 of the same year. The cost of this wall was \$24,050.

Mr. Gray stated that interlocking switches would be installed in the yard. By this means when one switch is opened all the rest close automatically. The switches will be moved from a tower.

Personal News and Notes

The Brockville town council has abolished the office of town engineer. In future all works will be carried out by special appointment.

Mr. H. S. Hancock, jr., formerly city engineer of Fort William, and Mr. G. P. Astell, until recently a member of his staff, left last week for Vancouver, B.C.

The Lord Strathcona cup, the premier prize of the Strathcona Curling Club, was won by City Engineer A. J. McLean, who defeated Mr. S. Kelly, city electrician.

Hon. Geo. Graham, Minister of Railways and Canals, was in Montreal last week in conference with Messrs. Vautelet, M. J. Butler and H. L. Hodge, the Quebec bridge experts.

Mr. J. W. Longbottom, a Toronto building contractor, died last week at his residence in that city, 74 Northumberland avenue. Deceased was born at Bolton, Ont., 58 years ago.

At the recent convention of the Alberta Association of Architects at Calgary a committee was appointed to discuss the best means for obtaining a contract form for general use throughout the province.

The Guelph, Ont., Board of Works are about to invite applications for a new city engineer. The present official, Mr. James Hutcheon, finds that it is impossible for him to devote his whole time to civic work.

Increased activity is expected by the building trades this season at St. John, N.B. The master carpenters of that city are expected to demand an increase to \$3 a day, but probably this will be arranged satisfactorily.

A number of English capitalists will build a \$300,000 hotel at Saskatoon, Sask., the contract having been let to the Winnipeg firm of Carter-Halls-Aldinger. Messrs. Brown & Vallance, of Montreal, are the architects.

The will of the late F. B. Polson, of the Polson Iron Works, which was filed for probate last week, discloses the fact that Mr. Polson owned 2,998 one hundred dollar shares in the iron works which bears his name and \$11,000 in real estate and other holdings.

Exceptional winter building activity is a feature of the situation at Winnipeg. For the first time work has been maintained throughout the winter with practically no interruption. It is reported that in addition to the work under way contracts aggregating \$11,000,000 have been awarded.

The London, Ont., Board of Water Commissioners have decided to impose a penalty of \$9,200 on the Canadian Westinghouse Company for non-fulfilment of a contract for the installation of certain electrical machinery and apparatus which was delayed from October 28th until the middle of last month.

The following names are mentioned in connection with the vacancy caused by the death of Mr. J. E. Schwitzer, late chief engineer of the C. P. R.: F. F. Busted, at present general superintendent on the Pacific coast; F. P. Gutelius, general superintendent at Montreal, and J. G. Sullivan, at present the assistant chief engineer in Montreal.

We regret to report the death of Mr. Geo. McFarland, a well known building contractor, of Vancouver, B.C., which occurred last week in that city. The late Mr. McFarland was born at Niagara-on-the-Lake, Ont., 70 years ago, and went to British Columbia about 1890. He carried out important contract work at Vancouver, Victoria, New Westminster and Nelson.

Mr. Isaac Laurin has instituted a \$50,000 suit against the city of Montreal for alleged patent infringement. Mr. Laurin claims that the water department has adopted an effective device invented by him for draining hydrants out so as to prevent freezing. For this he received no recom-

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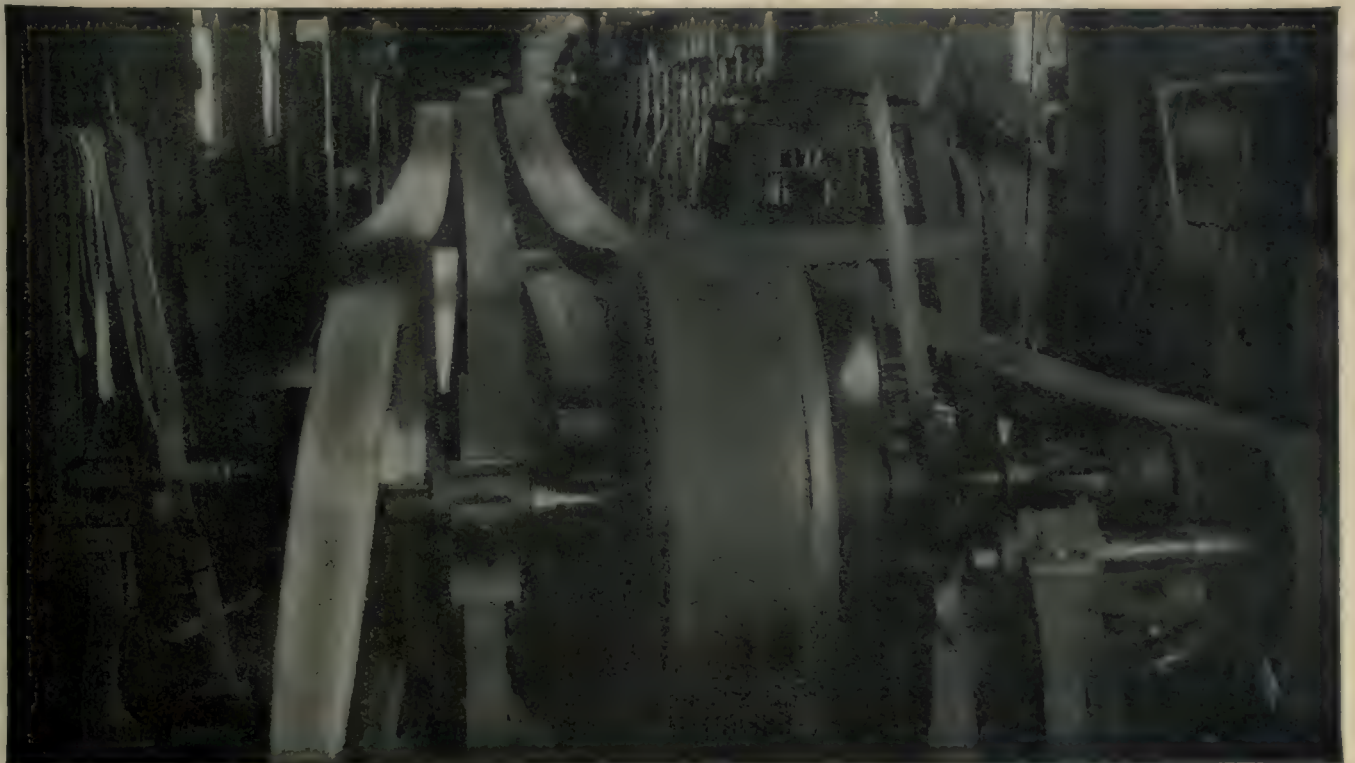
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pense. The city officials, Messrs. Janin and Lesage, claim that this identical pattern of hydrant has been in use for the last thirty years.

The annual report of Town Engineer Johnston, of Berlin, Ont., shows that the sum of \$146,638 was expended in local improvements during 1910. Four miles of cement walk were constructed at a total cost of \$11,642. Concrete curbs and gutters represented \$3,714.

City Surveyor Barlow, of Montreal, was complimented by the Board of Control on the expeditious manner in which his department has succeeded in clearing the streets of snow after the big storm. The expense of the recent blizzard to the city are estimated at \$40,000. On one day 1,300 teams were engaged. There are 500 miles of sidewalks in the city to clear.

City Engineer Rust, Mr. Kenneth Aitken, city electrical engineer, and Mr. J. W. Moyes, consulting engineer, all of Toronto, were in New York last week gathering information upon the construction and operation of the Edison storage batteries. Mr. Rust also obtained estimates for the building of motor busses, for purpose of comparison with figures submitted by English firms.

Mr. Allan Purvis, manager of the interurban lines of the British Columbia Electric Railway Company, has informed the president of the Burnaby Board of Trade, Mr. B. G. Walker, that the company will erect, in the near future, a fine station at Edmonds, which is situated just on the city limits in Burnaby. The station will be after the style of the one at Chilliwack, with inside waiting rooms, electric heating, etc.

At a recent meeting of the Winnipeg branch of the Canadian Society of Civil Engineers there was a further discussion of the paper given by Mr. W. G. Chace at the annual convention of the parent society. Those who took part were W. M. Scott, Professor Brydone-Jack, J. J. Aldridge, D. A. Ross and others. The opinion was unanimous that the methods employed and the progress made on the plant were eminently satisfactory.

James C. Kennedy, civil and hydraulic engineer, Vancouver, spent the week of January 16-21 in Winnipeg attending the annual meeting of the Canadian Society of Civil Engineers. On his way back Mr. Kennedy spent a few days at the famous Coldstream Ranch near Victoria, B.C., where he is superintending the carrying out of an extensive irrigation project. Recently Mr. Kennedy removed his office from the Flack block to Suite 413, in the new Pacific Building, corner Hastings and Howe streets.

The Glidden Varnish Company have sent a special representative to South Africa to place their concrete finishes and waterproofings among the architects and engineers. Their Mr. Tornero, a native of South America, sailed on January 25th to locate permanently in Buenos Ayres, where he will have entire charge of the development of the concrete coating business of the Glidden Varnish Company, as pertaining to South American countries. Demands for the Glidden products are coming from every quarter of the globe and their export business during the past year in concrete finishes was enormous. Their principal sources of out-are India, South Africa, China and South America.

A Dominion patent was secured four years ago under the name of Tarlithic for a pavement which has since been laid in Collingwood, Chatham and Guelph, and has proven in each case highly satisfactory. Tarlithic has been used extensively in England for years. It is composed of a concrete foundation, and a wearing surface three inches thick of broken stone, cement, and certain gas tars, spread on the foundation in layers and rolled after each layer is spread with an 8-ton roller. The surfacing materials are heated be-

fore being placed on the roadway, then allowed to cool, allowing all the gases to escape before being compacted. The finished pavement presents an excellent appearance and has the advantages of economy, durability, noiselessness and sanitation. The Fielding Paving & Construction Company, of Chatham, Ont., and John Conn, of Windsor, Ont., are behind the proposition.

Quebec Builders' Exchange

The annual meeting of the above body which was held on February 3rd, was presided over by Mr. E. T. Nesbitt, who was re-elected president. The remaining officers were appointed as follows: Vice-president, A. Picard; secretary-treasurer, J. D. Lefavre; directors, E. T. Nesbitt, C. E. Morrisette, L. H. Gaudry, A. Picard, A. Dugal, G. A. Marier, L. H. Peters, J. E. Marineau, J. L. Lachance, P. A. Lamonde and N. Barbeau. The delegates elected to represent the Exchange at the annual meeting of the C. N. A. B. now being held in Winnipeg were Messrs. Picard, Gaudry and Lachance. The second annual dinner of the Exchange will be held at the Kent House, Quebec, on February 25th.

The Late Roderick McLennan, C.E.

A distinguished career was ended recently by the death of Mr. Roderick McLennan, C.E., at his home in Toronto. The late Mr. McLennan was born at Glengarry in 1823 and was the son of Scottish parents. On leaving college he engaged in railway construction in the Southern States as an engineer, and was identified with such lines as the Georgia Central and South-Western Railways.

In 1864, while trying to return to Canada, Mr. McLennan was taken prisoner by the Confederate soldiers, and detained for thirteen weeks. On arrival in Canada Mr. McLennan worked on the Intercolonial Railway, and later did survey and exploration work in British Columbia. In 1872 he was made district engineer of government railways between Port Arthur and Winnipeg, and afterwards became chief engineer of construction for the C. P. R. on the Lake Superior division. Mr. McLennan took up his residence in Toronto in 1885. He had been living in retirement for the last fifteen years.

Reinforced Concrete Barges and Pontoons

We are in receipt of an interesting little booklet on the above subject from James Taylor, consulting engineer, Montreal. The history of concrete boats, as set forth in this folder, dates back to 1850, when a Frenchman named Lambot constructed one, exhibiting it five years later at the Paris Exposition. This is supposed to be the first reinforced concrete structure of any kind. Lambot patented the invention, believing that the material was well adapted to boat building. From that date, however, no further development took place until in 1907, the Signori Gabellini, an Italian firm, took the matter up on a large scale, and constructed a concrete barge of 150 tons for use on the Tiber and the coast. This boat has been in continuous service ever since and proved thoroughly satisfactory in every way. Since then concrete boat-building has made rapid progress in Italy and France, and there are now large numbers of barges and pontoons, of this construction and of all sizes, in use in these countries. As an illustration of the adaptability of this material for marine floating structures, it may be stated that the Italian firm mentioned above have built six car ferries for the Italian State Railways, each 158 feet long and each capable of transporting six freight cars. Concrete boat building has thus passed the experimental stage and it seems to us that this form of construction is worthy of the investigation of the engineering and contracting interests.

Contracts Department

News of Special Interest to Contractors, Engineers, Manufacturers and Dealers in Building Supplies.

Information for insertion in these columns is invited from Architects, Contractors, Engineers, etc.

Waterworks, Sewerage and Roadways

Belleville, Ont.

Tenders will be received until February 25th for excavation of 9-in. drain on Campbell street from Y. M. C. A. to Front st. sewer. Specifications at Y. M. C. A.

Brantford, Ont.

Tenders are called by the Board of Works until March 2nd for supply of sewer pipe for year 1911. T. Harry Jones, city engineer. Advertisement in "Tenders and For Sale Department" of this issue.

Calgary, Alta.

Tenders addressed to W. D. Spence, city clerk, will be received until March 15th for construction of concrete walks. Specifications at office of city engineer.

By-laws will be submitted to the ratepayers for approval shortly to authorize the expenditure of \$245,000 on waterworks extensions; \$40,000 on sewer connections; street paving plant (previously mentioned). By-laws are also being prepared for a large trunk sewer and for lateral extensions, to cost about \$500,000. A. G. Graves, city commissioner.

The city is now constructing a miniature gravity system that will cost \$8,000. This new system is the one that will supply water to the new power plant on the Elbow, near the street car barns. A head of about 8 feet of water will thus be obtained. Eighteen inch wooden pipes will be used, excepting where the pipes cross the river, when iron is used. There is 3,500 feet of piping. A supply of between 4 and 5 million gallons will be obtained in a 24 hour day.

Carleton Place, Ont.

A public meeting has been called to discuss the proposition of installing a waterworks system.

Edmonton, Alta.

Tenders will be received by city commissioners here until March 1st for supply of lead pipe, galvanized iron pipe and brass goods. Specifications at waterworks department.

Hamilton, Ont.

Tenders addressed to G. H. Lees, chairman of Board of Control, will be received until March 9th for construction of sewers, etc. S. H. Kent, city clerk. Advertisements in "Tenders and For Sale Department" of this issue.

Kingston, Ont.

Kingston will build all its roadways under the local improvement law.

London, Ont.

Tenders addressed to chairman No. 2 committee were received until February 20th for construction of sewer on Windsor ave., involving 810 lineal feet 8-in. tile sewer; 1,854 lineal feet 6-in.

side drains; 3 brick manholes. A. H. VanCleve, city engineer.

Montreal, Que.

The mayor and city clerk have been empowered to enter into a contract with the firm of Messrs. Herring, Fuller & Monahan, New York, who will draw plans for the work to be done. These plans are to be ready for the early part of the coming spring, so that the city will be in a position to call for tenders for the construction of the plant. All operations in connection will be carried out under the direction of George Janin, city engineer. The plans will provide for a low lift pumping equipment, preliminary filters and final filters. In addition to this, there will be special reservoirs for the filtered water, whilst all appurtenances, including pipes conveying water to and through the present closed conduit and terminating in a new suction well for the high lift pumping apparatus, are provided for.

North Toronto, Ont.

North Toronto ratepayers passed a resolution favoring the construction of a sewerage system from the plans prepared by Engineer T. Aird Murray, the cost to be levied by a general tax.

Oshawa, Ont.

At a meeting of the council the town engineer was authorized to advertise for tenders for asphalt blocking of centre of town roadway.

Tenders are called until March 18th for construction of an asphalt block pavement on a concrete base, etc. Advertisement in "Tenders and For Sale Department" of this issue. Frank Chapell, town engineer.

Ottawa, Ont.

Mr. N. Cauchon is preparing plans for a sedimentation basin for Ottawa's water supply from Lake Deschene, which will be laid before the board of trade at its next meeting.

Pembroke, Ont.

Tenders called for laying 5,900 feet 16-in. force waterworks main from near pump house to connect with present system opened 13th, bids as follows: Emile Michel, Pembroke, \$4,300; Edward Behan, Pembroke, \$6,765; Feiney-hough & Banand, Pembroke, \$10,492; G. Crowe & Son, Trenton, \$5,989; R. Brewder, Ottawa, \$4,452; J. F. Connolly, Toronto, \$5,800. A. J. Fortier, clerk.

The following list of tenders received for intake pipe and force main will be of interest:

Geo. Crowe & Son, Trenton, Ont., intake, \$9,812; force, \$5,989; total, \$15,801. Accepted.

Emil Michel, Pembroke, force, \$4,300. Accepted.

J. F. Connolly, Toronto, intake, \$12,400; force, \$5,800; total, \$18,200.

R. Browder, Ottawa, intake, \$13,000; force, \$4,452; total, \$17,452.

E. Behan, Pembroke, intake, \$13,650; force, \$6,765; total, \$19,615.

Rutherford Cumming, Toronto, intake, \$14,490.

Leslie Construction Co., Toronto, intake, \$17,690.

Ferneyhough & Barnes, Pembroke, force, \$10,692. John L. Armour, resident engineer; T. Aird Murray, Toronto, consulting engineer.

Penticton, B.C.

Contracts will be let shortly in connection with waterworks which will involve an expenditure of about \$130,000. F. H. Latimer, construction engineer. F. E. Tiley, city clerk.

Peterborough, Ont.

The tenders for machinery for pumping station are as follows: Canadian Fairbanks Co., vertical gasoline engine and compressor, belted, \$4,170; Canadian Fairbanks Co., gasoline engine and compressor, combined, one machine, \$1,290; Vandeleur & Nicholls, vertical gasoline engine, geared to Reavell compressor, \$1,557; Canadian Rand Co., vertical Fairbanks horizontal compressor, Peerless chain drive, \$9.75; Vandeleur & Nicholls, 10 h.p. motor Reavell compressor, \$1,350; Canadian Rand Co., 10 h.p. horizontal compressor, Peerless chain drive, \$1,246; Lancashire Dynamo and Motor Co., 10 h.p. motor, geared to Sentinel vertical compressor, \$1,092. City Engineer Hay; consulting engineer, W. E. Chipman.

Ridgeway, Ont.

Tenders addressed to M. S. Pound, clerk, will be received until March 1st for construction of proposed drain in the vicinity of Crystal Beach, Tp. of Bertie; said drain to be 2,700 feet long. 42-in. in diameter at intake, increasing 42-in. in diameter at intake, increasing out. Plans at office of above.

Souris, Man.

Tenders addressed to J. W. Breakey, sec.-treas., will be received until May 1st for waterworks debentures to the amount of \$95,000.

Tenders addressed to V. H. Williams, town engineer, will be received until March 20th for excavation, laying and back filling for about 31,000 feet of standard vitrified sewer pipe and all necessary tees, wyes, etc.; excavation, laying and back filling for about 31,500 feet of standard c.i. water pipe and all necessary tees, reducers; excavation, setting and back filling for 70 standard fire hydrants; construction of about 75 man-holes and setting covers and frames of same; the construction of a brick building, 60 ft. x 40 ft. x 14 ft. on concrete foundation, together with all necessary machinery, consisting of compression tanks, gasoline engines and pumps. Plans, etc., at office of the above. J. W. Breakey, secretary-treasurer.

Toronto, Ont.

Tenders addressed to Chairman Board of Control, will be received until February 28th for supply of 20-in. c.i. pipe.

Specifications at office of city engineer.

Tenders addressed to G. R. Geary, chairman of board of control, will be received until March 14th for the following: 3,400 lin. ft. of 60-in. reinforced concrete pipe; 9,728 lin. ft. of 66-in. reinforced concrete pipe. Plans, etc., obtained from Main Drainage Department, City Hall. Advertisement in "Tenders and For Sale Department" of this issue.

Vancouver, B.C.

The time for receiving tenders for supply of brass goods and galvanized iron pipe has been extended until February 27th. Wm. McQueen, city clerk.

Tenders addressed to Wm. McQueen, city clerk, will be received until March 22nd for supply of water pipe, fire hydrants, valves and pig lead for this city. Specifications at waterworks department, city hall.

Tenders for the supply of a road roller were received as follows: P. E. Harris & Co., \$3,200 and \$3,610; Watrous Engine Works, \$3,470; Canada-Ford Company, \$2,545; Beach Manufacturing Company, \$3,290, \$3,395, \$3,820, and \$2,950; Mussons, Ltd., \$3,150 and \$4,275. The Buffalo Steam Roller Company and W. C. Winterburn also tendered, but failed to enclose cheques.

Alderman Enright urged that in view of the fact that several outside districts were being brought into the city, the board should take steps to buy an additional roller to the one now tendered on. He also thought it would be advisable to buy a steam shover. This and the above tenders referred to city engineer, acting chairman, Crowe, and Alderman Enright.

Victoria, B.C.

Tenders for clearing View street were as follows: B. W. Smith, \$2,350; A. O. Roy, \$2,500; Murray & McKinney, \$2,190.

Tenders are called by Public Works Department until February 24th for dredging for road and drainage ditch in Maple Ridge.

Tenders for the construction of about 400,000 square yards of pavement will be received until March 3rd. Specifications at office of City Engineer, A. Smith; W. W. Northcott, purchasing agent.

The development of Sooke Lake as a source of supply for Victoria was authorized at a special meeting of the council. The city, according to a statement contained in a report by Mr. Raymur, water commissioner, has until March 15 next to start work on the expropriation of the properties required.

The plans for the parapet which is to be included in the Dallas road wall will be referred to the Victoria Architects' Association for an expression of opinion as to their ornamental excellence before the Pacific Coast Construction Co. is instructed to proceed with the work.

AWARDED**Fort William, Ont.**

The following tenders for supply of 30,000 pig lead were received: Lumby Stenhouse, Fort William, \$1,197; W. S. Piper, Fort William, \$1,164; Anderson & Co., Fort William, \$1,150; Northern Engineering Supply Co., Fort William, \$1,155; Plumbing & Engineering Supply Co., Fort William, \$1,130 (accepted). John Wilson, city engineer.

Montreal, Que.

Tenders were awarded for the supply of Paving blocks and chainstone. For the former the Laurentian Granite Co., Ltd., being the lowest tenderers, were awarded the contract. The total quantity called for in this instance was 25,000 square yards and the company's figure was \$1.48 per yard; Standard and Laurentian block, 9-inch blocks, to be supplied at \$85 per 1,000, and 6-inch at \$70. The proportion of each size required by the city will be determined as the permanent works are being carried out. For chainstone the lowest offer for straight stone was from Hubald Crevier, at 41 cents per linear foot. He secured the contract for 150,000 feet. For curved stone Messrs. Dixon and Mandeville, at 52 cents per foot, received the award for 2,000 feet.

Ottawa, Ont.

Tenders for over a quarter of a million dollars worth of supplies were dealt with by the board of waterworks committee.

The tenders accepted by the committee were: Cast iron pipes, A. W. Fleck, representing the Canada Iron Company, Limited, \$11,583.40; special pipe castings, the Canada Iron Company, Limited, \$2.70 per cwt.; hydrants, Chaudiere Machine Company, \$38.50 each; oils and grease, Capital Warehouse Company, \$390.50; valves, Chaudiere Machine Company, \$1,148.15; lead pipe, McKinley and Northwood, \$1,801.10; brass, Robert Mitchell and company, Montreal, \$1,915.50. The tenders accepted and those to be further considered by the board of control are:

Brick, Peerless Brick Company, \$8.20 per thousand, being the lowest.

Vitrified clay pipe, Canadian Agency and Supply Company, 64 per cent. off catalogue price; McNally and Company, 61 per cent off catalogue price.

These are the two lowest tenders; the city engineer will report as to the quality, the lowest being for Swansea pipe, manufactured for Scotch pipe.

Broken stone, West End Construction Company, the lowest.

Sand, Foster and Irwin, the lowest, at 94 cents per cubic yard.

Cement, T. S. Kirby and Company, and Wright and Company, each 53c per cwt.; Ottawa Fireproof Company, Canadian Portland cement, 52 cents. The city engineer will report on the quality of the Canadian Portland.

Hardware, assorted goods, W. G. Charleson, being the lowest.

Nepean sand stones, Canadian Quarries Company, \$53 per thousand and \$53 per track blocks.

Castings, Thos. Lawson and Sons, \$3.25 per cwt.

Asphalt, Barker Asphalt Company, \$27.80 per ton; Elder Albano Asphalt Company, \$27.10. The city engineer will have an analysis made to determine which is the better.

Lumber, McAuliffe, Davis and Company, assorted prices, the lowest.

Toronto, Ont.

Board of Control has awarded tenders for the low level interceptor as follows:

The Godson Contracting Co., of Toronto, \$13.10 per lin. foot.

City Engineer, \$18.30 per lin. foot.

C. H. Rust, City Engineer; A. C. D. Blanchard, assistant engineer, main drainage works.

Vancouver, B.C.

The following firms tendered for supply of steam road roller: Western Engine Co. (Aveling & Porter), Vancouver, B.C., \$3,290, free; (Mussens Ltd. (Ruston Proctor Ltd.), Vancouver, B.C., \$3,150, free; Mussens Ltd. (Austin Mfg. Co. motor), Vancouver, B.C., \$4,275, free; Beach Mfg. Co. (Monarch), Portland, Ore., \$3,965, duty; H. B. Gilmour (Watrous), Vancouver, B.C., \$3,470, free (accepted); P. E. Harris & Co. (Aveling & Porter), Vancouver, B.C., \$3,200, free; Canada Ford Co. (Forster), Montreal, \$2,700, free; Buffalo Steam Roller Co., Buffalo, N.Y., \$2,600 (Buffalo); B. C. Winterburn (Fowler), Victoria, B.C., \$3,500, free. W. A. Clement, city engineer.

Victoria, B.C.

Tenders for the year's supply of brick were received from Baker Bros. and the Victoria Brick and Tile Company, both for \$12.75 per thousand. Last year's price was \$12. Each concern will be given half the order.

Railroads, Bridges and Wharves**Belleville, Ont.**

The railway commission has approved the plans of the Canadian Pacific for their proposed line from Toronto to eastern Ontario, through Whitby, Oshawa, Bowmanville and Cobourg to Belleville, and construction is promised to be undertaken shortly. The present plans of the company call for a line running directly through the towns mentioned to Belleville, thence turning northward to Bathurst, about ten miles west of Smith's Falls, where the main line will be reached.

Quebec, Que.

The time for receiving tenders for construction of about 56 miles of the Quebec & Saguenay Railway has been extended until March 10th. J. F. Guay, civil engineer, Quebec.

Fredericton, N.B.

Tenders for Macs Bay sea wall are called until February 27th by Public Works Department here. Plans, etc., at the Public Works Department, Fredericton, N.B.; at the office of Hon. W. C. H. Grimmer, Surveyor-General, St. Stephen, John Morrissey, chief commissioner.

Fort William, Ont.

The by-law to authorize the construction of a bridge suitable for vehicular and electric railroad traffic across the Kaministiquia river was carried.

Kingston, Ont.

The bill to incorporate the Ottawa and Smith's Falls and Kingston Railway Company, was approved by the railway committee of the legislature, but was not reported finally, as it had not been properly drafted. The company asked for a charter allowing them to run an electric road, develop electric power and to dispose of the surplus.

A civic deputation composed of Ald. R. F. Elliott and John Carson will wait upon the Minister of Militia in reference to the question of constructing a new bridge across the lower portion of Kingston harbor to the Pittsburg shore. The Department of Militia is interested as access to military grounds, etc., is gained through this bridge.

Lanark, Ont.

Tenders for construction of wooden bridge over the Clyde will be received until March 4th. J. Boyd Caldwell, chairman roads and bridges committee.

London, Ont.

It is announced that all wooden bridges between Toronto and Windsor on the C. P. R. will be replaced by steel and concrete.

County Engineer Charles Talbot is preparing plans for between 40 and 50 bridges, ranging in length from 10 to 200 feet, which are to be erected on the roads throughout the county this summer. All the bridges are either steel or concrete. The bridge over the Thames at what is known as the Giles site, will not be erected until next year, as the contract will not be let until December.

Le Petit Debarquement, Que.

Tenders addressed to R. C. Desrochers, secretary, Department of Public Works, Ottawa, will be received until March 8th for construction of wharf here.

Montreal, Que.

Construction of the Canada & Gulf Terminal Railway from Matane to Gaspé, it is stated, will be commenced in the spring.

Port Arthur, Ont.

It is stated that a pleasure pier will be constructed here. J. W. Gates is interested.

Port Stanley, Ont.

H. J. Lamb, London, is reported to be preparing plans for breakwater here, 200 feet. Noted in issue of February 8.

Quebec, Que.

The following tenders were received for St. Charles bridge: Mr. F. X. McGigan, \$183,00 and \$185,000; Mr. Lemon, Montreal, \$155,200, \$156,200 and \$155,000; J. G. Gignac Cie., \$202,000 and \$217,000. The tenders were referred to Mr. Valle, engineer of the public works department, who will report to council.

Renfrew, Ont.

The tenders received for pile for construction of new Horton bridge were not accepted, the price being too high.

Richibucto, N.B.

Tenders addressed to R. C. Desrochers, secretary, Department of Public Works, will be received until March 15th for construction of extension to north breakwater here. Plans at this department, at the offices of E. T. P. Shewen, Esq., district engineer, St. John, N.B.; Geoffrey Stead, Esq., district engineer, Chatham, N.B., and on application to local postmaster.

Swan River, Man.

Tenders addressed to Joseph Armstrong, secretary-treasurer, municipal council, will be received until April 15th for supply of one 94-ft. centre to centre of end bearings steel-riveted Pratt truss bridge with (steel) stringers, and 4-in. tamarac plank floor for steel bridge over Woody river. Specifications at Department of Public Works, Winnipeg.

Tracey Station, N.B.

Tenders are called by Department of Public Works, Fredericton, until March 10th, for construction of concrete substructure and approaches of bridge over Oromocto river, etc. Plans, etc., at the Public Works Department, Fredericton, N.B., at the store of Ernest A. Tracey, Esq., Tracey Station. John Morrissey, chief commissioner.

Vancouver, B.C.

Survey parties will be despatched north next spring to locate the line of the British Columbia & Alaska Railway between Fort George and a point in Southeastern Alaska. The route from Lytton and St. George has already been located. L. M. Rice, C.E., of Seattle, is in charge.

Victoria, B.C.

Need of having the plans for the sea wall on Dallas road revised before further work is done on same has been demonstrated by the effect of the recent gales. The opinion of the engineers supervising the work is that the base of the new wall should be at least four feet deeper than the present plans call for, so as to get a depth below low tide.

AWARDED**Merritt, B.C.**

It is understood that Macdonell, Gzowski & Co., of Vancouver, have secured the contract for the second thirty-mile section of the Kettle Valley Railway.

Red Deer, Alta.

The contract for concrete foundation of high level bridge over Red Deer river on Alberta Central Railway, has been awarded to Jackson & Goldie, Winnipeg. J. Grant McGregor, chief engineer.

Public Buildings, Churches Schools, etc.

Barrie, Ont.

The plans for the proposed new Armory show a building 70 x 160 feet, pressed brick with stone trimmings, two stories. The drill hall, 70 x 120, will have ten foot brick wall and trussel iron roof. Estimated cost, \$15,000.

Bassano, Alta.

Tenders addressed to H. Buckingham, secretary Bassano, S.D., will be received until March 4th for construction of 4-room brick school. Tenders will be received in bulk without the heating and ventilating system separate. Plans, etc., at office of architect W. T. Williams, Medicine Hat, or from the above-mentioned.

Calgary, Alta.

It is understood that an appropriation of \$75,000 was made to build a new land and irrigation department building here.

Under date of last information the contracts for erection of St. John's church had not been awarded. Estimated cost, \$12,000. Materials, brick (veneer). Messrs. Lang and Major, architects.

By-laws to expend \$75,000 on fire station, and \$120,000 on two incinerators, will be voted on shortly. A new isolation hospital and municipal store house are being considered. A. G. Graves, city commissioner.

Chippawa, Ont.

Plans are being prepared for a new 4-room school here. Architect Borter, Welland.

Carleton Place, Ont.

Tenders addressed to Geo. Gardiner, secretary building committee, will be received until March 18th for construction of new St. John's church, at Boyds, seven miles from here. Plans, etc., at office of Mr. J. S. L. McNeely, barrister, this place.

Castleford, Ont.

Tenders for enlarging school No. 3 Horton, addressed to A. Johnson, jr., will be received until March 1st. Plans, etc., at office of the secretary, W. J. Humphries.

Cookshire, Que.

Tenders are called until March 1st for construction of school in district No. 1, parish of St. Isidore d'Auckland. Plans, etc., at office of Rev. Nap. Favreau, Sawyerville.

Dundas, Ont.

Tenders were called until February 17th for masonry, carpentry, galvanized iron work, heating and plumbing, electric wiring and drainage in connection with House of Refuge near here. S. McPhie, Hamilton, architect; J. W. Jardine, county clerk.

Edmonton, Alta.

The question of a Children's Shelter will be considered by public works committee.

A by-law authorizing the purchase of a site for city hall will be submitted, after which plans for the new building will be considered.

Tenders will be called for \$100,000 stock pavilion to be erected by Edmonton Exhibition Association as soon as the plan is chosen from the competitive ones submitted.

The Nurses' Home, in connection with the Royal Alexandra Hospital here, will be erected as soon as definite plans have been determined. Meyer J. Sturn, Chicago, is acting as consulting architect. Estimated cost of building, \$4,000.

Galt, Ont.

There will shortly be an active campaign for the provision of larger quarters for the Y. M. C. A., of which Mr. A. R. Goldie is president.

Halifax, N.S.

The preliminary plans for the mining and metallurgical laboratory in connection with the Nova Scotia Technical College have been approved and call for a building 110 feet in length by 70 feet, of brick with granite trimmings. Prof. E. A. Holbrook is in charge of the design and construction. Work is expected to start in April and finish in August.

Harriston, Ont.

Tenders addressed to R. C. Desrochers, Secretary, Department of Public Works, Ottawa, will be received until March 13th for construction of public building here. Plans, etc., at office of H. J. Lamb, district engineer, at the local post office, and at Ottawa.

Kingston, Ont.

The post office at Kingston Junction owned by Alexander Campbell, has been destroyed by fire. Loss, about \$5,000.

La Tuque, Que.

The proposition of erecting a hospital here this spring is being considered. Rev. Father Corbell is interested.

London, Ont.

Tenders addressed to R. C. Desrochers, secretary, Department of Public Works, Ottawa, will be received until February 27th for addition to military stores building here. Plans on application to Mr. H. J. Lamb, district engineer, and at the above department.

Melville, Sask.

The Lutheran Church for Western Canada have decided that the Lutheran College shall be situated here.

Midland, Ont.

Tenders for sale and removal of the buildings purchased by the Public School Board are called until March 1st. C. D. Tuleman, secretary.

Montreal, Que.

The building inspector and fire chief Tremblay are to report on the location of a fire hall on St. Hubert street.

New Westminster, B.C.

The plans for the new University School will be ready in about a week, it is stated. They call for an immediate expenditure of about \$100,000, and later on of about \$500,000. Capt. H. J. R. Cullin is interested.

Oak River, Man.

Tenders are called until March 29 for issue of \$7,000 debentures for the purpose of building a municipal hall. G. McIntyre, secretary-treasurer.

Orillia, Ont.

The General Hospital Board have under consideration the enlargement of the hospital.

Ottawa, Ont.

An 8-room addition will be built to the Mutchmor street school, to cost not more than \$65,000.

The First Congregational Church will call for plans shortly for the erection of their new church on the corner of Florence and Kent streets.

Tenders addressed to J. Albert Ewart, 103 Sparks street, will be received until February 27th for erection of new Bethany Presbyterian Church.

Prince Rupert, B.C.

Application has been made to the government for a site for a new school in west end which will be required in the near future.

Port Simpson, B.C.

Tenders are invited until February 28th for erection of large one-room school here.

Regina, Sask.

A by-law for the installation of fire hall equipment to cost \$7,500 will be submitted shortly; also one to provide for the granting of \$15,000 to the Y. W. C. A. for erection of a new building.

Toronto, Ont.

Permit was granted to Toronto General Hospital for 2-storey brick and steel power house and laundry on Elizabeth and Hayter streets, \$55,000; also for Nurses' Home on College street, \$250,000.

Vancouver, B.C.

C. P. Jones, Vancouver, is the architect for erection of stock-judging pavilion for the Exhibition Association. Estimated cost, \$30,000. Thirteen plans were presented. Tenders will be called at once.

The cost of rebuilding Mountain Valley Methodist Church recently destroyed by fire, is estimated at \$22,000.

Victoria, B.C.

Tenders addressed to Wm. W. Northcott, superintendent public buildings,

will be received until February 24th for erection of two fire halls. Information obtained from the above-mentioned.

In the provincial estimates, \$150,000 has been voted for immediate enlargement of the legislative wing of provincial buildings; \$16,500 for repairs, etc., at Government House.

Winnipeg, Mna.

It is stated that the erection of post office will be started this year. \$10,000 has been appropriated by government.

The Elmwood Presbyterian Church congregation have decided on the corner of Johnson avenue and Bird's Hill road as the site for their new church.

Battleford, Sask.

Tenders addressed to R. Rogers, Minister of Public Works, will be received until February 28th for erection of administration building for Agricultural College, St. Norbert. Plans, etc., at office of Provincial Architect Hooper.

The congregation of Dufferin Avenue Presbyterian Church are about to start a building campaign fund for a mission church to be erected on the site recently purchased at the corner of McKenzie street and Burrows avenue. Mr. Edward Brown is interested.

AWARDED**Calgary, Alta.**

Doyle & Thomas, of Lethbridge, have the contract for the school near Colonel Walker's residence, at \$95,000; Peers & Macleod the contract for the Hillhurst school, at \$98,000.

Chilliwack, B.C.

The contract for the building of the new city hall has been let to J. C. Robertson, of this city. Estimated cost about \$17,000.

Saskatoon, Sask.

It is stated that the tender of Smith Bros. and Wilson, of Regina, for building the first part of new Emmanuel College, has been accepted.

Residences**Brandon, Man.**

Tenders were called until February 20th for erection of manse for St. Paul's Presbyterian Church. Plans, etc., at office of Shillinglaw & Marshall, Architects.

Calgary, Alta.

Tenders were called until February 20th for erection of residence for Lieut.-Col. Jas. Walker at East Calgary. Messrs. Lang & Major, architects. Tenders were called in October for excavation and concrete work.

Edmonton, Alta.

Building permits have been issued as follows: Johnson and Maxter, First st., rooming house, \$4,000; A. Rendall, 3 two-storey frame dwellings, Peace avenue, each, \$3,200.

London, Ont.

Tenders will be received until February 25th for erection of brick residence on King street. H. C. McBride, architect.

Vancouver, B.C.

Preliminary plans have been prepared for the construction of an eight-storey apartment building on Melville street, at a cost of approximately \$225,000. The

building, which will measure 66 by 132 feet, is to be erected by Mr. J. Seabolde, and construction will be commenced early in the spring.

The following building permits have been issued recently: Beard Home Building Company, dwelling, 1916 Eleventh avenue west, \$4,000; Beard Home Building Company, dwelling, 1735 Eleventh avenue west, \$4,000; F. L. Dixon, two dwellings, 1624 Graveley, \$3,500; Shaw Bros., dwelling, 1126 Eleventh avenue west, \$4,200; R. E. Piper, store and dwelling, 2847 Manitoba street, \$3,000.

Winnipeg, Man.

Tenders addressed to F. R. Evans, 506 Somerset Building, will be received until February 22nd for erection of brick and stone residence for J. M. Aikins, Esq.

Business Buildings and Industrial Plants**Carleton Place, Ont.**

The plans for the new Union Bank block have been received and call for a two-storey structure, of brick, with Roman stone front.

Edmundston, N.B.

The Felix Hebert Hotel, of which Mr. J. M. Sirois is proprietor, was destroyed by fire on the 14th inst. Estimated loss, \$10,000.

Edmonton, Alta.

It is understood that the property lately occupied by C. P. R. offices on Jasper avenue, recently sold to Capt. Robinson, will be used as a bank site for the Northern Crown Bank. Lane & Scarth effected the sale. The C. P. R. have purchased the McLeod block, which they will have remodelled until the erection of their block.

Farnham, Que.

The building owned by Mr. A. Saur-ette, contractor, was destroyed by fire on the 15th inst. Estimated loss, \$18,000.

Kingston, Ont.

North American Smelting Company is about to erect a lead smelter here to treat the ore that comes from their mines in Loughboro Township, in Frontenac County.

Maniwaki, Que.

It is announced that Messrs. Ayers & Hamelin, Montreal, are negotiating with this municipality towards locating here. Mr. D. Cavanagh, mayor.

Merritt, B.C.

A large gypsum plant will be located at Spatsum on the main line of the C. P. R. The refining plant, it is stated, will be constructed on the shores of Burrard Inlet near Port Moody. Those interested are George Hinton, of the Hinton Electric Co., 606 Granville st., J. J. Banfield, E. W. McLean, and E. A. Choate, of Vancouver.

Montreal, Que.

Damage was done to the wholesale grocery warehouse of D. C. Brosseau and Company, Notre Dame street to the extent of about \$50,000.

New Westminster, B.C.

Mr. Abraham Goldberg, of the Vancouver Junk Works, it is stated, has purchased a site from the Western Steel

Corporation with 200 feet of water frontage. Work will be commenced immediately on construction.

Ottawa, Ont.

Mr. R. Gordon Stewart has purchased the First Congregational Church, on the site of which he will erect a fine office building this summer. Messrs. Larmonth & Walsh effected the sale.

Perth, Ont.

This municipality will vote on a by-law shortly to assist a carpet manufactory which is seeking a location in eastern Ontario. Robert Dodds, of Guelph, is interested.

Peterborough, Ont.

The Canadian General Electric Company are considering the construction of a lamp factory here to cost about \$250,000. Gen. manager, Mr. Nichols; assistant general manager, J. J. Ashworth.

Port Mann, B.C.

Mill No. 1 of the Canadian Western Lumber Company was destroyed by fire on the 10th inst. Loss estimated at about \$10,000.

Regina, Sask.

Permits were issued to Saskatchewan Hotel Company, a two-storey addition to the King's Hotel on Scarth street, \$40,000; the Toronto Type Foundry, for a warehouse at a cost of \$18,000.

Rosthern, Sask.

Mr. H. A. McEwan intends erecting a building 30 x 70 feet. Plans are now being prepared.

Sherbrooke, Que.

Tenders are wanted until February 28th for erection of barn, 40 x 50 feet. Alex. Ames & Sons, 279 Wellington st.

St. Boniface, Man.

Mr. G. M. Ellis has secured option on 30 acres of land east of the Seine river as a site for an automobile factory which he is planning to establish here. Estimated cost, \$1,250,000.

The Manitoba Rolling Mills Company are planning for the enlargement of their business this spring, erecting the necessary plant for steel work on their present site with an equipment of at least four furnaces and two trains of rolls.

St. John, N.B.

Messrs. Scovil Bros., Ltd., will erect on the property adjoining their present store a modern 5-storey building, with provision for additional stories.

Toronto, Ont.

Plans for the expansion of C. P. R. interests are before the board of control for consideration.

A large office building for the Dominion Express Company will be erected on the Government House site. King and Simcoe streets, while a portion of the grounds will be laid out as a park. A viaduct will be built across the north end of the city, and a large station put up near Yonge street north. A new union station will be erected whether the viaduct proposition goes through or not. Several new freight yards will be established in outlying portions of the city. This, with the new office building previously mentioned, will bring the expenditure to about \$5,000,000.

Vancouver, B.C.

Provision for three more storeys has been made in connection with the hotel

being erected for Sam Kee, corner of Main and Harris streets. Contractor, R. P. Foreshaw; estimated cost, \$100,000.

Tenders are called until February 24th for erection of 250-foot extension to C. P. R. freight shed; also extension to C. P. R. station at New Westminster. H. Rindal, division engineer, C. P. R., Vancouver.

Among the building permits issued are British Columbia Telephone Company, covering the erection of new substation in Kitsilano, \$44,000; another to Mr. C. A. Godson, covering alterations to his block on Hastings street near Carrall, \$24,000.

It is stated that the British Columbia Steel Company will establish its plant at Port Mann and that its charter is practically assured. Estimated expenditure, \$10,000,000. A. P. Gillies, Tacoma, Wash., is interested.

Victoria, B.C.

Plans have been drawn for a two-storey brick block to be built by Mr. Arthur E. Haynes on the south side of Fort street at a cost of about \$25,000.

Windsor, Ont.

The ratepayers voted the granting of privileges to the following firms: Moloney Electric Company, St. Louis, and Canadian Winkley Co., Detroit, Mich. The former will build a \$10,000 plant at once in the factory district, the latter has bought a site in the west end, where a factory will be erected this year.

Winnipeg, Man.

Nares Block, a 5-storey structure, collapsed, it is said, owing to adjacent building operations. Estimated loss, \$100,000.

Sub-contracts for the erection of new Bank of Commerce will be let in the near future. Lyall Mitchell Company have the contract for excavation and foundations.

Tenders addressed to Frank Lee, division engineer, will be received until March 1st for construction of frame buildings on the Manitoba division. Plans, etc., at offices of the superintendents at Fort William, Kenora, Brandon and Souris.

Woodstock, Ont.

A by-law to loan the Ken Knitting Company \$20,000 was carried. The company will build a \$35,000 factory.

AWARDED

Vancouver, B.C.

The contract for steel work in connection with construction of B. C. Telephone Exchange, corner of Yew and Tenth avenue, has been awarded to Messrs. Ross & Howard, Vancouver. Estimated cost, about \$43,000.

The contract has been let by W. A. Clark for the erection of an \$80,000 block on Granville street.

The contract for block for Mr. A. A. Riley, of the Crown Investment Company is with Messrs. McLennan & McKenzie, this city.

Victoria, B.C.

A. H. Mitchell has the contract for erection of 2-storey business block for Mr. A. E. Haynes. Cost \$13,000. Architects, Messrs. James & James.

Power Plants, Electricity and Telephones

Calgary, Alta.

The council have decided to submit a by-law for \$50,000 for the purchase of the power site on the Elbow.

By-laws to expend \$380,000 on electric light extensions, and \$60,000 on conduit system, will be voted on shortly. A. G. Graves, city commissioner.

Tenders addressed to city commissioners will be received until March 22nd for supply of the following: one 1,500 turbo generator, set with condenser, etc., three 1,000 s.v.a. single phase transformer, 12,000 to 2,300 volts, with switching gear, etc.; one 100 k.w. exciter. W. D. Spence, city clerk.

Elstow, Sask.

Tenders were called until February 18th for construction of about 75 miles of telephone line, etc. H. Young, secretary.

Hamilton, Ont.

Applications are being received until March 15th from electrical engineers for preparing estimates of cost, etc., for a municipal electric power and light system. S. H. Kent, city clerk. Advertisement in "Tenders and For Sale Department" of this issue.

The Dominion Power & Traction Co. propose adding to plant in 1911 as follows: At power house, a 6,400-k.w. a.c., 2,400-volt generator and 7,100-h.p. Voith turbine; at Hamilton a substation, 8,000-k.w. capacity, Westinghouse equipment, and at Brantford a substation, 3,000-k.w. capacity, Westinghouse equipment. W. C. Hawkins, general manager.

Medicine Hat, Alta.

Tenders addressed to A. K. Grimmer, city engineer, will be received until March 1st for construction of natural gas well. Advertisement in "Tenders and For Sale Department" of this issue.

Penticton, B.C.

This municipality has under consideration the establishment of a hydro-electric plant and lighting system to cost about \$70,000. Contract will probably be let in two or three months. F. H. Latimer, consulting engineer.

Prince Albert, Sask.

Contracts will probably be let shortly for a 600 k.w. direct-connected unit (engine or turbine) at the municipal electric light plant; also preliminary work in connection with a 10,000 h.p. electric plant.

Regina, Sask.

A by-law providing for additions to the electric lighting plant at a cost of \$100,000 will be submitted shortly. This provides for the installation of electric lighting additions, the street railway generating unit and equipment.

Saskatoon, Sask.

Additional machinery for municipal plant will be purchased. E. L. White, superintendent, has recommended improvements and extensions involving an expenditure of about \$140,000.

Vancouver, B.C.

See "Business Buildings Awarded." Plans are prepared for the increase of the equipment of the Vancouver Gas Co. (Continued on page 33)

Tenders and For Sale Department

For Sale—Second Hand

No. 8 Austin Gyratory Crusher.
No. 6 and No. 3 Austin complete plant.
No. 3 Austin and 2 No. 6 Gates and No. 5 "B."
70-ton Vulcan Steam Shovel, 2-yard.
50-ton Bucyrus Steam Shovel, 1¾-yd.
Loco. Crane, with 1¾-yd Clam Shell.
Little Giant Traction Steam Shovel, 1¾ yd.
Hayward Orange Peel Buckets, 1 and 1¼-yd.
Concrete Mixers, Steam Rollers, Air and Steam
Drills, Air Compressors, Locomotives, Dump
Cars, etc.

All our goods we fully guarantee.

Send for our February Booklet.

WILLIS SHAW MACHINERY CO.,
171 La Salle St.,
Chicago, Ill.

Town of Dauphin

Province of Manitoba

Tenders for Reinforced Concrete Highway Bridge

Sealed tenders addressed to the undersigned
Town Clerk will be received up to 8 p.m. Sat-
urday, the 25th day of February, 1911, for all
labor and material necessary for the construction
of two reinforced concrete highway bridges to
be constructed in the Town of Dauphin.

Plans and specifications will not be sent out,
but may be seen at the Town Clerk's office,
Dauphin, Man., or at Provincial Public Works
Department, Winnipeg, Man.

The lowest or any tender not necessarily ac-
cepted.

H. F. CALDWELL,
Mayor.

A. H. F. STELCK,
Chairman Public Works Committee.

J. W. JOHNSTON,
Town Clerk.

6-8

TENDERS WANTED

Sealed tenders addressed to Geo. H. Lees
(Mayor), Chairman Board of Control, and sent
by registered letter, plainly marked on the out-
side "Tender for Sewer," will be received by the
undersigned up to 10 o'clock a.m., of Thursday,
March 9th, 1911, for the construction of the fol-
lowing sewers:—

Belview ave., from Cannon st. to Primrose ave.
Carrick ave., from King to Main streets.
Dunsmure ave., from Fairholt road to Carrick av.
Kensington ave., from Barton to Cannon streets.
King st., from Lottridge st. to Garfield avenue.
Rosslyn ave., from Barton to Cannon streets.
Central ave., from Norway ave. to Prospect st.
Lorne ave., from Central to Cumberland aves.
Glendale ave., from Barton st. to end of Glen-
dale avenue.

Blake st., from Maple to Cumberland aves.
Maple ave., from Springer ave. to Blake street.
Boylestone ave., from Barton st. to end of
Boylestone ave.

Ralmoral ave., from Cannon to Barton streets.
Grosvenor st., from Cannon to Barton streets.
Barton st., from Trolley st. to Robins avenue.

Plans and specifications and other information
can be obtained at the office of the City En-
gineer.

The lowest or any tender not necessarily
accepted.

S. H. KENT,
City Clerk.

Hamilton, February 17th, 1911.

8-8

Tenders

Bulk tenders will be received by the under-
signed until noon of March 4th, for the construc-
tion of new Y. M. C. A. building, Belleville,
according to plans and specifications furnished
by C. J. Gibson, architect, Toronto. Plans may
be seen at the Y. M. C. A. rooms, Front street.
The lowest or any tender not necessarily accepted.

7-8

J. L. HESS, Secretary.

Town of Oshawa Asphalt Block Pavement

Sealed tenders will be received up to and in-
cluding the 18th day of March, 1911, for the con-
struction of an Asphalt Block Pavement on a
concrete base, together with cement concrete
curb, gutter and widening of sidewalk where
necessary upon the following streets:

King street, 1,750 lineal feet of width, varying
from 30 to 40 feet.

Simcoe street, 1,650 lineal feet of width vary-
ing from 30 to 40 feet.

The part to be paved will include that portion
of the road occupied by the track of the Oshawa
Street Railway Company.

Plans may be seen and specifications obtained
from the Town Engineer's Office, Town Hall,
Oshawa.

The lowest or any tender not necessarily
accepted.

W. E. N. SINCLAIR, B.A., LL.B.
Mayor.

FRANK CHAPPELL,
Town Engineer.

Oshawa, February 20, 1911.

8-8



Department of Railways and Canals

Dominion Canals

Notice to Dealers in Cement

Sealed tenders, endorsed "Tender for Cement,"
will be received by the undersigned up to 16
o'clock on Friday, the 24th February, 1911, for
the supply of some 200,000 barrels of cement,
more or less, required for the construction and
maintenance of the various canals of the Do-
minion and to be delivered in such quantities,
at such places and at such times as may be
directed.

Dealers in cement may tender for the total
quantity required, or for such portions thereof
as may suit their convenience.

Specifications, forms of tender and full infor-
mation can be obtained from the Purchasing
Agent of the Department of Railways and Canals,
Ottawa, on and after this date.

The Department does not bind itself to accept
the lowest or any tender.

By order,

L. K. JONES,

Secretary.

Department of Railways and Canals,

Ottawa, 8th February, 1911.

Newspapers inserting this advertisement with-
out authority from the Department will not be
paid for it.

8-8

City of Strathcona (Alberta)

Tenders for

Engine, Boilers and Generators

Tenders addressed to David Ewing, Chief En-
gineer power house, Strathcona, Alta., for the
above machinery, will be received until noon,
Wednesday, March 1st, 1911. Specifications may
be obtained upon application to the undersigned.

A. J. McLEAN,
City Engineer.

Strathcona, Alta., Jan. 16, 1911.

4-8

Tenders for Cement Walks

and Concrete Curb and Gutters

The Board of Works of the Town of Berlin
will receive tenders addressed to A. H. Millar,
Town Clerk, up to March 2nd next, for construct-
ing cement walks, and concrete curb and gut-
ters during the year 1911. Specifications may
be seen at the office of the Town Engineer.

The lowest or any tender not necessarily
accepted.

H. A. DIETRICH,
Chairman.

Berlin, Feb. 17, 1911.

8-9

TENDERS WANTED

The Quebec & Saguenay Railway

Tenders will be received up to March 10th,
1911, at 12 o'clock noon, by the undersigned, for
the construction of about 56 miles of the above
railway, from Cap Tourmente to Murray Bay
Wharf, divided up into sections of ten miles.

A certified cheque amounting to \$20,000 for
each ten mile section tendered for must accom-
pany each tender.

Forms of tender may be obtained and speci-
fications and plans examined at the office of J. F.
Guay, Civil Engineer, Morin Building, Quebec.

The right is reserved by the company to reject
any or all tenders.

6-8

(Signed) J. F. GUAY.

City of Brantford

Tenders for Sewer Pipe

Sealed tenders addressed to Ald. Chas. Hart-
man, Chairman of the Board of Works, in care
of the City Clerk, Brantford, Ont., will be re-
ceived until 12 o'clock noon on Thursday, March
2nd, 1911, for the supply of Sewer Pipe, required
by the City of Brantford during 1911.

Specifications may be seen and instructions to
bidders and forms of tender obtained on appli-
cation to the City Engineer.

Each tender must be accompanied by a marked
cheque, payable to the order of the City Treas-
urer for the amount called for in the form of
tender.

The lowest or any tender not necessarily
accepted.

T. HARRY JONES,
City Engineer.

City Hall, Brantford,
February 14th, 1911.

8-8

Tenders for Bridge

Tenders will be received by the undersigned up to 6 o'clock p.m., Saturday, the 4th day of March, 1911, for the erection of a reinforced concrete bridge, single span over the Clyde River at a point about 3 miles north of Lanark Village. Bridge about 70 feet long.

Plans may be seen at the office of the undersigned at Lanark, or tenderers may submit their own plans and specifications.

Deposit of ten per cent. to accompany each tender, which will be returned if tender not accepted.

The lowest or any tender not necessarily accepted.

Dated this 2nd day of February, 1911.

J. BOYD CALDWELL,
Chairman of Roads and Bridges Com.
Lanark, Ont. 6-9

For Sale

One second-hand No. 1 Smith Concrete Mixer with engine and boiler complete.

One second-hand 7 x 12 Hoisting Engine, 3 drum d.c. and boiler complete, nearly new.

One 5-ton derrick with cables and sheaves.

One 3/4-yard Clam Shell Bucket, nearly new. Apply to

A. J. CROMER,
Brantford, Ont.

7-8

Medicine Hat, Alberta

Tenders for

Natural Gas Well

Sealed tenders will be received at the office of the City Engineer, City Hall, Medicine Hat, Alberta, until (12) o'clock noon on the First day of March, 1911, for the construction of a Natural Gas Well.

Specifications and all other necessary information can be obtained on application from the City Engineer. The lowest, or any tender not necessarily accepted.

A. K. GRIMMER,
City Engineer.

Medicine Hat, Alta.,
February 15th, 1911.

8-8

Supply of

Reinforced Concrete Pipe

Tenders will be received by registered post only, addressed to the Chairman of the Board of Control, City Hall, Toronto, up to noon of Tuesday, March 14th, 1911, for the following:

3,400 linear feet of 60-inch Reinforced Concrete Pipe.

9,728 linear feet of 66-inch Reinforced Concrete Pipe.

Envelopes containing tenders must be plainly marked on the outside as to contents.

Tenderers shall submit with their tender the names of two personal sureties, approved by the City Treasurer, or in lieu of said personal sureties the bond of a Guarantee Company, approved as aforesaid.

Plans and specifications may be seen and forms of tender obtained from the Main Drainage Department, at the office of the City Engineer, Toronto.

The usual conditions relating to tendering as prescribed by city by-law must be strictly complied with, or the tender will not be entertained.

The lowest or any tender not necessarily accepted.

G. R. GEARY (Mayor),
Chairman Board of Control.

City Hall, Toronto,
February 20th, 1911.

8-8

TENDERS WANTED

Sealed tenders, addressed to Geo. H. Lees (Mayor), Chairman of the Board of Control, and sent by registered letter, and plainly marked on the outside "Tender for Sewers," will be received by the undersigned up to 10 o'clock a.m., of Thursday, March 9th, 1911, for the construction of the following sewers:

Main street, from Albert street to Trolley street.
Maple ave., from Springer st. to Trolley street.
King street, from Garfield avenue to Spadina ave.
Barnesdale ave., from Dunsmore ave. to King st.
Highland ave., from Trolley st. to end of street.
Cannon street, from Trolley st. to Ottawa street.
Fairview ave., from King st. to Highland ave.
Barton st., from Lottridge st. to Trolley street.
Belview ave., from King st. to Cannon street.
Mars ave., from Wentworth st. to Douglas st.
Prospect st., from Main st. to Cumberland ave.
Lorne ave., from Maple ave. to Central avenue.
Fairview ave., from Highland ave. to Cannon st.

Plans and specifications and other information can be obtained at the office of the City Engineer.

The lowest or any tender not necessarily accepted.

S. H. KENT,
City Clerk.

Hamilton, February 16th, 1911.

8-8

Miscellaneous

Advertisements under this heading one cent a word per insertion. Box No. ten cents extra

AGENTS WANTED in all parts of Canada to handle a complete line of up-to-date steam water and air specialties. Box 225, Contract Record, Toronto, Ont. 8-8

WANTED—Salesman to sell a complete line of steam, water and air specialties as a side line. Address Box 226, Contract Record, Toronto, Ont. 8-8

AGENTS WANTED—Large American firm manufacturing a complete line of lineman's tools, and portable saw rigs for builders, contractors and lumber yards wants Canadian representatives. For particulars apply, Box 221, Contract Record, Toronto, Ont. 8-9

Power Plants, Electricity and Telephones

(Continued from page 31)

The contract for steel is stated to have been given to Ashmore, Benson, Pease & Co., Stockton, Eng. Contracts for excavation and concrete work are still to be let.

Victoria, B.C.

Tenders for the installation of the cluster lighting system on Yates street between Government and Douglas sts. have been received by the city council from Hutcheson Bros. for \$1,450 and the Electrical Construction Company for \$1,400.

AWARDED

North Toronto, Ont.

Mr. W. A. Hansar, of Earlton, was awarded the contract by the lighting committee for supply of poles as follows: 400 30-ft. long; 100 35-ft. long, and 50 40-ft. long, at \$3.20, \$6.25, and \$8.80, respectively.

Miscellaneous

Calgary, Alta.

Tenders addressed to W. D. Spence, city clerk, will be received until February 24th for purchase of pile hammer.

Guelph, Ont.

The fire, light and markets committee have decided to recommend the purchase of 500 feet of new hose, eleven

globe suits, and a number of pairs of rubber boots.

New Dublin, Ont.

Tenders are called by J. B. Barry, township clerk, until March 6th for crushing 1,000 cords of stone in the township of Elizabethtown.

Ottawa, Ont.

Tenders addressed to chairman, board of control, will be received until March 14th for supply of combination automobile fire engine, pumping capacity, 700 to 800 gallons per minute. For further information apply to chief of the fire department, John Henderson, city clerk.

Tenders are called until February 24th for supply of some 200,000 bbls. of cement, etc., for construction, etc., of the various canals of the Dominion. Advertisement in "Tenders and For Sale Department" of this issue.

Toronto, Ont.

Recent building permits include: G. Philips, 3 att. 2 1/2-storey brick dwellings on 113-5-7 Howland avenue, \$7,500; T. Pennock, 3 att. 2-storey brick dwellings, Uxbridge avenue, \$8,000; Ontario Jockey Club, 1-storey gal. iron betting shed, King E., \$7,500; S. Lorie, alt. to factory, 208-210 Adelaide street west, \$6,000; E. G. Switzer, 3 pr. semi-det. 2 1/2-storey brick dwellings, Indian road, \$14,000; W. H. Niddrie, 2-storey brick apartments, cor. Brunswick and Barton, \$11,000; Geo. Hedderson, 5 pr. semi-det. 2-storey brick dwellings, Beach avenue, \$20,000; Henry Matheson, 3-storey brick addition to apartments, 608 Ontario st., \$6,600; H. Shinkman, 3 att. 2-storey brick dwellings, near antler, Campbell ave., \$5,900; J. W. Walker, 2-storey brick apartments, cor. Bedford and Chicora, \$12,000; S. G. Farrell, 3 att. 2-storey brick dwellings, east side Booth, \$6,000; T. McLaughlin, 2-storey brick apartments, Irwin ave., \$8,000; P. Wyatt, 3 det. 2-storey dwellings, brick fronts, Jones, \$5,000; E. G. Lloyd Co., 2-storey brick factory, east side Carlaw, \$3,000; A. W. Reid, 4 2-storey brick dwellings, Summerhill Gardens, \$12,000; R. Larkin, 3 pr. semi-det. 2-storey r.c. dwellings, brick fronts, Jones avenue, \$9,600.

Vancouver, B.C.

Permits were granted as follows: S. W. Hopper, 3516 Third avenue west, \$3,000; C. F. Taylor, 1376 Thirteenth avenue west, \$4,500.

Morrison & Dagnall, builders and plumbers' supplies, etc., Montreal; R. Morrison & Josiah Woodward Dagnall have registered.

The rumor is abroad of a C. P. R. line paralleling the G. T. R. to Toronto. Part of the big expenditure in Toronto is said to be called for on account of this. The new line will commence at Bathurst, ten miles west of Smith's Falls, and proceed southwesterly to Belleville. The whole of this line, it is said, will be double-tracked, and as the line between Smith's Falls and Montreal is double-tracked already, the C. P. R. will have a double track all the way between this city and Toronto, and an alternative route between Smith's Falls and Toronto and will reach all the important industrial communities between Montreal and Toronto now served by the Grand Trunk alone. Work will commence, it is said, in the spring.

Digging Ditches with Dynamite

By Arthur E. Morgan*

In the lowlands of southeast Missouri, a considerable amount of excavation for drainage ditches is now being made with dynamite, a method of construction discovered by accident in 1909. In blowing large stumps preparatory to digging drainage ditches, it was noticed that where several stumps close together in a line were blown out, a depression remained which had approximately the dimensions of the required ditch. Acting on the suggestion thus offered, efforts were made to blow out a channel by placing a single charge at a time, with results which were not satisfactory. Next charges were placed in the ground 2 feet apart for a distance of 100 or 200 feet, and an effort was made to discharge them at about the same time by means of fuses. As the explosion of all charges was practically instantaneous, it was apparent that all but the first had been discharged by concussion.

The experimenters continued setting charges 2 or 3 feet apart for distances up to a quarter of a mile, and

constructed about a year, was 6 feet wide on the bottom, 12 feet wide on top, $3\frac{1}{2}$ feet deep, and in good order. In digging it two $\frac{1}{2}$ -lb. sticks of 50 per cent. dynamite were placed 3 feet apart in the ground and between 3 and 4 feet deep. Two men will construct a quarter of a mile of ditch in a day.

At a cost of 15 cents per pound for dynamite, and \$20 per mile for placing the charges, the ditch in the condition in which it was examined, after a year of depreciation, had cost about 5 cents per cubic yard. The ditch had been constructed through the woods without cutting down any of the trees, and in some instances the fallen trunks were lying across the channel.

This method of construction is coming into general use in excavating lateral ditches in the wet muck soils of southeast Missouri. Its advantages lie in its usefulness for digging ditches too small for a dredge, and through ground too wet for economical work by hand or with teams and scrapers. Whether larger channels can be constructed by using larger charges of dynamite, placed at greater depths, remains to be seen. Sandy soils are not handled as readily as clay or muck, and where ditches have been blown out in sand, the cost per yard has been several times as great. Neither does the method work well in dry soil. The use of 60 per cent. dynamite has in some cases given better results than 50 per cent. If the success achieved by this method of excavation is repeated in other parts of the country, it will appear that we have added to our construction methods another means of earth excavation, applicable to wet muck and clay soils, under conditions where none of our former methods of excavation were economical for the construction of small channels.

Master Builders' Convention at Winnipeg

At the fifth annual convention of the Canadian National Association of Builders, held last week in Winnipeg, the following officers were elected:

President, E. T. Nesbitt, Quebec (re-elected by acclamation); vice-president, G. W. Boughton.

Provincial vice-presidents—Quebec, Jas. Ballantyne, Montreal; Ontario, Geo. Gander, Toronto; Manitoba, Fred. H. Davidson, Winnipeg; Saskatchewan, R. G. Lecky, Regina; Alberta, R. A. Brocklebank, Calgary.

Secretary-treasurer—J. H. Lauer, Montreal.

Representative Directors—Quebec, Arthur Picard; Montreal, J. P. Anglin; Ottawa, J. Lackie; Toronto, John Aldridge; London, E. R. Dennis; Winnipeg, Chas. W. Sharp; Regina, D. J. McKay; Calgary, J. W. Aldridge; Edmonton, C. C. Batson; Lethbridge, H. J. Goode.

An extract of an interesting paper read at this meeting by Mr. Peter MacKissock will be found on another page. The detailed report of the proceedings will be published in our next issue.

found in all cases that it was necessary to set a fuse to only one of the charges, in order for the whole to be exploded. Up to the present this method is in use only for the construction of small ditches 3 or 4 feet deep and 6 to 12 feet wide. The dirt removed by the dynamite is thrown onto either side for 100 feet or more, and does not lie more than 6 inches or 1 foot deep along the margins of the ditch. The charges are set by making a hole of the necessary depth with a bar, and then pushing the dynamite into the hole with a wooden stick, tamping dirt on top. In order to secure a uniform cross section it is found necessary to place the charges at equal distances apart, and at such a depth that they will be on the proposed bottom line of the ditch, and that the charges should be approximately equal in size.

The best of the channels constructed in this manner are as nearly uniform in cross section as they could be made by using teams and scrapers.

One of the ditches examined, which had been con-

Mr. A. H. VanCleve, city engineer, of London, Ont., has tendered his resignation, to take effect March 1st. This step, we understand, is attributable to his recent difference with the water commission. It is stated that a compromise may be effected.

According to the annual report of the Waterworks Engineer, Vancouver now possesses 174 miles of watermains, over 25 miles having been laid during the past year. There were 3,065 new water services laid in, making a grand total of 17,549. Seventy-six new hydrants were installed, increasing the total number in use to 902.

The Western Steel Corporation has secured ten millions of capital from the Carnegie Steel Corporation, of which sum two millions is to be invested in a steel plant near Vancouver. The whole of the capital will be utilized on the Pacific coast, some of it being intended for the extension of the company's steel plant at Irondale, Wash.

Over thirty-six miles of new streets were laid down within the eight square miles comprising Old Vancouver during 1910, ten miles being macadamized. Sewers and basement drains constructed aggregated eighteen miles. Over twenty-one miles of three-plank walks were put down in the various wards by corporation laborers, while contractors laid over twenty-three miles of cement pavement and put in two and one-half miles of cement curbing. Over three miles of permanent paving were completed, the unfinished sections totalling an additional nine miles.

*In Engineering-Contracting.

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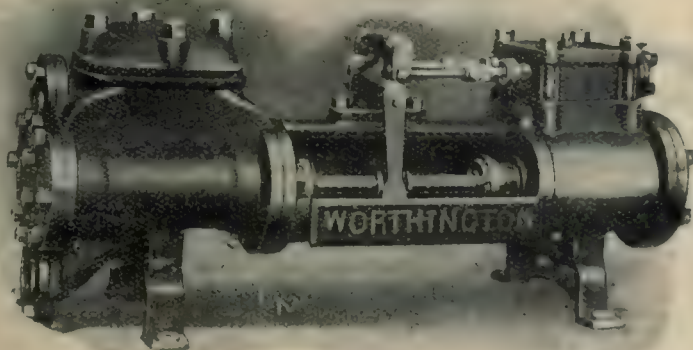
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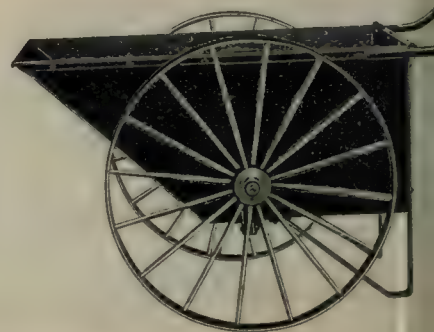


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February 22, 1911

No.

Modus Operandi of the Public Press

The manner in which the Vancouver papers reported the recent discussion at Winnipeg anent the relations between the city of Vancouver and their engineer is a rich example of the capabilities of the public press in such matters. It also goes to show what a high value is placed upon sensational copy as compared with personal reputation. One of those who took part in the discussion at the convention of the Canadian Society of Civil Engineers was Mr. James Kennedy, who, upon his return to Vancouver early this month, did his best to remove the false impressions made at Vancouver. It was reported that Mr. Kennedy had stated that the city engineer had been dismissed. There was no truth in the report, neither was there the slightest intimation that his dismissal was under consideration. And certainly it was untrue that the Mayor had been accused of personal animosity, while the right of the council to act without interference from the society was never questioned. The society was well within its rights in having the discussion, and inasmuch as no resolution was made, criticism from the daily papers was particularly ill-timed and impertinent. The distorted versions of the discussion were a source of some annoyance and one is inclined to wonder whether after all the representatives of newspapers upon their appearance at such gatherings should not be required to furnish certificates as to their responsibility and good standing in the community. We would not advocate their exclusion, but we would certainly suggest the enactment of protective measures of some kind.

Winnipeg Setting the Pace

The first week of February was an eventful one in the building world in Winnipeg. During that week conditions changed and developments took place that had a remarkable effect upon the prospects for the year. Those prospects, at the end of January were of a fairly promising nature, but during the period named it became apparent to all who are thoroughly in touch with conditions that the outlook grew more promising

day by day. A prominent contractor stated that he believed there had never been so much business in sight at that particular period of the year, as was the case at the end of the first seven days of February. While a great deal of that business had not yet reached a stage where figures were required, it was certain that the much greater part of it would materialize and that plans would be under way before the close of the present month. Already a number of the interested parties are making inquiries of consulting architects and contractors in regard to features of the work and conditions, and the interest displayed promises well for the building and construction business of the next few months. The projects under discussion include a number of large structures for business purposes.

Tile Business Unprofitable Under Present Conditions

Our attention has been directed to the unprofitable conditions obtaining on certain lines of goods used in the building trade. In the present instance, we would refer particularly to the tile business, the history of which during the last ten or fifteen years, in Toronto at any rate, seems to be that of non-success. One firm after another has withdrawn from the field disappointed to find that there was nothing ... Possibly the labor entailed in the installation of the tiles is usually under-rated; the workmen may not accomplish as much work as they should, or again, proper allowance may not be made for changes which necessitate taking down the tiles and putting them up again without further remuneration. Whatever the cause it makes very little difference, but we understand that if costs were properly kept on many of the jobs taken at prevailing figures in Toronto the balance would show such a small margin as to make the business unprofitable, for the net result would be on the wrong side of the ledger. An industry requiring mechanical skill, decorative taste and business ability should not be prosecuted under such undesirable conditions. The way to improve it may possibly be more difficult than we suppose, but if we were asked to offer a solution we would certainly suggest a new basis of figuring.

Foreign Cement Barrels

Our attention has been called to a paragraph headed "Foreign Cement Barrels," published in our issue of December 28. From the information contained therein it might be inferred that the domestic barrel is inferior to that received from Europe. That this is not the case is shown by data received from the Canada Cement Company, Limited. The barrels used by this concern are manufactured by an English cooperage maker and have the same grooved and tongued stays, are headed equally as well and have four iron hoops instead of two, as mentioned in the former article. These barrels are also lined with waterproof paper, which makes them air and damp-proof. The Canada Cement Company consider them equal to any export barrel made abroad.

Erratum.—Our attention has been directed to an error which appeared inadvertently in an article, "Our National Heritage," published on p. 43 of our last issue. The statement was made that "80 per cent. of the products of the Canadian farmer find a market in Canada." This should have read, "eighty per cent. of the products of the Ontario farmer find a market in Canada."

Practical Work in Engineering Training

Its Value and How it Should be Acquired—The Publication of Contractors' Data — Value of Itemized Cost Records

Office of the Chief Engineer, Intercolonial Railway,
Moncton, N.B., January 31, 1911.

Editor, Contract Record:

I have read with much interest Mr. Holgate's article in your issue of November 23rd, 1910, on "The Training of the Engineer-Contractor."

The summer days, weeks and months which comprise the college vacation should certainly be put to the best possible use by the student, and it should be impressed upon him by parents and teachers that this period of time should be a period of real practical work, at something pertaining to, or in some way connected with the course which he is pursuing in college. Mr. Holgate has suggested that he should be so interested in his vacation work, whatever it might be, that he will have gained enough information on it to write a paper when he returns to college, and have it counted in his regular examination marks.

If this were made a college rule, I believe that it would be a very great assistance to both professors and students. The student would immediately become more interested in his vacation work. He would be more observant; he would not hesitate to ask questions of persons who knew how to do some one thing well; to make notes of methods of work suited to particular situations; to make quick estimates of what the work was costing, and to think out quicker and cheaper ways of doing it. Everything around us is capable of being improved upon; but the man who really thinks is somewhat of a rarity. Thinking is hard work, and a college professor has said that the average student does not do ten minutes' hard thinking in a day.

Should a student be fortunate enough to secure employment with, say, a building contractor, he should be very careful to get permission from his employer to take notes on machinery, methods of doing work, and to make sketches, ascertain costs, etc. His notes and sketches, and his paper, if he writes one, should be submitted for his employer's approval before it is handed in to his college; and it should never afterwards appear in an engineering paper of society proceedings or transactions without the employer's special permission. I have known much trouble to arise between contractors and inspectors owing to the publication of descriptions of the contractors' machinery, methods of doing work, materials used, etc., without the contractor's permission.

Where competition is keen, many contractors object very decidedly to having the world know precisely how they handle their work, or to having some of their pet improvements or trade secrets minutely described for the benefit of their competitors.

Students are becoming less averse to taking hold of whatever comes their way in vacation work; and this is well, because the students are so many and the works so few. There will always be some swelled heads though, like the young man who was afraid to let his parents know that he was "time-keeping" for a contractor, as they would probably think the work much beneath the dignity of their would-be-engineer.

I do not see how practical work and cost-keeping

can be taught in the college without great loss of valuable time. It might perhaps be done to a limited extent by having up-to-date tables of costs for every conceivable kind of work, varying between certain limits, to cover differing circumstances; and these costs might be used by the students in making estimates, so that they would thus obtain a knowledge of costs in a general way.

In practice, no two jobs are precisely alike, and actual costs at one place will not cover actual costs at another place.

Good judgment and knowledge of local conditions are always necessary to a successful contractor. How are college professors to acquire such judgment and knowledge? Would not special teaching on the subject of costs be more likely to do harm than good, since there would be no certainty that the assumed costs would apply to any particular locality? The majority of contractors have no rigid system of cost-keeping. If the work is paying as a whole, they are apt to do the best they know how, all round, and let it go at that. If they are losing money, they will investigate the individual parts of the work sufficiently to find where the trouble is and improve it, if they can. At the close of the work, the actual cost of the individual parts of the work are not, as a rule, reduced to such a state of perfection that they are entirely applicable to the next job, and ready to be written into the next tender for work in another part of the country.

Itemized Cost Keeping.

In future, as competition becomes keener, it will be necessary to pay greater attention to cost-keeping of the individual parts of work. Then we shall see less frequently engineers estimating that hardpan can be removed by hand from sewer ditches for 50 cents per cubic yard, at the same time contractors are actually paying 90 cents to \$1.25 for removing the same material from similar ditches half a mile away.

A student can find a great deal to learn, if he keeps his eyes open, even in the simple operation of digging a sewer ditch. Does it require one picker to a shoveller or will one picker keep two shovellers going? One or other may make or break the contractor. If the material, for some reason, becomes saturated with water, he will soon find that the cost is multiplied by two. If quicksand is encountered and sheet-piling is required, with the winter close at hand, the contractor's price will need to be a good one to bring him out whole; when some of the backfilling is sure to be frozen, so that it will need to be picked over again.

The simplest performances such as these are full of information and suggestion for the student who can think and reason, and who is anxious to collect some out-of-school wisdom to carry back to his college, and later realize where some of his theory fits into his practical experiences.

Our technical colleges are doing excellent work and Canadians may well be proud of them.

Yours truly,

William B. Mackenzie,
Chief Engineer.

New Bank Building at Winnipeg

The Canadian Bank of Commerce has under construction at Winnipeg a new building, to replace the one which was recently taken down and which stood on Main street. The new structure will be six storeys high from the street and will have a basement and sub-basement.

The front will be constructed of gray granite. The columns will be eight in number and will be six feet in diameter at the base. The walls will be constructed of hard burned brick.

The foundation is of reinforced concrete. The excavations for the boiler-room reach a depth of thirty-two feet. The savings bank vaults and safety deposit vaults will be built in the sub-basement.

The banking room will occupy the main floor and will extend upward for three storeys. The floors of this room will be tiled, the tiles being laid on reinforced concrete. The floors in the offices above will be of hardwood, laid on reinforced concrete. The ceiling above the banking room will be supported by a steel truss.

The height of the building from the street level will be 97 feet, the width 104 feet 1 inch, and the depth 120 feet.

The cost mentioned in the application for the building permit is \$800,000.

Messrs. Darling & Pearson, of Toronto, are the architects, and Messrs. The Lyall, Mitchell Company are the contractors for the erection of the building. Mr. Robert Wilson is the representation of the contracting firm.

A somewhat remarkable feature in connection with the project is the fact that Mr. Wilson superintended the erection of the Bank of Commerce building which was erected on the same spot in 1899, he also had charge of the work of taking down this structure, and is now looking after his company's interests in the erection of the new building.

The former building was crated and shipped to Regina, where it will be rebuilt.

Permeability of Concrete

That brick pavements, and in fact pavements made of all kinds of material, expand with the heat and contract with the cold is of course well known; such expansion in some instances resulted in the arching of a pavement, the center lifting in some cases several inches from the foundation. We do not recall, however, having seen any figures as to the actual amount of expansion and contraction caused in pavements by temperature changes. An investigation of the amount of such movement is being undertaken by the United States Bureau of Standards, which has sent from Washington two of its engineers to study the brick speedway at Indianapolis, which is considered perhaps the most perfect specimen of brick paving in the country. From the results of these tests it should be possible to estimate with more exactness the size of expansion joints which it is necessary to provide in



The Bank of Commerce now under construction at Winnipeg
Darling & Pearson, Architects; Lyall-Mitchell Company, Contractors.

constructing brick pavements of various widths and in various climates.

At the same time these engineers propose to test the rigidity of the pavement—that is, the deflection occasioned by the passing of a load over it. For this purpose a sensitive spirit level will be used which will indicate a change in level at one end of one ten-thousandth of an inch. This would not seem to have as much immediate value to the engineer, although it may serve to indicate the value of certain coefficients of elasticity and other properties of brick pavements.

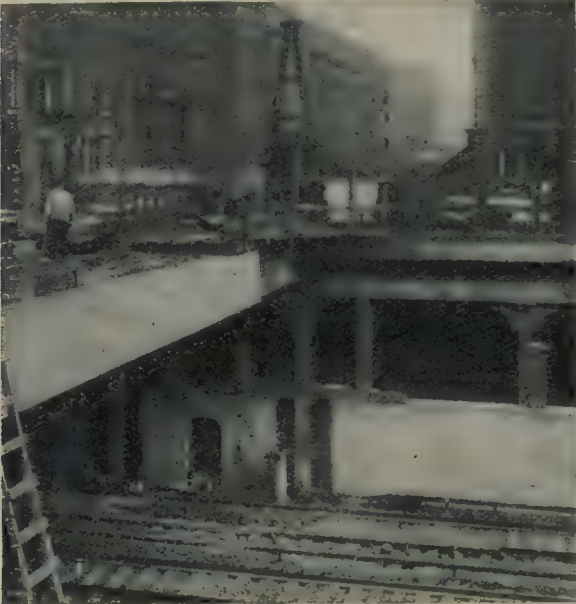
Motion in Brick Pavements

Studies have been made by the Board of Water Supply of New York city of the effects of various fine materials incorporated in the matrix of concrete in reducing permeability, including clays, hydrated lime and puzzolan and sand cements; these two cements being more finely ground than Portland cement. The conclusion reached was that concrete, practically impervious under 200-ft. head, can be produced with any of these materials, but that equally good results can be secured at no greater cost by using sufficient Portland cement, the latter method having the advantage of securing concrete of increased strength, while the other materials usually reduce strength.

Concrete Pile Foundations in Drilled Holes

A job of underpinning required by unusual conditions and carried out by a novel scheme has recently been completed in the new terminal of the New York Central & Hudson River Railroad at New York City.

Near the northerly end of the yard, 54th street crosses the yard on a concrete-floor bridge, carrier by steel girders resting on columns set outside of the central tracks. The columns supporting the easterly end of this bridge have shown a settlement, due to a compression or a movement of the soft material which occurred in a pocket of the rock at this point. The re-



Drilling 14-in holes for Concrete Underpinning Piles

maining columns of the street superstructure nearby have their footings directly on rock, but under the group of four columns just at the bridge the rock dips to 15 to 20 feet below the track level, and at this point the settlement has occurred, in spite of the fact that the concrete footing was constructed about 4 feet deep here.

It was therefore decided to provide a more secure foundation by underpinning the present columns without removing them, and carrying the foundation to rock, after which the original level could be restored

vation would have interfered very seriously with the traffic on the adjacent tracks, and due to the danger to traffic, it was decided it was not feasible to cut or blast out the concrete footing wall or the protection pier which extends above the foundation footing about 6 feet. The engineers in charge, therefore, decided to put holes down to rock and to cast concrete piles in these holes.

In using these machines the plan was to drill down four holes close together around each column, driven through the concrete footing to rock and penetrating into the rock far enough to make sure a sound bottom had been reached, then to cast reinforced-concrete piles in these holes, place an I-beam grillage on top of the four-pile group and rest the column on this new base.

The work was carried out without incident or extreme difficulty, except the interruption and slow progress occasioned by the drilling through reinforcing rails embedded in the concrete, timber grillages and boulders in the soft material below. The drills were set up on the street above (see view Fig. 1) and worked through holes cut in the street floor. The first operation was to drill a 14-in. hole down through the concrete footing. Through this a 10-in. extra heavy steel pipe was driven through the soft material to rock. The hole was afterwards cleaned out and a 5-in. core hole was put down into the rock from 4 to 8 feet in order to ascertain if bed rock and not a boulder had been struck. In case the drill passed through the rock into the soft material, showing that a boulder had been struck, the steel pipe, whose lower end was fitted with a thick cast-steel drive shoe, was driven down through the obstruction by a heavy ram. When a final bearing on rock had been secured, reinforcement consisting of seven 1-in. longitudinal rods with $\frac{1}{4}$ -in. wire wrapping, previously made up on the ground to the length required, was lowered into the hole and then filled with a 1:2:4 mixture of concrete, carefully tamped or churned into place.

The four piles of the set were spaced 3 feet longitudinally, 2 ft. 8 ins. transversely, or as close as the column base permitted. The entire work included only 16 holes, but, due to its nature, required about two months to complete, with two machines at work during part of the time. The drills, one a Davis, the other a Terry (both shot drills), had no difficulty in cutting through the concrete and the reinforcing rails of the foundation. Most of the delay in the work was caused by striking boulders in the soft material and timbers.

Test borings to determine the character of the material along the line of the new high level intercepting sewer now under construction at Toronto, were made with an auger operated by hand. The material for the most part is stiff blue and yellow clay, containing some small boulders. The auger bit was about $1\frac{1}{2}$ inches in diameter and was screwed into the end of a section of pipe. As the hole was deepened successive lengths of screw-joint pipe were added and the line of pipe sections with the auger at the bottom end was rotated by Stillson wrenches. Holes were put down in this manner to depths of 20 to 30 feet and the cost was from 25 to 30 cents per linear foot. As a rule the material is stiff enough to stand up in the hole without caving. The bit is withdrawn frequently and samples of the material removed from the auger and placed in glass jars for future reference. When large boulders were encountered which could not be passed by the bit new holes had to be started.

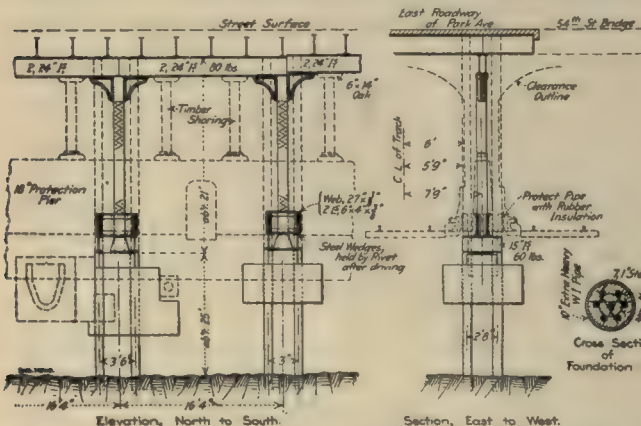


Fig. 2.—Sketch of Street Bridge Columns, showing new Foundations

by jacking up the columns. On account of close proximity of the main line tracks to the columns, any exca-

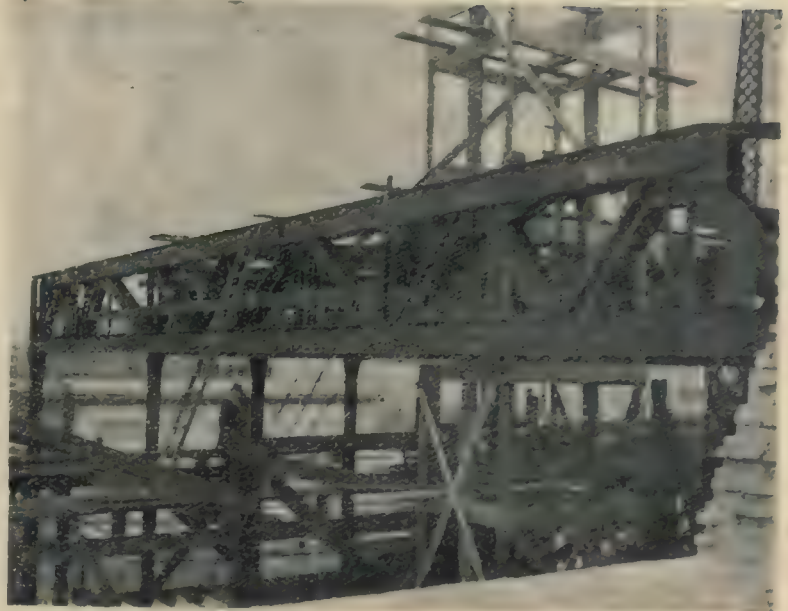
Noteworthy Steel Truss

An example of structural steel construction which has many remarkable features is that from which the illustration published herewith is taken. It is one of three steel trusses recently placed in position in the new Bank of Montreal building at the corner of Portage avenue and Main street, Winnipeg.

Each truss is 90 feet long and weighs 38½ tons. They are the longest trusses ever constructed at Winnipeg and constitute the heaviest piece of steel structure work yet constructed in Western Canada.

These trusses are built up of plates and angles with top and bottom chords of box section. They were shipped from the works in three main sections, the heaviest of which weighed 20 tons. Six teams were required to haul each section to the site, where they were moved from the wagons by means of rollers to the main floor of the bank. The several sections were then assembled and rivetted up into one complete truss. The trusses were raised into position to the top of the steel columns, about 50 feet above the floor, by means of two latticed steel gim poles, one placed at each end. To the underside of the finished trusses is attached the ceiling of the main banking room, making a clear height of 48 feet from floor to ceiling. These three trusses are designed to carry two floors, which, when completed, will contain living rooms for some of the employees of the bank, besides other rooms.

The trusses are a portion of a total order of 700 tons of structural steel supplied for the Bank of Montreal by the Manitoba Bridge & Iron Works, Limited, to Messrs. Norcross Bros., the general contractors. All the steel was fabricated under the inspection of the Duckworth-Boyer Inspection Company, Limited, Montreal, through their western representative, Mr. Geo. Campbell.

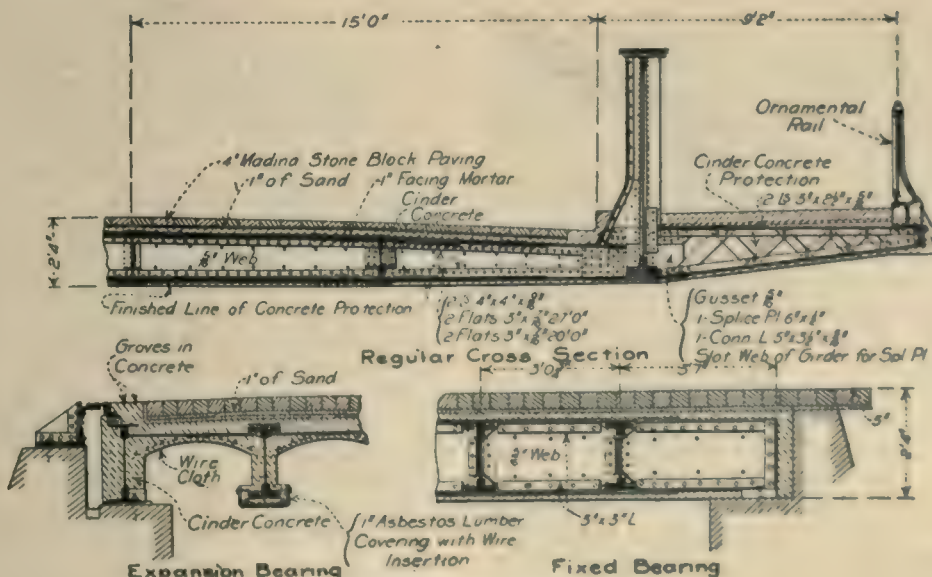


The first of the three largest Trusses yet constructed in Winnipeg, all of which will be used in the new Bank of Montreal Building. Each Truss is 90 feet long and weighs 38 1-2 tons.

Messrs. McKim, Mead & White, architects, of New York City, designed the bank building and all the steel used in it. Their representative in Winnipeg directly in charge of the work is J. N. Semmens.

Kensington Avenue Bridge, Buffalo

Kensington avenue, Buffalo, is carried over five tracks of the New York Central & Hudson River Railroad by a through plate girder, and deck I-beam bridge, with the steel work protected from the locomotive fumes. It is 50 ft. 4 in. wide over all, and has one 64-ft. 7-in. through plate girder span over four tracks and one 20-ft. 4-in. deck I-beam span over one track, supported on a concrete pier and on two concrete abutments nearly parallel to the tracks. It is proportioned for



Details Kensington Avenue Bridge

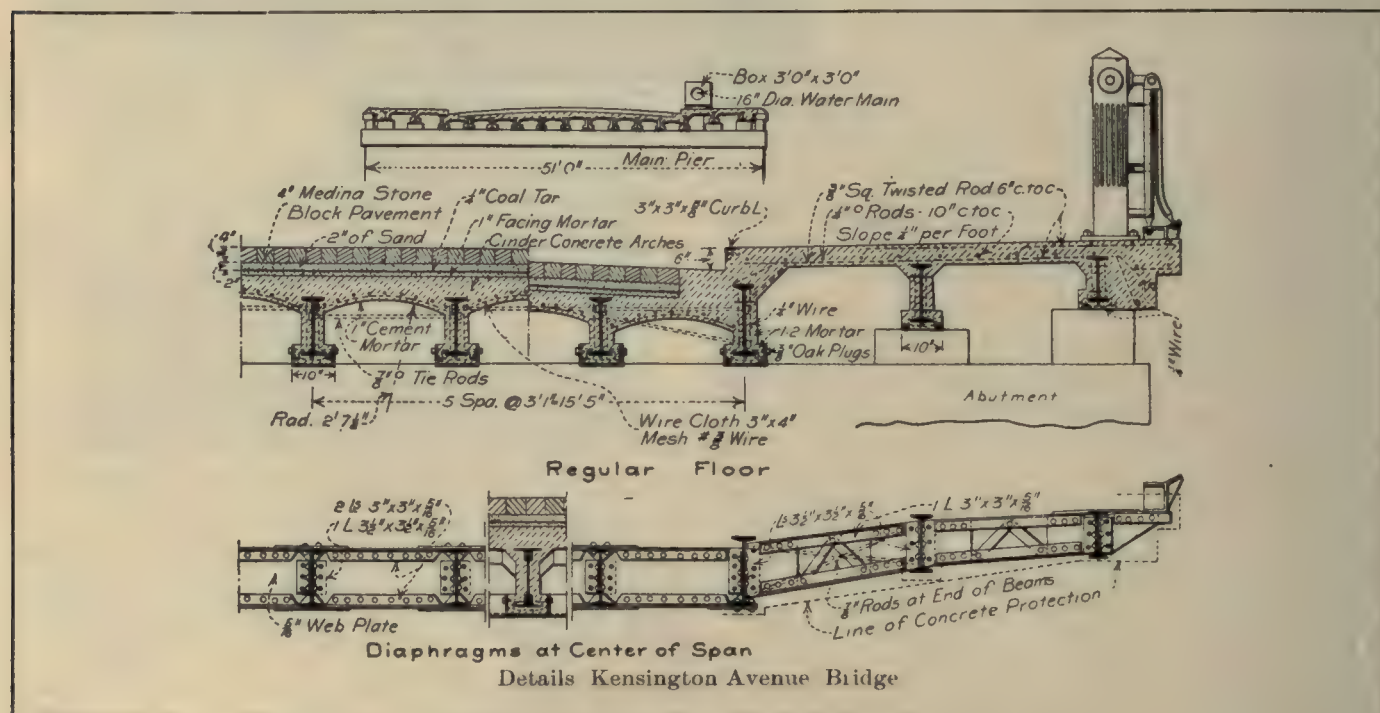
a live load of 100 lb. per square foot and a road roller with 26,800 lb. and 18,000 lb. on axles 11 ft. apart.

It is designed in accordance with the specifications for the extension of the Buffalo grade-crossing improvements, and the long span has two main girders about 7 ft. deep over all, and 32 ft. 6 in. apart on centers which are proportioned for a dead load of 4,900 lb. per linear foot. The loads and allowance for impact produce a maximum flange stress of 4,232,000 lb., which requires a net area of 34.8 square inches made up with 8 x 6-in. flange angles and cover plates. The girders are connected by rivetted floor beams 3 ft. apart, with heavily reinforced top and bottom flanges, the latter being horizontal, and the former being curved to correspond with the roadway crown.

The floor beams are connected to the girders in the usual manner by end sections of the web plates which extend beyond the top flanges of floor beams, and are field-riveted to the vertical stiffener angles of the main

forced with $\frac{1}{4}$ -in. rods and 1 x $\frac{1}{8}$ -in. soffit clips. Asbestos lumber troughs of $\frac{1}{4}$ -in. reinforced material were attached to the mortar protection of the bottom flanges of the floor beams and diaphragms by oak plugs embedded in the mortar. It was thought that cracks due to the deflection of the shallow floor beams might develop in the mortar protection covering and permit the locomotive fumes to attack the embedded steel. The asbestos troughs were used to cover any such cracks, all joints in the sections of troughs being covered inside with thin asbestos sheathing.

The roadway floor is finished with 1 in. of mortar, on which there is a 1-in. sand cushion covered with Medina stone block paving 4 in. thick. The sidewalk has a flat concrete slab 5 in. thick, made of 1:2:4 stone concrete reinforced by 1 per cent. of twisted $\frac{3}{8}$ -in. rods. All structural steel embedded in the concrete is first covered with 1 in. of Portland cement mortar or is brushed with Portland cement grout. Above the



girders. They are special in that they do not form gussets reaching to the top flange of the main girder, but terminate a little below the neutral axis of the girders, while the flange angles which stiffen their inclined edges are continued to the top flange of the main girder, being bent where they intersect with the stiffener angles in girders. This was done in order that the angles might be carried to top flanges of girders for stiffeners with a minimum encroachment in clearance. Lattice girder cantilever brackets about 9 feet long project from the outer faces of the main girders in the plane of the alternate floor beams to carry the sidewalks.

The floor beams are braced by three lines of longitudinal plate girder diaphragms with continuous top and bottom cover plates, which, like the floor beams, are entirely enclosed in cinder concrete. The spaces between the floor beams are spanned by cinder concrete arches 6 in. thick at the crown, made 1:2:4 with Portland cement, and reinforced 1 inch above the soffit with 3 x 4-in. mesh Clinton wire cloth. The bottom flanges of beams, girders, brackets and diaphragms are covered with 1:2 Portland cement mortar, rein-

forced with $\frac{1}{4}$ -in. rods and 1 x $\frac{1}{8}$ -in. soffit clips. Above the floor there is no concrete protection for the steel, which is painted in the usual manner.

The short span has 15 and 18-in. longitudinal I-beams about 3 ft. apart, carrying 1:2:4 cinder concrete arches and a roadway similar to that of the long span. The I-beams are enclosed with concrete protection like the stringers in the other span and are connected at their center points by plate girder diaphragms under the driveway, and by riveted open frames under the sidewalks. Longitudinal girders have sliding bearings at the expansion ends where the floor is carried over the back wall by the usual sliding apron plate.—Engineering Record.

The maximum fee which Messrs. Hering & Fuller will charge the city of Montreal for drawing up plans and specifications for the filtration plant is \$31,000. This is on a basis of about 2½ per cent. of the total cost. The plant when completed will cost \$1,257,000.

The Dominion Trust Company, of Vancouver, B.C., are about to commence the erection of a 6-storey building at Victoria at a cost of \$135,000.

The Reminiscences of a Master Builder

Early Apprentice Days in Scotland—Later Impressions: Employer and Employee, Builder and Owner—Insufficient Remuneration of Contractor

By Peter MacKissock, Winnipeg

It would have been comparatively easy to have culled some facts from the most up-to-date text-books, diluted with copious extracts from the Encyclopedia Britannica, added a few technical matters from my own experience and inflicted the whole heterogeneous mess on this long-suffering audience as a contribution from a scientifically-minded 20th century master builder.

It is, however, more and more borne in upon me as I grow older, that as a rule we take ourselves far too seriously, and expect others to take us at our own valuation. This has a tendency to develop us, consciously or unconsciously, into "poseurs," and our public pose gradually becomes more important to us than we really are.

The apparently wisest individuals I have ever seen were six owls that I saw in Stanley Park in Vancouver. These owls sat roosting on a stick, in a cage, and were miracles of preternatural gravity, and of overwhelming, mysterious, sphynx-like wisdom. I looked at them with a deepening sense of my own unworthiness and hopeless ignorance, and was about to efface myself from their neighborhood and drown myself in Burrard Inlet, from sheer disgust at my own utter insignificance, when one of them winked at me, quite distinctly; and the scales fell from my eyes, and I realized they were only posing for the public benefit, and that they did not really know very much more than the rest of us. So I thought that to-day it would be well for me not to attempt too high a flight but to remember that we are brothers-in-trade, gathered from east and west, largely to make or renew acquaintanceship, and to rub shoulders with each other so that we may reduce our angularities of thought and disposition, and get rid of that tendency to provincialism which prevails sometimes almost unconsciously. Therefore, with your permission, and premising that I am a very ordinary individual indeed, much more desirous of learning than capable of teaching, and holding all forms of self-advertisement in detestation, I shall try to give you a few reminiscences and impressions which, after all, have no special value except that they are my own, and may wake some responsive chords in the hearts of other master builders present.

When I tell you that I have been a master builder for some 200 years you may think I exaggerate slightly, but if there be anything at all in the theory of heredity, it is an undoubted fact.

In my own personal share of that time the individuality most impressed upon me, so far as building matters are concerned at least, is that of my own apprentice foreman.

How distinctly I recall him, clear hewn in deep relief upon the tablets of my memory! Not only had he been principal foreman to my late father as far back as I can remember, but he had also been his friend. He was a native of Stirlingshire, Scotland, and he had the fresh ruddy complexion and springing step of the mountaineer; strongly marked and characteristically Scotch features, and keen, bright blue eye. With the kindest heart imaginable he had the harshest, most strident voice which ever emanated from the lips of mortal man. I have known that voice strike terror into the heart of many a mild young Irish laborer.

My earliest recollections of my old friend cluster round his visits to our home at "New'r-day." For years he was

our "first-foot," and the fateful hour of twelve had hardly done ringing when he was at the door and had passed in, fresh and cheery, bringing with his very presence a breath of breezy mountain air and several blends of Mountain Dew. His pockets bulging with oranges, sweets and shortbread, he would wish us all a "hearty guid New Year." That shortbread, of his own manufacture, I shall never forget. "A' made it masel," he would say, his face beaming with honest pride, and we could well believe it. It was of the strength, consistency and flavor of a well-made slab of concrete, and for armour plating for a Dreadnought it could not have been excelled. But we children ate it. We were young and our cares sat lightly upon us, and at the risk of life and teeth we ate it, even if, like other daring ones before us, we "bitterly thought of the morrow."

The Writer's Early Training.

Old Geordie "put the tools into my hands," as the phrase goes in Scotland, both for stonecutting and masonry (he was a past master of both) and for the next few years I practically belonged to him. Let me here say for the benefit of those who are not acquainted with the old Scottish "feudal system" of making a master builder, that the fact of my being the boss's son did not in the least prevent me from being subjected to an iron discipline, which I think Geordie, as a staunch Radical, rather enjoyed on the son of an equally staunch Conservative. And yet, advanced liberal though Geordie was in politics, he also was, like many of my race, most conservative so far as old customs were concerned. With regard to clothing I am certain he regarded masonry and "moleskins" as inseparable, and I can well remember the ineffable contempt with which he used to regard some of the younger generation of masons who so far forgot what was due to custom and tradition as actually to appear in what old Geordie called their "Sawbath troosers." He seemed to feel that in tampering with the sacred moleskins they were removing the ancient landmarks and that the end of all things was near.

He insisted of course upon my wearing the correct costume, and nothing pleased him better than taking me down town on a Saturday night to buy me two pairs of these white moleskins—one pair to wash the other. On one occasion he was rendered supremely happy by my being persuaded to go in for, as an extra, a pair of the infinitely more aristocratic "Windsor Corduroys," a material whose wearing qualities are expressed in the words of the Psalmist, "And shall from age to age endure." I was not so happy as he because those "Windsor Cords" were, when new, of a bright yellow, making me look, at my callow and growing age, like a gigantic yellow canary; but old Geordie was delighted, and I liked him so well that I was content.

Using the term "master builder" in its true sense as expressing the mastery of that trade, as apart from "employer," I have yet to meet a better master builder than old Geordie Taylor. With him, "bond" was a religion, and his plumb rule, square and level were to him as the Ten Commandments. Methods may and do vary, new materials and conditions are introduced, but the great fundamental principles handed on to us by Assyrian, Babylonian, Egyptian, Greek and Roman, are eternal, and these my old apprentice foreman had absorbed into his very being. Slovenliness, sloppiness and rule of thumb he would not tolerate, and I

am certain that he considered our own business as the only really important one, and all others as subsidiary and inferior, if not altogether unnecessary—after all not a wholly bad creed for a master builder.

In the days of which I am at present speaking—the early eighties—many stonecutters, masons and others, were constantly coming and going between my father's employment in Glasgow and New York, and other American and Canadian ports, and it seemed the natural thing for me, immediately on the expiry of my five years' indentures, to sail for New York City. Besides it ran in the blood for us to become real "journeymen," and my father had preceded me in a long visit to this side many years previously, having helped to build the old City Hall in Hamilton, Ont., about 1860, I should think.

Different methods in the stone yard and in the building crowded in on me and I had a busy time assimilating them all, hanging on to the sheet anchor of what old Geordie taught me, and developing my technical training at the same time. I wanted to see all I could in the States, and I did—from Boston to New Orleans, and from Charleston, S.C., to Mexico. It was at that period, too, when as a necessary addition to the excellent education and technical training which I owe to my respected father, I received that further education which only the old soldier can give to the raw recruit. It was in New York where one of the many witty Irishmen whom it has been my privilege to count as friends, helped educate me by not paying me the compliment I fished for. I had just adopted the new collar as neckwear, the stand-up all-round, clerical-looking one which had just come into fashion. I was young and I wore it good and high, and I asked Anthony how I looked. In his south of Ireland accent he replied, "Ye look like nawthin' but a cuddly lookin' over a white gate."

During the twenty-five years which have elapsed since I became, in the original and true meaning of the term, a "journeyman," and started out after the higher degree of master builder, I have seen, like Ulysses of old, "many lands, many men, and many cities," not without observing, and many impressions have fixed themselves idelibly in my mind.

Relations Between Employer and Employee.

The first is in reference to that which is always with us, viz.: the relations which exist between employer and employed. I do not wish to pose as an authority on political economy, and so I shall avoid the terms capital and labor. After all, are not these terms somewhat misleading in this instance? Are not we ourselves in the ranks of labor, producing, after the hardest and sometimes most thankless work, almost wholly for the benefit of capital? "Employers" and "employed" let it be therefore.

The point of view at the moment seems to be that we have taken two different sides in a gigantic struggle, which shall leave one side forever at the mercy of the other, and that our interests are eternally antagonistic. My impression is, as I have indicated, that this is an entirely wrong position.

After much consideration I am of the opinion that trades-unionism ere long will be a thing of the past. The inherent defect of trades-unionism is that the fact of a workman being a member of any union does not guarantee his efficiency in the trade which that union represents.

Compare this with the requirements of the men who have gone before, men whose handiwork the modern mechanic has not yet excelled—in many cases not yet equalled. Into the old Guilds which flourished during the Renaissance in Italy, no man could enter without proving his efficiency, and the very fact of his being a member was a guarantee that he knew his business, and knew it thoroughly. Glass-makers of Venice and Murano, goldsmiths and sculptors of

Florence and Rome, their trades-unions guaranteed efficiency, and there was not even a genius like Benvenuto Cellini, or the mighty Angelo himself, but had to prove to the satisfaction of the board of examiners that he could actually produce with his own hands the finished article of his trade. This example was followed all over Europe, and in the Old Country, and is still a part, more honored in the breach than the observance nowadays, of the constitution of my own guild—that of the Incorporation of Masons of the City of Glasgow. This condition of things containing the true principle which gave long, healthy, and productive life to the old guilds, is entirely lacking in the trades-unions of to-day.

Another fatal defect is that notwithstanding the clear teaching of all history that force is no remedy, the unions are coercive with regard to their fellow-workers or would-be fellow workers, and are becoming more and more artificial. The inexorable fate of all superimposed tyrannies awaits them.

I do not here deal with organized labor as apart from present day trades-unionism, and I differentiate between them. I look, on the other hand, for a future development which shall be far-reaching, indeed.

I have long been impressed with the advantage of the working agreement between employers and employed, provided it is approached and entered into in the right spirit by both parties to it, and loyally adhered to. Otherwise it is useless. The spirit of suspicion, quite different from watchfulness, is to be deprecated, and the spirit of mutual understanding encouraged. I have known a threatened strike to be averted, largely because the employees were satisfied that the president of the Master Builders' Association, of which I was then a member, had the interest of the whole trade at heart. He was able to bring them to see that the interest of employers and employed were not antagonistic but identical. Events proved him to be right. This end was only attained by belief in mutual good faith, supplemented by the clearing up of many misunderstandings, some of them trivial enough.

The Builder, the Architect and the Owner.

My next impressions are connected with the master builder's relations to his employers; the architects and owners.

My experience has been that the really good architects—men who have been decently bred, and who have had a good training, and above all, who have the right atmosphere about them—are always the most approachable, and the most free from assumption of superiority, and snobbishness generally. Further, I have always found that the most capable architects, those of the best standing in their profession, are invariably ready to give courteous consideration to any suggestion from an experienced contractor, and to give a master builder credit for taking interest in his work for the work's sake, apart from the "dollar-and-cent" point of view.

I have, of course, met the other type of architect, a cross between a putty man and a peacock, and he is the gentleman who looks upon the contractor as a convict out on ticket-of-leave, and not reporting himself regularly. It is he who draws a specification and terms-of-contract in which the sole rights reserved to the contractor are to pay out wages; hand checks to the supply people; cover up and pay for the architect's blunders, omissions and general incompetency; be responsible for the upkeep of the building during the rest of the term of his natural life; and then, having washed his feet and shaved his head, he may crawl to the footstool of the Most High, and get a certificate for 67 per cent. of the work done—perhaps. Ten years after the contractor's death his widow may collect the final balance.

To such an architect I would recommend the study of the old proverb, "It's a long lane that has no tomato can."

But on the other hand, it is the master builder's duty, as it ought to be his pleasure, to treat the architect with the courtesy he himself expects, to back him up and handle his work without worrying the architect unduly, and generally to act "on the square" with him.

Insufficient Remuneration.

One other point which impresses itself upon me is that in consideration of the training he has had, the enormous amount of figuring he has to do, the constant keeping of himself abreast of his times or a little ahead of them, the worry and responsibility he undertakes, I do not think the ordinary contractor is anything like sufficiently remunerated. Wherein does the remedy lie? Here, at the opening of 1911 we are looking forward to a vast amount of good work. Will the present entirely irrational system be continued? If so, why?

Lastly, let me put myself on record once again as being impressed with the advantage of an apprenticeship to some section of the business for all master builders. This apprenticeship should be supplemented by a thorough technical training, prepared for in the schools as far as possible.

* * *

As a closing thought let me recommend to myself, and to my brothers-in-trade these golden words of the old Roman emperor and philosopher, Marcus Aurelius:

"At what time soever thou wilt, it is in thy power to retire into thyself, and to be at rest, and free from all businesses. A man cannot any-whither retire better, than to his own soul; he especially who is beforehand provided of such things within, which whensoever he doth withdraw himself to look in, may presently afford unto him perfect ease and tranquillity."

Maintenance of Macadam Roads

The Edinburgh county road surveyor gives the results of his observations in England and his experience in Scotland with respect to the use of tar and pitch as binding materials for stones used in making and repairing roads. The four methods of applying tar are: (1) Tar spraying; (2) tar macadam; (3) pitch grouting; (4) tar matrix.

The above methods and cost per superficial yard over ordinary macadam, detailed by the county road surveyor, are here summarized:

Tar spraying.—It is essential that all dust and caked mud be removed from the road before the liquid is applied. After tarring, a slight sprinkling of whinstone screenings is spread over the surface. Hand tar spraying is considered superior to machines, although it costs slightly more and takes longer. In this process tar is not so much a binder as a waterproof protection to the road surface. It is soon worn away, however, and when broken up the road is thrown into an uneven and dirty condition. It is now admitted that tar spraying lasts only for one season. The life of a road subjected to much fast motor-car traffic is increased 15 to 20 per cent. when tar sprayed. One of the main thoroughfares in Edinburgh County costs on an average \$1,460 per mile per annum to maintain as at present. If tar sprayed its whole width the cost would be \$1,800 per mile, after allowing for the increased life of the road, as above indicated.

Tar spraying is most suitable for county roads where expenditure is limited, and although tarring the entire surface would be preferable, a width of 10 to 12 feet in the center would accommodate motors and protect the metal bed, allowing at least double the length being sprayed, and leaving the sides with a better foothold for horses during frost.

Tar macadam.—This consists of thoroughly mixing the stone with tar and pitch previous to its being laid on the highway. All stones should be dry, which necessitates pre-

paration of the material under a covered structure. Tarring may be done by hand or machinery. It is usual to allow the material to lie in heaps one to three weeks to mature before applying. The coatings are applied in three layers of $2\frac{1}{2}$ and $1\frac{1}{2}$ inches and $\frac{1}{2}$ inch stone, rolled separately, and finished with a thin layer of fine dry screenings. Tar macadam roads are easily cleaned, and the cost of maintenance on an average of years is less than ordinary macadam. It is slippery during frost and unsafe on gradients steeper than 1 in 20. Under very heavy traffic it loses its bituminous surface in two or three years, and the top layer becomes separated from that below. This system involves a comparatively heavy initial expenditure, and its general adoption on county roads would appear to be impracticable.

Pitch grouting.—This consists of application to a scarified road, rolled smooth, of a 3 to 4 inch coat of whinstone metal, consolidated in a dry state, after which boiling pitch and tar is poured into the joints, sprinkled with small whinstone or limestone gravel, and rolled until thoroughly hard. The composition is made up as follows: Pitch (best coal tar), 1,100 pounds; refined tar, heavy bodied, 800 pounds; creosote oil, 100 pounds; total, 2,000 pounds. The mixture is applied to the roads at boiling point with spray cans, whinstone chips are immediately applied, and rolling at once undertaken. This composition is of a quick-setting nature, but retains considerable viscosity. The surface must be thoroughly dry before it is applied. The surface is smooth, but not slippery. The traffic is carried on the metal and not on the tar, as is the case with tar macadam, tar painting, or tar matrix. This is regarded as the best system for tarring county roads, as it makes them almost dustless, effects a great economy in cleaning, is easily repaired, and the life of the road is increased by at least one-third.

Tar matrix.—There are three methods of applying tar matrix. It is usual to slightly scarify the existing road surface. The first is to spread a layer of small gravel, previously tarred, to a depth of 1 inch to $1\frac{1}{2}$ inches, on which is laid ordinary road metal. This is rolled until the matrix is forced to the surface. In the second the road metal is spread first and well rolled in the dry state before the matrix, composed of tarred materials up to 1 inch in size and to the foregoing depth, is applied. This is rolled until the interstices are filled with the matrix and a smooth surface has been obtained. A thin finishing coat of finer tarred materials is usually applied, sprinkled with dry sand or chippings, and rolled until thoroughly hard. The third or Gladwell system is a combination of the first two, having a matrix both above and below the metal.

Rocmac.—Roads made on the Rocmac system are claimed to be dustless, waterproof, economical, durable, and non-slippery. The solution is a chemical composition, made under pressure, the foundation of which is silicate of soda and sugar. The solution is mixed with high-class $\frac{1}{4}$ -inch limestone and gravel free from impurities. This is laid about 1 inch to $1\frac{1}{2}$ inches deep on the road surface, which has been slightly scarified. On this is spread the ordinary macadam metal, about 3 inches thick, and thoroughly rolled until the matrix entirely fills the interstices and comes to the surface. Owing to the simple preparation of the matrix and small plant required, the work can be undertaken by ordinary workmen, but experiments have proved expensive compared with pitch grouting.

In Scotland, as well as England, county road boards that have experimented with tar macadam in constructing new roads and maintenance of old have practically abandoned it, the cost being prohibitive. Tar spraying of 10 to 12 feet in the center is generally regarded as the limit of economical treatment of macadam roads in outlying districts, and this has been restricted to main thoroughfares and of village roads. For suburban roads it is likely that the use of pitch grouting will increase.

A workman who claimed \$10,000 from the Toronto Construction Company for the loss of his eyesight as a result of a dynamite explosion, was awarded \$1,000 and costs by Judge Champagne in Hull.

The Canadian Northern Railway has completed the grading on the line through the Fraser Valley, and the contractors are now awaiting the arrival of two shipments of steel on the coast to begin tracklaying. The British Columbia section of the system extends through the Yellowhead Pass to Kamloops, and down the Fraser Valley to the coast.

Rules of Measurement for Contractors

Suggestive Regulations for Excavating and Concrete Work Adopted at Chicago—The Various Provisions for Extra Work and Deductions

In view of the extent to which concrete is now being used in foundation work and general building construction, the following rules of measurement, which have been adopted by the Chicago Contractors and Masons' Association, the Chicago Architects' Business Association and the Western Society of Engineers, cannot fail to prove of interest:

Excavation of Cellars and Basements.

1. Excavation to be measured and computed by the actual amount of material displaced. If unit price is based upon loose measurement, add forty (40%) per cent. to actual bank measurement, except if consisting of sand and gravel, when only twenty (20%) per cent. will be added. If rehandling becomes necessary, same to be done at a special price agreed upon in addition to the above.

Excavation of Trenches and Pits.

2. Excavation of trenches, pier holes, or pits when more than 3 feet wide to be computed on actual contents when less than 5 feet deep.

When less than 3 feet wide excavation of trenches, pier holes or pits to be computed on actual contents if less than 2 feet deep.

If more than 2 feet deep, compute contents of trench on basis of 3-ft. width, even though same is narrower.

If less than 2 feet in depth, estimate actual width.

For pits and pier holes more than 2 feet deep and less than 12 square feet in area estimate area of same on base of 12 square feet multiplied by depth of same down to 5 feet, and no more than 5 feet deep, estimate on same basis as given below for additional depth of trenches, with the same percentages of increase added.

Add 75 per cent. to actual contents of excavation of trenches, pier holes or pits for depth between 5 feet to 10 feet.

Add 150 per cent. to actual contents of excavation of trenches, pier holes or pits, for depth between 10 feet and 15 feet.

Add 225 per cent. to actual contents of excavation of trenches, pier holes or pits for depth between 15 feet and 20 feet.

Add 300 per cent. to actual contents of excavation of trenches, pier holes or pits for depth between 20 feet and 25 feet.

Add 375 per cent. to actual contents of excavation of trenches, pier holes or pits between 25 and 30 feet in depth.

Add 450 per cent. to actual contents of excavation of trenches, pier holes or pits between 25 and 30 feet in depth, and so on, adding 75 per cent. accumulative for every 5 feet additional depth.

Back Filling and Grading.

3. Soil required for back filling or grading to be measured by computing from cross-sectioning cubic contents of area to be filled or graded.

4. Sheet piling and lagging to be estimated per thousand feet of lumber required. Kind of lumber to be specified.

5. Shortage of earth banks to be done at unit price, per square foot of shored surface of bank.

6. Pumping or bailing when required to be done at special price, in addition to excavation unit price, as the excavation rules are based on dry work; this, however, does not apply to rain or storm water.

Concrete Foundations.

7. Foundations for walls to be measured actual contents when made with square and level off-sets.

Footings with sloping or beveled off-sets less than 30 per cent. from the horizontal multiply area of base by greatest height of footing. This applies to piers also, except when courses in pier foundations are less than 12 feet in area, when 1 cubic foot will be added for each corner for every foot in height of such course.

8. Foundations for all projections, such as chimney breasts, plasters, buttresses, or flues, connected with walls to be measured actual contents contained therein, and 1 cubic foot added thereto for each corner for every foot in height.

9. Recesses and slots in foundations to be measured solid and in addition thereto allow two (2) cubic feet for every foot in height or length.

10. Arches in foundation. Multiply length of chord at spring arch by height from chord to extrados by thickness of arch, and add to the wall measurement. Height of arch equal to thickness of wall.

11. Circular or polygon foundations to be figured at double actual contents.

12. For wall 14 feet or less in height, 24 inches or more in thickness, use the actual thickness as basis in computing the volume. For walls less than 24 inches in thickness, add one-half the difference between the actual thickness and 24 inches in computing the volume. If walls are more than 14 feet in height between doors, add to cubic contents fifteen (15) per cent. for every additional 4 feet in height, on accumulative scale, as given for trench excavation.

13. For circular walls of radius sufficiently large to obviate the necessity of using specially prepared lumber for forms, add one-fifth of length to girt wall, and figure cubic contents on the same basis as prescribed for external and division walls, paragraph 12.

14. For battered or sloping walls, estimate contents on same basis as for external and division walls, and add one-half of contents of wedge, or batter to same when narrower on top than 24 inches. See paragraph 12 and 17.

Intersection and division walls, 24 inches thick or less (bonded together in any manner not abutting), to be measured as slot or recess. When thicker, add 1 foot to length of wall for every intersection when measuring.

15. In retaining walls, reinforced with beams, columns or girders, figure concrete casing a minimum thickness of 12 inches from outside edge of steel on side next to earth bank and 6 inches from outside edge of steel on opposite side—i.e., compute wall 1 ft. 6 in. thicker than width of steel.

For all other retaining walls, compute on same basis as for external walls, paragraphs 12 and 17.

No deduction in cubic contents of concrete to be made for metal imbedded in same.

16. Hollow walls to be at special rates.

17. For each corner of wall more or less than 90 deg., add 1 ft. 6 in. to girth length of walls in measuring.

The term corner is used for salient angles of walls, and angle for re-entering angles.

18. All plain projections, such as chimney breasts, piers connected with walls and pilasters, to be measured actual contents contained therein, and 1 cubic foot added for each corner for every foot in height.

19. Independent plain square piers to be measured by

same rule, i.e., add 1 cubic foot for each corner for every foot in height. For plain polygon or round piers, add 4 cubic feet for each foot in height.

20. Recesses and slots to be measured solid in addition thereto allow 2 cubic feet for every foot in height or length.

21. In vaults, multiply length of chord at spring of arch by height from chord to extrados by thickness of arch.

In walls, find contents of arch by same rule and add same to wall measurement, as called for in paragraph 10.

In sewers and tunnel arches, multiply length of extrados by thickness of arch.

Openings with Frames Built In.

22. Deduct contents of windows, doors, and other openings, measuring from jamb to jamb and from top of sill to spring of arch, and add 2 feet of wall for each jamb for every foot in height of opening when plank frames are used; if box frames are used, add 4 feet of wall for each jamb for every foot in height.

Openings Without Frames.

23. Deduct contents of openings, same to be measured from top of sill to spring of arch and shortest distance between concrete jamb for width, and add for each jamb 2 feet of wall for every foot in height of opening.

Circular, oval or other special shaped openings to be figured at special price.

Chimney Breasts, Flues and Pilasters.

24. All flues or hollow in chimneys or walls less than 2 feet in area figure solid and add 2 cubic feet for every foot in height. All flues and hollows in chimneys or walls from 2 feet to 4 feet in area to be measured solid. When larger, deduct one-half of contents of flue.

Detached portions of chimneys in buildings and plain chimney tops above roof to be measured solid, and 1 cubic foot to be added for each corner for every foot in height.

25. Detached chimney stacks to be figured at special rates.

26. No deduction allowed for omissions of concrete for cut stone, terra cotta or other trimmings, bond blocks, timber, joists or lintels.

All ornamental or moulded work in cornices, gutters, belt or sill courses, etc., to be figured at special rates.

27. Cutting and patching of joists, girder, or other holes, slots, panels, recesses, etc., to be paid for on basis of time and material required.

28. When ordered by owner, architect, engineer or the superintendent in charge of the work, to rack or block in consequence of delay of delivery of iron, steel, stone, terra cotta, or other material, that concrete work may connect with such racking or blocking shall be measured as extra work, as follows: Increase girt length of such line by one-half and multiply by thickness of wall.

Concrete Floors on Soil and Tile Arches.

29. Floors to be measured by the superficial surface between outside walls of building. No deductions to be made for floor sleeps, conduits, pipes, drains, division or partition walls. No deduction to be made for any piers, columns, chimney breasts, pilasters or other projections of walls of 10 feet or less in area.

Caissons.

30. Owing to grillage in caissons being left at different heights in same building, unit price for caissons will be computed on excavated contents, including necessary wood-lagging and rings for same. Cubic contents of excavation of caissons to be computed from top of first set of lagging to bottom of caissons and from outside of lagging. If steel or any other special casing is required, same to be paid for additional at special unit price per pound.

31. Area of bottom of bell to be multiplied by height of bell to neck for cubic contents.

32. For caissons 7 feet or more in diameter, estimate actual contents from outside to outside of lagging.

For caissons from 7 to 6 ft. 6 in., inclusive, add 5 per cent. to actual contents.

For caissons under 6 ft. 6 in. to 6 ft., inclusive, add 15 per cent. to actual contents.

For caissons under 6 ft. to 5 ft. 6 in., inclusive, add 25 per cent. to actual contents.

For caissons under 5 ft. 6 in. to 5 ft., inclusive, add 35 per cent. to actual contents.

For caissons under 5 ft., add 50 per cent. to actual contents.

33. If compressed air is required, same to be paid for in addition to the above.

33. If rings are ordered left in caissons, same to be paid for additional at unit prices per pound.

34. Pumping and bulkheading to be paid for at additional price.

35. No deduction to be made for cubic contents of metal imbedded in concrete.

Concrete for filling of caissons to be computed on actual contents per cubic foot of concrete, but no deduction to be made for any metal imbedded in same.

Reinforced Concrete Work.

37. Reinforced walls: Compute concrete on same basis as specified in sections 12 and 17 for external and division walls, and add to same cost of reinforcing metal put in place. If through changes or revisions cutting of reinforcing metal delivered or ordered becomes necessary, estimate the full length of such bars or metal fabric, and add to same cost of cutting and fitting required. Reinforcing metal to be computed on unit price per pound or square foot. No deductions to be made in estimating cubic contents of concrete for any metal imbedded in same, such as wire netting, expanded metal, bars, beams, columns, etc.

Columns.

38. Measuring of plain uniform size column to be covered by the foregoing paragraph 19 relating to piers.

39. Capitals, cap, brackets, panels, moulding or other ornamental or moulded work to be figured special rate.

Girder, Floor Beams or Other Drop Projections Below

Floor Slab.

40. For projections named in this paragraph, add for each corner and angle to cubic contents 1 cubic foot for each foot in length. For each chamfered or rounded corner or angle add $\frac{1}{2}$ cu. ft. for each foot in length in addition to the above.

41. Floor and roof slabs to be estimated on same basis as called for in paragraph 29 for floors on soil, and at a minimum thickness of 6 inches. Less than 6 inches in thickness will be computed as 6 inches.

42. No deductions to be made in floor area for opening of less than 20 square feet. For larger openings, after deducting full area of opening, add one superficial foot to floor area for each foot in length of girt of opening, and 1 cubic foot extra for each corner or angle.

43. For pits, baskets or other depressions in floor, add one superficial foot to the area of walls and floor of same for each foot in length of each corner and angle.

44. Setting of fabrics, frames, pipes, sleeves, bolts, rods, clamps, etc., imbedded in concrete to be paid for additional at special price.

Floor Base and Coves.

45. Floor base and coves to be estimated at special price per lineal foot, with 1 foot added to length of same for each corner and angle. For base or cove around round

columns, estimate three times girt of column, and for square or polygon columns, add 1 foot for each corner to girt of same.

46. Concrete stairs to be estimated square foot area of face of treads and risers. Stair landings and platforms between floors to be same unit price per foot as stairs.

47. Curbs and roofs of skylights to be estimated on same basis as called for in sections 40 and 41, except that quantities for same shall be doubled.

48. Sidewalks laid on soil of tile brick arches to be estimated same as floor slab, section 29, with special unit price.

The Strength of Piers or Columns of Different Materials

The diagram herewith shows the compressive strengths of columns or piers of various materials: steel, brick, cement mortar and timber. It brings clearly into view some comparisons well enough known in their fundamental figures but often forgotten. The fact that timber posts are stronger than either brick piers or cement (or concrete) columns appears plainly from the diagram. In a paper on "Fire Waste and Its Prevention," read before the National Association of Mutual Insurance Companies at Peoria, Ill., September 28, 1910, Mr. J. E. Howard, of the Bureau of Standards, the author of this diagram, remarked on it as follows:

The comparative strength of steel columns is given at 30,000 lbs. per square inch, an ordinary strength for struc-

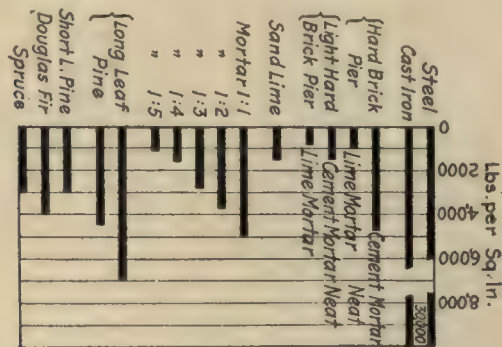


Diagram Showing Compressive Strength of Piers or Columns of Different Structural Materials

tural steel. It may vary from this according to the grade of steel used, lower or higher according to the elastic limit of the metal, and modified by the workmanship.

The compressive strength of cast-iron columns has been found in the vicinity of 30,000 lbs. per square inch also. This metal occasionally gives higher results and at times lower. The uncertainty of having a sound casting is a source of trouble and detracts from the reliability of cast-iron.

The strength of individual brick greatly exceeds that of brick when laid in piers. This is due largely to the grade of mortar employed. Hard-burned brick frequently range in strength from 15,000 to 20,000 lbs. per square inch when tested singly and an exceptional shale brick was found to possess the phenomenal strength of 38,000 lbs. per square inch. In piers, however, one having a compressive strength of 3,000 lbs. is a very strong one, although when a hard brick is laid in neat cement a resistance between 4,000 and 5,000 lbs. may be displayed. The same grade of brick laid in lime mortar will develop only about 1,500 lbs. per square inch ultimate strength. Light-hard brick show less difference in strength whether laid in neat cement or in lime mortar. They develop lower strength than the harder brick, and being nearer the strength of the lime mortar the cushioning of the mortar is more favorable relatively. Provided the stronger brick could be laid in mortar having

nearer the characteristics of the brick, then a much higher strength might reasonably be expected.

Sand-lime brick range in strength from 1,500 to 3,000 or 4,000 lbs. per square inch.

The strength of mortar composed of Portland cement depends upon the richness of the mixture. The diagram illustrates the range which may be expected in mortars from a 1:1 mixture to a mixture containing one part Portland cement to five parts of sand. The rigidities of these mortars are approximately in proportion to their strengths. The strength of concretes is about the same as that of the cement mortars. The addition of the stone has been found not to modify the ultimate strength, over wide ranges. Some examples have shown a slight loss in strength of the concrete over that of the mortar used without the stone, and illustrations of the opposite kind may also be found.

Occasional sticks of long-leaf pine are found which develop the maximum strength plotted on the diagram, but a common strength is in the vicinity of 4,000 lbs. per square inch, while 3,000 lbs. is an ordinary value for short-leaf pine. Douglas fir has generally a compressive strength of about 4,000 lbs. per square inch.

These values are such as may be found, but the wide range in ultimate strength which is displayed by structural materials makes it necessary to consider specifically the properties of those materials which are actually to be used when judging of the strength of any particular structure.

Contractors' Annual Meeting at Windsor, Ont.

At the regular meeting of the Builders' and Contractors' Association of Essex, held on the 7th inst. at Windsor, Ont., the following officers were installed: President, U. F. Dumouchelle; vice-president, T. W. Brooke; treasurer, Robert Parker; recording secretary, G. W. Freeman; financial secretary, Geo. C. Haugh. The occasion was the fourth annual meeting of the association and the members found much cause for gratification at the results obtained since its inception.

After the routine business had been put through, the recording secretary, Mr. G. W. Freeman, read an interesting paper dealing chiefly with the general ethics of the contracting business. "If we cannot place the top stone upon the building," said Mr. Freeman, "it will be ours to lay a firm and deep foundation upon which others may erect a superstructure, and although we work in the basement, others will yet gild the dome." For the promotion of the common weal it was necessary for some to play subordinate parts, but they were all sharing the honor of a great work if they pursued an honorable course in their business and helped to raise the reputation of the trade in general to a higher level. A "square deal" should be the first consideration at all times.

A pleasing departure from the regular business of the association is the provision for social intercourse made by the directors. During the winter months periodical euchre contests have taken place. Refreshments are provided and prizes given, and the events are looked forward to with much pleasure on the part of the members. The membership of the association is between 40 and 50.

A dry dock which will accommodate vessels 700 feet long is now about completed at Port Arthur, Ont., on the north shore of Lake Superior. It was built for the Western Dry Dock & Shipbuilding Company, which at the same time has been erecting a shipbuilding plant around the new basin. The contract for the work, which was begun only last April, was held by the Canadian Stewart Company. We hope to publish a detailed description of this work in an early issue of the Contract Record.

Extensive Deposits of Canadian Marble

Particulars of Important Investigations made recently in the Province of Ontario—Material of Excellent Colour and Texture—A Promising Field

One of the latest papers published by the Canadian Department of Mines is devoted to the geology of the Haliburton and Bancroft areas, in the Province of Ontario. This territory lies several hundred miles north of the central portion of Lake Ontario. Messrs. Frank D. Adams and Alfred E. Barlow, who write the report, give interesting particulars of vast marble beds that seem to promise well. Throughout the area embraced in the report the limestones are found for the most part in a very highly altered condition, being coarsely crystalline, white in color, and usually more or less impure, owing to the presence of grains or scales of certain silicates. These silicates occur not only disseminated through the rock, but are often especially abundant along certain lines or bands, thus giving to the limestone a foliated or stratiform appearance.

The investigations show conclusively that the coarsely crystalline Laurentian limestones or marbles were originally fine-grained limestones of a bluish or drab color, similar to those seen in the more recent sedimentary deposits, but which, by the forces of metamorphism, have been so completely altered that, except in some few places, all traces of their original character have been completely obliterated. The coarsely crystalline varieties of these rocks are by far the most abundant. In these the calcite individuals usually have a diameter of from 2 to 7 millimeters. In some localities, as in the townships of Glamorgan and Cardiff, the constituent calcite grains measure from 2 in. to 3 in. in diameter. In color, these coarsely crystalline limestones, when free from silicates, are usually white. In some localities, however, they have a pinkish, and in others a salmon, color. Large bodies of limestone having the former color occur along the shores of Salmon Lake in the township of Limerick; while in the township of Minden there are great bodies of limestone of the latter tint, forming a very handsome rock. These colors are not due to the presence of any foreign material, but belong to the calcite itself.

The limestones in some parts of the area are almost free from the silicates and other minerals which are usually present in them, and form great bodies of pure marble. This is usually too coarse in grain to permit of its being used for the purposes for which the best qualities of marble are employed, a fine saccharoidal texture being seldom seen, but nevertheless in many localities marbles of good quality could be obtained, which would make beautiful building stone and would serve the purposes for which marble is ordinarily employed. Some years since a small quarry was opened in the township of Glamorgan, near the line of the Irondale, Bancroft & Ottawa Railway, and some marble taken out which was used for tombstones, several of which may now be seen in the cemetery at Gelert. The stone has a good appearance, being pure white in color, but rather coarse in grain. A great development of nearly pure marble is found in the same township, to the south of Contau Lake, where it is excellently exposed along the Kinmount Road. There is also a large body of this marble exposed on the shores of the western half of Deer Lake, in the township of Cavendish. The exposures are very extensive, especially about the northern end of the lake, where the rock has a well-bedded appearance, the beds being nearly vertical. Great bodies of marble, which is usually fairly pure and which in many places contains very little foreign material, are found forming the shores of Jack Lake in northern Me-

thuen, and extending across into the adjacent township of Burleigh, in the southeastern portion of which the occurrences are very large. Another large body is found in the township of Anson.

Limestone in Cardiff.

Affording a marked contrast to the rock from the localities of the above mentioned, is an occurrence of limestone in the township of Cardiff. Here the rock is developed in places as a beautiful cream-colored alabaster, which is so fine in grain that its crystalline character can only be recognised under the microscope. This rock was supposed by the residents in the vicinity to be gypsum, but is in reality a very fine-grained limestone. It contains in places large twisted individuals of calcite as if the structure were due to cataclastic action.

Opportunities and Prospects.

Only a few places have been opened as yet for ornamental stone throughout this area, but Messrs. Adams and Barlow say that the examinations they made were sufficient to show that marbles of various colors and textures, equal to the best imported material, could be obtained in the region. Large blocks, free from flaws and shakes, suitable for columns of any size, can be quarried, and as transportation facilities are adequate, the stone could be put on the market in large centres, such as Toronto, Ottawa, and Montreal, at prices much lower than those obtained from imported marble. In Faraday township a great deal of work has been done in opening up a marble quarry, on the northern edge of the area of crystalline limestone immediately south of the extensive body of nepheline syenite near Bancroft. The presence of good, workable marble has here been proved, by pits and strippings, over an area of more than half a mile long by some 1,000 feet wide. Stone can be obtained ranging from a coarse crystalline white marble to a greyish, dove colored, fine-grained stone; variegated and veined marbles have also been uncovered in places by removal of the drift. At the main working place of this quarry a wide dike of igneous rock has slightly disturbed the beds, but nevertheless some very large blocks have been extracted; some of these, which were lying on the floor of the quarry, weighed up to twenty tons or more, without any apparent serious flaws. In other parts of the ridge the beds are lying in a very favorable position for working, the dip being slight.

City Engineer Ker favors McGregor's Lake as a source of water supply for the city of Ottawa, and recommends an early start on the project. Mr. Allan Hazen, of New York, is also in favor of this scheme.

Mr. Frederick L. Olmstead, of Boston, the landscape expert, has submitted to the Quebec government important recommendations for the development of the city of Montreal, the improvement of its transit service and the opening of new thoroughfares. The Montreal Parks Commission is in favor of Mr. Olmstead's report and does not think that the cost of carrying out his suggestions would be prohibitive.

The city of Montreal will spend \$1,000,000 on permanent street work this year in addition to \$500,000 for sidewalks.

Winnipeg's Great Preparations

Planning to Expend Huge Sums — Manitoba Power Company's Important Projects — The Supply Market

Office of the Contract Record,
Winnipeg, Feb. 17, 1911

The coming construction season for Winnipeg and vicinity promises to be one of more than usual interest to contractors, material men and supply houses. There is a tremendous amount of work in sight and the next month will see the completion of plans which mean the expenditure of huge sums. While it is impossible to predict what the labor situation will bring forth, it is safe to assume that there will be some difficulty in securing sufficient labor to carry on the work in hand as rapidly as will be desired.

Though active work will not begin until April, there is already sufficient work in preparation for the new Agricultural College, which will amount to approximately \$1,000,000; the Dominion government is planning to remove the drill hall at Fort Osborne to a new site and construct a modern rifle range outside the city limits; a new court house and parliament buildings with a residence for the Lieutenant-Governor are under discussion; while the University of Manitoba is trying to arrange for the financing of its new site to the southwest of the city. These are all government projects.

The three big railway systems have planned for work which will make a heavy draft on the supplies of unskilled labor. The Hudson's Bay railway will be started, the Winnipeg Electric has a number of extensions to make, including a new power house, and the Manitoba Power Company will start work on its hydro-electric plant, transmission lines and rural railways. Two large bank buildings are now in progress and the contracts for a third will be let shortly. The city of Winnipeg will push construction on its hydro-electric plant, transformer stations and distributing system, which it is expected will be in readiness by July 1. In addition to these the city has a tremendous amount of local improvements in hand. The school board has two buildings under construction and others are being planned.

These alone would mean a busy season in the building trades, but the work on residential property is expected to total as much as all of the corporation and municipal work in the city. Many sales have been recorded within the last fortnight, and the purchasers have placed orders with their architects for plans.

Supply Firms Getting Busy.

Material men are getting in shape to meet the demand, which will begin early because of the amount of preparatory work done last fall. This year will see a large amount of sand and stone brought from Lake Winnipeg district, the opening of the St. Andrews locks making this source of supply readily available. In the Tyndall, Stony Mountain and Stonewall districts the quarry owners are putting their plants in shape for a heavy production, and the brick yards are stacking wood for a big season. Money is comparatively easy for all legitimate enterprises so that this phase of the situation is giving little anxiety.

The Manitoba Rolling Mills Company, St. Boniface, Man., is planning for an enlargement of their business this spring. They propose to go into steel work and will construct the necessary plant on their present site. They will produce small bars and reinforcing rods, rolling them from pig and scrap. There is a large market for this class of material available and they will put in at least four furnaces and two trains of rolls, practically doubling their present plant.

The erecting equipment for the new steel bridge across the Assiniboine river at Winnipeg is now on the ground

and work will be started at once. It will give access to the Union Depot from the south.

Plans are now in hand for the combined C. N. R. and G. T. P. viaduct across the south end of Main street, Winnipeg, and it is expected that they will be submitted to the Railway Commission and city council at an early date. It is the intention to leave headroom of 14 feet 6 inches for street car traffic, and it is proposed to raise the level of the present C. N. R. main line so as to give a free roadway across the Norwood bridge to St. Boniface, where there is now a heavy traffic. It is also reported that the Great Northern will come in to the Union Depot over this same line and that an agreement to this effect will shortly be signed. This means that the Great Northern will start work at once on their line from the United States boundary to Winnipeg. They already own a large site in the centre of the city which it is reported will be used for freight purposes.

A group of contractors, of whom J. D. McArthur is one, have secured the contract for a 70-mile extension northward of the Algoma Central, the work to be completed this season. A number of sub-contractors have been called in and are working on the plans.

Manitoba Power Company's Important Projects.

Within the next two or three months the E. B. Reese Engineering Company, Winnipeg, will be in the field for a large amount of central station and other electrical equipment. This company, of which Mr. E. B. Reese is the chief, is the present representative in Winnipeg of the Manitoba Power Company, a group of Montreal capitalists.

A contract has been secured to supply the city of St. Boniface with electrical energy, which the municipality will in turn retail to consumers as well as supply its own needs. At present the municipality uses about 3,000 horsepower and it is expected that with the rates secured they will be in a position to compete directly with the Winnipeg Electric Street Railway Company to supply various large industries which now secure their energy from other sources. Special inducements will be offered manufacturers to locate there and the power will be supplied at cost, laid down.

In addition to this contract the Manitoba Power Company is negotiating for a number of franchises in the province with the intention of operating along the lines of the Ontario Hydro-Electric Commission—that is, to supply small towns and villages and individual consumers along their transmission lines. Negotiations are now in progress for permission to run a line of electric railways through the municipality of St. Vital, and this line will ultimately be continued through to the North Dakota boundary, serving a rich and well-settled country.

The Manitoba Power Company has also acquired the various charters held by the Rural Railways Company, and it is the intention to develop these, giving a wide and complete system of radiating railways out from Winnipeg.

Though the plans have not yet been completed for the development they have advanced to a stage where a general idea is possible. The company has secured from the Dominion government the rights to develop Big Bonnet, or Great Falls as it is sometimes called, on the Winnipeg river. The initial development will be 21,500 k.w., but this will be increased with the demand to the full capacity of the falls, 75,000 h.p. The first system will call for about 300 miles of high tension transmission lines, probably carrying current at 120,000 volts, three-phase and thirty cycles. The high tension wires will be carried on bridge type towers of a modified design especially suited to the nature of the country to be crossed.

In the distribution, the high voltage will be tapped off at three or more substations, being sent out at a voltage of 13,-

000 on the radiating distribution system. The voltage supplied to St. Boniface has been contracted for at 2,200 volts, 60 cycles. Low voltage current will be supplied to small consumers in the agricultural districts.

A feature of the contract with St. Boniface lies in the fact that energy must be delivered to them by November 1, 1912, and a bond of \$250,000 will be entered into for the completion of the contract.

In order to fulfil the terms of the contract and save the forfeiting of their bond the company must use all haste in the completion of their plant and nothing will be permitted to stand in the way. At the power site there is a considerable amount of granite rock to be removed and a dam about 18 feet in height is to be erected. Ready access to the work is possible, for the company has secured the charter for a short line which will run from Lac du Bonnet station on the C. P. R. immediately to the site. In consequence there will be no trouble in transporting material and supplies.

L. H. S.

Edmonton Builders Declare Open Shop

At a recent meeting of the Edmonton Builders' Exchange it was decided to declare open shop on May 1st. The following is a copy of the final letter sent to the unions:

"That whereas it is the firm conviction of this exchange that the agreement formerly existing between the general contractors' association of this exchange and your union, has been annulled through violations, and further, whereas other unions having declared their determination not to enter into any further agreements with the exchange, thereby making said agreements not workable, as instanced during the several strikes of 1910 when members of your union refused to work, the Edmonton Builders' Exchange declares in behalf of its affiliated associations for open shop in all building trades except those of the Bricklayers' and Laborers' Unions, which latter had in their agreement the necessary non-sympathetic strike clause."

To Other Unions Interested.

"The Edmonton Builders' Exchange with all affiliated associations, having unanimously declared in favor of the open shop for all building trades, except that of the Bricklayers and Laborers' Unions, which latter have in their agreement the necessary non-sympathetic strike clauses, you are hereby respectfully advised that there will be no further agreements signed between your union and either the Edmonton Builders' Exchange or any of their affiliated associations. This ruling to go into effect May 1st."

Herewith is attached the maximum scale of wages decided upon by the several associations, and ratified by the Edmonton Builders' Exchange.

	Per hour.
Bricklayers	67½
Carpenters	50
Electricians	50
Laborers	35
Lathers (per day)	3.00
Metal lathers	50
Painters	50
Plumbers	60
Plasterers	70
Hod carriers	35
Mortar mixers	43¼
Stone cutters	65
Sheet metal workers	55
Structural steel workers	Open

The official letters to the several unions were signed by President R. G. Manson, of the Edmonton Builders' Exchange, and A. L. Wetmore, secretary-treasurer of the Edmonton Builders' Exchange.

Paving Work at Victoria, B. C.

The city council of Victoria, B.C., have decided that hereafter tenderers for asphalt pavements must be prepared to bid on a standard concrete base instead of, as heretofore, permitting the companies to tender not only on a standard pavement but also to submit tenders on pavements in which a base of other materials was intended to be used. The result of such action will bar companies such as the Worswick, Bitulithic and others which use a base composed of sand gravel and bitumen or asphalt, unless they tender on the standard concrete base.

The decision was arrived at during the consideration of the general conditions under which contract work must be carried out this year. After setting forth the respective duties of contractors and the city engineer relative to plant, tools, indemnity, proportions of materials to be used, patents, etc., the engagement of local labor as far as possible and the exclusion of Oriental labor, the fixing of a minimum wage of 34½ cents per hour for an eight hour day, the placing of the city engineer in supreme charge and control and regulations as to time limits, penalties, etc., the council passed the following section, but only after a lengthy discussion:

"A standard base of cement concrete must be used in connection with all pavements of an asphaltic nature. The concrete foundation or base will be four inches thick for light traffic and five inches thick for heavy traffic. The concrete shall consist of one part cement to three parts of sand, and five parts of gravel or broken stone thoroughly mixed. The materials of each class must be submitted to the engineer and the quality thereof approved of in writing by the city engineer before used.

"Upon this base is to be placed a wearing surface of an asphaltic nature. The contractor in case of alternative bids will be expected to furnish his own specifications which will be subject to the approval of the city engineer. In no case will the wearing surface be less than two inches, and samples of the pavement shall accompany each tender. The form of tender will show the thickness of cement base required."

Under the above section the contractor will not be prevented from bidding upon the class of wearing surface he sees fit but he must make his own specifications for a wearing surface and shall fully describe the difference between the alternative pavement and the standard pavement. The specifications for the standard wearing surface will be prepared later by the city engineer.

The unit basis of work will also be adopted, that is the contractor will be paid a fixed price per square yard of pavement, per lineal cubic yard of earth excavation and per cubic yard of rock excavation.

The tenderer must leave fifteen per cent. of the contract price with the city for ten years as a guarantee that he will maintain the pavement in good condition and give a bond for twenty-five per cent. of the amount of his contract for a period of five years as a guarantee of maintenance.

The Ontario Government is introducing a new bill looking to the protection of workmen employed in building construction. Special provision is made against unsafe scaffolding, and there are a number of regulations provided for railings on scaffoldings and the planking of floors. The penalty for any infringement is fixed at \$500. The regulations will not make any difference in Toronto as the city by-laws already cover the points in the new measure.

The Clair & Fort Kent Bridge Company are applying to the legislature for authority to construct a bridge over the St. John River, between the village of Clair in Madawaska and Fort Kent, Me.

With a view to prohibiting the erection of overhead sprinkling tanks, the Montreal Board of Control has instructed Building Inspector Chausse to make a special report.

Notes on Railroad Development

Increasing Activity in the West—Unprecedented Demand for Labor Expected—C. P. R. Plans for Toronto

A project is under consideration by several capitalists of Vancouver, B.C., for constructing a railway to the crest of Grouse Mountain, which is situated about 12 miles from Vancouver. Mr. H. C. Miles, Vancouver, is interested.

Contracts have been let and work started on clearing the townsite of Port Mann, which is to be made the Canadian Northern Railway's Pacific terminal. Four thousand acres, with a water frontage of $2\frac{1}{2}$ miles, have been surveyed, and nearly 1,000 men are engaged upon the work of laying out the townsite, which will be completed within four months. The town is situated on the south bank of the Fraser River, a little east of New Westminster, B.C. The river at this point is over one mile wide, and there is a depth of 40 feet of fresh water at the docks.

It has been announced by the Minister of Public Works that the matter is seriously under consideration of having surveys made for the projected tunnel under Northumberland Straits between Prince Edward Island and the mainland. The distance at the most narrow part of the Straits is nine miles.

On February 1st the steel of the Grand Trunk Pacific Railway had been laid to Prairie Creek, a distance of about 55 miles from Edson, Alta., or 185 miles west of Edmonton, where the track will end until such time as the bridge over Prairie creek has been completed. As soon as this is done the laying of the steel will be resumed and probably carried on as far as the Athabasca river, where another bridge has to be constructed.

The Street Railway Commission of the city of Guelph, Ont., has received tenders for the construction of the new branch of the railway to be built in St. Patrick's Ward. Construction will commence as soon as the snow is off the ground.

Extensive construction work is under way at Prince Rupert, B.C. In the business section of the city, public work to the extent of nearly \$500,000 is under way. Street grading on the Grand Trunk Pacific calls for much heavy work. On First, Second and Third avenues, near the water front, the rocky bluffs are being dynamited, and the deep fills brought up to grade. Railway construction is advancing rapidly. For more than 100 miles supply trains are operating, and from Kitselas to Hazelton, at least 60 per cent. of the grade is in excellent shape. By spring there will be a passenger and freight service from here to Kitselas. Permanent tracks are being laid in the Prince Rupert yards and temporary terminal facilities are being built.

Press reports quote P. Welch as stating that between 1,000 and 3,500 men will be engaged in construction work on the G. T. P. by the firm of Foley, Welch & Stewart, of St. Paul, Minn., which has the contract for the building of the road as far west as Tete Jaune Cache. Mr. Welch recently returned to Edmonton, Alta., from the west, after a trip as far as the head of the steel, near Prairie Creek.

It is now reported in Prince Rupert that the Grand Trunk Pacific may not be the only railway having a terminal within its gates. The Mackenzie & Mann syndicate is credited with the intention to construct and operate a line to Prince Rupert. At the present time and for some considerable time past the Mackenzie-Mann syndicate has had surveyors and prospectors in the field to the north of Kalen Island, and it is currently reported that one of their next announcements will be that they are going to invade Prince Rupert from the north. From the Portland Canal

they are at present constructing a line eastward and they are also credited with being behind the company ostensibly owning the surveyed road from Stewart down in the direction of Port Simpson.

According to a despatch from Victoria, B.C., active work has been commenced on the Vancouver Island section of the Canadian Northern Pacific Railway. A store and general depot have been established to form a base of supplies, and a branch camp is now in course of construction at Peddar Bay. From Peddar Bay construction will be carried on in both directions, while other camps will be established along the route. The contractors are willing to sub-let the contract for the second twenty miles of the railroad, but as there is three feet of snow on the route running from Sooke to Shawnigan Lake, construction will be impossible there for some time. Sixteen sub-contractors have been over the second twenty miles and are ready to tender. The sub-contractors will not only clear the right of way, but will also complete the construction work. As there are no formidable difficulties in the first forty miles it is confidently anticipated that rails will be laid over this portion by the end of the year.

It is stated that there will be an unprecedented demand for labor in Western Canada this year, particularly in railroad work. It is estimated that 7,000 men will be needed at Edmonton, where the Canadian Northern will carry out extensive work. The main line will extend from Ste. Anne west to the mountains, and on that stretch of road it is expected that the contractors will have grading outfits stretched all along the line before the construction work is far advanced. On the C. N. R. branch lines a large number of men will be required for the completion of the Landing line, the construction of the Strathcona cut-off and the completion of the Vegreville-Calgary line. A big piece of work is also to be done on the Morinville-Battleford line, east of Morinville.

C. P. R. to Spend Millions in Toronto

Mr. David McNichol, vice-president and general manager of the C. P. R., is authority for some interesting details of the company's extensive plans for Toronto.

A large office building will be erected for occupation by the Dominion Express Company on the Government House site at the corner of King and Simcoe streets. Inside of the King street walls of the freight yards will be a driveway thirty feet wide, lighted from the street. A park will extend from the western end of the Government House property on King street.

The proposed viaduct from Summerhill avenue to Poplar Plains road and the new station just east of Yonge street, North Toronto, will cost from \$500,000 to \$630,000. Plans for the new ticket office at the corner of King and Yonge streets are not completed, but the building will be thirteen to fifteen stories high. A new union station will be constructed whether a viaduct is built or not. The whole scheme involves a total expenditure of \$5,000,000.

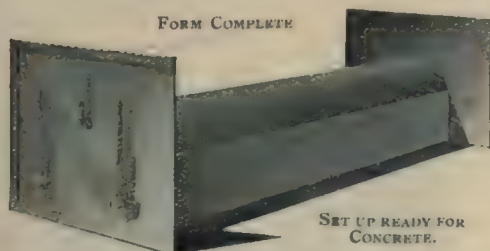
Municipal Activity at Calgary, Alta.

The city council of Calgary, Alta., have approved of submitting the following by-laws at a special election to be held in the course of a few weeks: \$75,000, fire station; \$120,000, two incinerators; \$20,000, street paving plant; \$40,000, sewer connections; \$60,000, conduit system; \$245,000, waterworks extensions; \$380,000, electric light extensions.

In addition to these, some \$256,000 has already been voted for waterworks extensions and \$484,000 for street railway extensions during the coming summer. By-laws are also being prepared for a large trunk sewer and for lateral

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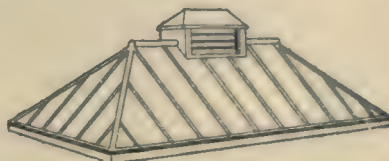


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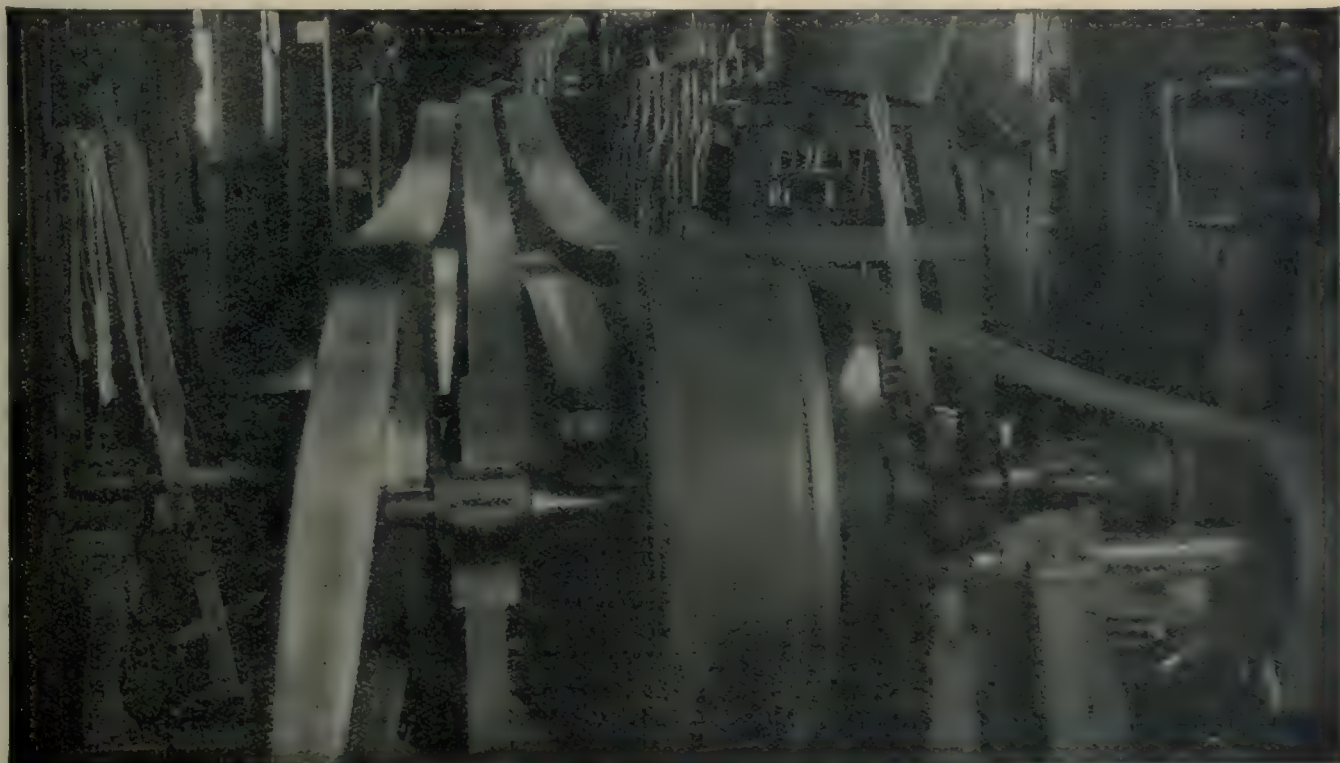
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extensions. This will cost about \$500,000. A new isolation hospital, and municipal store house and machine shop are additional projects, according to information furnished by Mr. A. G. Graves, city commissioner.

Personal Mention

City Engineer Rust, Toronto, has appointed Mr. J. Race to take charge of the laboratory work at the filtration plant.

The death occurred recently in Calgary, Alta, of Mr. Wm. Garson, the contractor for the new post office at Strathcona, Alta.

Messrs. E. R. Dennis, Geo. S. Gould, A. C. Nobbs, W. T. Brown and J. Jones were among the London, Ont., delegates to the C. N. A. B. convention at Winnipeg last week.

The special committee of the Winnipeg city council is busy on a revision of the building by-laws. Building Inspector Rodgers and Messrs. W. Fingland and J. D. Atcheson, architects, are associated with the council in this work.

The town council of Souris, Man., has engaged the services of Mr. V. H. Williams, as resident engineer, to superintend the construction of the waterworks system. Mr. Williams is at present assistant to the C. P. R. engineer resident at Souris.

Messrs. Hamel and Tessier, of Quebec, have entered into partnership as consulting civil engineers and have taken an office in the Hochelaga Bank Building in that city. For the last two years Mr. Hamel has been in the employ of the Quebec bridge engineers.

Mr. A. B. Wilson, who has been connected with the Tungstolier Company, Conneaut, Ohio, for the past two years as their St. Louis representative, has been made vice-president and general manager of the Tungstolier Company of Canada, Limited, with offices at Toronto.

Mr. R. G. Saunders has been appointed assistant city Engineer of Moose Jaw, Sask. Mr. Saunders was in the Toronto Water Works Department before going to Moose Jaw last year and his many friends will be glad to learn of his success.

Messrs. Powers & Brewer, contractors, Grand Falls, N.B., have completed the installation of a modern system of waterworks at that place. The work was carried out under the supervision of Mr. Edward Powers. This firm has also finished a contract for the C. P. R. a few miles out of Grand Falls.

Mr. Allan Hazen, of New York, the consulting engineer on the filtration plant at Toronto, advises that city to economize the water supply and put meters on all the water services, at a cost of \$800,000. At the present rate, he says, it will be necessary to spend \$5,000,000 on extensions during the next few years and to dig a new tunnel under the Bay.

At the annual convention of the Western Ontario Clay Products Association held recently at Chatham, Ont., the following officers were elected for 1911: President, John Wardell, Blenheim, Ont.; 1st vice-president, A. Davenport; 2nd vice-president, D. Martin, Thamesville, Ont.; secretary-treasurer, A. Wehlann, Cairo. The association decided to meet at the same time and place next year.

City Engineer Smith, of Victoria, B.C., is looking for an expert in asphalt paving. Recently the city council decided that an expert should be engaged to inspect the work of paving contractors, and see that the city is getting the best material and work. With some 21 miles of pavement passed last year, but not yet commenced, and many more works to be passed this year, the whole to date aggregating something less than \$2,000,000 in cost, the necessity for a close civic inspection of the work is apparent.

In the action which Mr. E. J. Lennox, architect, is

bringing against the city of Toronto, in which he is claiming \$208,000 for services in connection with the erection of the city hall, the city has put in a counter-claim for \$150,000 for extra cost of masonry and stone work which Mr. Lennox is alleged to have had done without authority. When the case come up for hearing it will in all probability last several days, as it not only involves the large amount of \$208,000, but will require an enormous amount of detailed investigation. The statement of claim takes up about 34 or 35 pages of typewritten foolscap.

Mr. J. G. Sullivan, assistant engineer of the Canadian Pacific Railway in Montreal, who, at the time of the death of the chief engineer of the company, the late J. E. Schwit-



Mr. J. G. Sullivan, now of Winnipeg, Assistant Chief Engineer, C. P. R.

zer, was under appointment to go to Winnipeg as assistant chief engineer, has left Montreal for the West, and will immediately assume his new duties there. Mr. Sullivan was named to go to Winnipeg when Mr. Schwitzer was made chief engineer. It was thought that there might be some change as the result of the death of the chief engineer, but it has now been decided to carry out the former plan. A sketch of Mr. Sullivan's career was published in our issue of January 18.

Trade Enquiries

The Dominion Government Trade and Commerce reports contain the following trade enquiries. Readers of the "Contract Record" may obtain the names of enquirers by writing us, enclosing stamped envelope, and stating number of enquiry.

163. **Fire escape landings, etc.**—An English manufacturer of fire escape landings and ladders for outside mills and public buildings, would like to be placed in correspondence with Canadian importers.

165. **Agents.**—An English firm manufacturing stone-breaking machinery, concrete block machines and concrete mixers, screens, elevators and conveyors, etc., are open to appoint reliable Canadian agents.

169. **Agents.**—A Scottish company manufacturing paints, oils, colors and varnishes, would like to get into communication with manufacturers' agents in various parts of the Dominion prepared to represent them on a commission basis.

Contracts Department

News of Special Interest to Contractors, Engineers, Manufacturers and Dealers in Building Supplies.

Information for insertion in these columns is invited from Architects, Contractors, Engineers, etc.

Waterworks, Sewerage and Roadways

Berlin, Ont.

Tenders addressed to A. H. Millar, town clerk, will be received until March 7th for supply of the following for year 1911: sewer pipe, manhole castings, Portland cement, step irons. Specifications at office of town engineer. E. Bricker, chairman. Tenders were also called until March 2nd for the following in year 1911: laying cement walks, concrete tile, Portland cement, curb irons. Specifications at office of town engineer. H. A. Dietrich, chairman.

Edmonton, Alta.

Instructions have been issued to Supt. McLean of the water department to prepare specifications of the water pipe and valves which will be required to meet the season's departmental needs. Estimates of the season's requirements in sewer pipe will be prepared by Engineer Lat-ornell.

Goderich, Ont.

We are informed that the \$30,000 voted by by-law in January will be spent on the waterworks this year.

Harriston, Ont.

Tenders are called until March 15th for purchase of \$35,000 waterworks debentures, etc. L. Brisbin, treasurer.

Lethbridge, Alta.

The construction of a gravity system of waterworks is being considered at an estimated cost of about \$800,000. C. M. Arnold, city engineer.

Moose Jaw, Sask.

Tenders addressed to W. F. Heal, city clerk, will be received until April 10th for supplying material for and constructing a sewage disposal plant, etc.; also supplying two electrically driven centrifugal pump and auto starter complete with all piping connections. J. M. Wilson, city engineer. Advertisement in "Tender and For Sale Department" of this issue.

The Sewer and Water Committee recommended that city engineer Wilson prepare plans for storm sewers as proposed in his annual report. Also that plans be prepared for sewer and water extensions to South Hill as proposed by the engineer in his letter of February 17th. Further, that the engineer call for tenders as soon as possible for the construction of the sewerage disposal plant and sewer and water extensions planned in 1910. They further recommend that the city engineer be authorized to secure prices for the material to be supplied by the city for the work and submit same to this committee.

North Portal, Sask.

A waterworks system will be established here by the C. P. R. at an estimated cost of \$50,000. F. E. Schwitzer, assistant chief engineer, Winnipeg, Man.

Petrolia, Ont.

This municipality is calling until March 20th for the construction of about 6,000 square yards of pavement and about 2,500 lin. ft. of concrete curb, etc. J. McHattie, town clerk. Advertisement in "Tenders and For Sale Department" of this issue.

Point Grey, B.C.

Tenders addressed to H. Floyd, C. M. C. W., will be received until March 6th for delivery of steel pipes, valves, etc.; excavating, laying and jointing about 38 miles of pipes, etc. Specifications at office of the engineers, Messrs. Cleveland & Cameron, Vancouver.

Sherbrooke, Que.

Tenders are called until March 2nd for excavation of about 18,000 cubic yards of solid rock and 4,000 yards of earth for reservoir on Short property. Plans, etc., at office of the City Engineer.

St. Boniface, Man.

Plans are being prepared by City Engineer for construction of reservoir with 1,000,000 capacity.

St. Lambert, Que.

The ratepayers voted for the borrowing of \$225,000 for permanent road improvements, among which are paved streets and concrete sidewalks.

Toronto, Ont.

York County Council agreed to the scheme of road improvement formulated by the City of Toronto and the Provincial Government.

Tenders addressed to G. R. Geary, Chairman of Board of Control, will be received until March 14th for supply of the following: 3,400 lin. ft. of 60-in. reinforced concrete pipe; 9,728 lin. ft. of 66-in. reinforced concrete pipe. Plans, etc., at Main Drainage Department or at office of city engineer.

The construction of the following asphalt pavements has been recommended by City Engineer Rust: Waverley Road, from Queen to south end, \$11,366; Empire avenue, from Queen to Eastern avenue, \$6,616; Barrett avenue, from 159 feet south of Chelsea to Edna avenue, \$1,144; Maclellan avenue, from Edgar to Summerhill, \$6,412; College street, from Manning avenue to Dovercourt road, \$31,898.

Vancouver, B.C.

Among the local works to be considered is the paving of Broadway with granitoid blocks from Granville street to Ontario street, at a cost of \$215,000. Another large work slated for consideration is the bitulithic paving of Twelfth avenue from Bridge street to Main street at a cost of \$42,000.

Victoria, B.C.

The city engineer has made a report of the cost of asphaltting Esquimaux road from Bridge street to Point Ellice bridge. This work which is part of the larger work of improving Esquimaux

road right through to the city limits, is estimated to cost \$18,346.

AWARDED

Belleville, Ont.

A contract was given to the Schuster Company for supply of 1,000 barrels, more or less, of cement at \$1.57¼ per barrel, for the season of 1911.

Burnaby, B.C.

Walter Thomas, 731 Jervis street, Vancouver, has been awarded the contract for construction of waterworks system for D. L. 186, \$24,088. Engineer in charge, Kiliner & Holland, Vancouver.

North Vancouver, B.C.

At a special meeting of the city council estimates for cast iron water mains were considered and that of Evans, Coleman & Evans for 1,100 tons of piping at \$37,260 was accepted. Mayor McNeish.

Ottawa, Ont.

The council awarded the contract for supply of c.i. pipe to the Canadian Iron Corporation, Limited, Montreal, \$11,579.

Railroads, Bridges and Wharves

Brandon, Man.

The government and the G. T. P. will build their road to Brandon this year. Mayor Fleming.

Fredericton, N.B.

Hon. John Morrissey, Chief Commissioner, is calling for tenders until March 13th for lumber for the Fredericton highway bridge.

Tenders are called by the Department of Public Works until March 6th for re-building No. 18 Brook bridge, parish of Sheffield. Plans, etc., at above department and at residence of W. Hargrave, Lekeville Corner, Sheffield, Sunbury Co.

It is understood that the I. C. R. management plan a number of improvements on the Canada Eastern branch during the coming season. New steel bridges will, it is said, be placed this season across the Nashwaak river above Marysville, at Blackville, and also at Nelson Hall, between Carroll's Crossing and Doaktown.

Frankville, N.S.

The Department of Public Works, Ottawa, is calling for tenders until March 21st for construction of breakwater at Breen's Pond. Plans obtained at this department, at the offices of E. G. Millidge, Esq., district engineer, Antigonish, N.S., C. E. W. Dodwell, Esq., and on application to the local postmaster.

Halifax, N.S.

It is understood that the legislature will assist in the building of about 150 miles as a branch of the I. C. R. from here to the Strait of Canso.

Minnitonas, Man.

Tenders addressed to E. Widmeyer, secretary-treasurer, will be received until April 15th for supply and erection of

steel Warren truss bridge and two concrete piers, etc. Plans, etc., on file at office of above and also at office of chief engineer, Department of Public Buildings, Winnipeg.

Ottawa, Ont.

Tenders addressed to Charles Macnab, county clerk, will be received until March 13th for construction of one reinforced concrete bridge, Tp. of Osgoode, and two reinforced concrete bridges, Tp. of Huntley. Plans, etc., at office of R. W. Farley, county engineer.

Vancouver, B.C.

The C. P. R. has called for tenders for the construction of thirty miles of the Kootenay Central south from Golden, B.C. The southern terminus will be Galloway station, on the main line of the Crow's Nest Pass Railway, near Cranbrook.

Public Buildings, Churches Schools, etc.

Abbotsford, B.C.

Tenders for erection of 2-room building as annex to school here. F. C. Gamble, public works engineer.

Berlin, Ont.

It has been decided to launch a campaign to raise \$30,000 for the purpose of erecting a permanent home for the Y. W. C. A.

Brandon, Man.

The plans of Messrs. Shillinglaw & Marshall for erection of new curling rink were considered by the club. No decision was made.

Brantford, Ont.

The St. George Baptist Church recently destroyed by fire will be rebuilt at an estimated cost of \$20,000. Rev. Mr. Newcombe, pastor.

Calgary, Alta.

The plans of Davis & Brooks of this city have been accepted for the new city hall building. Ten sets of plans were submitted.

Collingwood, Ont.

Tenders are asked by the trustees of Loree S. S. No. 7, Collingwood Tp., for the building of a new school, material on the ground. Plans, etc., on application to secretary, D. Sheridan, Loree, Ont.

Dartmouth, N.S.

The school board and Board of Trade have under discussion the erection of a modern school here. J. L. Wilson, chairman Public School Board.

Edmonds, B.C.

The municipality of Burnaby will submit a by-law to the ratepayers calling for over \$80,000 to be expended in the purchase of several school sites.

Edmonton, Alta.

Plans for the erection of new church on Twenty-first street for West End Methodist Church will be called shortly. Rev. J. E. Coulter, pastor.

The Masonic Temple Company have under serious consideration the commencement of their new Temple shortly at an estimated cost of about \$125,000. Directors, T. M. Grindley, F. M. Morgan, H. Darling and others. Noted previously.

R. W. Lines, architect, was awarded the first prize in the plan competition

for the new \$100,000 stock pavilion to be erected by the Exhibition Association this year. Instructions will be issued to prepare specifications, after which tenders will be called. Plans call for a brick and stone building, 2-storers, 340 x 190 feet, etc.

Fort William, Ont.

Tenders addressed to Hood & Scott, architects, Murray Building, will be received until March 6th for erection of Free Library.

Tenders addressed to R. E. Mason, architect, will be received until March 11th for new Nurses' Home for the McKellar General Hospital; also for erection of additions, etc., to Central school, until March 10th.

Gad's Hill, Ont.

The following tendered for erection of school here: Geo. Fink, Stratford, \$2,327; C. Daburne, Amuhee, \$2,232; Henry Reis, Milverton, \$2,325; William Elligsar, Stratford, \$2,346. Under date of last information contract had not been let.

Galt, Ont.

A by-law will shortly be introduced to raise \$25,000 for addition to hospital.

Tenders addressed to Rural Dean Ridley, chairman building committee, will be received until March 7th for erection of school house for Trinity Church congregation. Plans, etc., at residence of architect, Wm. Scott, Galt.

Goderich, Ont.

We are informed that the tenders for new town hall here opened about March 1st. Estimated cost, about \$35,000.

Guelph, Ont.

Tenders addressed to the Guelph Humane & Children's Aid Society, care of Mr. Tovell, 23 Douglas street, will be received until March 7th for construction of "The Shelter." W. A. Cowan, architect.

Kingston, Ont.

Plans for the new wing for the post office here have been passed at Ottawa and William Newlands, architect, is authorized to call for tenders.

Tenders are called until March 10th for the several trades required in erection of Nicol Building for School of Mining, Queen's University. Estimated cost, without heating, etc., \$45,000. Messrs. Power & Son, architects. Advertisement in "Tenders and For Sale Department" of this issue.

London, Ont.

The separate school board have under consideration the erection of a new school in the north end this summer.

Montreal, Que.

The proposal to build a new club house for the Shamrock A. A. A. has been abandoned and it has been decided to make considerable extensions to the old building in Mile End. This will include a modern gymnasium, swimming bath, bowling alleys and hand ball court. The plans are now being prepared by the executive committee and work will be started early in the spring.

Nelson, B.C.

Tenders for the erection of isolation hospital are called. G. C. Mackay, city engineer; Dr. Hartin, M.H.O.

Orillia, Ont.

An addition to the Y. M. C. A. Building will be built. A campaign to raise \$10,000 has been commenced.

Otter Point, B.C.

Tenders were called by Public Works Department, Victoria, until March 1st for erection of 1-room school here. M. Emerson, secretary of school board.

Ottawa, Ont.

The Dominion government will have to consider the erection of a separate building in Ottawa as a national art gallery.

Building Superintendent Garvock will prepare plans for annex to Mulchton school. Noted in last issue.

A committee appointed by both sides of the House recommend the construction of a new wing on the Senate side of the Parliament Building. This addition, it is calculated, will provide a stack room for about 250,000 books and will also give a couple of additional rooms for Senate Committee purposes. The cost of this proposed structure would be about \$300,000.

Regina, Sask.

Mr. M. W. Sharon is the architect in charge of the erection of the two new buildings for the Dominion Fair. Work, it is stated, will begin at once.

In order to concentrate the diocesan buildings, a deputation of clergymen from the diocese will wait upon Premier Scott to ask for a site for diocesan buildings on the old gaol grounds at a reasonable price. They will include a cathedral, St. Chad's College, a bishop's court and residence, and a hostel. The cathedral alone will probably cost more than \$250,000.

Renfrew, Ont.

Architect Meredith, of Ottawa, is being consulted by the separate school board with reference to building, the board having decided to erect a new school this year.

Simcoe, Ont.

Tenders are called until March 20th for erection of brick veneered 1-storey school house with basement, S. S. No. 14, Charlotteville. Plans, etc., at residence of Abram Neilson, Walsh, Ont.

South Vancouver, B.C.

A by-law to authorize the expenditure of \$60,000 on schools will be submitted to the people.

St. Catharines, Ont.

The Public School Board decided to call for tenders as soon as plans for Alexandra school can be perfected.

Toronto, Ont.

The congregation of the Grosvenor Street Presbyterian Church have decided to move to a new site as soon as possible.

An addition to Sherbourne Street Methodist Church has been authorized by the congregation, and work will be started about April 1. Cost, about \$50,000. Rev. Dr. S. P. Rose, pastor; members of the building committee are Messrs. F. H. Clark, J. W. Flavell, H. H. Fudger and John N. Lake.

Vancouver, B.C.

St. Mark's congregation, Kitsilano, have decided to erect a new church to cost about \$125,000. Building committee, Messrs. J. Z. Hall, F. Bayliss, G. Brown, W. J. Gilbert, S. Wye, C. Buscombe, P. Gomery, Captain Fleming and Maillews was appointed. Architect R. S. Twizell submitted plans.

Under date of last information tenders for erection of Chalmers Presbyterian

Church were being called for. Plans call for concrete, brick and stone, size (ground floor), 9,000 ft.; number of floors, two; estimated cost of building and equipment, \$80,000. Architect, S. B. Birds, A.R.I.B.A., Loo Block.

Plans were presented for the erection of Labor Temple, to be erected by the Trades and Labor Council at the corner of Dunsmuir and Homer streets. It will be four stories in height and will cost \$143,000. The contract has been awarded and the permit for the work will be issued in a few days.

Victoria, B.C.

Shops will shortly be taken for the purpose of erecting a new Christ Church cathedral, to cost probably \$250,000.

Warren, Man.

Tenders addressed to M. Oughton, Hanlan, Man., will be received until March 4th for the erection of 4-roomed school for the S. D. of Warren. Plans, etc., with the architect, R. L. Smith, 509 Builders' Exchange, or with M. S. Peacock, secretary - treasurer school board.

Winnipeg, Man.

An extension to Holy Trinity Church will be built at once at a cost of \$70,000. Address Rev. Archdeacon Fortin.

AWARDED

Mount Forest, Ont.

The tender of Contractor Proctor, of Sarnia, for the new post office, has been accepted by the government.

New Westminster, B.C.

The contract for the new Y. M. C. A. building has been let to Messrs. Sloan & Harrison, building contractors, of this city, \$37,000. This does not include the heating and plumbing. For the heating \$5,000 will be required. The building will be of stone and brick and it is expected that it will be completed in August.

Orillia, Ont.

The plans of H. W. Angus, North Bay, were chosen from among eight others submitted for the erection of new Sunday school building for Presbyterian Church here. T. G. King, secretary.

Winnipeg, Man.

The contract for erection of Selkirk avenue branch, Y. M. C. A. building has been awarded to S. Brynjolfsson & Co., Builders' Exchange, Winnipeg. The contract includes all trades, except tile, marble, heating and plumbing. Architect, Jackson & Rosencranz, New York; J. H. G. Russell, Winnipeg. Tenders for erection of central building will be called shortly. Estimated cost of latter, about \$275,000.

Residences

Brantford, Ont.

Mr. J. M. Shuttleworth will erect a fine new residence on the Hamilton road this year.

Brockville, Ont.

Tenders addressed to B. Dillon, architect, will be received until March 4th for cement and brick work, etc., required in the erection of garage, carriage house, etc., for Mrs. C. E. Fulford.

Ottawa, Ont.

Recent building permits include: W. J. Fitzpatrick, dwelling, Sunnyside avenue,

\$2,500; W. O'Byrne, dwelling, Archibald street, \$2,800; W. H. Hooper, dwelling, Carling avenue, \$6,000; Mesdames M. E. Elliott and J. E. Lowe, dwelling, Percy street, R. A. Kemp, builder, \$6,500; W. J. Best, dwelling 2nd avenue, \$3,800.

Tamworth, Ont.

Samuel Shannon's residence was burned on the 22nd ulto. Loss, \$12,000.

Victoria, B.C.

Building permits were issued to Mrs. McCarter, dwelling on David street, to cost \$2,500; to Mr. Reginald Genn, dwelling on Prior street to cost \$2,000; W. Dunford & Son, dwelling on Princess avenue, \$2,800; J. Townley, dwelling on Simcoe street, \$2,800; E. Tuck, dwelling on Grant street, \$2,800; W. N. Hall, dwelling on Robertson street, \$2,000.

Walkerville, Ont.

The summer residence of Tracy McGregor was destroyed by fire on the 22nd ulto. Loss, about \$30,000.

Winnipeg, Man.

Building operations will commence on the erection of a residence for the Norwood Presbyterian Church. Rev. R. J. Hay, pastor.

Tenders addressed to E. D. Tuttle, architect, 701 McArthur Building, will be received until March 13th for erection of residence for Mr. A. A. Miller, on Huron street.

Tenders addressed to Hugh G. Holman, architect, Suite 4, Monadnock Bdg., 313 Fort street, will be received until March 4th for erection of residence for Mr. T. G. Thompson. Plans, etc., at office of the above, or at Builders' Exchange.

AWARDED

Victoria, B.C.

Permit was granted to Mr. Simon Leiser for dwelling to cost \$18,000. Contractors, Murray & McKinney; architect, S. McLure, 606 Front street.

Business Buildings and Industrial Plants

Blairmore, Alta.

The grinding room of the Rock Mountain Cement Company's plant was destroyed by fire on the 20th ulto. Estimated damage, about \$5,000.

Brantford, Ont.

Tenders were called until February 28th for excavation of site for proposed new Royal Loan Building. Specifications at office of L. D. Barber, architect, Temple Building.

Calgary, Alta.

Tenders addressed to Lang & Major, architects, Board of Trade Building, will be received until March 6th for excavation and concrete work required in the foundation of a business block for Lieut.-Col. James Walker on Seventh avenue.

Tenders for one or more of the following buildings will be received at the office of the C. P. R. Division Engineer, Calgary: C. P. R. Standard No. 4 Section House — Bowell, Langdon, Maharg, Cheneka, Anthracite, Sawback, Stephen, Cathedral, Airdie, Wessex, Innisfail, Penwin, Labuma, Menaik, Mile 6. 7. Wetaskiwin Subdiv., Stowe, Lundbreck, Sandstone, Azure. C. P. R. Standard No. 5 Station (with 12-foot freight shed)

western lines, at—Tompkins, Redcliff, Suffield, Bow Island, Burdett. C. P. R. Standard No. 10 Station, at—Gleichen, Bassano, Hosmer. C. P. R. Standard No. 1 Bunkhouse, at—Calgary and Red Deer. C. P. R. Standard Plan "A" Station (with 50-foot freight shed), at Canmore and Bittern Lakes.

Locomotive Foreman's Cottage, Red Deer.

Six-stall addition to Standard No. 2 Engine House, Red Deer. Plans, etc., at the office of the assistant chief engineer, Winnipeg; division engineer, Moose Jaw, Calgary and Vancouver; resident engineer's office, Medicine Hat and Cranbrook.

Chatham, Ont.

The council are negotiating with an iron and steel industry which is seeking the location of a Canadian branch. Ald. Dunn and S. B. Arnold are interested.

Dalhousie, N.B.

A plebiscite will be taken as to the offer of civic privileges to Chappell Bros., Sydney, N.S., in return for which large saw and planing mills will be erected to take care of the lumber cut on their newly acquired limits across the river in Bonaventure county.

Edmonton, Alta.

The C. N. R. are to prepare plans early this spring for additions and extensions to their Edmonton terminals, to cost \$30,000.

We are informed that the building of the business block by representatives of the Houston Estate, has been postponed. Noted in issue of February 1.

Espanola, Ont.

Tenders for the building for the Spanish River Pulp & Paper Co., are being called for, and the machinery has been ordered. It is the company's intention to have the mill in operation by October next. Noted previously.

Fort Frances, Ont.

The C. N. R. plan to build a \$200,000 tourist hotel at Pither's Point park, provided the site is given to them.

Tenders are called for erection of school for S. S. No. 3, Devlin. Plans, etc., at residence of G. C. Watson, secretary, LaVallee.

Fort William, Ont.

Plans for the erection of plant for the Swift Canadian Company have been approved and excavation will commence as soon as possible. Estimated initial cost, \$75,000. E. M. Bell, local manager.

It is announced that Chas. Greer, manager of the Alexander Hotel, will erect a large hotel at Graham, the G.T.P. divisional point near the junction of the transcontinental line of the G. T. P. and the Lake Superior branch.

Guelph, Ont.

The property owned by Mr. J. J. Mahoney, has been purchased with a view to the erection of a factory, it is stated.

The C. P. R. management have called for tenders until March 6th for purchase of the buildings standing on the C. P. R.'s premises on Cardigan street. A. L. Hertzberg, division engineer, Toronto.

The plans for the erection of the arcade are almost completed and show that on the ground floor will be built a number of stores, some on each side, with numerous offices above, the whole thing to be topped by a tower.

Hamilton, Ont.

The Oliver Chilled Plow Works Company of Canada, secured a permit to erect a \$200,000 building, and will, it is announced, spend \$600,000 on its local plant. Tenders for a 1-storey 135 x 576 ft. foundry building are called for.

Moose Jaw, Sask.

The Saskatchewan Flour Mills will increase the mill capacity from 1,600 to 2,000 barrels per day, and construct an oatmeal mill with a daily capacity of 600 barrels. F. A. Bean, managing director.

Messrs. Willoughby, Pickett & Craig have made application on behalf of clients for the purchase of building lots here. The purchasers desire to erect a building of from \$35,000 to \$40,000 value, about 100 to 115 feet, built of brick or cement on the outside and finished by the slow burning process. Action delayed.

Montreal, Que.

On the 27th ulto. damage to the extent of about \$150,000 was done to the Ives Modern Bedstead Company's plant.

Damage to the extent of about \$20,000 was done to the Brault Carriage Works, St. Antoine street, on the 24th ulto.

The damage by fire on building and stock of D. C. Brosseau & Co., wholesale grocers on the 20th, amounts to about \$75,000.

The C. P. R. has a permit for the erection of new freight sheds, to extend from Lacroix street, near the Place Viger station, to Montcalm street, \$66,000. J. G. Sullivan, assistant chief engineer, Montreal.

Ottawa, Ont.

Plans are being drawn for the structural steel works. H. W. Baker, publicity commissioner.

Nimmo and Soper have formed a syndicate which has purchased a lot on Albert street near Bank where a large office building will be built.

F. X. Tradburks is preparing to build a large commercial building at the corner of Somerset and Lebreton street. It will contain nine stores.

The Bank of Ottawa has purchased a large block on Sparks street and will, it is understood, continue its large bank building on Wellington street through to Sparks street.

Port Hope, Ont.

Mr. Thomas Garnett has the contract to build the substation for the Seymour Electric Light and Power Company. The building will be 41 x 33, constructed of concrete, brick and steel. It is to be completed by May 15th.

Portage la Prairie, Man.

The Bank of Ottawa will erect a branch office here this spring. Plans have been prepared. Contract not let yet. T. B. Sharpe, local manager.

Quebec, Que.

The Canadian Bank of Commerce has purchased the Victoria Chambers property, St. Peter and St. Paul streets, Quebec. The intention is to remove the present building and erect a new branch.

Regina, Sask.

The Aultman-Taylor Co., Marion, Ohio, is having plans prepared for a large warehouse to be erected here this spring.

Tenders are requested until March 4th

for erection of warehouse for the Great West Saddlery Co., Ltd. Messrs Storey & Van Egmond, architects.

Tenders addressed to Storey & Van Egmond, architects, Regina and Saskatoon, will be received until March 6th for erection of bank building for the Bank of Ottawa.

Red Deer, Alta.

The Alberta Hotel Company, Calgary, will build here this spring a new hotel. Estimated cost, about \$60,000. W. J. Stock, Empire Hotel, Calgary, is interested.

Saskatoon, Sask.

A. Bowerman is having plans prepared for a business block to be constructed here at a cost of \$140,000.

The J. L. Case Co., of Racine, Wis., are negotiating towards location of a warehouse here, plans for which call for a building about 400 feet x 250 feet.

St. Catharines, Ont.

Under date of last information the contracts for erection of gymnasium and assembly hall rear of Collegiate Institute had not been awarded. Estimated cost of building, \$10,000; of equipment, \$500. The architect has not been chosen yet.

A. E. Coombs is interested.

Negotiations were concluded for the purchase of 40 lots here, which, it is understood, will be used as an industrial site by Cushing Bros., Limited, Calgary, for a large woodworking establishment.

St. John, N.B.

The Bank of New Brunswick has purchased from the St. John Real Estate Company a lot in Haymarket square, and it is understood that they will erect a new bank building there in the near future.

Toronto, Ont.

A transept and nave will be added to St. Alban's Cathedral at an expenditure of about \$300,000. It will be commenced, if possible, in October next.

Plans prepared by Dr. R. A. Cram, Boston, a noted church architect, were finally accepted. Bishop Sweeney is in charge.

A. R. Denison & Stephenson, architects, 20 King street west, are calling for tenders for removal of houses upon property corner of Broadview and Elliot street, the proposed site of branch for Home Bank of Canada.

Vancouver, B.C.

Mr. George Dawson is having plans prepared for the proposed business block to be erected at the corner of Hastings and Main streets at an estimated cost of \$125,000.

Mr. Gordon E. Brady, Montreal, is here, with the intention, it is reported, of looking for a site for the location of a steel plant to handle the western business. Tract of land opposite Port Mann is favored.

F. L. Buckley, managing director of the British Canadian Lumber Company, has been given authority to carry out large extensions for the company, which include the erection of a saw and pulp mill on Massett Island where lumber has been purchased.

Among the building permits were the following: Atkins & Watson, 4-storey building on Hornby street; E. A. Marshall, 3-storey apartment house at 2515 Yukon street, \$50,000; Hotel Vancouver

annex, covering an expenditure of \$190,000; Skene & Christie have the contract; Honeyman & Curtis are the architects. Plans for this building were filed last December.

Victoria, B.C.

Building permit was issued to Messrs. Brown & Simmons for a livery stable to be erected on Fisguard street to cost \$8,400.

Tenders are called by Thos. Hooper, architect, Royal Bank Chambers, until March 2nd for erection of 3-storey, etc., brick building on Fort street.

Winnipeg, Man.

Plans have been prepared for the remodelling of the C. N. R. ticket offices here.

Tenders are called until March 1st for the St. Charles Country Club Building per plans and specifications on view at the Standard Trust Company's offices, Keewayden Block, Portage avenue east.

The Rat Portage Lumber Company is preparing plans for its new sawmill which will be built on the site of the old one in Norwood destroyed by fire last fall. The mill will be modern in every respect and will have a capacity of 40,000 feet daily.

E. F. Hutchings, President Great West Saddlery Co., announces the company will erect the following branch warehouses this summer: Regina, Sask., 3-storey, 50 x 90 feet, of solid brick, costing \$25,000; Edmonton, Alta., 6-storey, 53 x 150 feet, costing \$102,000; Saskatoon, Sask., 6-storey, 120 x 50 feet, costing \$90,000.

AWARDED**Ottawa, Ont.**

Esdale and Douglas have been awarded the contract for building an annex to stores belonging to S. McClenaghan, corner of Division and Somerset street. J. P. MacLaren, architect.

Rosthern, Sask.

The contract for Mr. H. A. McEwen's new building on Ens street has been let to Wilker & Son.

Vancouver, B.C.

M. R. P. Foreshaw is the contractor in charge of the erection of hotel for Sam Kee. Patrick Donhoe, architect. Estimated cost, \$95,000.

Power Plants, Electricity and Telephones**Alberni, B.C.**

The Alberni Electric Light and Power Company, Limited, with head offices in Alberni, has been incorporated, and it is announced by the president, Dr. A. D. Morgan, that it will be in a position within two months from date, to install fixtures and supply electric light in every house in Alberni. Arrangements have been made for the purchase of a steam engine and boiler, and the electricity will thus be generated until such time as the demand for light and power becomes large enough to justify a much larger expenditure on the harnessing of water power somewhere in the district. W. W. G. Allister, secretary-treasurer; H. B. Mitchell, mechanical engineer.

Brandon, Man.

As a result of the report on the defective wiring in the hospital here, new

wiring will be installed at a cost of about \$700.

Calgary, Alta.

The Natural Gas Company, Calgary, will lay piping from Gleichen, 55 miles distant, at an approximate cost of \$3,200,000. Work will be started this spring.

Port William, Ont.

The directors of the Kaministiquia Power Company have voted to spend \$250,000 this summer for enlarging the power plant. R. S. Kelsch, construction engineer.

Ottawa, Ont.

A company is being organized to develop power at Carillon and Point Fortune on the Ottawa river under a lease granted to C. Ross, of Ottawa, about three years ago.

The Department of Public Works will issue a call for tenders for the construction of the dam at the foot of Quinze Lake, about 18 miles from head of Lake Temiskaming, the estimated cost of which is \$59,000. Tenders will also be called this spring for the new dam at the head of Gordon Creek, which it is expected can be rebuilt from the present Lumsden estate dam, for a cost of about \$5,000.

Prince Albert, Sask.

Mayor Holmes and Ald. S. McLeod and James McKay, K.C., who comprised the deputation to Ottawa report that Prince Albert will be given the La Colle Falls power site on much the same terms as Winnipeg secured the Point du Bois site, a certain amount of development of power being required. In regard to the proposal that the government in making out its scheme to make the Saskatchewan river navigable should co-operate with the city in its power scheme work at La Colle Falls, the deputation said that the suggestion had been favorably received at Ottawa.

Regina, Sask.

A bill is now before the legislature which provides for a tax of 2 cents per acre on all land in the province for telephone purposes.

Renfrew, Ont.

The indications now are that Renfrew municipality and the Renfrew Power Company will jointly build a reservation dam at the outlet of Round Lake, one of the upper lakes of the Bonnehere. A considerable sum of money will probably be required for the work and permission to levy toll on all power users along the river benefited through the storage of water.

Toronto, Ont.

Tenders are called until April 4th for delivery of 1,340 tons or open hearth steel rail, etc.; also 30,000 untreated wood ties, etc. Advertisement in "Tenders and For Sale Department," of this issue.

Victoria, B.C.

It is the intention of the city to install about 150 lamps at various points. The order will be further extended on the ratepayers apprising the electric light committee. Chairman, Ald. H. M. Fullerton.

Yorkton, Sask.

Arrangements for the instalment of an electric lighting plant to supercede the

present acetylene system are almost completed. It was expected that the new plant would be ready for use in May, but it is probable that all the work will not be done until June. W. E. Skinner, Limited, Winnipeg, are the consulting engineers. Cost, about \$40,000.

Wolseley, Sask.

Announcement has been made by the provincial government of the erection of a long-distance telephone line from Wolseley to the Manitoba boundary.

AWARDED

Fort Frances, Ont.

Nelson & Cassaday were awarded the contract to supply electric light poles for the town lighting system. The price to be paid is \$1.75 per pole for 30 ft. 6 in. top and \$3.25 per pole for 35 ft. 7 in. top.

Winnipeg, Man.

The following contracts for the ensuing year have been awarded by the Manitoba government telephone commission: Poles, J. L. Hyland Company; hardware, Miller, Morse and Company, J. H. Ashworth Company, and Northern Electric Company; insulators, Pittsburg High Voltage and Insulator Company, and August Fibiger; copper wire, Wire & Cable Company, and Eugene F. Phillips Electric Works; iron wire, Steel Company of Canada and Northern Electric Company; cable, Wire & Cable Company; cross arms, side block and top pins, etc., Northern Electric Company; Tri-Provincial Electric Supply Company, West Canadian Lumber Company, and Brown and Rutherford; underground conduits, Tri-Provincial Electric Supply Company.

Miscellaneous

Fort William, Ont.

The Canadian Fire Underwriters' inspector in his report asks for two additional fire engines, also a chemical engine to be placed in No. 8 station.

Ottawa, Ont.

Tenders addressed to the Chairman of Board of Control will be received until March 14th for delivery of combination automobile fire engine, pumping capacity from 700 to 800 gallons a minute. John Henderson, city clerk.

Tenders addressed to A. Johnston, deputy minister of marine and fisheries, will be received until March 20th for supply and delivery of 190,000 gals., etc., of illuminating oil and 55,000 imp. gals. of oil fuel, according to specifications, etc., which can be obtained from the Collector of Customs at Toronto, Petrolia, Sarnia, and from the agents of this Department at Montreal, Quebec, St. John, Halifax, Pictou, Charlottetown, and from the purchasing and contract agent, Marine Department, Ottawa.

Vancouver, B.C.

The following building permits have been issued: A. A. Burpee, frame stable, 25 Twelfth avenue west, \$2,500; Robertson & Cowperthwaite four frame dwellings, 3327 Trafalgar, \$6,000; D. Alecorn, dwelling, 2721 Third avenue west, \$2,000; Atkins & Watson, brick garage and rooms, Hornby street, \$40,000 (four stories); E. A. Marshall, three storey brick stores, etc., 2515 Yukon street, \$50,000; Mrs. A. Hamilton, frame dwelling, 1656 Seventh west, \$2,200; Grace Church

(Methodist), 737 Fourteenth east, \$2,595; Mr. T. Medforth, frame dwelling, 1035 Twelfth west, \$3,500; Geo. Pound, frame dwelling, 1038 Eleventh east, \$2,000; T. Sedgwick and J. Mackenzie, St. George street, \$8,000; A. Shaw, frame dwelling, 2841 Scott street, \$3,000; A. Steoff, frame store, Park drive, \$5,000; E. Hammond & Son, 1258 Barnard street, \$4,000; Beard Home Building Company, 1916 and 1735 Eleventh avenue west, \$4,000 each; F. O. Dixon, 1624 Graveley street, two houses, \$3,500; Shaw Bros., 1126 Eleventh avenue west, \$4,200; W. J. Harrington, dwelling, 1076 Seventh avenue west, \$2,500; M. Meslings, dwelling, 2063 Graveley street, \$2,000.

Victoria, B.C.

The Vancouver Island appropriations to be spent for road for the coming fiscal year are as follows: Alberni, \$75,000; Comox, \$85,000; Cowichan, \$35,000; Esquimalt, \$65,000; Nanaimo City, \$13,000; Newcastle, \$26,000; Saanich, \$10,000; The Islands, \$30,000; Jordan River road, \$34,000; Vancouver Island Trunk road, \$30,000. In addition to the foregoing the supplementary estimates for work ending March 31st of the present year include: Alberni, \$4,000; Cowichan, \$2,000; and Esquimalt, \$11,000. The total amount to be spent on roads in the province is \$2,842,000. Added to this must be the appropriation set aside for bridges throughout the province, which comes to a total of \$858,500, and a total of \$406,900 appropriated roads, streets, bridges and wharves in the supplementary estimates, making a grand total to be spent on roads in the province of \$4,107,400. Of this total, as is shown, Vancouver Island has secured probably upwards of half a million dollars.

Winnipeg, Man.

Tenders addressed to The Standard Trusts Company, assignees of The Lake Winnipeg Lumber Company, Limited, will be received until March 20th for the purchase of timber, sawmill, steamer, etc., etc.

Recent building permits include: H. Adams, blacksmith shop on east side of Langside, \$3,000; Ed. Noe, four dwellings on north side Rosser avenue, \$12,000; W. A. Cameron, dwelling, west side Horne, \$4,200; J. W. Alderson, dwelling, east side Lipton, between Ellice and Sargent, \$2,000.

New Companies

Shawinigan Pulp and Paper Company, Shawinigan Falls, Que., capital, \$100,000, incorporated. Incorporators, Jos. L. Marchesseault, merchant; J. E. Thibeaudeau, mnfr., Shawinigan Falls; J. Boivin, merchant.

Three Rivers, and E. Thibeaudeau, photographer, Shawinigan Falls.

George Thomson Lumber Company, Limited, Toronto, incorporated, capital, \$100,000. Incorporators, George Thomson, Goderich, lumber dealer; and F. Thomson, Southampton, lumber dealer.

George Rathbone, Limited, Toronto, capital, \$200,000, incorporated to manufacture, etc., and deal in saw logs, shingles, etc. Incorporators, G. Rathbone, manufacturer; T. E. Rathbone, and C. Marshall, all of Toronto.

The Herod Machine and Motor Company, Limited, Brantford, Ont., incorporated. (Continued on page 31)

Tenders and For Sale Department

To Contractors

Tenders will be received at the office of the Secretary, School of Mining, Kingston, up to 6 p.m. of Friday, March 10th, for the several trades works required in the erection and completion of the Nicol Building for the Governors of the School of Mining and Agriculture.

Plans and specifications may be seen at the University and at the office of the undersigned.

The lowest or any tender not necessarily accepted.

POWER & SON, Architects,
9-10 Merchants Bank Chambers, Kingston.

Tenders for Cement Walks and Concrete Curb and Gutters

The Board of Works of the Town of Berlin will receive tenders addressed to A. H. Millar, Town Clerk, up to March 2nd next, for constructing cement walks, and concrete curb and gutters during the year 1911. Specifications may be seen at the office of the Town Engineer.

The lowest or any tender not necessarily accepted.

H. A. DIETRICH,
Chairman.
Berlin, Feb. 17, 1911. 8-9

For Sale — Second Hand

No. 8 Austin Gyrotory Crusher.
No. 6 and No. 3 Austin complete plant.
No. 3 Austin and 2 No. 6 Gates and No. 5 "B."
70-ton Vulcan Steam Shovel, 2-yard.
50-ton Bucyrus Steam Shovel, 1 1/4-yard.
Loco. Crane, with 1 1/4-yard Clam Shell.
Little Giant Traction Steam Shovel, 1 1/4 yard.
Hayward Orange Peel Buckets, 1 and 1 1/4-yd.
Concrete Mixers, Steam Rollers, Air and Steam Drills, Air Compressors, Locomotives, Dump Cars, etc.

All our goods we fully guarantee.

Send for our February Booklet.

WILLIS SHAW MACHINERY CO.,
171 La Salle St.,
Chicago, Ill.

Tenders for Bridge

Tenders will be received by the undersigned up to 6 o'clock p.m., Saturday, the 4th day of March, 1911, for the erection of a reinforced concrete bridge, single span over the Clyde River at a point about 3 miles north of Lanark Village.

Bridge about 70 feet long.

Plans may be seen at the office of the undersigned at Lanark, or tenderers may submit their own plans and specifications.

Deposit of ten per cent. to accompany each tender, which will be returned if tender not accepted.

The lowest or any tender not necessarily accepted.

Dated this 2nd day of February, 1911.

J. BOYD CALDWELL,
Chairman of Roads and Bridges Com.
Lanark, Ont. 6-9

Tenders Wanted

The Town of Petrolia intends to construct about 6,000 square yards of pavement, and about 2,500 lineal feet of concrete curb and gutter combined, and invite tenders for Vitrified Brick, and any other kind of pavement.

Parties tendering must enclose a specification of the pavement they purpose laying along with their tender.

Tenders to be placed with me on or before 5 p.m., Monday, March 20th, 1910.

Any tender not necessarily accepted.
J. McHATTIE, Town Clerk.

City of Toronto Civic Car Lines

Tenders for Rail & Ties

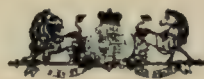
Tenders will be received by registered post only, addressed to the Chairman of the Board of Control, City Hall, Toronto, Canada, up to noon on Tuesday, April 4th, 1911, for delivery of Thirteen hundred and forty (1340) tons of open hearth steel rail, 80 lb. section, also thirty thousand (30,000) untreated wood ties, white cedar preferred, although other woods will be considered.

Envelopes containing tender must be plainly marked on the outside as to contents.

Specifications and forms of tender may be obtained upon application to the office of the City Engineer, Toronto.

The lowest or any tender not necessarily accepted.

G. R. GEARY (Mayor)
Chairman, Board of Control.
City Hall, Toronto, Feb. 23, 1911, 9-11



RIDEAU CANAL

Notice to Contractors

Sealed tenders addressed to the undersigned, and endorsed (a) "Tender for Timber," or (b) "Tender for Timber and Plank," will be received at this office until 16 o'clock on Monday, the 20th March, 1911, for the supply and delivery of British Columbia or "Douglas Fir" dimension timber and also for other Lumber and Timber required for use on the Rideau Canal for the year 1911-1912.

Specifications, Bills of Timber and full information can be obtained from the Purchasing Agent of the Department of Railways and Canals, Ottawa, on and after this date.

The lowest or any tender not necessarily accepted.

By order,
L. K. JONES,
Secretary.

Department of Railways and Canals,
Ottawa, 22nd February, 1911.

Newspapers inserting this advertisement without authority from the Department will not be paid for it. 9-10

City of Moose Jaw, Saskatchewan

Main Drainage Works

Sealed tenders endorsed "Tender A" and "Tender B" will be received by the undersigned City Clerk until 8.30 o'clock p.m., on Monday, April 10th, 1911.

Any tender received after the above-stated time will be declared informal.

Contract "A."

Supplying material for and constructing a Sewage Disposal Plant complete, including Pump House, Sedimentation Tanks and Percolating Filter, also the supply of materials for and the laying of a Trunk Sewer and Water Main.

Contract "B."

Supplying two Electrically Driven Centrifugal Pumps and Auto Starters complete with all piping, connections, etc.

Plans and specifications for Contract "A" may be obtained from the City Engineer, Moose Jaw, upon receipt of a marked cheque for the sum of \$25 to be held until the return of plans and specifications, and for Contract "B" plans and specifications will be sent upon request.

The lowest or any tender not necessarily accepted.

J. M. WILSON, City Engineer. W. F. HEAL, City Clerk.
Moose Jaw, Feb. 18th, 1911. 9-14

City of Moose Jaw, Saskatchewan

SEWER AND WATER EXTENSIONS

Sealed tenders endorsed "Tender 28," "Tender 29," "Tender 30" and "Tender 31," will be received by the undersigned City Clerk until 8.30 o'clock p.m. on Monday, April 10th, 1911.

Any tender received after the above stated time will be declared informal.

Contract 28.—The laying of approximately 30,700 lin. feet of tile pipe sewer, building man-holes, etc.

The laying of approximately 29,700 lineal feet of cast iron water main, placing valves, valve boxes, hydrants, etc.

Contract 29.—The supplying of approximately:

- 29,600 lineal feet of 6-in. c.i. water pipe.
- 112 lineal feet of 4-in. c.i. water pipe.
- 132 6-in. cast iron reverse curves.
- 34 6-in. cast iron crosses.
- 72 6-in. cast iron tees.
- 29 4-in. off 6-in. cast iron tees.
- 28 4-in. cast iron tees.
- 95 6-in. cast iron plugs.

Contract 30.—The supply of approximately:

- 26,600 lin. feet of 8-in. vitrified tile sewer pipe.
- 5,225 lin. ft. of 10-in. vitrified tile sewer pipe.
- 1,100 lin. ft. of 12-in. vitrified tile sewer pipe.
- 25 8-in. tees.
- 75 6-in. tees.
- 25 8-in. bends, 90 deg.
- 100 6-in. 1/4 bends, 90 deg.
- 25 8-in. stops.
- 25 10-in. stops.
- 400 4-in. to 6-in. increasers.

Contract 31.—The supply of approximately:

- 65 6-in. 3-way hydrants.
- 147 6-in. gate valves.
- 29 4-in. gate valves.
- 150 6-in. valve boxes.
- 29 4-in. valve boxes.
- 88 manholes, frames and covers.

Plans and specifications for Contract 28 may be obtained from the City Engineer, Moose Jaw, and from the offices of the Canadian Engineer at Toronto and Winnipeg.

Plans and specifications for Contracts 29, 30, and 31 will be sent upon request.

The lowest or any tender not necessarily accepted.

J. M. WILSON, City Engineer. W. F. HEAL, City Clerk.
Moose Jaw, Feb. 24, 1911. 9-14

Miscellaneous

Advertisements under this heading two cents a word per insertion

WANTED—Construction Engineer having several years experience in concrete and general construction work. Apply to Smith, Kerry & Chase, Confederation Life Building, Toronto, Ont., by letter only, stating experience fully. 9-9

AGENTS WANTED—Large American firm manufacturing a complete line of lineman's tools, and portable saw rigs for builders, contractors and lumber yards wants Canadian representatives. For particulars apply, Box 221, Contract Record, Toronto, Ont. 8-9

City Engineer Wanted

For city of 15,000 population. Considerable permanent street work to be done. Apply, stating experience and salary wanted, Box 230, Contract Record, Toronto, Ont. 9-10

New Companies

(Continued from page 29)

incorporated, capital, \$40,000. Incorporators, C. H. Herod, C. J. Harris, manufacturers, and C. Cook, broker, all of Brantford, Ont.

Canadian Automatic Gas Company, Limited, Toronto, incorporated, capital, \$250,000. Incorporators, C. F. Ritchie, barrister; J. H. Oldham, student, both of Toronto.

The Inwood Rural Telephone Company, Limited, Inwood, Ont., incorporated, capital, \$25,000. Incorporators, J. H. Morrison, W. R. Dawson, and J. Brown, merchants, Inwood.

Owens Lumber Company, Limited, Montebello, Que., incorporated, capital, \$100,000. Incorporators, N. Dickson, Notary Public, A. Holden, and James Buchanan, accountants, all of Montreal.

Lake Superior Paper Company, Sault Ste. Marie, Ont., incorporated, capital, \$8,000,000. Incorporators, Thos. Gibson, barrister; A. Taylor, secretary, and N. D. Bayly, clerk, all of Toronto.

Montreal General Contracting Company, Limited, Montreal, incorporated, capital, \$200,000. Incorporators, E. G. Evans, civil engineer; R. Moffat, contractor; G. G. Hyde and W. G. Pugsley, advocate, all of Montreal.

National Brick Company of Laprairie, Limited, Montreal, incorporated, capital, \$2,000,000. Incorporators, C. G. Greenshields and E. R. Parkins, advocates, both of Montreal.

Business Notes

P. Garneau & Co., contractors, Quebec, have registered.

S. McCormack, plumber, Ottawa, is stated to have assigned.

The Belding Lumber Co., Ltd., Toronto, winding-up order granted.

H. Cauchon, contractor, Beauport, Que., is reported to have sold assets.

Pepin & Caron, contractors, Hull, Que., are stated to have sold assets.

Lambert & Frere, lumber merchants,

Montreal; J. H. Lambert & J. N. Lambert, have registered.

The Canadian Municipal Supply Co., Montreal, Que., O. H. Smith, have registered.

The Co-operative Bit & Tool Co., Mystic, Que., are reported to have dissolved.

Kilmer, Pullen & Burnham, Limited, Montreal, F. Pullen, president, have registered.

J. Long & Co., plumbers and tin-smiths, Welland, are reported to have assigned.

Jas. C. Claxton & Son, builders and contractors, Toronto, are reported to have assigned.

Canadian Storage Battery Works, Limited, Winnipeg, Man., is reported to have assigned.

J. Willis & Sons, contractors, Montreal, C. J. Wills, A. S. Wills and J. F. Wills, registered.

Bourque & Pichette, contractors, Montreal, Que., Chas. E. Bourque & A. Pichette registered.

J. Messier & Son, East Farnham, car makers, J. Messier, jr., and Eugene Messier, have registered.

Cabana & Comeau, Montreal, Que., contractors, Montreal. H. Cabant and P. Comeau, registered.

L. Villeneuve & Cit, Ltee., lumber merchant, Montreal, L. Villeneuve, president, have registered.

The Atkins Storage Battery Company, Vancouver, are reported to have assigned.

Blais & Frigon, cement work, Victoriaville, Que.; Alfred Frigon and J. E. Blais have registered.

Blackadar & Blackadar, manufacturers lumber and general store, Millville, N.S., have formed partnership.

The Canadian Iron & Metal Co., Montreal, are registered as H. Levine, P. Lippenholtz and M. Butler.

Canadian Storage Battery Works, Ltd. (Estate of) Winnipeg, are reported to be advertising assets for sale by tender.

A. H. Bennett, brass foundry, Vancouver, is reported to have assigned to Canadian National Investment, Limited.

Nepisiguit Lumber Co., Ltd., Bathurst, N.B., mfrs. lumber and shingles, E. P. Mackay and Geo. Gilbert, permanent liquidators.

Under the name of the Canadian Northern Branch Lines Company, the C. N. R. is applying for incorporation with power to build eighteen branch lines in Manitoba, Saskatchewan and Alberta.

The Cowan Construction Company, Limited, of Winnipeg, is reported to be applying to the Lieutenant-Governor-in-Council for authority to change the name to the Union Construction Company, Limited.

It is understood that the company will undertake an important contract on the Canadian Northern main line between Pembina river and the Rocky

Mountains, in addition to other contracts in the prairie country.

Two of the original members of the company have sold out their interests to T. J. Merry and Joseph M. Mackenzie.

Mr. Mackenzie is a son of Sir William Mackenzie, president of the Canadian Northern Railway. F. W. Tisdale and Frederick Fox are also named on the directorate of the reorganized company.

It is understood that the Canadian Pacific will do a lot of work in the Northwest this year. The double-tracking to Brandon will be completed and a new line built into Strathcona from Sedgewick, a distance of about ninety miles. The superstructure of the bridge at Lachine, near Montreal, will be used for the new bridge at Outlook Crossing on the South Saskatchewan river.

An international trunk line highway between New York and Montreal may soon be established. The ways and means of securing the Canadian end of the highway were discussed by an enthusiastic gathering in Montreal recently. The New York to Rouse's Point Road is expected to be started this year, a bill having passed the State Senate this winter, making the sum of \$1,200,000 immediately available to finish the remaining stretches of the line.

The British Columbia Gazette gives notice of the incorporation of the following companies: The Realty Fruit and Lumber Company, Limited, capital, \$500,000; Island Lumber Company, Limited, capital, \$100,000; Taylor Brick Company, Limited, capital, \$50,000; The Wolverine Company, Limited, capital, \$75,000; The Granite Creek Lumbermen, Limited, capital, \$65,000; Western Canadian Lumber & Fuel Company, Ltd., capital, \$150,000; Home Loan & Contract Company, Limited, capital, \$300,000; Nanaimo Brick & Coal Company, Ltd., capital, \$200,000; Essex Shingle Company, Ltd., capital, \$10,000; Canadian Crude Oil Co., Ltd., capital, \$750,000; The Canadian Ideal Gas and Light Co., Ltd., capital, \$5,000; The Interior Lumber Company, Ltd., capital, \$20,000; Iowa Lumber and Timber Company, Limited, capital, \$250,000; Oliver Scrim Lumber Company, Limited, capital, \$100,000; Victoria-Vancouver Lime and Brick Company, Limited, capital, \$100,000; The Realty Fruit and Lumber Company, Limited, capital, \$500,000; Island Lumber Company, Limited, capital, \$100,000; Taylor Brick Company, Limited, capital, \$50,000; The Wolverine Company, Limited, capital, \$75,000; The Granite Creek Lumbermen, Limited, capital, \$65,000.

The Canadian Pacific Railway have announced their intention to spend over \$250,000 in improvements to their lines in London, Ont., this summer. The improvements include the building of a new station and round houses and the construction of new yards. The appropriation for this work has already gone through, and in preparation for the starting of building operations the houses on the site of the station are being moved away. Other improvements in the vicinity of London include the replacing of the wooden bridges between Toronto and Windsor with up-to-date steel and cement structures. Over half a million dollars has been set aside for this work by the C. P. R.

Construction of Highway Bridges and Culverts*

The past year has been a particularly favorable one on account of climatic conditions for construction work of all kinds. Particularly is this true of culvert and bridge work. Undoubtedly concrete was more widely used for this purpose during 1910 than in any previous year. There is a general movement toward the adoption of this material for use in structures of this character. Little advertising or persuasion is necessary now to convince township or country road officers that the best material for their waterways is concrete.

In general, the types in use now are circular culverts built over collapsible moulds; slab top or box culverts; arches; I-beam construction, including I-beams supporting a concrete floor, and I-beams piling, with concrete filled between for abutments or side walls. In addition, steel bridges with concrete floors are used to some extent.

The types of bridges and culverts recommended by the Highway Commission are as follows:

First. Round culverts built over collapsible moulds with a small amount of longitudinal reinforcements, including all sizes up to a 36-inch diameter.

Second. Box culverts or slab bridges from 2 to 20 feet span.

Third. Reinforced concrete arches from 8 feet span up to 100 feet, used where the foundation and lead room are favorable.

Fourth. Pony truss bridges, from 30 to 80 feet span, with reinforced concrete floors.

Fifth. Reinforced concrete girders of either the through or deck type from 25 to 50 feet span.

There have been no notable failures of concrete work in the state during the past year. There are, however, we believe, some serious mistakes being made that will eventually result in failures. The mere fact that a bridge or culvert is standing is no reason for assuming that it is a safe kind of structure to build.

Among the costly mistakes that have been most frequently made is that of low bidding. Concrete work is not and never will be cheap work, and concrete workers should not attempt to compete in first cost with bridges of other less permanent material except under very favorable circumstances. The fact that concrete work well done is permanent, entailing practically no maintenance charges, should be sufficient to off-set in the minds of public roads officers, the somewhat higher investment. We have found that bids on plans prepared by the Highway Commission and on which the competition has been strong, have almost invariably been below the estimated cost. On the other hand, it is apparent that contracts have been taken at a loss by many concrete contractors, because of the rank favoritism that prevails in so many counties or on account of the conditions that have been imposed upon contractors, which have effectively eliminated competition. Iowa can and should offer an open field to the cement contractors of the state. Under existing methods and conditions, this field is closed. In probably 75 per cent. of the counties of this state there is not such a thing as actual competition in the bridge business. We are very much in need of some laws that will give all men who wish to do public work, and are capable of doing good work, an equal chance.

In response to the demand for concrete bridges the steel I-beam bridge has been encased in concrete

and used extensively in some counties. This is a needless waste of steel, as a few rods of steel would reinforce the abutments far more effectively and the prices that have been paid for this material are far in excess of the market value. When used for floors, the I-beam construction is not economical, as the I-beams must carry their own weight plus that of the concrete floor plus the loads that pass over them. This is not reinforced concrete construction, and if the I-beams are sufficiently large to take the superimposed loads, the cost complete with concrete floor would be considerably more than the slab, reinforced with steel rods.

There are many mistakes made in concrete construction, due to incomplete knowledge of the man handling the material or insufficient supervision. Among these mistakes are the misplacing of reinforcing steel. Careless placements of the steel reinforcing is a really serious matter, for in the use of the slabs and their sections, a minimum thickness is nearly always used. If, then, the steel is misplaced even one-half inch from its figured positions, the calculated stresses will be greatly increased and if in a thin section the steel is misplaced one inch, then the stresses induced may cause serious cracks or even failure.

At Iberville, Que., operations have been resumed at the plant of the Norcross Brothers Company. About 125 hands are employed.

The Bricklayers and Masons' Union of Vancouver, B.C., has notified the city officials that its new scale of \$6 for an 8-hour day will go into effect on April 1st.

The price of common brick is on the increase at Victoria, B.C. Last year's figure was \$12 a thousand, but two tenders submitted recently to the city for the year's supply were both for \$12.75 a thousand. The contract was equally divided at this price.

On February 16th, Mr. C. H. Mitchell gave an interesting address before the Engineers' Club of Toronto, on the Ontario Power Company's conduit at Niagara. The address was illustrated by a number of excellent views showing constructional progress.

Mr. G. R. Conway has been appointed chief engineer of the B. C. E. R. (Vancouver), with charge of the engineering staff and subsidiary companies. Until recently Mr. Conway was chief engineer of the Monterey Subway Light & Power Company and the Monterey Waterworks and Sewer Company, Mexico. Among important contracts of which he had charge previously may be mentioned the installation of the waterworks system at Aberdeen, Scotland.

Regina, Sask., anticipates an exceptional demand for unskilled labor this season. The city has a very heavy construction problem to carry out. Among the important items may be mentioned the construction of the street railway, the completion of the parliament buildings, the G. T. P. shops and railway lines, the Fair buildings, C. N. R. and C. P. R. buildings, and scores of residential and commercial structures.

Mr. F. F. Tye, of Toronto, is now in Ottawa, engaged with City Engineer Ker in preparing a report on railway entrances into the city. The report, after approval by the city council, will go to the Board of Railway Commissioners.

*Extract from a paper read by T. H. Macdonald before the Iowa Association of Cement Users.

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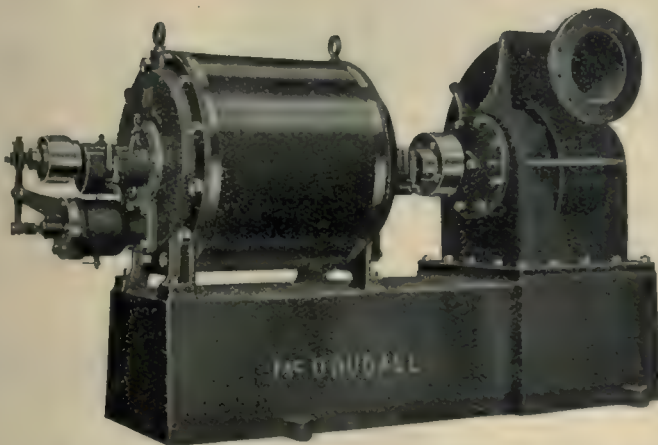
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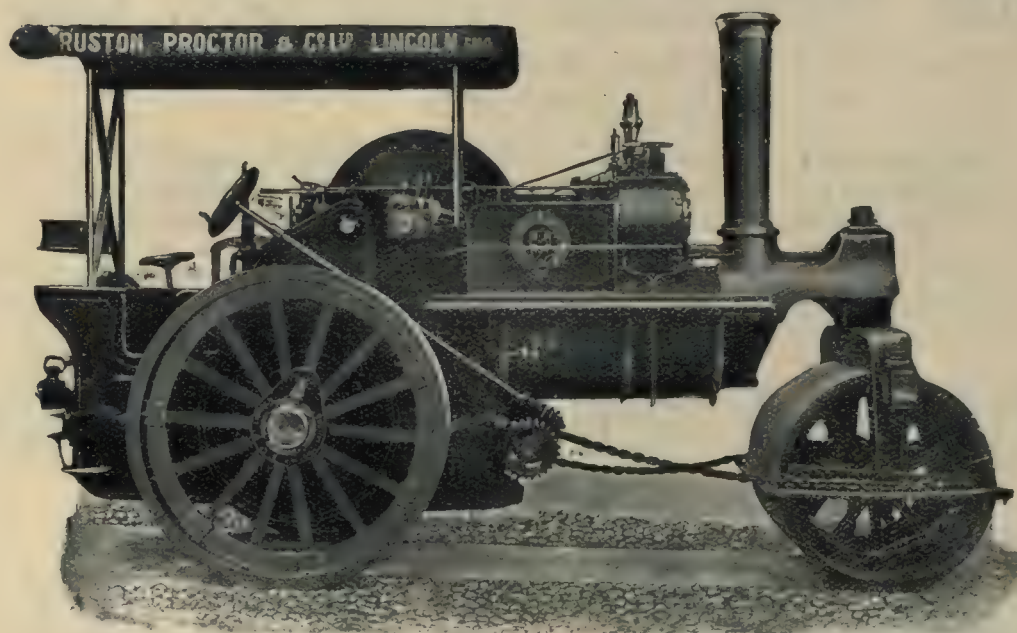
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Aldermanic Ignorance

In spite of the fact that their city engineer submitted a report in which he showed that a saving had been effected for the city last year by employing the contract system, the aldermen of Victoria, B.C., decided upon starting out on the city paving programme this season with day labor. There was considerable discussion on the point, and the Mayor suggested undertaking two batches of work under similar conditions, doing one by day labor and one by contract. The majority of the aldermen failed to understand why the city should not do as well as the contractors.

Evidently some kind of an educative campaign is needed in Victoria, B.C., to expound the elementary principle of adaptability, and to show the worthy aldermen that because, for instance, a man is capable of running a farm properly, it does not follow that he would make a neat job of cutting out a pair of pants. This argument is perhaps rather far-fetched in its present application, but certain it is that either the city engineer will be an expert in his own particular profession or he will be capable of both designing and executing his work—and making a botch of the whole thing.

The Lowest or any Other Tender not Necessarily Accepted

While it is generally conceded that the above provision is necessary for the protection of municipal authorities and others, the rejection of the lowest bid is a frequent source of trouble and misunderstanding. A brief discussion of the question at this time will perhaps come opportunely. We agree that the power not to accept the lowest bid should always be taken, for there are men of doubtful standing in the contracting as in every other industry, but there are times when this power is used without rhyme or reason, to the great detriment of the honest contractor.

Our attention has been called to a recent case of this kind, and such cases are said to be far too frequent. The case is that of a local authority preferring a local

contractor over another bona-fide and lower tender. In the particular case which has led to these remarks there does not exist the slightest ground for suspicion of evil practice; but we are fully convinced that in the majority of cases the transactions will not bear the light of day. It is unjust to those who go to the expense of tendering if the authority from the first intends to favor a local man if he happens to be near the mark. Without specializing the particular persons and localities, let us see how contrary to true business such favoritism must be. A certain authority advertises for tenders; the work is important, and worthy the consideration of any large contractor. Good firms go thoroughly into the matter, and, as in the present case, one of the members of the firm, with a competent engineer, visits the place to obtain the fullest information. The tender is sent in and proves to be the lowest submitted; references are duly furnished, and prove to be satisfactory. Yet in the end this tender is passed over in favor of a local man. Upon writing to ascertain the reason for this, the firm receives a letter to the following effect:

re——— Improvements.

Dear Sir:—

I have received yours of the — inst. In reply, I must refer you to the conditions stated in the advertisement inviting tenders, viz., that the council did not bind themselves to accept the lowest or any tender.

At the same time, I may venture to explain that in accepting Mr. —'s tender the committee were mainly guided by the consideration that, having regard to the small amount in difference between his tender and yours, due regard should be had to the claims of a local contractor.—

Yours truly,

There is absolutely no logical consistency in reasoning of this kind. What is the limit of the difference that shall be taken into account? Why not word the advertisement for tenders: "That if the tender of the local contractor does not exceed the lowest bona-fide tender sent in by more than 10 per cent. the tender of the local man shall be accepted?" Of course, under such conditions no outsider would tender, and the locals would have it all their own way. A still more serious difficulty arises than that of the loss of work. Other local authorities receiving tenders from the firms passed by are apt to pass them by also; not because they can give any valid reason for so doing, but simply because one authority passed them by for no assignable reason. Firms of repute do not like to be served in this manner, and they may justly claim to have something to say in the matter. Without a word of warning, they go to considerable trouble and expense solely in the end to be put out of court because of not being represented on the spot.

The correspondent who calls our attention to this matter contends that, all things being considered, as much, or more, money is spent in a particular place when an outsider gets a large contract as when a local man gets it. We are hardly inclined to go so far as this, though at first sight it seems somewhat reasonable. The local contractors are supposed to find work for their men as heretofore, and other men to be brought for this particular work. We must point out that the local men, if they have sufficient work for their ordinary staff, would also have to increase their number of workmen to meet extraordinary demands. In reality this is only a side issue, and has nothing to do with the merits of the case. We hold that the lowest tender should, without hesitation, be accepted, when it is a bona-fide tender sent in by a responsible firm.

The Preparation of Engineering Contracts

Accurate Description of Work in Specification Essential to Success of All Undertakings — Contradictory Clauses and Other Sources of Trouble

By Wm] H. Bailey

A contract is defined by Blackstone as "An agreement upon sufficient consideration, to do or not to do a particular thing." Other definitions are: "A transaction in which each party comes under an obligation to the other, and each reciprocally acquires a right to what is promised by the other," and "A convention by which one or more persons obligate themselves to one or more persons, to give, or to do or not to do something."

Contracts may be written or in parol (i.e., verbal or unwritten) or partly written and partly in parol, but in most states some contracts must be in writing and generally it is safer to have the contract in writing and thus avoid disputes. Where the parties have reduced their contract to writing, the written contract cannot be varied or modified by a prior or contemporaneous parol agreement, but if through fraud or mutual mistake the parties have failed to correctly embody their agreement in the written instrument a court of equity will, upon a satisfactory showing, reform the contract so that it will express the real intention of the parties.

The contract should specify:

1. The parties;
2. The thing to be done;
3. The time and place for doing the thing to be done;
4. The price or consideration for the thing to be done;
5. The time and place for paying the price or consideration.

To constitute a contract there must be an agreement directly contemplating and resulting in an obligation and the agreement must be enforceable in law. Some of the essentials are:

1. There must be distinct communication by the parties to one another that it may effect the legal relations of the parties and be an act in the law, therefore:

- a. It must be in the form required by law;
- b. There must be a consideration when required by law;
3. The parties must be capable in law of making a valid contract;
4. The consent expressed in the offer and acceptance must be genuine;
5. The object which the contract proposes to effect must be legal.

Engineering contracts are usually in writing and every important contract should be reduced to writing and every subsequent amendment or modification of it should be in writing. A written contract may be all contained in one paper or may be made up of two or more instruments; it may consist of one formal instrument signed by the parties or it may be made up of letters or other written communications in which a proposal is made on one side and accepted on the other.

An important part of every engineering contract is the specification. This may be in whole or in part written in the body of the contract, or, as is generally

the case, is contained in a separate writing or writings and by the reference made a part of the contract.

The Contract and the Specification.

When the contract consists of two parts, one of them, signed by the parties and containing the formal elements, is usually called the "contract," and the other attached or referred to in the first and describing the work to be done or thing to be furnished is usually called "specification (or plan and specification)." The two constitute the contract in the full legal sense.

That part which we call for convenience "the contract" is usually prepared by a lawyer; perhaps it may be copied from a form found in a text book or be a printed blank, but the original was no doubt prepared by a lawyer. A careful engineer will examine it carefully and if necessary ask advice or explanation regarding matters in it which he does not understand or which seem to be obscure or not to express the intention of the parties.

That part usually called the "specification" should be prepared by an engineer. Like the lawyer's work it may be copied from a text book or be a printed blank but nevertheless if it is worth using it should have been prepared originally by an engineer.

When the contract and the specification are brought together they should be carefully compared to see whether they are in conflict and it will be well to provide either in case of conflict, although generally the contract so called should be construed as more authoritative since it was last prepared and had generally received more personal attention from the contracting parties than the specifications.

A specification has been defined as "A written statement containing a minute description or enumeration of particulars." A good definition of an engineering specification is: "A concise, accurate and detailed description of the work or structure to be built, together with a concise, accurate and detailed description of the materials and their method of fabrication and to some extent of the methods of construction of the work or structure." Maps, plans and drawings are often a part of a specification and are sometimes a necessary part.

The Lawyer's Share.

As explained above, the part of an engineering contract generally called the "contract" usually is and ought to be the work of a lawyer; that part of such contract called the "specification" or "plan and specification" usually is and in all cases ought to be the work of an engineer.

Not only is the specification usually a necessary part of an engineering contract but it is the most important part of it. If the specification is skillfully drawn, it will be possible to get a good job with a faulty contract, but with an improper specification, a faulty job generally results. In every engineering contract, therefore, both in preparing the contract and in carrying out the work contracted for, the engineer's work is of the first, the greatest importance.

The care and skill with which you plan the work upon which you are employed and the fidelity with which you prepare the specification under which the work is to be done, or interpret the specification and see that its provisions are carried out, if you are superintending the work, will soon determine your place in your profession. If the specifications you prepare prove to be unreliable or if you are found to be unable to properly interpret properly prepared specifications you will soon be working at something besides engineering, or if you continue in the profession it will be in some inferior and ill-paid position.

Preparing the Specification.

In preparing a specification it will be allowable, and is often the best practice, to copy approved forms; some of the forms found in text books, in printed blanks and in the reports or proceedings of engineering societies or in the manuals of manufacturers, embody the very best practice and the latest and best experience. But do not copy a clause or section from any form without carefully reading it to see that it does not contain something unnecessary in the work in hand or something which ought to be changed on account of some special or local condition.

It would not be possible to lay down all the rules which ought to be observed in preparing plans and specifications for any and all kinds of work or even for particular classes of work, but there are a few rules which it will be well to bear in mind. Remember, though, that there are exceptions to all rules.

1. Whenever an article has been standardized it will be generally best to specify standard form or quality rather than to specify some special form or quality which will be no better, while increasing the cost.

2. Do not include any clause which is so drawn that the engineer or inspector can, if he so wish, cause great monetary loss to the owner by allowing inferior work or material than was contemplated. Such a clause would, as to a contractor, be one which required everything to be furnished to the satisfaction of the engineer or inspector after all had been specified of certain brands or qualities or as to an owner be one which after fully specifying brands or qualities would permit a substitution of something else satisfactory to the engineer or inspector.

3. All requirements should be sincere and not made with the view to becloud the minds of bidders. So too, care should be exercised to avoid contradicting clauses which will tend to obscure the intent.

4. The specifications should not on the one hand be so general that no two bidders will bid on the same thing nor on the other hand be so exacting that it will be difficult to comply. A clause may on one hand be so general that inferior work can be done, and on the other so exacting that it will be practically impossible for the contractor to comply and still not secure a better structure.

5. The specifications should, as far as possible, leave the method of doing the work to the contractor. A contractor may have methods of doing work different from those known to the engineer which will enable him to bid lower than his competitors.

6. Care should be exercised not to require anything which, while it may add to the cost to the contractor, will not add to the useful value of the work, and not to specify something which the contractor will not be expected to do or furnish.

7. Clauses which favor one manufacturer should ordinarily be avoided.

Some things to be avoided in preparing a specification may be illustrated by specific instances which have come to my notice.

In a specification for paving it was provided that the cement concrete should be made of cement, river sand and river gravel. No river sand or river gravel could be had unless it was brought in on cars but there was near by bank sand and bank gravel of excellent quality which had always been used. When a bidder enquired of the engineer he was told that the bank sand and bank gravel were intended and the matter was provided for in the contract. The specification had been copied from a form used by the engineer in another locality.

In a sewer specification it was provided that where it was necessary to lay the pipe in water a jute gasket should be well rammed into the joint. In the trial of a suit the engineer admitted on the witness stand that he saw sewer laid in water without any jute gasket and that he knew that none was used on the work though he had certified that it was done according to the specification. He said, however, that it was not customary to use jute gasket and he had not intended to require it, but in preparing the specification he had copied the clause in question from some old form.

I have seen a specification which called for limestone in a locality where a better stone but no limestone was abundant, and much cheaper, and on the other hand I have seen a specification which called for trap rock in a locality hundreds of miles from any trap rock and where limestone was the material generally used. In such cases either there must be an increase in cost to the owner without better work or a material must be substituted for that specified.

I have seen specifications for steel beams, etc., which described a material which differed from standard forms and would have to be specially made for the work when standard forms and sizes having as great or greater strength could be furnished at much less price.

Novel Concrete Tank with Dome-shaped Bottom

The University of Arizona is located at Tucson, Ariz., but outside of the corporate limits of the city. The water required for use on the campus, including that which is used for irrigation, is supplied by a pumping plant located upon the grounds. The water which is used for irrigation is pumped directly into the ditches, supplying the various parts of the grounds, and the water which is required for other uses is pumped into an elevated tank, connected with the water mains. The tank now in use is a reinforced concrete structure 40 ft. in height and 25 ft. in diameter, with a capacity of approximately 60,000 gallons. The water tank consists essentially of a vertical cylinder and two domes. The lower half of the vertical cylinder forms the tower which supports the tank proper, and the upper half of the cylinder forms the outer wall of the tank. The lower dome forms the bottom of the tank proper, and the upper dome forms the roof of the structure. A projecting band encircles the cylinder along the springing line of each dome, each band containing the steel reinforcement required to resist the adjacent dome. The thickness of the cylindrical shell is but 4 inches, and it has no buttresses to assist in carrying the load. The thickness of the lower dome is 3 inches, and of the upper dome 3 inches, except near the springing lines, where the thickness is increased—Engineering News.

Concrete Abutments for Steel Bridges

Principles of Design from the Practice of the Illinois Highway Commission — Diagrams for Estimating Amount of Concrete and Cost

By H. E. Bilger *

To design economically a retaining wall and insure stability is a problem that is not susceptible to accurate mathematical solution. A great many formulas have been advanced that deal with earth pressure under different conditions. But the formulas are necessarily based on assumptions more or less unknown, and consequently for ordinary cases there is little or nothing to be gained in applying a supposedly rational formula to determine the stability of a retaining wall against overturning.

For plain abutments up to 25 ft. in height the practice of the Illinois Highway Commission is to make the width of the base 33 per cent. of the total height (or 25 per cent. where the foundation is to be rock or shale). Our plain concrete abutments rest on a concrete footing 18 ins. thick and projecting 9 ins. horizontally beyond the front and the back of the wall proper. The back of the wall is made vertical, primarily to throw the centre of gravity of the wall farther

of the total height for heights up to 30 ft. Needless to say that the stability moment of the buttress wall is somewhat less than that of the plain or solid type of wall. This is due to the relative amounts of concrete in the two walls, but also because of the centre of gravity of the concrete in the buttress wall coming nearly to the toe of the wall. It is true that the difference in the weight of the two walls is very largely made up by the weight of the backfilling occupying the space between the buttresses; but this compensating factor is not sufficient to make the buttress wall as stable against overturning as the plain wall when the ratio of base to height is the same.

To retain the same width of the footing of the buttress wall, so as to have the design of the two types consistent, it is considered that the anchorage of the wings to the main wall by the horizontal reinforcement is sufficient to make up for whatever difference might exist between the stability of the two types of walls. This anchorage is not considered, however, in cases where the angle between the wings and the center line of the road is more than 45 degrees.

As with plain abutments, the width of the footing at the end of the rings is made 33 per cent. of the total height at that point. The footing depth is very frequently 18 inches, but this may vary some 6 inches either way, depending upon the design required for the particular case. The wall proper is made arbitrarily 12 inches wide at the top, but at the top of the footing it usually varies from 18 to 24 inches, depending upon the design as required by the conditions. Three buttresses 12 inches thick are used behind the main wall and occupy the full width of the footings that remains back of the wall. In the wings, the buttresses are placed some 6 or 7 feet c. to c., depending on the length of the wings. Three buttresses for each wing are commonly used.

The bridge work of the Illinois Highway Commission requires a personal inspection of the bridge site with the local officials, and almost invariably the officials expect that an estimate of the cost will be made at this time. Consequently, the engineer must be prepared to give an estimate that will closely approximate the one that is made from the detailed drawings. This is usually somewhat difficult, unless the time is taken to compute the number of cubic yards in the abutments.

For the purpose of determining off-hand the approximate number of cubic yards in a pair of concrete abutments, the accompanying diagrams have been prepared, and are applicable within the limits shown by the specific cases used. For plain abutments, 27 different designs were taken from the files of the Commission and the number of cubic yards in the two abutments of each design was plotted against $H^2 (R + 2W)$, where (H) is the total height of the wall, (R) the clear roadway of the steel superstructure, and (W) the length of one wing measured on the stream side of the wing. It will be noticed that the number of cubic yards in two abutments varies ap-

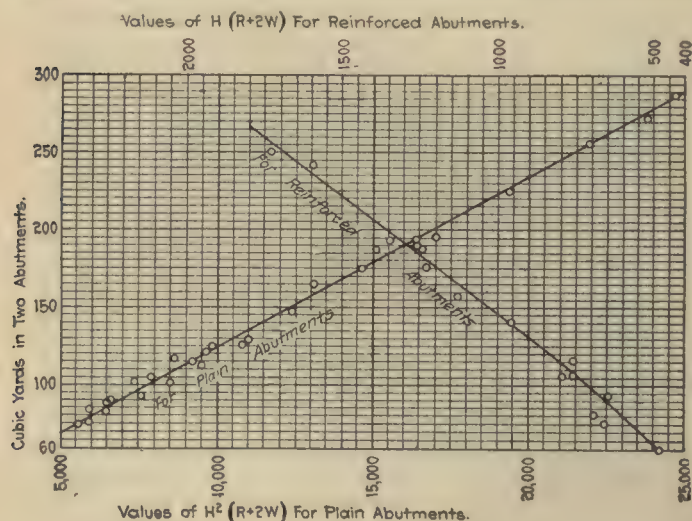


Fig. 1

away from the toe, and secondarily for the sake of appearance.

At the end of the wing the width of the footing is 33 per cent. of the height of the wall at this place, but with a height less than 13 ft. (when we use the customary 9-in. horizontal offset for the footing), the width of the wall at the top of the footing will be slightly less than 25 per cent. of the height. In these cases the width of the wall at the top of the footing is made 25 per cent. of the height above the top of the footing, and the horizontal off-set of the footing is adjusted until the width of the footing is 33 per cent. of the total height. Wing walls are made 12 ins. wide on top, and the total width of the abutment proper at the top usually varies from 20 to 32 ins., depending upon the size of the shoe that is built for the superstructure. Of this top width, 8 ins. is in all cases used for the parapet wall.

For the reinforced buttress type of abutments it is the practice to make the width of the base 33 per cent.

* Assistant Engineer Illinois Highway Commission

proximately as the square of the height. The width (R) was taken as the clear roadway for the reason that this is the figure obtained at the preliminary inspection of the bridge site.

It will be noticed that the maximum variation from the line plotted is 8 cubic yards, while the average is about $3\frac{1}{2}$ cubic yards. For a particular bridge site, suppose the distance from the crown of the finished roadway to the bed of stream should be 14 feet, and that the footing should be carried to a depth of 4 feet below the bed of the stream, making (H) equal to 18 feet. If the wings are each to be 15 feet long and the abutments are to carry a superstructure having a clear roadway of 16 feet, we have a value of 14,900 to be read off at the bottom of the diagram. It will be seen at once that there are 178 cubic yards of concrete in the two abutments.

The 27 abutments used in making this figure varied in height from 12 ft. 4 ins. to 24 ft. 3 ins., the average being 17 ft. 4 ins. The wings ranged in length from 5 ft. to $17\frac{1}{2}$ ft., the average being 12 ft. 2 ins. The width of roadway varied from 14 to 18 ft., but was 16 ft. in the large majority of cases. The total width of the wall at the top varied from 20 to 32 ins., the average being 27 ins. In all cases, 8 ins. of this width is used as a parapet wall and comes to the top

plotted against $H \times (R + 2W)$, the notation being the same as before. It is to be noted that in reinforced abutments the cubic contents vary in proportion to the total height, instead of as the square of the total height (as with plain abutments). Take the same abutments: clear roadway, 16 ft.; height, 18 ft., and length of wings, 15 ft. We have 828 as the quantity to be read off from the top of Fig. 1. Getting the intersection with the line for reinforced abutments, we find that the two abutments would contain 120 cubic yards of concrete. Fig. 1 is thus a ready means of ascertaining very approximately the concrete in two abutments in terms of the height, roadway and height of wings when the design of the abutments is in accordance with the practice as previously described.

Having found the expression that is a measure of the number of cubic yards in a pair of abutments, the next step is to correlate it with a unit price that we may be enabled to arrive at the approximate estimate. For this purpose the diagram shown in Fig. 2 has been prepared.

The actual cost of one cubic yard of concrete complete in place as an integral part of a wall will depend upon a number of individual items. For nearly all ordinary highway bridge abutments only the following items have a very large influence in determining the actual cost per cubic yard; (1) the cost (at the bridge site) of sufficient aggregate to make 1 cubic yard of concrete; (2) the cost (at the site) of sufficient cement to make this cubic yard of concrete; (3) the cost per cubic yard of concrete to make the necessary excavation to start the concreting of the footings.

There are exceptional cases where the cost of this excavation (which includes also cribbing, sheet piling and pumping) will run as high as \$3 or \$4 per cubic yard of concrete. On the other hand in a very few cases this excavation item may fall as low as 75 cents (or even 50 cents) per cubic yard. But for probably 85 per cent. of all the cases encountered, the excavation item will not vary more than 30 per cent. from a fixed quantity.

The item for mixing and placing concrete might vary from \$1.25 per cubic yard for crushed rock concrete, mixed by hand, to possibly as low as 30 or 40 cents per cubic yard for gravel concrete mixed by machinery. In spite of this possible wide variation we find that the cost for this item varies but little from a fixed amount. Likewise the item for forms is a more or less fixed quantity for plain abutments and another fixed quantity for the reinforced abutments.

It will be seen that the cost of the cement and the aggregate delivered to the bridge site are the two items that have the most to do with determining the price per cubic yard of concrete. For plain abutments the sum of these two items will very seldom fall below \$2, and will just as seldom exceed \$6. Under the most favorable conditions in location near to a railway station, the cost of the cement delivered to the bridge site would hardly fall below \$1.50 for plain concrete 1:3:5. Even if satisfactory gravel is available at the bridge site it would cost probably at least 50 cents per cubic yard to haul it to the mixing plant. On the other hand the cost of the cement and the aggregate at the bridge site might even exceed \$6.

In the light of this, Fig. 2 has been prepared to give the price of two plain abutments under conditions where the cost of the cement and the aggregate at the bridge site might vary from \$2 (by \$1 increments) to \$6, and for reinforced abutments from \$2 to \$7. The

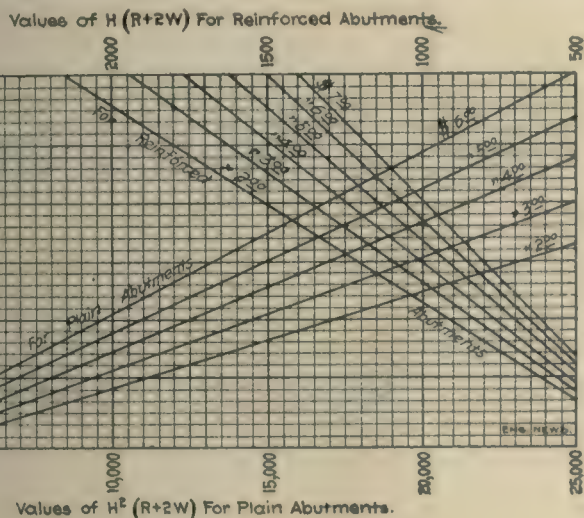


Fig. 2

of the stringers in elevation, the remaining portion of the wall stopping in elevation at the bottom of the shoe.

It might at first be thought that the cubic contents would be more nearly proportional to the height only up to the bridge seat, because the height of the parapet wall is a constant for any given superstructure and is entirely independent of the height of the abutment. After plotting the quantities both ways it was found that the cubic contents varied more nearly proportional to the total height of the wall. The angle at which the wings stood with respect to the main wall ranged in these cases from 30 to 60 degrees. The more nearly the direction of the wing approaches a parallel with the line of the road the higher will be the wing at the end, and consequently the number of cubic yards will be somewhat increased. But as the corner formed by the intersection of the abutment proper and the wing is measured twice, these two factors practically compensate one another.

For reinforced abutments 15 designs were taken from the files of the Commission and the number of cubic yards in the two abutments of each design was

items for forms, mixing and placing concrete, and excavation will be as nearly a constant for the reinforced abutments as they are for the plain abutments.

From the 15 different designs of reinforced abutments which were used in preparing Fig. 1 it was found that the amount of reinforcing steel bars per cubic yard of concrete averaged 70 lbs., and that the widest variation from this average was small. This item for reinforcing steel, as well as the bending and placing of same, has been duly considered in preparing Fig. 2. Also all other items that have a material influence on the cost of concrete in place. For this reinforced work the mixture is 1:2½:5, as against 1:3:5 for the plain concrete.

Assuming the aggregate and the cement at the bridge site for one yard of plain concrete to cost \$4, and using the same abutments that were previously considered, we find that 14,900 at the bottom of Fig. 2 intersects the \$4 line for plain abutments at a point showing the price of the two abutments to be \$1,770. Similarly, 828 from the top of the figure intersects with the \$4 line for reinforced abutments at a point showing the price of the two abutments to be \$1,620. This is not actual cost of the abutments to the contractor, but rather the price of the abutments; it being the figure at which the township of county can expect to get the work done by contract. By correlating the expression that measures the number of cubic yards in a pair of plain abutments, it would be possible

to work out a diagram that would show graphically by the intersection of lines the economical height for any particular set of conditions. But what is wanted more especially is to get the absolute figure on a pair of reinforced abutments, both under the same conditions.

It is not the practice to select the type of abutment merely upon the relative price. A case frequently arises late in the season when the abutments must be built before freezing weather. The reinforced abutments might be the more economical by say \$100, but by the selection of this type the work might be delayed two or three weeks in getting the reinforcing steel from the mills. Again, the frequency of freshets might make the contractor's cost of pumping, cribbing, etc., excessive. As it might require two or three times as long to carry the concreting up to the water surface by using the reinforced type as against the plain wall, the latter should be the design adopted, providing the differences between the cost of the two types would not be excessive. It might be mentioned also, that no small part of the concrete work under the supervision of the Illinois Highway Commission is done by local men who have had very little experience with concrete. This point, however, is not considered in selecting the type of abutment, for the reason that the Commission furnishes a competent inspector to superintend the construction of the work. Thus, the complexity of the design is not an embarrassment to the local contractor.

Steam Rolling In Road Construction

Practical Hints on Most Efficient Methods—Stone Should be Well Rolled Before Binder is Applied—Directions as to Spreader

By W. Maughan*

No hard and fast rules can be laid down for this sort of work, but at the same time it is absolutely necessary that the driver should understand how to make a road, or, rather, he should know how not to unmake it—for the spreader of the material is the man on whose eye and judgment falls the brunt of the task of shaping the roadway. The chief point for the driver to observe, and in which his roller is specially concerned, is that he should so drive his roller that he first of all completes the work of the spreader in doing his share towards the actual shaping of the roadway, while he should also endeavor so to use his roller that any inequalities of surface left by the spreader are eliminated; and, generally speaking, these two men must understand each other thoroughly and "work to each other" if good work is to be effected. The roller should first be driven carefully along the outsides, working out a little at the ends before starting to go back, for if the driver goes along the outside of the roadway without getting away from the side before starting back he will find that the engine will drop a few inches nearer the side when reversed, so that on all occasions it is best to get out a few inches, working the width of the hind rollers up towards the center of the road. Then do the other side the same way, always trying to keep the margins in towards the middle of the road; or, put another way, first form the abutment of your arched roadway, only putting on the crown as you would the keystone of an arch—namely, last of all.

A roller should not be run along too fast, 2 miles an hour, generally speaking, being quite fast enough; and in some cases this could be brought down to 1½ miles an hour with advantage. The driver should not go twice along the same track unless on the outsides. Of course, if the outsides are well consolidated there will not be much chance of the metal squeezing out and the crown getting flat, a point which is of vital importance on roads subjected to heavy and fast motor car traffic. Besides it is no use the spreader shaping the road if the roller is used in such a way as to partially undo his work. In fact, the great aim of the driver should be to complement the work of the spreader by what might be termed a "leveling up and down" process, care being taken to add any additional material required to fill any depressions as soon as they show themselves under the roller, instead of leaving these until the roller has made them worse, while also making the filling up more difficult by consolidating the material around the depressions.

I might here, perhaps, give one or two of the chief causes of these depressions, or incipient potholes, which are often the rule in coating work badly done, but which occasionally appear in even the best work.

All depressions or potholes, or at least all large ones, in the old surface, should be filled up and rolled before the regular coating is applied. As the result of my experience on heavily motor traffic roads, I might add that I have this done even before the foundation coat is applied, as I consider such preparatory work absolutely necessary if a finished surface is to be obtained.

*Presented at the General Meeting of the Institution of Municipal Engineers of Great Britain.

No stone should be tipped, either from carts or barrows, within such distance from the edge of the metal as will preclude the possibility of that stone being applied without being completely "turned over." This is, of course, more necessary when the spreader is fed from carts than from barrows, as not only do the small stone, chips and dirt fall principally over a comparatively small and probably softer material. At least but the larger stones, of course, roll down the outside, and thus practically form a ring of the larger sized and, generally speaking, sound metal around the comparatively small and probably softer material. At least this is what generally happens when coating with material which has been broken by hand on the road side.

Directions as to Spreader.

The spreader should be a spreader in reality, not one who merely levels down the heaps of materials in the defective manner I have endeavored to describe, while also for the most part thus managing to get the smallest of the stone at the bottom and the largest at the top—the exact reverse of which procedure should be his chief aim. Further, when spreading particular care should be taken to work round the outside of each heap and get the largest sized material on that portion of the road where it is most required—e.g., when dealing with one of the narrow or "single track" roads I take particular care to see that the largest sized metal is carefully put in the wheel tracks, the smaller sized material being left for the crown, which will generally be found on such roads to be unduly high, in some cases in fact being squeezed up by the weight of the heavier vehicles passing over it.

To revert, however, more particularly to the duties of the driver, he should, of course, avoid, all hollow places and depressions (especially with the hind wheels of his roller) to keep down all places that appear high. These places are easily seen from the roller by an observant driver, and if the results of his observation are pointed out in a good spirit, and the men all work together, first class work is the result.

All stone should be well rolled before any binding is applied, and here again it is experience that counts, the object to be aimed at being to consolidate the stone as thoroughly as possible without crushing, before any attempt is made to bind the coating. When this stage has been reached the driver should immediately stop rolling until the binding is applied, even if it means keeping the roller standing, as the "grinding down" of stone is the most costly method of producing binding that can be imagined, while at the same time resulting in that most deceptive finish so often seen where these "dust manufacturing" methods have been resorted to.

In any case the aim should be quality, not quantity; but if the latter term must be the objective, why, then, use fine soil in its virginity? If the road is very narrow and "round" or high in the middle the driver will find he has only to lap over a few inches instead of the whole width of the wheel, as in such cases only the insides will be touching the road, and so will leave ridges along the coating unless covered a little at a time.

The sweepers should try to get the stones "covered up" as soon as possible, as this gives the driver a much better chance of getting them down properly. Slag can be got down pretty tight before any binding is put on, but stone requires much more thorough "working in" of the binding material; where stones

are applied in excessive thickness they will keep "on the work" unless the binding is judiciously worked in. I believe in getting the material down as tightly as possible before being watered, and in having any stones carefully put back into place that get moved from any cause whatever. Instead of excessively rolling any soft spots, try to avoid these as much as possible, and apply a little extra binding to keep the material down after you have got it in shape. If this soft place extends over only part of the road, it is much better to come over it backwards as much as possible, as the front wheels take out the track of the back ones, so by running forward on the side that is hard and coming back over the soft places it will be got into shape.

The "Mushroom" System

More and more the advantages of flat slab construction are becoming evident. From an attractive folder recently issued by the office of C. A. P. Turner, we quote the following points brought up in favor of this construction:

1. To build the floor slabs so as to transport the load directly to the columns without the use of beams and girders and take full advantage of the extraordinary strength developed by slabs reinforced in several directions.

2. To simplify the centering and thus reduce the cost of the temporary part of the construction.

3. To eliminate the beams and girders which interfere with light, catch dust, cost money to plaster and finish and reduce the clear storey height.

4. To arrange the reinforcement with a view to secure the maximum efficiency of the material.

Other points taken up in detail in the folder are the economic features, the adaptability, computation, etc. The folder is of interest and can be secured by addressing Mr. Turner at 816 Phoenix Building, Minneapolis, Minn.

Mr. L. P. Sherwood, principal assistant engineer of the Trent Canal, Peterborough, has been appointed principal assistant engineer in the Department of Railways and Canals, Ottawa.

Anchor ice has been a source of some trouble at the intake to the pumping plant of the waterworks of Cohoes, N.Y. The city's supply is taken from a power canal which taps the Mohawk River and the pumping is done entirely by waterwheels. The intake to the wheels is protected by a screen of steel bars with 1-in. clear openings between each pair. During cold weather anchor ice forms at the bars to such an extent as to block the passage of water through them and it is necessary each night to rake the bars clear and turn a steam jet on them.

Treating sawn and hewn ties in the same cylinder load was discussed by Mr. H. J. Whitmore during the recent annual meeting of the Wood Preservers' Association at Chicago. He advocated separate treatments, claiming that timber from which sawn ties are cut is, as a rule, of a better grade than that from which hewn ties are taken; that the hewn ties are usually seasoned along the line, while the sawn ties usually come direct from the mill and are, as a rule, green and not ready for treatment, and that the treatment can be controlled more readily when the two classes are separated.

The Building of a Mammoth Storage Dam

Constructional Features of an Interesting Engineering Work in Maine— Dimensions of the Structure — Difficulties Encountered by Contractors

Innumerable difficulties have had to be overcome in the building of the Azischos dam on the Magalloway river in the State of Maine. Located at the headwaters of the Androscoggin river in the Rangeley Lake system, this dam will have a storage capacity of eight billion cubic feet of water. It was not until February 15, 1910, that a decision was made to build a dam and its type decided upon. As it was imperative that all possible work should be performed during the ensuing summer, there was not therefore sufficient time to get out plans from which contractors could bid intelligently and the company instructed the engineering firm of Sawyer & Moulton of Portland and Lewiston, Me., to start the work on the force account basis.

Rush Work Before Spring Freshets.

Realizing that it would be necessary to commence work before the spring freshets set in, work was started immediately and for the hauling of 44,000 bags of cement together with a cableway 1,200 feet long, vast quantities of steel, stone crushers, machinery and supplies of various kinds to the amount of 250 tons, required perfecting of one of the most efficient transportation systems ever evolved. There remained only six weeks during which teaming would be possible and to haul to the site of the dam, 40 miles from the



The Dam as it Will Appear When Completed

nearest railroad station at Colebrook, N. H., the supplies and plant necessary for so gigantic an undertaking, was a task of herculean proportions. As it required at least four days for the teams to make the trip from the site of the dam to the freight station and return, and as there were not a sufficient number of farm dwellings located on the roads to be traversed, it became necessary to erect houses and stables at convenient points along the line of travel, so that the men and horses could be properly cared for during their journeys. So well laid out were the plans for this that the teams travelled on schedule time, and up to this writing it is stated that the instances have been rare when they failed to keep up to their schedule.

Owing to the great expense of getting material into the site it was decided to build a cellular concrete type of dam, and during the past summer 40 teams

have been at work and ten loads of material have been delivered at the dam daily.

The construction of the dam consists of piers four feet thick and 20 feet on centres, with a face slab resting against their upstream sides all to be reinforced. This is not the first dam of this type ever designed, but it is thought to be the first one ever constructed, and its general dimensions are as follows: Total length, including core wall 881 feet; height from ledge to top of dam 78 feet; depth of water held by dam 60 feet.

One of the first difficulties to be met with by the engineers was the lack of good sand bank within many miles of the dam, and it was necessary to make sand from the glacial debris on the ground. It was found that one-half of this material was sand suitable for the concrete, but the problem was to find a way to separate the good from the bad, and this was accomplished by designing a plant which screened the material, mixed it with water and then separated the different sized grains in a tank of flowing water. This was done by taking advantage of the fact that heavy particles settled more quickly than lighter ones. The sand grains which could be used were carried away to a storage bin, while the dirt and fine particles were carried away by the current of water. This apparatus worked so successfully that enough sand was made during the summer to provide for all the concrete that has been made up to this time. Only a few hundred feet from the dam a quarry was opened to obtain crushed rock for the concrete and by means of a gravity tramway the broken stone was conveyed to the crusher, the crushed rock being delivered to the elevators which hoisted it to the top of the store bins under which were located the concrete mixers, and as soon as the concrete was mixed, it was picked up by the cableway and carried in a narrow gauge road that runs over the top of the dam and rushed to its final resting place in the forms.

Water Used in Excavating.

It was necessary that a very large amount of earth be handled as cheaply as possible and for this reason it was decided to install a pumping plant of large capacity. Two "Terry" steam turbines were installed, each directly connected to an Alberger centrifugal pump. These turbines were supplied by a battery of six boilers, and the pump supplied 2,000 gallons of water per minute under a pressure at the end of the line of 100 pounds per square inch. The great force of this water was employed to excavate trenches and carry the mixture of water and dirt through flumes and to deposit the earth at any desired point. The preparatory work of clearing the site, building roads, cutting timber for fuel and saw logs, and the erection of temporary buildings was commenced on September 1, 1909.

Test pits had shown the depth below the surface of the ground at which ledge would be found, but they had not shown the condition of the ledge. When finally uncovered the ledge was found to be seamed where it was absolutely sound; this meant the removal of a layer over a large part of the dam foundation from 8

feet to 16 feet in thickness. The removal of such a large amount of ledge held back the progress of the work about six weeks. It also necessitated the working of large crews of men in restricted areas and otherwise complicated the details of construction. One of the most important questions in the construction of a dam of this height is the design of forms. The fact that the dam is composed of a large number of divisions practically alike suggested the use of forms made in sections so they could be taken down and used over. A system of bracing was originated doing away with the ordinary shoring that runs to the ground, comprising bolt sockets imbedded in the concrete, and pockets left in the faces of the piers to receive the bracing of the forms above. It is not be-



One of the Two Outlet Tubes to be Embedded in Dam

lieved that this way of building forms is any cheaper than the ordinary method, but it is strongly advocated on account of the rapidity with which they can be assembled without employing an army of carpenters to keep the form work ahead of the concrete.

Just above the site selected for the new dam stands the old Azicohos logging dam. A flume was constructed to carry the flow of the river from the old dam over the foundations of the new dam. When the outlet provided in the new dam was finished the water was turned through it and the old flume thrown away.

A Sluiceway in the Dam.

The entire country for many miles above the dam is heavily wooded and it is probable that for many years to come there will be 2,000,000 feet of logs passed through the dam annually. This introduced one of the hardest problems to be solved in the design of the dam. A study of conditions showed that it might be necessary to sluice logs through the dam with the lake level varying 25 feet. A slot was cut in the dam and a steel truss carrying a V-shaped flume was suspended at its upper end in this slot. The lower end of this truss was carried on trucks on a concrete pier below the dam. The logs are guided from the lake into the log-way slot in the dam where the rush of water running from the inclined flume car-

ries them along. This flume is to be continued down the river two miles where the logs will be discharged into the river. This steel truss is suspended at its upper end from a frame so that it can be raised or lowered by a hand power crane to meet the level of the water in the lake.

Present Status of the Work.

At the present time, the concrete foundation is in place along the entire length of the dam, and the buttresses and face wall are at varying heights. The work has been pushed energetically during the winter so that when the melting snows in the spring of 1911 fill the valley of the Magalloway river a large amount of water will be held. Proper provision is made during the cold weather for warming the materials from which concrete is made so that it sets before it freezes. Steam pipes and canvas covers are provided wherever necessary. A considerable amount of concrete has been placed since the freezing weather first appeared in the Magalloway regions, but as yet no concrete has been frozen.

The progress of the work is all that could be desired and since the beginning of concreting over 100 yards have been placed daily.

Vancouver Water Supply

The civic authorities have presented an application for water rights on Seymour Creek covering the establishment of a storage system on the stream which will enable the installation of supply mains capable of fully meeting the demands of the population of Great Vancouver in the years to come. The city will secure a flow of 100 cubic feet a second, equivalent to 50,000,000 gallons a day.

The waterworks officials believe that the creation of storage reservoirs at the points can be accomplished at comparatively small expense and provide during the heavy spring flow down the stream an ample supply of water for the enlarged city during the dry months of the summer.

The application does not in any way affect the present records on the Seymour, which total 3,000 inches, and are considered to fully cover the average flow of the stream. The rights sought are solely for storage purposes which stand on a different footing for an ordinary application for a water record. The dams erected to form the various storage pools will be equipped with gates which will enable the average flow of the creek to continue, merely retaining the surplus during the time of high water.

Cement Grout Cushion in Street Railway Pavement Construction

The contributing causes of trouble in construction along street car tracks appear to be: Vibration caused by the movement of cars over the tracks. Leakage of water into the cushion between the rails and adjoining pavement. The heavy stress to which the pavement is subjected, owing to the concentrated traffic upon it. A study of these conditions as they affect the pavement along street railway tracks has been made by Mr. Harry G. Davis, C.E., of Chicago, on behalf of the Chicago Street Improvement Association, and from his recently issued report we have taken the matter in this article.

The policy of street car company officials of increasing the weight of their cars and moving them at a greater speed means that present construction on a

carline street must be stronger than in the past. Every tendency of one part of the pavement to separate from the adjoining part is augmented, and every possible effort must be made to prevent this. For instance, in a creosoted block, brick or granite pavement, which is laid on a sand cushion, special treatment is needed to prevent this sand from being jarred out of place, causing a corresponding sinking of the pavement over the spot where the sand has "shifted."

Another evil effect of vibration upon the pavement, is that it has a tendency to cause disintegration. The disintegrating effects of vibration on a creosote block, brick or granite street is probably confined to the concrete foundation and to the cushion which is laid between the foundation and the pavement surface. Experience has proved that a well-made Portland cement concrete, properly mixed and tamped, is not affected by vibration to any serious degree.

Still another disastrous effect of vibration is to open a joint between the car rail and the abutting pavement, permitting water and mud to seep down into the cushion between the foundation and the pavement surface, permeating and diluting it to such a degree as to cause it to "shift" easily. This shifting process leaves a void beneath the paving surface and as soon as that part of the surface is subjected to the stress of traffic it sinks. This sinking, although it be only a matter of a fraction of an inch, is disastrous to any pavement and especially to a creosoted block, which, probably more than any other form of pavement, demand the maintenance of a smooth, even surface. As soon as the block goes down the least bit, it begins to get the pounding effects of the heavily loaded vehicles and a "rut" is produced.

With the sand cushion, usually laid underneath a creosoted block, brick or granite pavement surface, filled with water to saturation, the sand in reality becomes a quicksand, and extremely mobile. And it would appear that the "ruts" frequently seen along the car tracks on a comparatively recently paved street are the results of leakage of water from the surface of the pavement through the interstice between the pavement and the rail, opened, no doubt, by vibration, into the sand cushion and converting it into quicksand which, through its mobility, shifts beneath another part of the pavement, or out through the interstice upon the surface of the pavement. The vibration also has a "pumping" effect upon the saturated sand and augments the leakage to the surface of the pavement or the shifting to another position beneath the surface.

The leakage of water into the sand cushion may have another deteriorating effect upon the pavement aside from that of converting the sand into a quicksand. If the sand is thoroughly saturated and then frozen, it is likely to heave to such an extent as to subject the pavement adjoining the rails to undue stress. This might result in serious damage to the pavement.

It is doubtful if there can be any disastrous results from the stress of traffic upon the pavement adjoining the street car rails if the evils caused by vibration and leakage are overcome and the pavement set at the proper grade in reference to the grade of the car tracks. Unless there is a "drop" of the wheels of vehicles from the car rails to the pavement, or a "climb" from the rails to the pavement, there should be no trouble whatever. It might be well, at this point, to emphasize the importance of as nearly perfect joint as possible between the rails and the pavement.

It appears then that the chief difficulty comes from the leakage of water into the sand cushion, augmented

by vibration and the stress of traffic upon the pavement, causing a shifting of the sand in the cushion. This would indicate that the remedy lies solely in a treatment of the cushion which would render it impervious to water and thus remove the liability of "shifting" or leakage to the surface of the pavement, causing a shifting of the sand in the cushions. This would indicate that the remedy lies solely in a treatment of the cushion which would render it impervious to water and thus remove the liability of "shifting" or leakage to the surface of the pavement.

Several years ago, the South Park Commission in the city of Chicago adopted the policy of paving all intersections of parkways and carline streets with creosoted blocks. Not being bound by the specifications of the city of Chicago, the Park Commission laid its blocks on a cement grout cushion. Some of these intersections have been paved for nearly five years and altogether there are about 25 or 30 of them. In every case they have proved a success. Although some of the intersections have been subjected to extremely heavy traffic the pavement adjoining the street car tracks is in as good condition as it was the day it was laid. There can be little doubt that the success of these intersections is due to the fact that the grout cushion, being impervious to water, does not "shift" or leak out upon the surface of the pavement, and therefore remains in place and supports the blocks. No other explanation has been suggested.

Cement Grout Construction the Remedy.

The remedy, then, for the troubles surrounding street car track construction—and this applies with equal force to creosoted block, brick or granite pavements—is to provide for a cement grout cushion both between the street car tracks and for a distance of at least 1 foot outside of the outside rails. This will make the cushion impervious to water and will prevent its shifting from vibration or under the stress of traffic.

One of the features of this form of construction is that it adds but little to the cost of the pavement, and is easily made. The grout should be what is known as "dry-mix" and should be prepared in this way: Mix three parts of sand with one part of Portland cement, all dry, and work well together before placing in position. After being thoroughly mixed, spread the cushion in the same manner that a sand cushion is spread. Lay the blocks on this cushion and tamp them to place. Then flush the blocks thoroughly, so that the water may enter through such interstices as exist and into the cushion. If possible, keep traffic off the blocks for 24 or 48 hours to give the grout time to set, although this is not absolutely necessary, as the cement will "cake" sufficiently to make it a great improvement over a sand cushion, even though traffic goes on the blocks almost immediately.

Another difficulty that has been experienced with creosoted blocks on car line streets is the development of transverse "ruts" between the tracks. These "ruts" apparently result from the tie rods which are set at regular intervals, tying the rails together. Where this form of track construction is adopted, the blocks should be chamfered so as to provide for the tie rod. This would add but little to the cost of the pavement, probably not more than a cent or two per yard, as only two courses of blocks in every 6 lineal feet would need to be thus specially prepared.

C.N.A.B. Holds Great Meeting in Winnipeg

Report of the Fifth Annual Convention—Discussions and Business Prove the Vital Importance of this Association—Next Session at Toronto

Though the fifth annual convention of the Canadian National Association of Builders has passed into history, its work will remain. An outstanding feature of the convention has been the fact that now, after years of labor, the members are beginning to see their way clear to the attainment of the objects for which the association was primarily organized. But further, avenues have opened up whereby its scope of usefulness may be enlarged, and doubtless within a brief time it will become one of the leading factors in the development of Canada.

The national character of the association was never more in evidence than during the sessions held in Winnipeg, February 15 and 16. The members registered numbered over 100. Many of those from Winnipeg did not sign the register, though they attended and took part in the discussions. There were delegates from Quebec, Montreal, Ottawa, Toronto, London, Regina, Calgary, Edmonton and Lethbridge, and from the present rate of progress the number of constituent exchanges will have increased by fifty per cent. before the date of the next convention arrives.

Among those who registered are the following:

List of Members.

Robert Grant, Edmonton; E. T. Broad, Lethbridge; H. J. Toole, Lethbridge; A. M. Frith, Edmonton; D. J. McKay, Regina; Wm. Wilson, Regina; John A. H. Kake, Calgary; R. A. Brocklebank, Calgary; A. Desilets, Edmonton; J. W. Aldridge, Calgary; G. W. Boughton, Edmonton; W. T. Brown, Edmonton; R. L. McIntyre; John Jones, London; Thos. B. Beir, London; L. H. Martyn, London; E. R. Dennis, London; A. E. Hobbs, London; G. S. Gould, London; Geo. Gander, Toronto; Ed. Gearing, Toronto; John Robertson, Toronto; James Robertson, Toronto; A. D. Wetmore, Edmonton; C. C. Batson, Edmonton; P. L. Fraser, Toronto; H. V. Mitchell, Winnipeg; John McQuarrie, Winnipeg; C. R. Frost, Edmonton; J. H. Lauer, Montreal; George Pheasy, Edmonton; John Aldridge, Toronto; F. H. Davidson, Winnipeg; Frank Powell, Winnipeg; E. T. Nesbitt, Quebec; Henry Jennings, Toronto; C. M. Bremner, Edmonton; W. G. David, Regina; G. W. Bitnell, Toronto; E. A. Cunningham, Lethbridge; D. D. Smith, Regina; A. Smith, Lethbridge; R. J. Orr, Toronto; J. H. Tremblay, Winnipeg; A. J. Slocum, Regina; A. E. Davies, Regina; Shepley Construction Company, Winnipeg; J. Morley, Winnipeg; J. Lackie, Ottawa; Aug. Brochmer, Ottawa; James More, Ottawa; W. H. Carter, Winnipeg; F. E. Halls, Winnipeg; A. H. Aldinger, Winnipeg; George E. Bell, Winnipeg; W. E. Ramsay, Montreal; F. W. Forster, Calgary; F. J. Huxtable, Winnipeg; Thos. Barnard, Regina; A. M. Fraser, Regina; T. C. Alardyce, Winnipeg; Chas. Bulley, Toronto; D. A. Crothers, Winnipeg; J. T. Watson, Winnipeg; Jos. Bourgeault, Winnipeg; C. H. Taylor, Winnipeg; D. L. Campbell, Ottawa; Oliver & Manson, Winnipeg; W. P. Alsip, Winnipeg; G. S. Schaester, Calgary; W. J. Leslie, Toronto; C. H. Webster, Calgary; George Halford, Winnipeg; S. J. Kilpatrick, Winnipeg; Henry Bourgeault, Winnipeg; George Kennedy & Son, Winnipeg; W. J. Hynes, Toronto; E. Claydon, Winnipeg; Fonseca Roofing Company, Winnipeg; W. J. Davidson, Winnipeg; A. C. Osborne, Winnipeg; J. Threlfall, Win-

nipeg; George Murray, Winnipeg; R. Fullerton, Winnipeg; John Wallace, Winnipeg; M. W. Julien, Winnipeg; R. T. Beals, Edmonton; P. L. Harvey, Edmonton; C. S. Shipman, Winnipeg; S. H. Foster, Winnipeg; George Garrow, Winnipeg; F. Bateman, Winnipeg; M. Haas, Winnipeg; R. L. McIntyre, Toronto; Chas. Orr, Toronto.

Important action was decided upon in many details of the work, not the least of which was the decision to bring to bear upon the federal and provincial authorities, influence which may make for the passing or introduction of legislation which will assist in the objective of the association. The labor issue came up on several occasions and a resolution asking that the scope of the Lemieux Act be extended to the building trades received the heartiest support.

Changes to the constitution were made which will encourage the development of exchanges in the smaller towns and cities of Canada, and during the year every effort will be made to induce the formation of ex-



Mr. E. T. Nesbitt, of Quebec, who was re-elected President of the C.N.A.B.

changes at every point of importance. Provincial associations will also be encouraged, as being best adapted to meet strictly local conditions and influences.

At the opening meeting held on Wednesday morning, February 15, Mr. J. W. Morley bade the delegates welcome in the name of the local exchange. He said that he felt that the convention would prove to be a notable one because of the effect it would have in binding together the exchanges of the whole of Canada. So strong an organization could not fail to have an influence for good, and at the same time it would encourage the building up of a number of exchanges that would be attracted to the parent organization. The association had already proved itself, and the time had come for it to adopt an aggressive policy. The members would benefit personally and he was sure that Canada as a whole would be beneficially influenced. Harmony and co-operation should be the watchword.

The address of the president received a most hearty welcome. Copies were distributed among the delegates. That they appreciated the ideas advanced was sufficiently evidenced in the action taken later. The address was as follows:

President Nesbitt's Address*

At this our fifth annual convention I have the honor of addressing a truly representative association of all Canada. It has been my privilege as president during the past year to have contributed to the realization of our aims and aspirations, i.e., to make the association a power in the land, and I may be pardoned if I express myself as being proud of my achievement, for I am greeted here in this hall by representatives of every city of importance from Quebec in the far east, to Edmonton in the west, and I have the personal satisfaction that it is partly by my efforts that this has been accomplished. It is indeed a gratification to me to know that they have been appreciated. I take this opportunity to thank all the exchanges for the royal reception given our secretary and myself on the occasion of our recent visit to them.

When I joined the national body two years ago, it was composed of only three exchanges. To-day we are twelve, with a membership of about 1,200. I cannot but tell you how much we owe to our indefatigable secretary, Mr. J. H. Lauer, for his part in the missionary work, and any success must be shared with him.

Our Purpose and Objects.

It will, I hope, not be found out of place to make you acquainted with the purpose and objects of our organization. The importance and need of organization is demonstrated by the fact that the volume of the building business in Canada last year totalled \$120,000,000. These figures are convincing arguments for the necessity of perfecting our association. And now that we are here together it behooves us to get to work and accomplish something for our cause.

I will here enumerate a few of the important subjects that we must take up and discuss.

Legislation.

This is a big question, for we have to meet the labor element with their perfect organization, their councils, their members and their power, both at the seat of the federal government, and at the provincial legislatures. They not only have members of parliament to advance their interests, but a Minister of the Crown to watch that their demands are considered, while we, their employers, have to stand and look on—helpless. We should take a lesson from them, and instead of objecting to their methods we should emulate them.

Employers' Liability.

Laws are being enacted in every province that must be watched and fought so that no arbitrary measures are passed without our having a say.

Apprenticeship.

I need not here tell you of our great handicap of having to carry out work with unskilled workmen, and that in face of the restriction placed upon us by the labor unions, and with the aid of the government discouraging the immigration of tradesmen and mechanics, and to cap all, making it unlawful to work more than eight hours per day. This is a vital question to our business and I would suggest that the state be asked to add to their policy of technical education a system of trade schools that will teach a boy to handle tools in such a way that the teachings of these higher educational establishments may be made capable of being carried out. For what will be the use of producing men able to develop beautiful designs if we cannot get men skilled enough in their trades able to execute them

Lemieux Act.

Steps should be taken by us to persuade the government to have this act apply to all industrial disputes, instead of, as now, only to the labor disputes in public utilities. This would tend to lighten our burdens and avoid many strikes.

Architects.

Our relations with the architects is a subject of great moment to us, I would urge that measures be taken to have plans and specifications of all works for which bids are invited deposited in our exchange rooms. This would be a great benefit both to the architects and builders. Several other questions, such as detail plans of proposed work to accompany the general plans, should be discussed. I might add, in this connection, that the Public Works Department of the Federal Government has courteously acquiesced in our request and we are now receiving plans in the different exchanges.

Lien Law.

This, to my mind, is one of the most important measures that must be taken up. At present it is unsatisfactory and should be referred, if necessary, to a competent lawyer to frame a law that will protect the builder from loss.

Uniform Contracts.

A study of this should be made by competent men and a draft sent to all the exchanges for study and approval.

Incorporation.

I would recommend the consideration of the question of having ourselves incorporated by Act of Parliament. This would give us a status, add dignity to our association and give us better recognition.

The foregoing address, which was received with much enthusiasm, was referred to the committee on resolutions for the consideration of the suggestions offered by Mr. Nesbitt.

Mr. J. H. Lauer on the Work of the Association.

The Secretary-Treasurer, Mr. J. H. Lauer, of Montreal, submitted a brief summary of the work undertaken during the past year in the interests of Canadian builders.

He stated that at the last convention in London a resolution had been adopted, requesting the Federal and Provincial Ministers to furnish plans and specifications of projected public works to the respective builders' exchanges existing in the vicinity of the work contemplated. Copies of this resolution had been forwarded to the proper quarters, and he was happy to report that the request had been received with the greatest courtesy both by the Provincial and Federal Departments of Public Works, and finally conceded by Hon. Wm. Pugsley, Federal Minister of Public Works. It would be in order at the present convention to adopt resolutions of appreciation for the courtesies extended.

From a legislative standpoint, the most important measure brought forward at Ottawa was the perennial flower of Mr. Verville's 8-hour day bill on all federal public works. A resolution opposing this measure had been adopted at the last convention, and duly forwarded to Ottawa, asking that a hearing be granted to the representatives of the builders. The president and himself had made two trips to Ottawa in March and April last, and had appeared as witnesses before the special committee of the House, to which the bill was referred. The fundamental objection to the bill was that any arbitrary limitation of work in the building trades was opposed to the natural climatic condition of Labor, urging the extension of its scope to the building trades. This Act had proved conclusively that compulsory investigation by a disinterested tribunal into the causes of trade disputes had averted projected strikes in nine cases out of ten; and strikes after all were "industrial civil war," benefiting neither employer nor employed. He recommended the adoption of an urgent resolution requesting

the Department of Labor to extend the scope of the Act.

The present policy of the Interior Department in discouraging the immigration of skilled mechanics also called for amendment. This country was suffering from scarcity of skilled labor, and it was absurd to attempt to artificially limit the supply of Canada's rapidly growing requirements to what might have been sufficient five or ten years ago. Every skilled mechanic in this country was an asset, and there was no danger of lowering the wage standard for years to come.

He welcomed the western exchanges into the national body, as a result of the president's tour last year, and had been in correspondence with St. Thomas, St. Ste. Marie, Stratford, Hamilton, and the eastern section in Halifax and St. John, and sincerely hoped by next year they would be one united body from coast to coast.

Conditions of Canada, whereby outdoor work was already seriously cramped and limited by our rigorous winters. Other objections were the discrimination against one particular trade in which a nine or ten-hour day in summer did not constitute any physical strain or hardship, while other trades which did constitute such strain and which employed young people of tender age, were not interfered with; and finally the injustice inflicted on the workman himself, who would thereby be precluded from making provision in fine weather against the short winter days. Canada was not yet industrially competent to adopt an 8-hour day against other competing nations. No convincing reply had ever been submitted against these arguments, and the bill went over last session only to be re-introduced during the present one, in a much more limited form. When the bill reached committee stage last January, he had sent telegrams to the respective Ministers again opposing the measure, which was also meeting with opposition from the labor unions themselves. It seemed certain, however, that in its present modified form the bill would be adopted, and deemed further steps to be wasted.

Another measure of interest to builders was the "Industrial Disputes Act, 1907," in connection with which he had had both interviews and correspondence with the Min-

During the first session the following committees were struck: Committee on legislation—Messrs. Sylvester, Calgary; J. W. Morley, Winnipeg; Aldridge, Toronto; Ramsay, Montreal, and Martyn, London, Ont. Committee on resolutions—Messrs. Nesbitt, Quebec; Aldridge, Calgary; W. H. Carter, Winnipeg; Broughton, Edmonton; E. R. Dennis, London; H. G. Goode, Lethbridge, D. J. McKay, and George Gander, Toronto, and J. H. Lauer, Montreal.

At noon the city of Winnipeg expressed its appreciation of the action of the Association in holding its convention there, by tendering the visitors a formal luncheon, at which his Worship, Mayor Evans, and the city council were the hosts. The luncheon, which was held in the Royal Alexandra Hotel, passed off most successfully. Mayor Evans especially congratulated the local exchange for the work it had accomplished in the upbuilding of the city, the grand total of which had set a record for Canadian progress in building operations. The only complaint he had to make was that the builders were making such progress that the city was more than kept busy in supplying the new districts with the necessary local improvements. The strongest proof of the beneficial nature of the C. N. A. B. lay in the fact that all over Canada there were exchanges being organized which sought affiliation with the parent body. The Mayor also touched upon civic planning and the work of the builder in preventing fire waste by encouraging a higher standard of construction. President Nesbitt made a suitable reply.

Because of a wet snow storm the afternoon enter-

tainment did not materialize, but in the evening a hastily planned smoker gave an opportunity for the members from the different provinces to get together.

Thursday's session opened sharp on time, the whole of the morning being devoted to the papers of Mr. Morley and Mr. MacKissock. The latter was published in our last issue.

Some of the expected papers did not appear for the afternoon meeting, Mr. Isaac Campbell sending his regrets, and Messrs. Irish and Cass being out of the city. However, those on hand afforded considerable matter for discussion. A tilt occurred between Mr. Deacon and Mr. Turner as to the respective merits of steel and concrete for building purposes.

Steel in Building Work.

In a general introduction to his address, Mr. Deacon gave a brief outline of his subject, pointing to the advantages of steel in building operations, its great strength and compactness, together with its ability to stand up under shocks which would mean the destruction of buildings of any other material. It was steel which made the high buildings of the present day possible, for in the past a high building meant an excessively thick foundation and bottom courses. With steel, all that is required are curtain walls, each floor carrying its own wall material. Even in buildings of from but four to six stories, steel effected a great saving.

Then there was another advantage, more particularly noticeable in Canada. The steel could be fabricated during the winter months when ordinary building operations were impossible, making it possible to complete a building during a single season. Then, too, it had always been found difficult to deliver materials during the height of the season, so that advance orders assured delivery. In his opinion, which he confessed might be biased, steel frame constructions with tile and thin concrete floors was the most advantageous type. So far as relative cost of concrete and steel was concerned that was a debatable question. Steel, however, could be erected more rapidly, and in case it was ever necessary to remove the building, there was always a certain amount of salvage in the steel structure.

As to its ability to carry weight, steel had fully proved itself, while with wood and concrete there was always a measure of uncertainty. There seemed to be no limit to the height to which steel buildings might be carried. Valuable property must have high buildings and it would seem that within twenty-five years many of the structures being erected to-day would have to be replaced by something more modern.

Mr. Deacon then went on to speak of what has to be done on structural steel after the contract has been let and before the piece can be shipped:

"As soon as a contract has been secured and entered, complete data relating to the construction is turned over to the drafting department. The first thing to be done by this department is to prepare a list of the material required, which is called an advice bill. The draftman to whom this is entrusted first carefully examines all data. If any necessary information is found lacking at any point in the progress of the work it is at once reported. Care is taken to include everything in the order bill that will be required to make the building, unless upon enquiry it is found that certain materials may be ordered later.

"In order to expedite the placing of orders for the material at the mills no more drafting is done than is necessary. It may be supplemented by freehand sketches and notes, which are preserved with other data for reference, by the checker and draftman making the shop drawings. For a contract of any magnitude the order bills are gotten out in sections; those parts which would be needed first are prepared first. In any case the first attention would be the

kind of material which would be most difficult to get promptly. The order bills are checked and a copy sent to the order department. The originals are retained for the guidance of the draftsman who makes the shop drawings.

"The order department makes up a mill order from the order bills, bringing together all items of the same kind and combining some of the shorter lengths into longer lengths to be sheared at the shop to proper lengths.

"Most companies must keep more or less material in stock, in order to be able to make prompt delivery of certain classes of work. In this way considerable waste of short pieces accumulates, which is applied on contracts whenever an opportunity offers or sold for scrap.

"After these mill orders have been made out the work is assigned by the chief draftsman, who has general supervision of all work, to whatever man he thinks is best fitted to get out the drawings. Generally a contract is given to a squad foreman, who has three or four men working under him, and who directs the method of getting out the work, writes the order bills for the material, and sometimes makes some of the more complicated drawings. When the drawings are made and traced they are sent to a checker who is generally an experienced draftsman. He checks every size and dimension given on the drawing and marks every change necessary in blue pencil. The drawing is then checked back and corrected by the one who made it and after being accepted and signed by the checker is ready to be sent to the blue print room. The man who makes the drawing and the checker are held equally responsible for any errors.

"When the shop drawings on a contract are complete, blue prints of them and the accompanying bills of material are sent to the various departments of the shop. In the template shop a wooden template is made for each constituent piece of each different member. This template is of the exact length or half length of the finished piece, giving bevells and has holes at every point where a rivet hole is to be located. It is to be clamped to the metal for the purpose of laying out the work to be done on each piece. Laying out directly upon the metal is seldom done because of the danger of making errors and ruining the steel for the purpose for which it is intended. When the steel arrives from the mills it is unloaded at one end of the plant, and marked with the contract number and sizes for future identification. Pieces of the same size are piled together and separated from other sizes as far as possible, so that any material can be gotten out easily at any time without handling other material which is not wanted. The unloading is usually done with an overhead travelling crane which deposits the material in any part of the yard. When enough material in any contract has been received from the mill and that contract is reached on the shop programme, the material is run into the shop as needed and usually continues straight through to the opposite end of the plant, where it is completed.

"The first operation after the material enters the shop is to straighten it out so that the template may be applied and all pieces laid out accurately. This is done with presses, rolls and sledges. The next operation is the laying out, or marking the lines on which the material is to be sheared and with a centre punch which fits closely the holes in the template, the rivet holes are marked. Some material is sheared to length and then laid out. From the shears or laying out skids the material passes to the punches where all rivet holes are punched. Next the various pieces which are to be riveted together are assembled and fitted, sufficient number of bolts being inserted to hold the material together until it is rivetted. Before the pieces are assembled such faces as will be inaccessible after rivetting are painted, and before the rivetting is done the holes are reamed out to correct inaccuracies in punching. After all the operations

are performed on a piece it is run into a scale and weighed, a shipping bill being made out. Having been weighed and inspected to see that it conforms to the drawing, it is painted and loaded upon cars or stored to go out when required. All bending, forge work, upsetting, etc., are usually done in the blacksmith shop. Turning, planing (except rotary planing) is done in the machine shop. All pieces before shipping are marked very plainly for identification, and a good erection diagram showing all marks and the position of all pieces in the contract is made."

Mr. Deacon closed with a few remarks about western conditions and practice.

The committee on resolutions had prepared its work most thoroughly and the following resolutions were brought forward for consideration and adopted:

Resolutions and Business.

Moved by George Gaudet, (Toronto), seconded by G. Silvestre (Calgary):

Resolved that a cordial vote of thanks be tendered His Worship Mayor Sanford Evans, and the council of the city of Winnipeg for the very generous hospitality extended the members of the 5th annual convention of the C. N. A. B. held in Winnipeg, February 15th, 1911. (Carried).

Moved by George Gander (Toronto), seconded by John Aldridge (Toronto):

Resolved that the thanks of the C. N. A. B. in executive session assembled at the 5th annual convention in Winnipeg, February 15th, 1911, are hereby tendered the Hon. the Minister of Public Works of Canada, for his courtesy in acceding to the requests of this body, expressed in the London convention to furnish plans and specifications of federal public works to the secretary at the local exchanges comprised in this association, to be constructed in the district in which such cities may be considered the centre. (Carried).

Moved by George Boughton, Edmonton; seconded by L. H. Martyn, London:

Resolved that the secretary advise the Minister of the Department of Public Works of all additions to our federated exchanges, from time to time, as such may occur. Further, that in accordance with the correspondence submitted from the deputy minister in April, 1910, the department be respectfully requested to include a copy of all public works to be executed in the vicinity of the principal building exchanges throughout Canada. (Carried).

Moved by W. E. Ramsay, Montreal; seconded by G. Silvester, Calgary:

Resolved that this convention again respectfully urge action, as already submitted by the London convention of 1910, by the Hon. the Minister of Labor, to include the building trades within the scope of the Industrial Disputes Act of 1907, and that this action be taken during the present session of parliament. (Carried).

In presenting this resolution Mr. Ramsay explained that in view of the success which had attended the operation of the Lemieux Act, it was thought advisable that it should also be applied to the building trades. It had saved a great deal of loss wherever it had been applied, and its operation had now been so far demonstrated as to win the commendation of many other countries.

T. R. Deacon feared that the period of investigation preceding the making of the award might lead to the men shirking, but the convention did not think that this would be material. This difficulty would adjust itself.

Moved by E. R. Dennis, London; seconded by W. H. Carter, Winnipeg:

Resolved that this society obtain the necessary information in regard to incorporation; and should this information

prove favorable, that the executive be empowered to take the necessary steps after each local constituent exchange has been fully consulted with. (Carried).

Mr. Nesbitt pointed out that if it were found advisable to incorporate or register the association, it would put them upon a firmer basis in law. It would make them a corporate body capable of signing contracts and making agreements within the law. Then, too, they would be able to insist, more strongly, that the labor unions become incorporated bodies. Nothing would be done, however, without first considering all exchanges.

Moved by L. H. Martyn, London; seconded by H. J. Goode, Lethbridge:

Resolved that article 7 of the constitution be struck out and the following substituted—"Applications for membership in the C. N. A. B. by local building exchanges shall be accompanied by cheque equal to the sum of \$1.00 per member of the actual total membership comprising such local building exchange at the time of the application for admission, as entrance fee, but in no case to exceed the sum of \$50.00. (Carried).

Moved by Mr. Aldridge, Calgary; seconded by G. W. Boughton, Edmonton:

Resolved that whereas, as the result of the conferences between the delegates representing the three Alberta exchanges, a provincial association has been formed to be known as the Alberta Association of Builders' Exchanges, working under and in connection with the National Association, this convention places on record its approval of the said action, and moreover, favors the extension of the principles of forming provincial associations in other provinces under the jurisdiction of the C. N. A. B. wherever the officers of the constituent exchanges of any one province deem it desirable to so co-operate for dealing with provincial legislation or other purely provincial problems.

Resolved further, that article 4 of the constitution be amended by the insertion of the following words after the first sentence—"In such cases where provincial associations are organized under the jurisdiction of the C. N. A. B., each such provincial association shall elect its representative vice-president on the executive committee of the C. N. A. B., the result of such election to be reported to the general secretary. Nothing herein contained, however, shall deprive the local exchanges comprised in such provincial associations, of their direct representation to the national association executive and convention. (Carried).

Moved by John Aldridge, Toronto; seconded by E. R. Dennis, London:

Resolved that the whole national association advocates the general principle of "open shop." It recognizes that under certain local conditions the enforcing of the "open shop" may not be practicable, and therefore declines to interfere with the authority of any constituent exchange to deal with its labor problems as it deems advisable. (Carried).

It was felt that the strong feature of this resolution lay in its recognition of the principle of individual action, while favoring the principle of the open shop.

Moved by W. E. Ramsay, Montreal; seconded by Mr. Aldridge, Calgary:

Resolved that article 8 of the constitution be amended by the addition of the following clause—"Provided always that any member of any constituent exchange when securing contracts within the territory of any other affiliated exchange shall conform to all rules and by-laws governing the exchange in whose district they secure the said contract." (Carried).

Moved by John Aldridge, Toronto; seconded by G. W. Boughton, Edmonton:

Resolved that each exchange be instructed to study without delay the existing lien laws of each province with

a view to effecting amendments for the better protection of contractors and supply firms. (Carried).

The president recommended the Quebec Lien Act to the members present as being the most favorable now in force in Canada.

Moved by H. J. Goode, Lethbridge; seconded by L. H. Martyn, London:

Resolved that this convention, recognizing the desirability of the uniformity of contracts, and also the fact that architects are grouped into provincial associations with varying practice in different provinces, urge the preparation and acceptance (by means of joint conferences between the various provincial architects and affiliated builders' exchanges) of a "uniform contract," in accordance with the requirements of each province which shall become the recognized contract acceptable to and enforced by members of constituent exchanges. (Carried).

Moved by W. E. Ramsay, Montreal; seconded by Mr. Aldridge, Calgary:

Resolved that this convention go on record as favoring the principle of the "Daylight Saving Bill," from the conviction that our workmen are justly entitled to some hours of leisure and recreation during the summer months, which can be effected without loss to either side by commencing work from May 1 to September 1, at 6 a.m., and closing down Saturday at noon.

After a brief discussion this measure was defeated by the western vote. It appeared from the nature of the discussion that the delegates did not appreciate the resolution, nor understand how the desired end was to be attained.

After some discussion it was decided that a deputation from the association should wait upon the Ottawa government to urge the interests of the Canadian quarry proprietors and cut stone contractors, it being generally considered that the present tariff does not afford sufficient protection to the industry.

Resolutions of thanks were also accorded the retiring officers, members of the local exchange, the press and all others who had assisted in making the convention a success.

The election of officers passed without a hitch except that Mr. Nesbitt attempted to escape from the unanimous vote that he retain the chair for at least another year. The members were insistent that he should continue the work which he had begun so ably and he bowed to their wishes. The result of the election was published in our last issue.

On February 14th some thirty or more delegates from London and Toronto, en route for Winnipeg, paid a visit to St. Paul, Minn., where they were entertained by the officers and members of the Builders' Exchange of that city. Mr. J. A. Seager, the president, and Mr. C. V. Williams, the secretary of the exchange, did the honors at a most enjoyable luncheon. Afterwards the party was joined by a number of Montreal and Quebec delegates, and a visit was paid to the magnificent State House and other places of interest.

The annual banquet, held in Manitoba Hall and attended by 642 persons, was one of the most noteworthy of the kind ever held in Winnipeg and is likely to mark a high-water level for the association for a number of years. There was keen competition for the next annual meeting, there being almost a tie between Calgary and Toronto. The deciding vote, which rested with Winnipeg, was given to the Queen City, and the easterners will thus have another chance to show the west that they can rise to the occasion. The 1912 convention promises great things and preparations are already being discussed.

Personal News and Notes

Mr. Neil R. Darrach, the St. Thomas, Ont., architect, will leave shortly for the West, having decided to transfer the scene of his activities to Regina, Sask.

Messrs. Spencer and Campbell have been placed in charge of the Montreal office of Kilmer, Pullen & Burnham, which has been opened at 11 St. Sacrament street, Montreal.

The Calgary bricklayers and masons have notified contractors that their wages will be 70c. an hour on and after June 1st, 1911.

Mr. H. S. Hancock, jr., formerly city engineer of Fort William, Ont., has opened an office at Vancouver, B.C., as consulting engineer.

Mr. John Lockhart died at Salisbury, N.B., last week. He was known as an expert bridge framer, having supervised much of this kind of work in the province during the last forty years.

City Engineer Rust, of Toronto, estimates the cost of the installation of water meters at between \$700,000 and \$800,000. It is thought that metering would result in a greatly decreased consumption and obviate the necessity for future extensions for a few years.

The death occurred recently at Meaford, Ont., of Mr. David McCann, a well-known builder and contractor. The late Mr. McCann was a native of Belfast and was in his 78th year. He saw military service with the Grey 31st Battalion at the time of the Fenian Raid.

Mr. Burtin Stewart, managing director of North, Griffiths & Company, general contractors, Vancouver, B.C., left that city recently for England, where he will remain for a few weeks. It is understood that Mr. Stewart's company is thinking of opening a branch office in Winnipeg.

Mr. C. H. Topp, formerly city engineer of Victoria, B.C., has been chosen to make surveys at the north end of Sooke Lake, preliminary to the employment of an expert supervising engineer for the construction work in connection with the big waterworks undertaking.

Mr. C. H. Mitchell, of Toronto, recently gave a lecture before the Engineers' Club of Cleveland, Ohio. Mr. Mitchell had a large audience of American engineers who were interested in the description of the works being completed by Canadian engineers.

Bruce & Sweatman, Limited, engineers and contractors, and Frank Sweatman, British Columbia land surveyor, have removed from Dominion Trust Building to Suite 16, Tunstall Block, corner of Granville and Dunsmuir streets, Vancouver.

At the 31st annual meeting of the Association of Manitoba Land Surveyors, held recently in Winnipeg, the following officers were elected for 1911: President, G. A. Bayne; vice-president, John Francis; secretary-treasurer, C. C. Chataway; members of council, J. L. Doupe, G. B. McColl, R. C. McPhillips and W. B. Young.

The Toronto Building Trades Council has called a mass meeting of workers, unionists and non-unionists, connected with all branches of the building trades, at the Labor Temple, for Wednesday, March 1, at 8 p.m. Addresses will be given by Mr. Allan Studholme, M.P.P., Mr. Wm. Glockling, president of the Dominion Trades Congress, Mr. John Bruce, general organizer of the Plumbers' Association, and others.

Mr. F. L. Fellowes has been appointed to the new post of supervising engineer of Vancouver, B.C., at a salary of \$8,000 a year. The agreement is for five years, with a

month's vacation yearly, and is terminable on six months' notice. Mr. Fellowes will take up his duties about the first of May. He went from Toronto to Westmount about thirteen years ago, and has been city engineer of Westmount for the last ten years.

The Concrete Form & Engine Company, Detroit, Mich., have favored us with an attractive catalogue containing a well-illustrated description of their various lines. Their collapsible steel forms are a great labor saver and are strongly recommended by prominent contracting concerns that have used them. The reduced cost of construction resulting from their use should appeal to contractors, city engineers, waterworks superintendents, state commissioners, and others who are buyers of supplies, materials and equipment for new work.

At the recent meeting of the Canada Cement Company Sir Sandford Fleming resigned as honorary president, being replaced on the board by Mr. Dennis Murphy, of Ottawa. Mr. C. H. Cahan, one of the largest shareholders, also resigned to admit of the election of a representative from London, Mr. Pierce Lacy. Mr. W. D. Matthews, of Toronto, also resigned, being unable to attend the board meetings. Mr. W. H. E. Bravender succeeded Mr. Matthews. The position of honorary president has been abolished. Senator Edwards and Mr. J. M. Kilbourne were re-elected president and vice-president, respectively.

At the annual meeting of the Ottawa Builders' Exchange on the 26th ult., Mr. T. D. MacFarlane was elected president; Mr. W. G. Adamson first vice-president, and Mr. A. G. Marshall second vice-president. Messrs. James Ritchie and D. J. Mackenzie were re-elected respectively as treasurer and secretary. The report for the year was most satisfactory. There are 115 members in the Exchange, representing 85 firms. The retiring president, Mr. Geo. A. Crain, who held office for three successive terms, spoke briefly on the activities of the past year. The delegates from this Exchange to the C. N. A. B. convention in Winnipeg on February 15 and 16 are Messrs. W. G. Adamson, A. G. Marshall, Jas. Lackie and August Boehmer.

Province of Quebec Electrical Association

At the annual meeting of the Electrical Association of the Province of Quebec the officers were elected as follows: President, N. Simoneau; 1st vice-president, C. Thomson; 2nd vice-president, L. Rousseau; treasurer, W. B. Shaw; secretary, J. E. McDougal.

Executive committee—F. J. Parsons, J. A. Hicks, C. E. McGregor, H. J. Vickerson, R. Moncel, H. Crouch, J. A. Valois and W. Smith.

York County's Road Work

At a meeting of the York County Council last week the Good Roads Committee presented its report, in which the following roads are recommended for improvement: Yonge street, from northern city limits to the town line between Markham and Whitchurch, 13 miles; Kingston Road, to Highland Creek; Weston Gravel Road, from Weston to Kleinburg station, 18 miles; Malton Road, from Weston to Malton, 6½ miles; Dundas street, from the city limits to Summerville, 5½ miles; Lake Shore Road, from Sunnyside to Long Branch, 5½ miles; Markham Road, from Langstaff to the town line between Pickering and Markham, 12½ miles; Don Mills Road, from city limits to Fourth Concession, Scarboro Township, 7½ miles; Kennedy Road, from northeast city limits to Stouffville, 23 miles; Vaughan Plank Road, from St. Clair avenue to Maple, 14 miles; making a total of about 120 miles.

Contract Record

ESTABLISHED 1886

A Weekly Journal of
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No. 10

Introducing a Record Season

In presenting to the engineering and contracting interests our Special Annual Number, we have every reason to believe that they will receive it in that spirit of co-operation and good-will which has contributed so materially to the advancement of this journal in recent years. Coming as it does at the opening of a season that gives every promise of record activity, its pages will doubtless be perused with more than ordinary interest.

In the preparation of this number we have endeavored to select those articles that are not only interesting in point of design but suggestive in practice. Thus, several recent departures in construction are noted at some length. We trust that our readers will not hesitate to afford us the opportunity of providing them with further information should they find any portion of our remarks insufficient.

A word at this juncture concerning the "Contract Record" may be permissible. It is our aim to publish a paper that shall be really helpful to the progressive men whom it serves; that shall protect the position of the engineer and fortify the interests of the contractor, at the same time bringing the one to a better understanding of the other, and striving at all times to promote healthy and honorable competition. In the past we have commented from time to time on unsatisfactory contracting conditions, on the prejudices and favors of local authorities, and other topics of editorial interest. That such comments have engaged the serious attention of our readers is evidenced by the discussions that have been carried on in these columns; and we shall continue this policy, believing that the success of this community as a whole depends upon a fair field that is always open to honest investigation. So much for the editorial conduct of the paper. For the rest, we hope to sustain the interest of the reader in making the paper more truly representative of the best modern construction; by publishing plans and working details whenever procurable; by expert articles and criticisms, and by developing the journal as a live news organ.

We have alluded to the prospects of the coming season as giving promise of record activity. We were always optimistic, for we regard pessimism as a disease rather than as a state of the mind, but in this case there are evidences to hand which amply support our prediction. With reports coming in from various sections of the country showing material increases over the corresponding periods of 1910, which was an exceptionally good year, and with satisfactory conditions in the supply and labor markets, there is no reason for doubt. One might urge the perennial complaint of the probably serious shortage of labor in Western Canada. This will loom up at the opening of many seasons yet to come. The problem of finding sufficient labor for the country's development will be long in its solution, for at present prospective work in Canada increases in a far greater ratio than immigration.

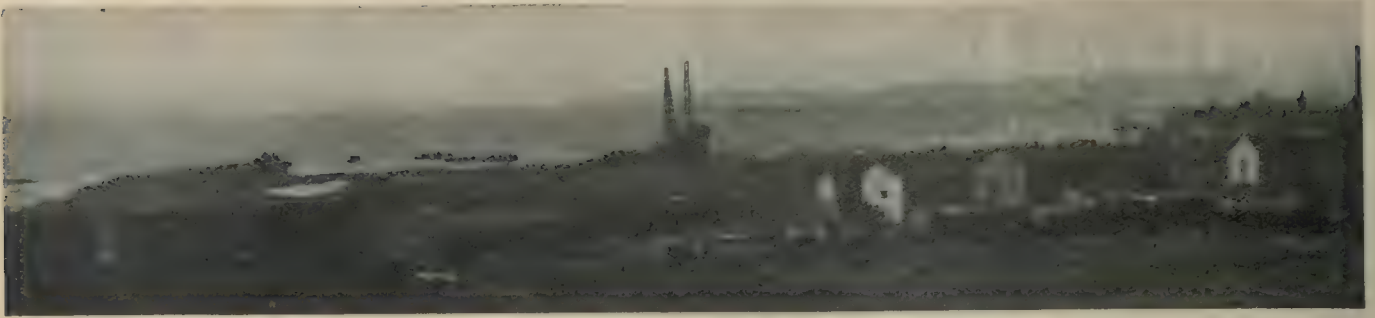
We take this opportunity of thanking our many advertisers for their generous support.

The Cement Show and Convention

The Canadian Cement and Concrete Association is broadening out in a manner that cannot fail to be of great benefit to building and allied interests in Canada. No effort has been spared to make a success of the convention and exhibition now being held at Toronto, and the widespread co-operation that has been put forth in this work must result in giving the industry a tremendous impetus. Both the time and the place are particularly opportune for such an event, and this meeting will mark a tremendous advance over previous undertakings of a like nature in this country. The value of such an exhibition as an educational factor cannot be gainsaid and no one can doubt the advantage of providing the means for this work. The concrete industry, of all lines of endeavor, is undergoing continuous improvement, and no engineer, architect or contractor can afford to neglect the opportunity for obtaining a critical insight into the developments that are taking place. The "Cement Show" affords practically the only opportunity for a study of the progress of the industry as shown by models and machinery. There is another strong point in favor of the exhibition, viz., that it awakens a general interest on the part of the public, which, while naturally relying upon professional advice for technical application, always welcomes the chance for individual investigation.

The recent action of the Ottawa city council in calling for tenders for castiron pipe, and in turning down the lowest bid because it happened to come from a British firm, will certainly not improve the reputation of the federal capital in contracting circles. The excuse made was that there would be delay in procuring the pipe from Great Britain. If this is such an overwhelming obstacle, and if the Ottawa council is so expeditious in proceeding with its municipal undertakings, why put these British firms to the trouble and expense of tendering? Why not insert in the notice for tenders a statement that only Canadian bids will be entertained?

The action of the Ottawa city council does not commend itself to us. It is work of this kind that helps to make the Britisher think lightly of the Canadian market. Business is business, and local sentiment should not influence it. Ottawa may not want British business or British competition, but all is not good that emanates from Ottawa and its example in this case constitutes a poor precedent.



General View of Site Pile Driver Starting on Coffor Dam

Dry Dock Construction at Port Arthur, Ont.

Detailed Description of Interesting Work Completed by the Canadian Stewart Company, Limited—A Resourceful and Expeditious Contract

Great Lake shipping on the Canadian side has long been hampered by the lack of dry dock accommodation at the head of Lake Superior. This condition, with the opening of the new dry dock just completed for the Western Dry Dock & Shipbuilding Company will cease to exist and an impetus will be given to the building of vessels and to its allied industries. The new dock is capable of holding the largest vessels on the lakes, it being 700 feet long and having a clear span at the portal of 77 feet 6 inches, with 21 feet of water from the sills. It is unique in that it is constructed throughout of concrete and steel and rests upon a rock foundation.

The Western Dry Dock & Shipbuilding Company, of which James Whalen is president, is in affiliation with the American Shipbuilding Company, who have large docks at Buffalo, Cleveland, Lorain and Superior. This association is evidence that no expense has been spared in making the new dock one of the best of its kind, and the fact that the Canadian Stewart Company, Limited, were the contractors who constructed the plant, is an assurance that the workmanship is of a high order. Mr. A. V. Powell, of Chicago, prepared the plans and specifications. Ultimately a complete shipbuilding plant will be operated, the work completed at the present time consisting of the dry dock

and two building berths, a large steel punch shop and machine shop.

In connection with the dry dock a large amount of excavation was necessary, 90,000 cubic yards of earth and rock being removed. A 70-ton Marion shovel, with a 2½ yard dipper fitted with Panama teeth, was used. Digging began at the shore end in April, 1910, and trains and dump cars hauled by locomotives transported the excavated material to form an earth fill on either side, making new ground beyond the original shore line. To completely cut off the water during construction a cofferdam 900 feet long was built in the shape of a horseshoe surrounding the site on three sides.

Two pile drivers were employed and these working in opposite directions from the portal end drove round piles in two parallel rows, 900 ft. long, forming an enclosure around the portal end 300 ft. wide. These piles, spaced 3 foot centres, formed an outer and inner fence for the 6 in. x 10 in. and 2 in. x 10 in. sheet piling which was afterwards driven to rock. Waling strips, 8 x 12 inches, were used for the sheet piling and round pile wales were used for the outside. Steel tie rods were placed across the cofferdam every three feet. On top of the round piling and sheet piling a framing was constructed of 8 in. x 12 in. timbers on



Coffer Dam in Course of Construction—Excavating Commenced

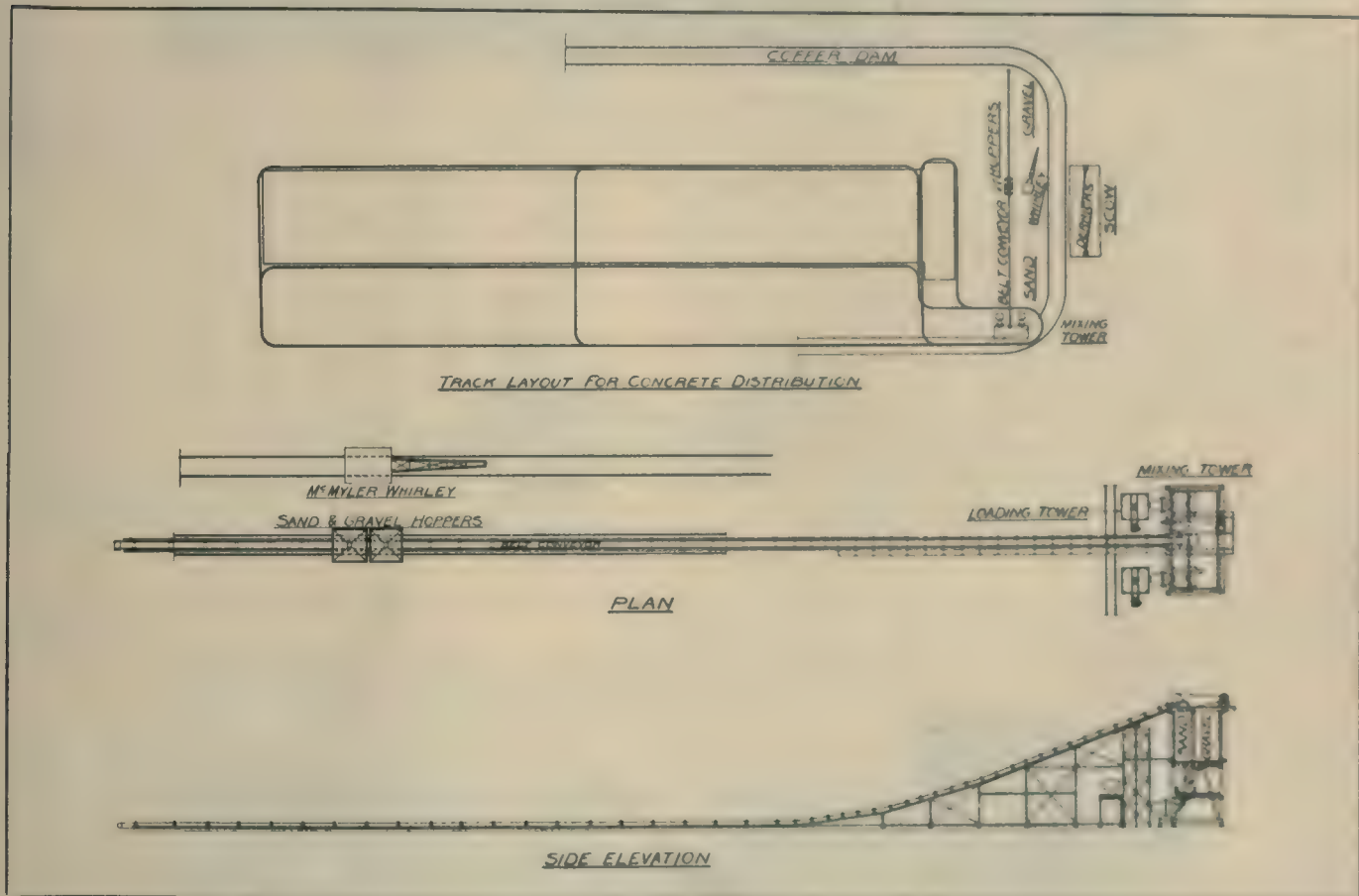
which a temporary dinkey track was laid. As fast as the sheet piling was driven, earth filling was carried out by means of trains of dump cars operated by dinkey engines. The resulting cofferdam was a very stable structure. To pump out and keep dry the dock excavation, and the enclosure formed by the cofferdam, two Emmerson Junior pumps and one No. 2 Emmerson pump were installed.

The cofferdam completed, excavation was carried to rock throughout, enough shale and igneous rock being removed to level the basin. Six Canadian Rand drills and one Kelly and Tanneheld 5-inch well boring machine comprised the drilling outfit.

The speed with which the concrete work was done was due to the organization of the working forces and the efficient arrangement of the plant. Placing concrete was so simplified that from the dredging to the

to cars above by a Ransome bucket hoist. These cars, "V" shaped, of one yard capacity, ran along the top of the dock wall forms and the concrete was poured directly into the forms. The tracks being laid in a number of loops crossing the dock excavation on trestles, no confusion was possible in returning cars to the mixers. By this system as much as 1,000 yards of concrete was placed by two shifts in one 24-hour day.

The forms for the side walls were made in small sections for convenience in handling. Each section was five feet wide and extended the full height of the wall. Seven of these were placed together and bulkheads were attached at each end. In this way a section of the wall 36 feet long could be poured, making a huge monolithic block. Alternate 36-foot lengths were first built, and when the concrete had finally set



final pouring the work was continuous. Scows of 1,000 yards capacity, fitted with derricks and clam shells, dredged sand and gravel from Lake Superior, sixty miles from the vicinity of the work, and unloaded it at the portal face upon the cofferdam on either side of a travelling McMyler whirley; two hoppers placed over a 24-inch conveyor belt, electrically driven, received the materials from the whirley and alternately fed the belt which led to the mixer tower. Here were two receiving hoppers for sand and gravel and below were two charging hoppers. These received the proper quantities of sand, gravel and cement for separate batches of concrete, and the whole was run into one of the two mixers below. A new charge was immediately prepared and this in turn run into the second mixer. In this way it was possible to have the plant working to its full capacity without intermission. The concrete after being mixed was elevated

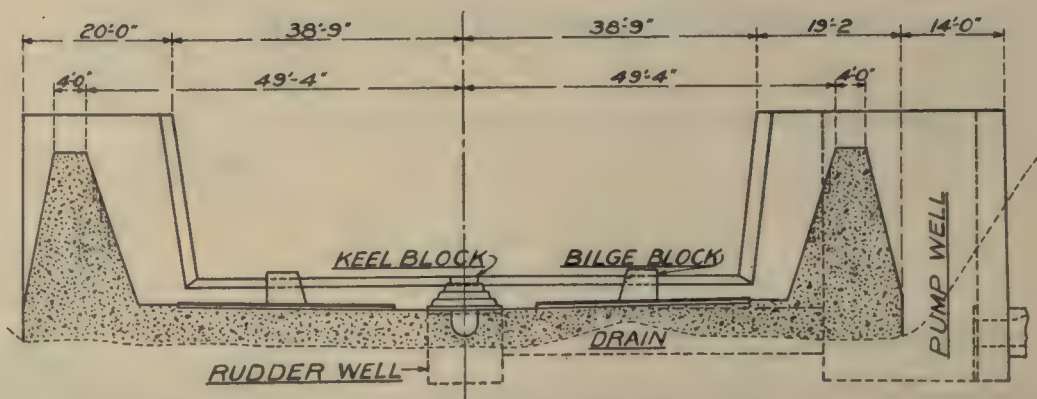
the intermediate sections were poured. An expansion joint was formed for every 36 feet of length, and so cracking was obviated.

The dock proper is 85 feet 4 inches wide at the floor level and 98 feet 8 inches at the top of the walls. It is 700 feet long, and a further length of 28 feet 6 inches with the portal may be utilized. Spaced every 18 feet in the side walls are three altar steps designed to hold lateral bracing when a vessel is in the dock.

The floor is of solid concrete from two to four feet thick, sloping towards a central drain which terminates in a rudder well at the portal end. From the rudder well, a drain protected by an iron grating gives access to the pumping well situated in the west portal pier. With a view to future extension this drain was duplicated on the opposite side of the pumping well so that when a second dry dock is built parallel the present basin, one pumping outfit will serve for both.



Construction Work at Site of Dock



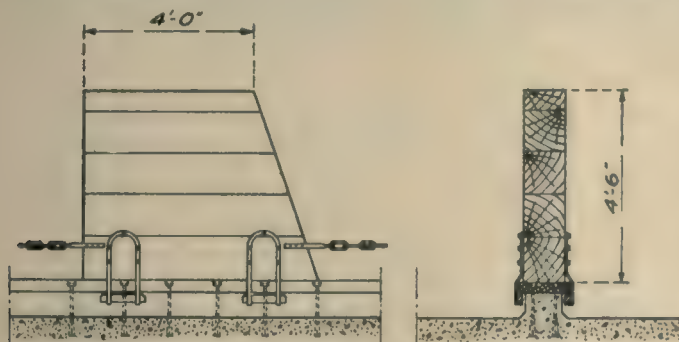
Cross Section Through Dock



Conveyor System for Removing Excavated Material

The portal walls are solid masses of concrete faced with concrete of a 1-3-5 mixture, which is also used in the side walls. The outside corners are curved and protected from injury by steel plates firmly attached by means of steel angle anchors imbedded in the concrete. The portal jambs and sills are faced with steel. Angles, $6 \times 6 \times \frac{3}{4}$ inches, firmly fastened to the concrete floor by $3 \times 3 \times \frac{1}{2}$ inch angles, four feet long, spaced every two feet, form a connection for the $16 \times \frac{3}{4}$ inch plate against which a heavy steel gate rests. Strong lateral anchors embedded in the portal piers hold the jambs in position. Great care was exercised in placing this steel framework to obtain a truly vertical and longitudinal alignment.

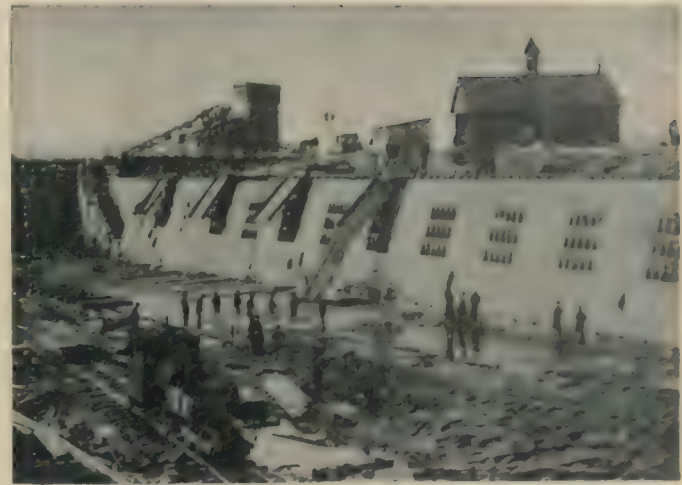
A feature of interest is the construction and arrangement of the bilge and keel blocks with their attachments. The slides upon which the bilge blocks move, spaced twelve feet apart on each side of the dock, are made of 3×14 inch white oak timbers bolted every two feet. Split anchor bolts, $\frac{3}{4} \times 18$ inches, fasten them securely to a concrete base and the nuts are countersunk leaving a smooth upper surface on which the bilge blocks slide. These are 4 feet 6 inches in height of 12×12 inch Oregon fir timbers. They are drift bolted together at the ends and are furnished



Bilge Blocks

with slide irons and wooden slide blocks clamping them to the slides.

Two hauling chains are attached to each block by means of "U" bolts and two fair leaders are attached



Method of Handling Concrete for Dock Bottom

to the dock wall, one at the lower angle and the other near the top. The keel blocks, constructed of 12×12 in. white oak timbers, bolted together with 1×20 in. lag screws, rest on a 12×14 -inch white oak timber set in the concrete floor and fastened thereto with 24-inch expansion bolts. These are spaced 6 feet apart and extend from the rudder well to within twelve feet of the shore end of the dock.

Five-foot concrete sidewalks run the full length at each side and four reinforced concrete stairways lead from their ends to the top of the dock walls.

The dock was begun in April, 1910, and completed by the end of November of the same year. The work was carried out under the direction of Wm. R. Sinks, manager, and R. H. Folwell, engineer for the Canadian Stewart Company, Limited.

In the competition for the plans for the new \$100,000 stock pavilion at Edmonton, instituted by the exhibition directors of that city, Mr. R. W. Lines was awarded the first prize of \$350. Mr. H. A. Magoon the second, of \$250, and Mr. Henderson the third, of \$200. The cost of the building as estimated by Mr. Lines is \$108,000. Construction will proceed at an early date.



Dock Basin Completed

Design of the N.T.R. Shops Near Winnipeg

With Particular Reference to the Steel Work — The Locomotive and Erecting Shop, and Other Structures—Heavy Type of Columns Used

Specially Contributed by Hugh A. Mackay, Chief Engineer Manitoba Bridge and Iron Works, Ltd.

There has just been completed at Transcona, about six miles east of Winnipeg, the shops for the National Transcontinental Railway, and a short description of the main features of these shops, with particular reference to the steel work, will doubtless be of interest. There are several features in regard to it which are out of the ordinary style of mill building, more particularly the columns.

These shops have been designed and erected for the purpose of attending to the repairs, etc., of about 1,800 miles of track. The portion now built comprises about two-thirds of the final plant, and it is expected that the remainder will be put up in the near future. The various buildings are erected on both sides of a midway with a 73-foot travelling crane running along its length, so that material from the different shops can be transferred easily from one to the other. The buildings are kept as close together as possible, making due allowance for future extension, owing to the difficulty of communication between them in very severe weather in winter.

The buildings are, in general, of self-supporting steel frames carried on concrete footings with concrete walls up to the window sills; above that the walls are of brick surmounted by a brick parapet with a concrete coping. The roofing is of wood covered with felt, and asphalt and gravel. The skylights are of thick ribbed glass supported on 3 in. x 1/4 in. steel bars at 24 inch centres with copper sheathing to carry the glass. The floors are, in general, of 3 inch wood flooring, spiked to sleepers bedded in bituminous concrete.

The most important building of all is the locomotive machine and erecting shop, and the boiler and tank shop. These form one building 820 feet long by 170 to 180 feet wide, containing about 3,000 tons of steel. The locomotive, machine and erecting shop

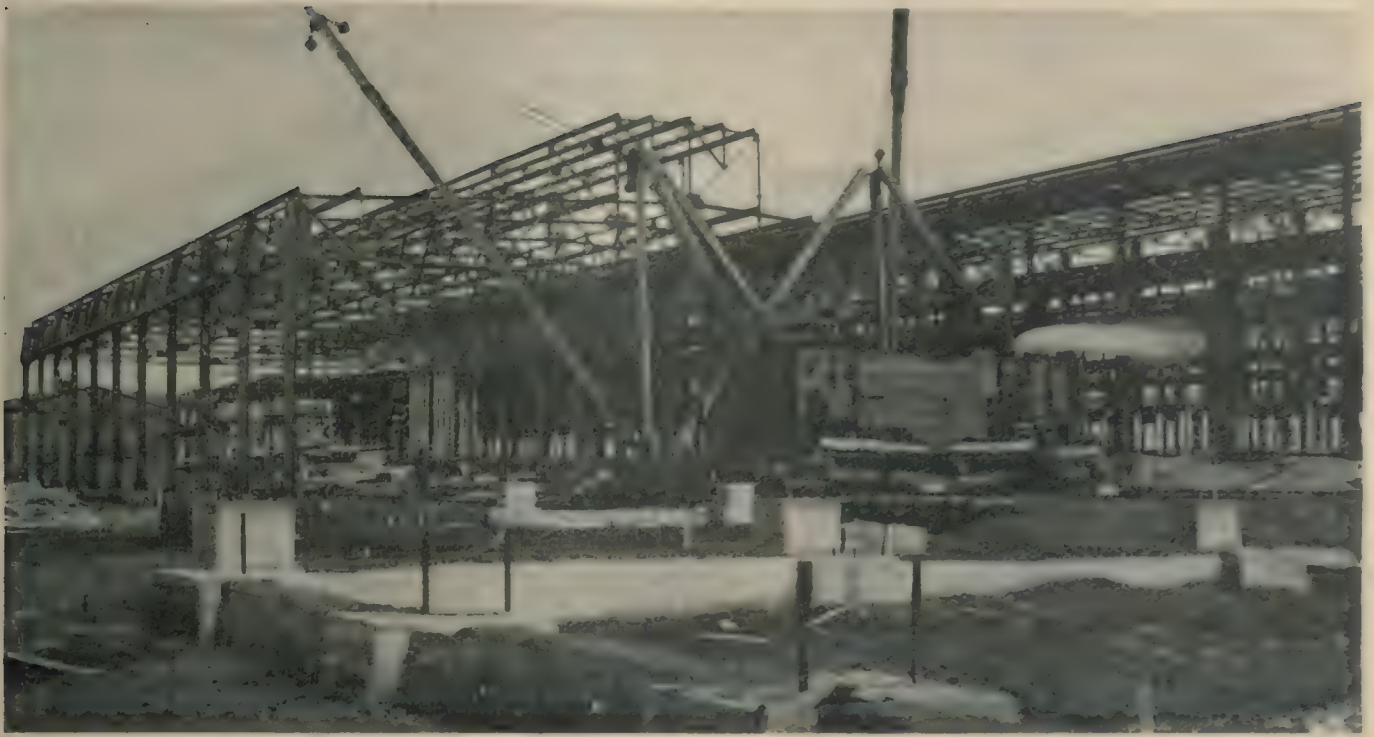
consists of three bays 70 feet, 60 feet and 40 feet wide, by 613 feet long. A glance at the general plan sections and elevations will show the layout of the building. The 70-foot bay has a height of about 47 feet to the underside of the trusses. The floor is laid out with 25 engine pits across the bay. There are two doors through which the locomotives come in, and they are lifted by a 120-ton electric travelling crane which carries them along to any particular pit. Underneath the 120-ton crane there is a 10-ton crane for general use.

The columns which carry these crane girders are of a very heavy type of construction. They are spaced at 24 feet centres. The outside wall or "A" line of columns on the 70-foot bay is similar to what is shown on the typical column detail. The shaft is built up of two 10 in. x 20 lb. channels and two 10 in. x 25 lb. channels directly under and carrying the 120-ton crane track girders, and two 10 in. x 20 lb. channels on outside of column. The web is of 36 in. x 3/8 plate and runs up beyond the girder seats, forming a tongue over which the angles of the upper part of the column run. The columns are set on reinforced concrete piers which are carried down to the clay and are of such a size that the presquare foot. The base of the column is 34 in. x 44 in. x 7/8-in. thick, with 6 x 4 x 1/2 stiffener angles; the anchors are four 2 in. diam. bolts. There are tie plates of 30 in. x 3/8 in. plate and 3 x 2 1/2 x 3/8 angles about every 8 feet on both sides of the columns rivetted through the flanges of the channels. At a height of 28 feet from the ground are the brackets for the 10-ton crane track girders and 35 feet up the brackets for the 120-ton crane.

The main difficulty in fabricating these columns was in rivetting the inside flanges of the channels through the web plate. No ordinary machine could



General View of Locomotive Shop. In the foreground are the Forms for Reinforced Concrete Storehouse



Forge Shop in Course of Erection. Footings for Power House in foreground

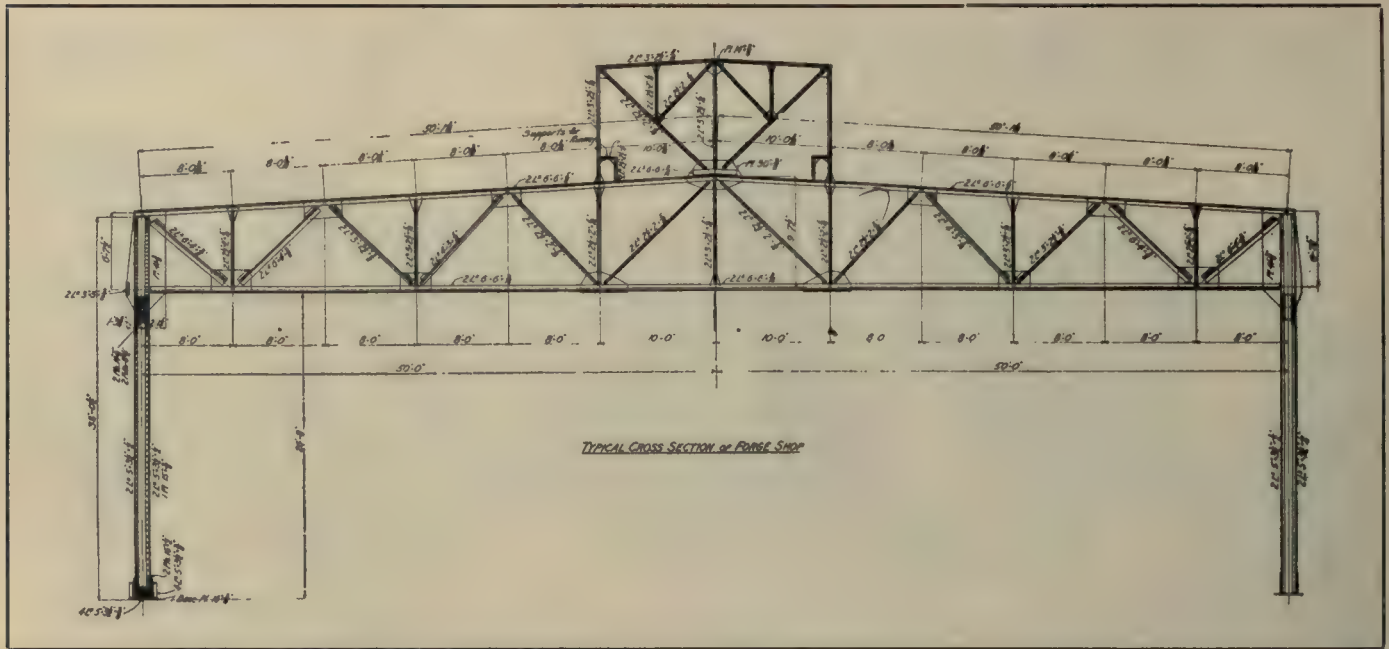
get in to do the work, and not being able to get one from any of the rivetting machine manufacturers exactly suited to this work, the steel contractors were forced to design one themselves, as the specifications would not allow of gun rivets being used, but had to be driven by a machine capable of exerting a holding on pressure. A suitable design was prepared and although doubt was expressed as to its practical working, it was cast in their foundry, fitted up and a trial made, when it was found to do the work satisfactorily. A second one was then made, with various slight im-

provements found necessary, as one was not able to handle all the work.

The inside or "B" line of columns on the 70-foot bay is that shown on the typical column detail. The shaft is of two 10 in. 30 lb. channels, for 10 in. 25 lb. channels and 36 in. x $\frac{3}{4}$ in. web. The bases and other details are similar to those described above on the "B" columns. The columns are the heaviest on the whole contract as they carry two 10-ton cranes, one 120-ton crane and the trusses of the 60-foot and 70-foot bays, their weight when completed being close to



End View of Locomotive Shop. Total length of Structure, 800 ft.

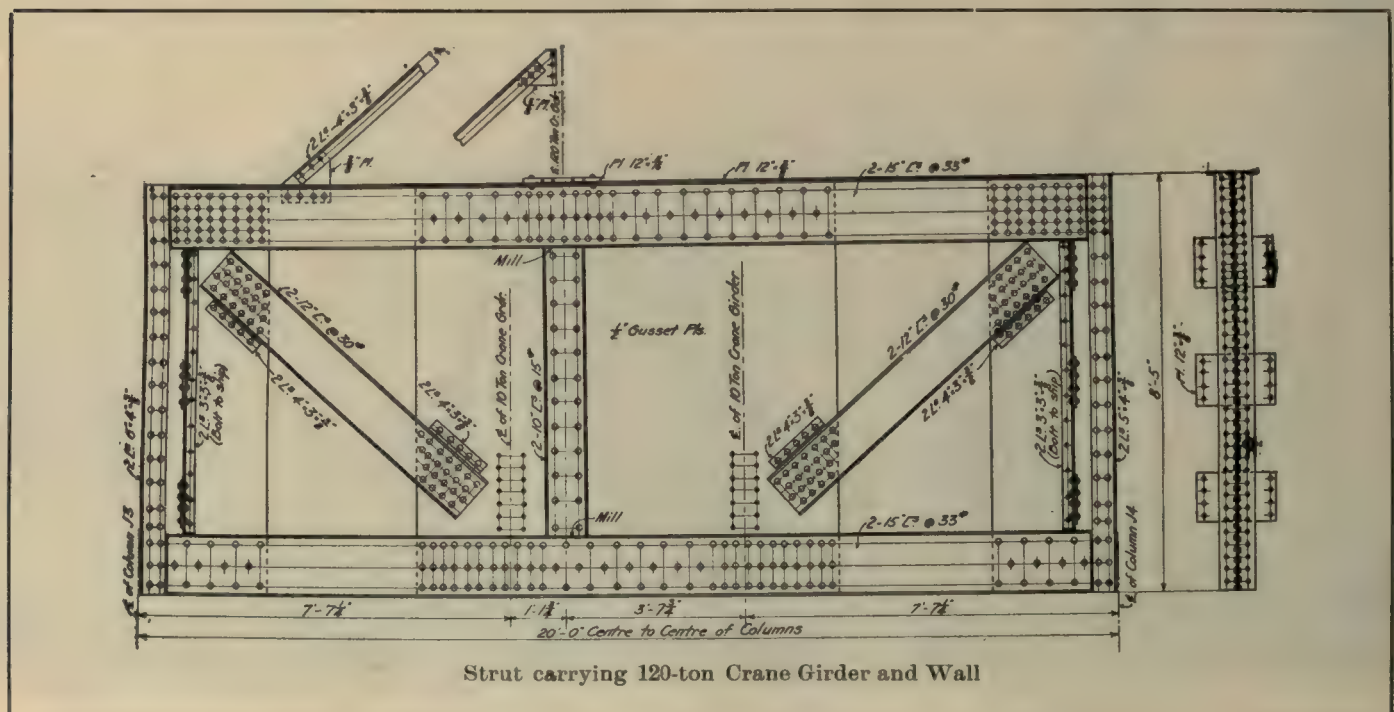


8 tons each. The "C" line of columns carry a 10-ton travelling crane and also the balcony on the 40-foot bay. They are of four 10 in. 25 lb. I beams and 24 in. x $\frac{3}{8}$ in. web plate. The top portion carrying the roof being of four 5 in. x $3\frac{1}{2}$ in. x $\frac{3}{8}$ in. angles and $13\frac{1}{2}$ in. x $\frac{3}{8}$ in. web plate. The "D" line on the outside of the building are much similar to the "C" columns, with the addition of connections for future extension so that an extra bay can be added to the shop at any time. At the end of the "C" and "D" line of columns four of the columns are run up to an extra height to form a tower for rivetting up boilers and they carry a 20-ton travelling crane. The space between the "B" and "C" columns is to be used for heavy machines. Part of one end is to be used as a flue shop, and the lye vat and fire furnaces and floor are in this bay.

The 40-foot bay, which will be used for light machine work, has a concrete balcony running along its

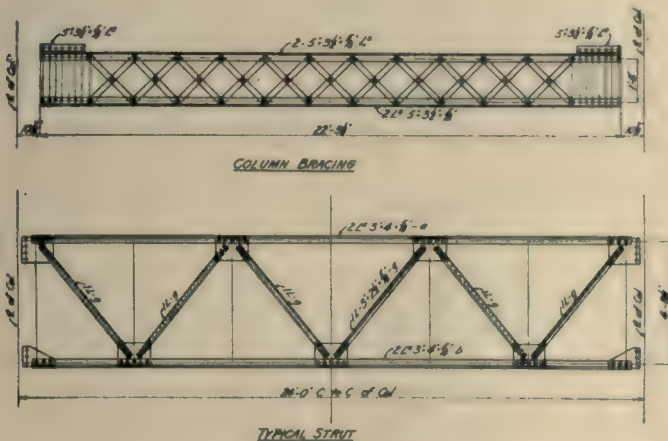
whole length. It is carried on girders 3 ft. 6 in. deep with 18 in. 55 lb. I beams at 6-ft. centres framing between them. On the inside columns there are brackets which carry the balcony out beyond the columns under the travelling crane so that material can be loaded or unloaded directly on to the balcony. This balcony carries the heating apparatus, fans, coils, etc., of which there are three sets. The building is heated by hot air. Steam from the power house is passed through the coils and the air is then drawn through these heated coils and distributed by concrete ducts to the various heating outlets placed at intervals along the walls. The rest of the balcony is used for locker rooms, lavatories, and light repair work, tinsmith and brass departments.

The columns throughout the whole building are very rigidly braced. On the "A" and "B" lines there is X bracing of four 5-in. x $3\frac{1}{2}$ -in. x $\frac{3}{8}$ -in. angles



every third bay, as shown on the section BB. Below that there are lattice struts of $5 \times 3\frac{1}{2} \times 5$ -16 angles with $2\frac{1}{4}$ -in. $\times$ $\frac{3}{8}$ -in. lattice bars. These struts run continuously the whole length of the building. A typical detail of these struts is shown. At the top of the columns there are struts of $4 \times 3 \times 5$ -16 chord angles and $3 \times 2\frac{1}{2} \times 5$ -16 angle diagonals. The lattice struts and X bracing are necessary owing to the heavy cranes carried on these columns. On the "C" and "D" columns the only bracing is an angle strut at the top of the columns. A typical detail of these struts is shown. This detail is similar to all the struts used throughout the contract between all trusses and columns. The detail of the large strut shown is the one which carries the end of the 120-ton crane track, and also the wall between the boiler and tank shop and the machine shop.

The trusses are of the type shown on the general section with monitor in the centre which carries the skylight. On the 70-foot bay the chords are of $6 \times 6 \times \frac{1}{2}$ angles for the top chord and $6 \times 4 \times \frac{1}{2}$ angles for the bottom. The trusses for the 70-foot bay have three rows of struts between them—one in the centre and two intermediate as shown in the general plan. These struts are of two $4 \times 3 \times 5$ -16 angles for chords and $3 \times 2\frac{1}{2} \times 5$ -16 angles for diagonals. The other



two bays have a similar strut in the centre only. In the case of the centre struts there are angle diagonals running up to the top of the monitors to act as braces. Every third bay there are top and bottom laterals to the trusses made of $3 \times 3 \times 5$ -16 angles. The purlins are in general 12-in. $\times$ $20\frac{1}{2}$ lb. channels spaced at 5-foot centres punched for wood strip for nailing roof. On the monitors the purlins are channels and with a beam to form the ridge. On the top flange they have rivetted on the angle cleats for connection of 3-in. $\times$ $\frac{1}{4}$ -in. steel skylight bars.

The window framing is in general as shown in the typical detail. The verticals are of 10-in. beams and channels and are tied into the columns by 6-in. $\times$ $\frac{3}{8}$ -in. bent plates. The lintel between the columns to carry the brick work over the windows is of two 15-in. $\times$ 33 lb. channels, with $15\frac{1}{2}$ -in. $\times$ $\frac{3}{8}$ -in. plate rivetted to the bottom. The ends of the lintels are framed into the columns. This framing runs continuously between every column all round the building and similar framing is used around the other buildings. The crane track girders are of a uniform span of 24 feet and for the 120-ton travelling crane are of the following section. The web is of 60-in. $\times$ $\frac{1}{2}$ -in. plate, the flange angles are 6-in. $\times$ 6-in. $\times$ 11-16-in. angles, stiffeners 5-in. $\times$ $3\frac{1}{2}$ -in. $\times$ $\frac{1}{2}$ -in. angles. There is a top cover

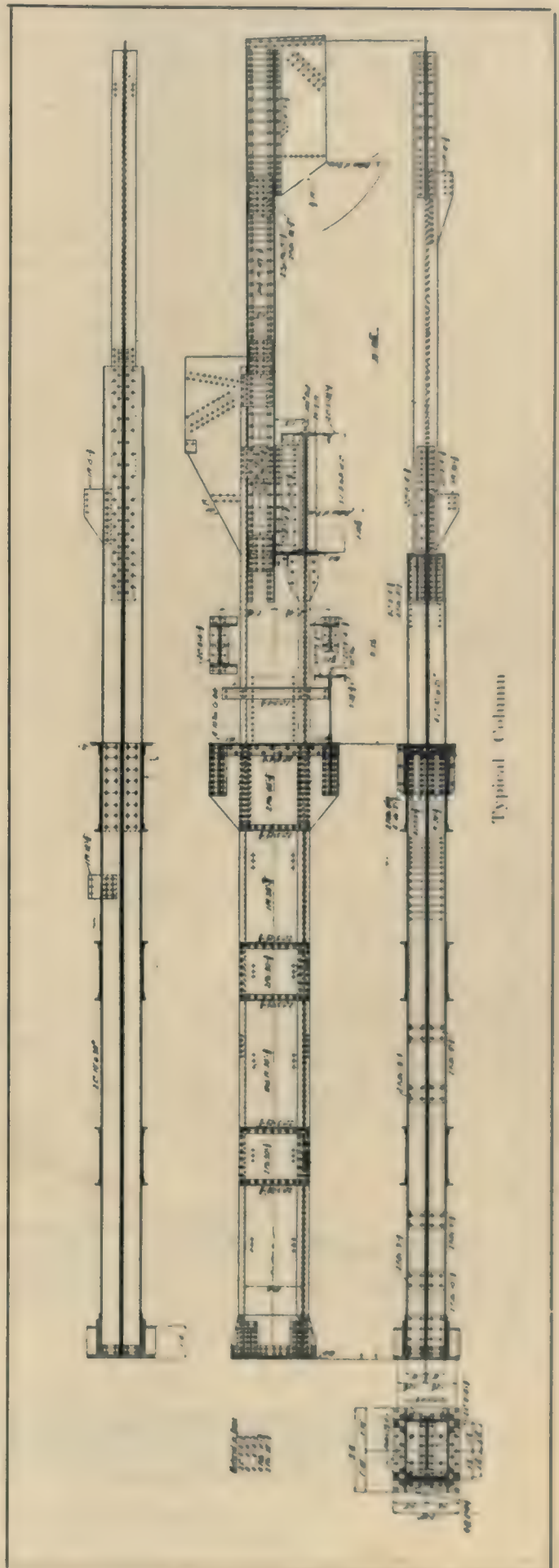


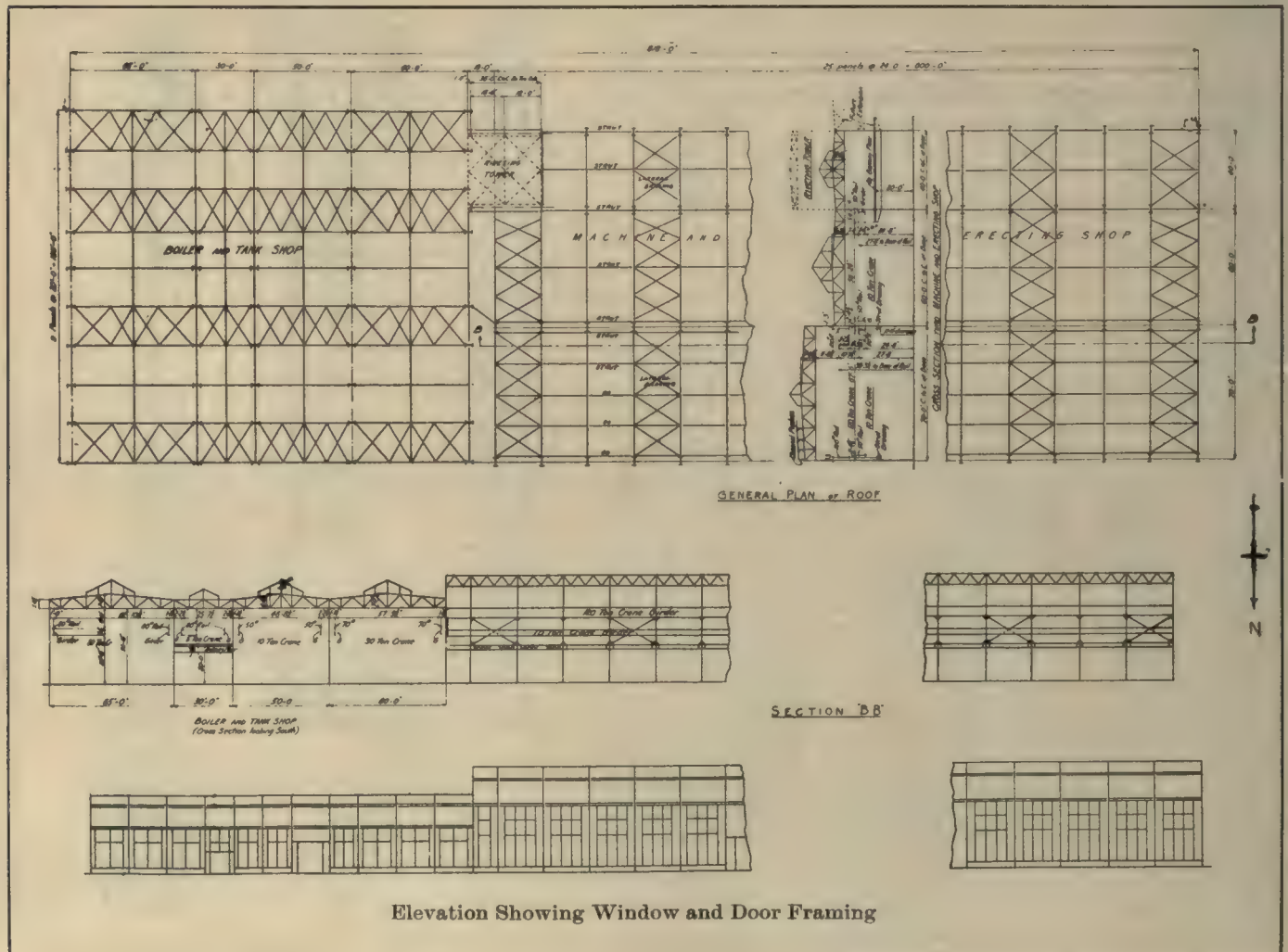
plate 24-in. x $\frac{1}{2}$ -in. with two 5-in. x $3\frac{1}{2}$ -in. x $\frac{1}{2}$ -in. angles rivetted one on each side of the plate to give lateral stiffness and resist the thrust due to the crane. The bottom cover plate is 16-in. x 11-16-in. These girders are rivetted through a stiffener to the columns and also bolted to the column seats. The 10-ton crane girders have 35-in. x 5-16-in. web plate and 6 x 6 x $\frac{3}{8}$ angles in flanges with two 3 x $2\frac{1}{2}$ x $\frac{3}{8}$ angles rivetted to the top flange.

The boiler and tank shop is situated at the end and forms part of the same building as the locomotive, machine and erecting shop. Its dimensions are 180 feet by 205 feet. It consists of four bays, 65 feet, 30 feet, 50 feet and 60 feet wide, and 36 ft. 6 in. high to the underside of the trusses. The layout of the bays is shown on the general elevation. The 65-foot bay is spanned by a 20-ton crane and is to be used for work on locomotive tenders. The 30-foot bay is to be used for light machinery, and over 100 feet of its length is a balcony similar to that in the locomotive shop and which carries the fans, etc., for heating the shop and also the locker rooms, lavatories, etc. Over the rest of the bay there is a 5-ton electric travelling crane. The 50-foot bay is to be used for heavy machinery and is spanned by a 10-ton travelling crane. The 70-foot bay is for boiler work and has a 30-ton crane over it. The steel work is similar to the rest of the locomotive shop, adapted to suit the different loads and conditions, but the general design and details are the same.

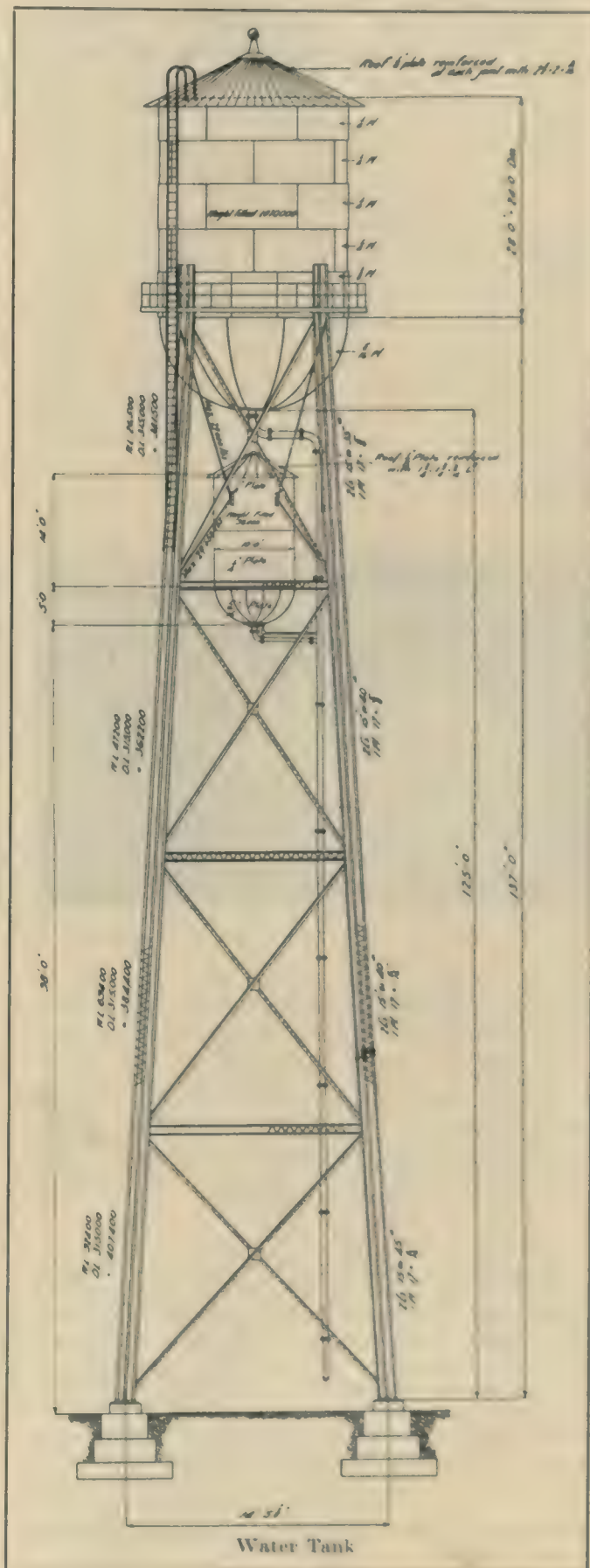
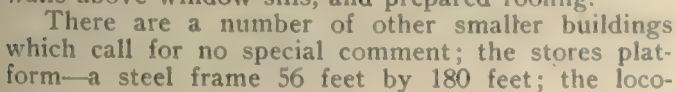
The forge shop is a building 260 feet long by 100

feet wide. As it carries no overhead cranes the columns are only light wall columns sufficient to carry the roof trusses. They are of four 5 x $3\frac{1}{2}$ x $\frac{1}{2}$ angles with 15-in. x $\frac{3}{8}$ -in. web plate. The trusses are of one complete span over the width of the shop, with chord angles of 6 x 6 angles. The gusset plates at the ends of the trusses are carried out beyond the columns to carry the lintels and window framing, which are similar to those described above and shown on the general detail of window framing. In the centre of the trusses there is a monitor 20 feet wide by 10 feet high with a runway each side. Owing to the vibration which may be caused by the heavy hammers, etc., which will be used, the building is braced very rigidly with struts and lateral bracing, which except for their number call for no special comment, as they are exactly similar to those described above for the locomotive shop.

The description of the steel for the above two buildings shows in general the two styles of steel work which were carried out in all the other buildings. Where there are heavy loads to be carried by the columns they are in all cases made of beams and channels similar to those described, and where they only carry relatively light loads, such as roof loads, they are only of plate and angle similar to the forge shop. These same styles were carried out in all the buildings and a detailed description of the steel work in them would be more or less of a repetition. Therefore a general description of the rest of the buildings is all that will be attempted.

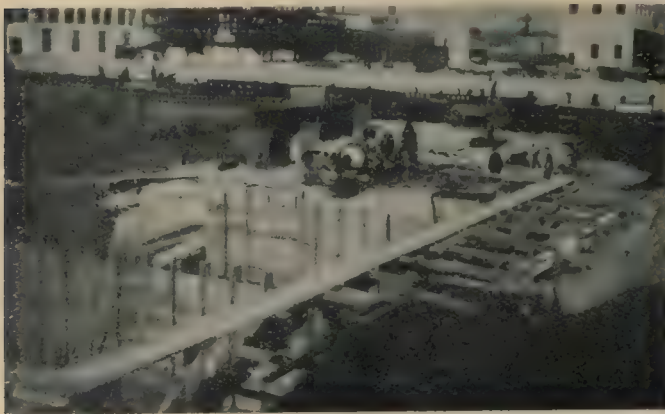


motive carpenter shop, 70 feet by 100 feet; the store house, a reinforced concrete building, 60 feet by 260 feet; the oil house, and the frog and track shop.



An interesting feature was the arrangement made for the water supply of the shops. The water for general use is obtained from the relatively soft water of the Red River. No provision has yet been made at the shops for softening this water, but it will probably be yet found necessary as the C. P. R. are installing a plant at their Winnipeg shops for treating the same water. On the bank of the river there is a pump house from which the water is pumped to a 2,000,000-gallon reservoir at Transcona. To give the necessary pressure for distribution it is then pumped to a 100,000-gallon elevated steel tank 125 feet above grade. The Red River water not being suitable for drinking, a small tank of 10,000 gallons capacity is suspended below the large tank and drinking water is obtained from a well which is pumped into it. A detail of this tank is shown with stresses and sections. The tower is of 15-in. channels with one 17-in. cover plate and latticed on the other side. It is of four panels with the necessary angle bracing and struts. The tank is 24 feet diameter and 28 feet high with hemispherical bottom of 5-16 in. plate. The straight tiers are of $\frac{3}{8}$ in. and $\frac{1}{4}$ in. plate, with $\frac{1}{8}$ in. conical roof, reinforced with angles.

The total amount of steel in the whole contract was 4,600 tons, which was fabricated and erected by



Reinforced Concrete Oil Tanks in Course of Construction at Toronto—Contractors: Foundation Company, Ltd., Montreal

the Manitoba Bridge and Iron Works, Limited, Winnipeg. Messrs. Haney, Quinlan & Robertson are the general contractors. The whole work has been carried out under the supervision of Mr. R. F. Uniacke, bridge engineer, National Transcontinental Railway, Ottawa, and under the inspection of the Canadian Inspection Company. The actual construction of the shops is under the supervision of Mr. F. W. Walker, superintendent of terminal shops for the National Transcontinental Railway.

Another step towards the realization of a "Greater Vancouver" was taken when the ratepayers of the large and populous section known as South Vancouver, voted in favor of annexation to the city. Legislative action will be necessary to ratify the step, and some time must elapse before the union becomes a fact. The total assessment of the new suburb is \$13,500,000; its area is over 14 miles, and the population is between 27,000 and 30,000. The inclusion of this district gives Greater Vancouver a population of approximately 155,000, which is increasing at the rate of about 1,000 a month owing to the influx from the east and Pacific coast points.

Reinforced Concrete for Oil Tanks

The Queen City Oil Company completed last fall some work at their West Toronto yards which may be of interest to readers of the Contract Record. This work consisted in the building of four reinforced concrete tanks for the storage of gasoline. To the knowledge of the writer, this is the first time that concrete has been put to this use in Canada, although the Standard Oil Company have built several at their Bayonne works in the United States.

On account of certain city regulations, these tanks were placed below ground and completely backfilled on top. Owing to confined space, the tanks were built rectangular in form (each tank 21 ft. 6 in. x 38 ft. long x 9 ft. 6 in. high) having total exterior dimensions of 94 ft. x 40 ft. x 6 ft. The tanks are to be filled by gravity from tank cars and used for the distribution of gasoline in West Toronto.

Work was started by excavating to just above the water level in the soil. This excavation was taken out by scraper teams, the final trimming being done by benching out. A concrete mat was deposited all over the bottom of the excavation and on this were built four tanks side by side but independent one of the other. A tile drain surrounded by broken stone was

placed around at the bottom and on the outside of the walls. This drained into two sumps, one on each side at the centre of the four tanks. Square reinforced steel was used throughout, and the concrete was of a rich, dense mixture. The walls and floor were poured continuously so as to do away with any bonding of old and new concrete, the gang working as late into the night as was necessary to complete each tank.

To economize time, the forms for two tanks were set up at one time, and after these had been poured and the concrete sufficiently set, the forms were stripped off and set up again for the remaining two. After the walls had hardened sufficiently, the roof and its supporting columns were placed and the slab poured. Two manholes were left in the roof of each of the tanks. These are to be used for the intake and discharge pipes and also for the cleaning out of the tanks. At the completion of the work a water test under a maximum head was made on each tank. These tests showed the tanks to be perfectly tight.

The above tanks were designed and built for the Queen City Oil Company by the Foundation Company, Limited, Bank of Ottawa Building, Montreal.

Road Construction for Heavy Traffic

Special Treatment Necessary for Suburban and Country Roads— Quality of Stone—Methods of Applying Tar and Other Materials

Specially Contributed by W. A. McLEAN, Provincial Engineer of Highways for Ontario

Country roads, as with city streets, are not all of a kind. On the contrary, there is a wide gradation to choose from, in order that varying local conditions with regard to traffic, materials, and general design, may be best adapted to one another. One strength of pavement is suitable for the heavy dray traffic of a wholesale district in a large city; another type is suitable for a lightly travelled residence street; and still another for a city park. In the same way country roads should be adapted to the factors which present themselves. There cannot, economically, be a standard specification for a country road, to be followed universally. The problem, at times, is a complex one, if the best combination of efficiency and cost is to be served. New materials are from time to time presenting themselves, which have to be tested under a great many conditions, and for a considerable period in order that their value and place in road-building may be determined. The character of traffic is subject to change, and at present, rapid motor vehicles, and heavy traction engines are adding their energies to narrow tires, frost and weather as agencies of road destruction.

In general, it may be said that gravel roads are suited to light driving, broken stone resists more constant and heavier travel, oils and bituminous binders help to preserve these, and concrete and vitrified brick are employed on heavily travelled suburban roads near large cities. Foundations of various kinds are used according to the weight of traffic, and the natural strength of the subsoil.

Roads adjacent to, and radiating from large cities, are frequently subjected to heavier traffic than are many expensively paved city streets. On leading suburban roads is concentrated a large amount of farm traffic from the surrounding districts. Some is only occasional during the year; miscellaneous loads come in at weekly or other regular intervals; while some, such as heavily loaded milk wagons are of daily occurrence. On some of these roads brick, gravel and sand are regularly hauled in heavy loads; and outlying factories create heavy traffic in certain cases. Heavy loads of merchandise are daily hauled away from the wholesale houses of the city, delivery wagons make regular trips; while additional light driving and automobiles make a total amount of travel that subjects leading suburban roads to a severe traffic test.

Common gravel, even of a good quality, ruts readily in such roads, requires constant repairs, and invariably in the fall and spring is flattened and cut up so that a dry surface is impossible. Broken limestone is plentiful in eastern Ontario, and is being used for heavy traffic, but even this material, laid in the ordinary way as water-bound macadam, is not strong enough for severe wear. It is almost impossible to prevent vehicles following one another in a narrow wheel track, and this constant wear soon creates a depression. On ordinary water-bound macadam, the dust nuisance has to be met, working as it does, dis-

comfort to the users of the road, and injury and loss to property adjoining the road.

Quality of Stone.

The first remedy that suggests itself is the securing of a harder material than limestone. Trap rock stands first among the stones suitable for road construction. This is an exceedingly hard and tough rock and is found in various parts of northern Ontario. It is quarried on Poole Island in Georgian Bay, and is used largely in Cleveland. The cost is much greater than of limestone owing to the transportation charges, but as deposits occur in Eastern Ontario, there is an opportunity to secure it at reduced freight rates. Granite is quarried in Northern Ontario, and is strong and less dusty than limestone. A wearing surface of three or four inches of granite or trap rock, over a limestone foundation, if properly laid and maintained, would make a much more durable road for heavy traffic, than can be secured from limestone alone. The harder stone is the more expensive to quarry and crush, but wears very much better on the road.

Oiling Roads.

The experience of Toronto and other cities, in oiling roads was last year extended to a few country roads in the province where the dust nuisance was a chief consideration. The oil generally used was a Canadian petroleum oil, having a paraffine base, and was sprinkled from an ordinary watering cart. This quality of oil coagulates the dust, so that it is too heavy to be blown by the wind, remains on the road surface, and creates a protective coat. Two or three applications of oil are made within a fortnight, early in the summer. This is followed by applications four or six weeks apart during the summer. To keep down dust for the season will ordinarily take four applications of oil, requiring about 3,500 gallons per mile, at four cents a gallon for the oil, and one cent for sprinkling.

Oils with an asphaltic rather than a paraffine base, are preferable, but the duty increases the cost. In the United States, asphaltic oils are commonly employed, containing from 40 to 80 per cent. asphalt. Greater care is required in applying asphaltic oil to the road than in applying thinner paraffine oils. The general method of sprinkling with asphaltic oil is much the same where used, and may be instanced by the Borough of the Bronx, N.Y., where dust laying is secured by a cold application of 50 per cent. asphaltic oil. It is distributed from an ordinary sprinkling wagon, about one-quarter gallon to the square yard of road. The treatment is applied to one-half of the road at a time, traffic being closed for from four to five days to allow the oil to penetrate the macadam and to harden. The application is repeated so as to give for the season one-half gallon per square yard. The oil is put on in June, July and August, as the dampness of spring and cool nights of fall limit the penetration of the oil which has been as much as 1½ inches. In this way slime and mud during and after rains is prevented. The cost in the Bronx is

about 3½c. per square yard per year. The road is swept to remove an excess of fine material before applying the oil.

High pressure sprinklers are used in some cases. The State Highway Commission of Massachusetts has imported such a sprinkler from England. The penetration of the asphaltic oil into the roadbed is aided by this method. The use of high pressure sprinklers is also favorably reported from East Orange, N.J., and elsewhere. Some highway engineers allow the oil to remain on the road for five or six hours to permit penetration of the oil, and evaporation of volatile matter, after which a light coating of stone screenings is swept or spread over the surface.

According to Massachusetts' experience, it is better that the road be somewhat damp when oil is applied, but in other cases a dry surface is sought, and in this regard practice is not uniform.

The cost of oiling varies according to locality, freight charges, amount, and class of oil used. Asphaltic oils are controlled by the Standard Oil Company, and the demand is so great that prices tend to advance. Asphaltic oiling costs from 5 cents to 10 cents a square yard for the season.

Tarred Roads.

The tarring of roads is largely practiced in Great Britain. In 1908 there were about 2,000 miles of tarred roads in England, but last year this had been increased to about 10,000 miles. The oiling of roads with light oils, while somewhat reducing wear, is



Road at Swampscott, Mass.

principally a dust palliative, but English practice in the use of tars seeks to combine with the reduction of dust, a material to bond, strengthen and preserve the road. There are four ordinary methods of using tar: (1) Tar painting, and spraying; (2) tar grouting; (3) tar macadam; (4) tar matrix. The tar used is coal tar, and with it is combined creosote oil and pitch.

Tar painting and spraying is similar in its results to the use of oil, and resembles strongly the use of asphaltic oil. Its effect is temporary, lasting only for one season, and when broken up, the road is left in a dirty condition. The road is first cleaned of all dust and caked mud, and a thin coat of tar is then spread in various ways by hand and by machine. A light coating of screenings is sprinkled over the surface.

The process of tar grouting consists in spreading over the road a surface layer of broken stone which is rolled smooth. Over this is poured hot tar from spray cans, filling the spaces between the stones. Stone chips are lightly sprinkled over the surface, and consolidation by rolling is then completed.

Tar macadam roads are built by coating the stone thoroughly with tar before laying on the road. A foundation of coarse stone is first laid; or an old mac-

adam road is used as a foundation, first cleaning away all dust and mud. The tarred stone is then spread in layers, which are rolled separately, and the whole is coated with dry screenings before final consolidation with a roller.

"Tar matrix" is a term applied to roads in which fine, tarred gravel or stone chips are used to fill the interstices of an ordinary macadam road, thus sealing and making the road surface impervious. There are three methods of construction. One way is to prepare and roll a good foundation of broken stone. On this is spread the tarred material to a depth of one or one and a half inches. Then a layer of broken stone about three inches in thickness is spread, and the road is rolled until the tarred gravel comes to the surface, making a smooth and well bounded surface. Another way is to spread the tarred matrix over the broken stone and roll it into the interstices. A third method, the "Gladwell system," is a combination of the two.

Tar in road-making has not been favorably regarded in Ontario, as the results have been considered too uncertain. Tar macadam roads were at one time used in Hamilton, and in Ottawa, but its use has been largely discontinued. This is due in part to the decreasing price of asphalt, and to the unscientific way in which tar was employed in the pioneer work. A fuller knowledge of the characteristics of tar is leading to more satisfactory results, and that it has a useful place as a roadmaking material cannot be doubted. In English experience, tar macadam is considered too expensive for general application, but tar grouting is found satisfactory for country roads. The refining of tar to remove volatile oils, the addition of creosote oil and pitch, with an occasional tar painting to seal the surface as it becomes brittle, are among the more important factors in the successful use of tar.

English experience shows that, in general, tar painting costs 6 cents a square yard; tar grouting adds 42 cents a square yard to the cost of the road; and a tar macadam surface over an old roadbed costs 80 cents to \$1 a square yard.

Asphaltic Binders.

In addition to the use of asphaltic oil as a dust-layer, this material, as well as refined asphalt, has been used to form a bituminous wearing surface in apparently every way that human ingenuity can devise. In general the methods employed in the use of tar are followed and may be classed in the same way as (1) spraying and painting; (2) asphalt grouting or the penetration method; (3) asphaltic macadam; (4) asphaltic matrix.

The latest development is the use of asphaltic oil by the grouting or penetration method. After a foundation or lower course of macadam has been laid and well consolidated, a surface layer of finer crushed broken stone is spread and partly rolled. Over this is flushed a grout of asphaltic oil containing 75 to 85 per cent. asphalt; or refined asphalt heated and fluxed is used. A light coat of screenings is spread, and the road is well rolled. This is followed by a surface painting or spraying of asphalt or asphaltic oil and a final sprinkling of stone screenings is added, after which solidification is completed with the roller. Asphalte, a mineral pitch, resembles tar, but is of more uniform quality, and the results in Ontario have been more certain.

The cost of asphaltic treatment has not been determined in any definite degree owing to the experi-

mental stage in which its use remains, but in a general way it has been found to add 50 per cent. to the cost of the road. In New York State the use of an asphaltic binder is found to add about \$2,000 per mile to the cost of a water-bound macadam.

Concrete Roadways.

Concrete pavements for town streets have been in use for a few years, with increasing popularity. The use of concrete has been extended to country roads, one of the most notable instances being that of Wayne County, Michigan, surrounding Detroit. The roadways are ordinarily 24 feet wide with concrete 10 to 18 feet wide, and the shoulders gravelled. The roads are laid in two courses, the lower, 4 inches thick, and the wearing surface 2½ inches. The difficulty with concrete in the past has been that it has a very hard, smooth surface, with insecure footing for horses, that temperature cracks are difficult to prevent, that it is brittle and chips away at expansion joints and temperature cracks, making holes difficult to repair. The city engineer of Ann Arbor has, however, had much success with a plan of tar-painting which overcomes these difficulties, and promises to make concrete, in proportion to its cost, one of the cheapest of pavements, and one especially suited to suburban traffic on main highways. Concrete pavements cost about \$1.25 a square yard; and the tarring costs about one cent a square yard per year.

Vitrified Brick.

The vitrified brick roadways around Cleveland have become deservedly famous. Vitrified brick are largely manufactured in Ohio, so that the cost at Cleveland is reduced to a minimum. These brick pavements, as with the concrete roadways previously described, are laid only the necessary width to accommodate traffic, usually from 10 to 18 feet wide, with broken stone or gravel at the sides, making a total width of 24 to 28 feet between gutters. A concrete foundation about four inches thick is first laid. On this there is spread a sand cushion two inches thick, which is compacted with a 500 pound hand roller. Over this are laid the vitrified brick, and the joints filled with a Portland cement grout. Concrete curbs hold the sides in place; below which are tile under-drains. Vitrified brick pavements in Ontario are costing about \$2.50 a square yard.

Proprietary Pavements.

To the roadmaking materials just described might be added a lengthy list of patented and proprietary mixtures and methods, such as tarvia, warrenite, bitulithic, glutrin, amiesite, texaco, tarmac, and many others. Westrumite is asphalt held in liquid form by the addition of spirits of ammonia. On exposure to the air the ammonia evaporates, and the asphalt toughens and solidifies. Rocmac is a material of a different class, and is supplied as a liquid which, mixed with limestone dust, on exposure to the air, gradually forms silicate of lime, a very strong binder. Test sections were last year laid at Niagara and Woodstock, and a road was built at Port Arthur. Experience in England and Scotland, while limited to about four years, is said to be favorable.

The illustration shows a road built by the Massachusetts Highway Commission, metalled 15 feet wide with trap rock on a cobble-stone foundation. The surface was treated in 1909 with two applications of asphaltic oil, each one-quarter gallon per square yard, and followed with a light dressing of sand and pea stone. The photo was taken in 1910, the surface hav-

ing had no oil during the summer, but a light coating of sand and fine stone.

New Waterworks System at Coldwater, Ont.

There has just been inaugurated a supply of water by gravitation for the town of Coldwater from plans and estimates prepared by the John Galt Engineering Company.

The sources of the supply are three creeks, situated at a distance of one and one-half miles from the town. The waters of these creeks were impounded by building a small concrete dam across each stream and leading the waters into the storage reservoir by means of tile sewer pipe.

The storage reservoir, situated at an elevation of 140 feet above the main street of the town, is rectangular in shape, its length being 167 feet and its width 82 feet with inner slopes of 2 to 1 and outer slopes of 1½ to 1. The reservoir holds 10 feet depth of water and has a capacity of about 516,000 gallons. The reservoir is formed partly in excavation and partly by banking, the amount of excavation being 2,600 cubic yards.

The inner walls of the basin were lined throughout with a layer of puddle clay, and on this was laid a layer of sand 3 inches deep. The entire walls and floor of the reservoir were then paved to a uniform depth of 8 inches with field stones roughly dressed, the paving being grouted with cement mortar.

From the reservoir an 8-inch cast iron pipe, 5,000 feet in length, was laid through the bush into the town, and within the town 3,600 feet of 8-inch, 3,800 feet of 6-inch and 5,500 feet of 4-inch cast iron pipe, with all the necessary valves, and 24 fire hydrants were laid.

The average daily flow from the springs is 150,000 gallons and as the population of the village is barely 900, an ample supply of water will be afforded for many years to come.

The quality of the water is pure, soft and colorless, and is excellently suited for dietetic and manufacturing purposes.

The pipelaying was carried out by Mr. John F. Connolly, Toronto, at a contract price of fully \$18,000. The reservoir contract was carried out by Mr. Geo. Moogk, Waterloo, Ont., the contract amounting to over \$3,500.

The work was designed and superintended by the John Galt Engineering Company, of Toronto and Winnipeg, represented on the ground by Mr. Geo. D. Mackie, C.E.

A new skyscraper in New York City is the Woolworth Building, at the southwest corner of Broadway and Park Place 105 ft. on Broadway, 197 ft. on Park Place. The area covered is 18,500 sq. ft. The building will contain 45 stories and rise to a height of 625 ft. above the street. The foundations will consist of 38 pneumatic caissons carried to bed rock at a depth of about 112 ft. below the curb, or 77 ft. below ground water level. There will be three floors below the street level, the elevation of the lowest being 37 ft. 6 ins. below the curb. These piers will be sunk to bed rock with the aid of compressed air and will be circular in form. The entire caisson, including the working chamber, will be constructed of reinforced concrete. This work is to be completed by March 15, 1911, by the contractors, the Foundation Company, of New York. The building will cost, including the land, about \$7,000,000.

New Bridges over False Creek at Vancouver

Design and Erection of the Westminster Avenue and Granville Street Bridges—Details of Operation, Progress and Cost

These two bridges are located in Vancouver, B.C., and cross an arm of the sea called False Creek. The upper one, which is at the present head of navigation, is on Westminster avenue, and replaced a wooden structure, which was removed by the contractor before the work of the present substructure was begun, but not before a temporary wooden trestle on piles was constructed to carry the street railway, wagonway, and sidewalk, a short opening being provided over the deepest part of the creek to permit the passage of small boats. The lower one is at Granville street and was built alongside of the old structure, but far enough away from it to prevent the slightest interference of any kind from either street or river traffic.

The Westminster avenue bridge consists of a 128-foot bascule span at the middle of the crossing, flanked at each end by a 75-foot deck plate girder span with an embankment at each approach. The bridge carries



Raising the Bascule Span, Westminster Ave. Bridge, Vancouver, B. C.

a double track street railway in a roadway forty-two feet wide, the distance between central planes of trusses being forty-three feet six inches; and two seven foot sidewalks are borne outside the trusses by cantilever brackets. The roadway flooring of the movable span consists of Australian hardwood planks 2 inches thick, laid transversely to the structure on creosoted planks of Douglas fir 4 inches thick, laid longitudinally. These lower planks rest on 6-in. x 9-in. cross ties of creosoted fir, hook bolted to the stringers, and spaced 30-inch centers. The stringers are of rolled I-beams "Bethlehem Special" section. The sidewalk floor consists of 2-in. Douglas fir planks, supported by longitudinal Douglas fir joists. Outside of each sidewalk is a substantial steel handrail weighing about fifty pounds per lineal foot. The roadways of the two approach spans are paved with creosoted Douglas fir blocks, and their floor systems are similar to that of the movable span.

As will be seen in Fig. 1, the bascule span is of the

simplest possible type. There is no machinery of any kind upon the span itself, that for rotation being located in a small house beneath the south approach span; while that for locking the end of the span and operating the portcullises, or gates, is placed at the inner ends of the approaches. The span and its live load are supported by an overhead axle, resting on pillow blocks which are carried by steel bents, and the whole supported by two concrete piers beneath the axle and two concrete pedestals at the end of the span. These piers and pedestals rest on pneumatic caissons built of timber and concrete, and are sunk to bed rock. The flanking spans rest at the ends of the bridge on concrete retaining walls supported by concrete footing courses sunk into the bed of the stream to a depth of about four (4) feet.

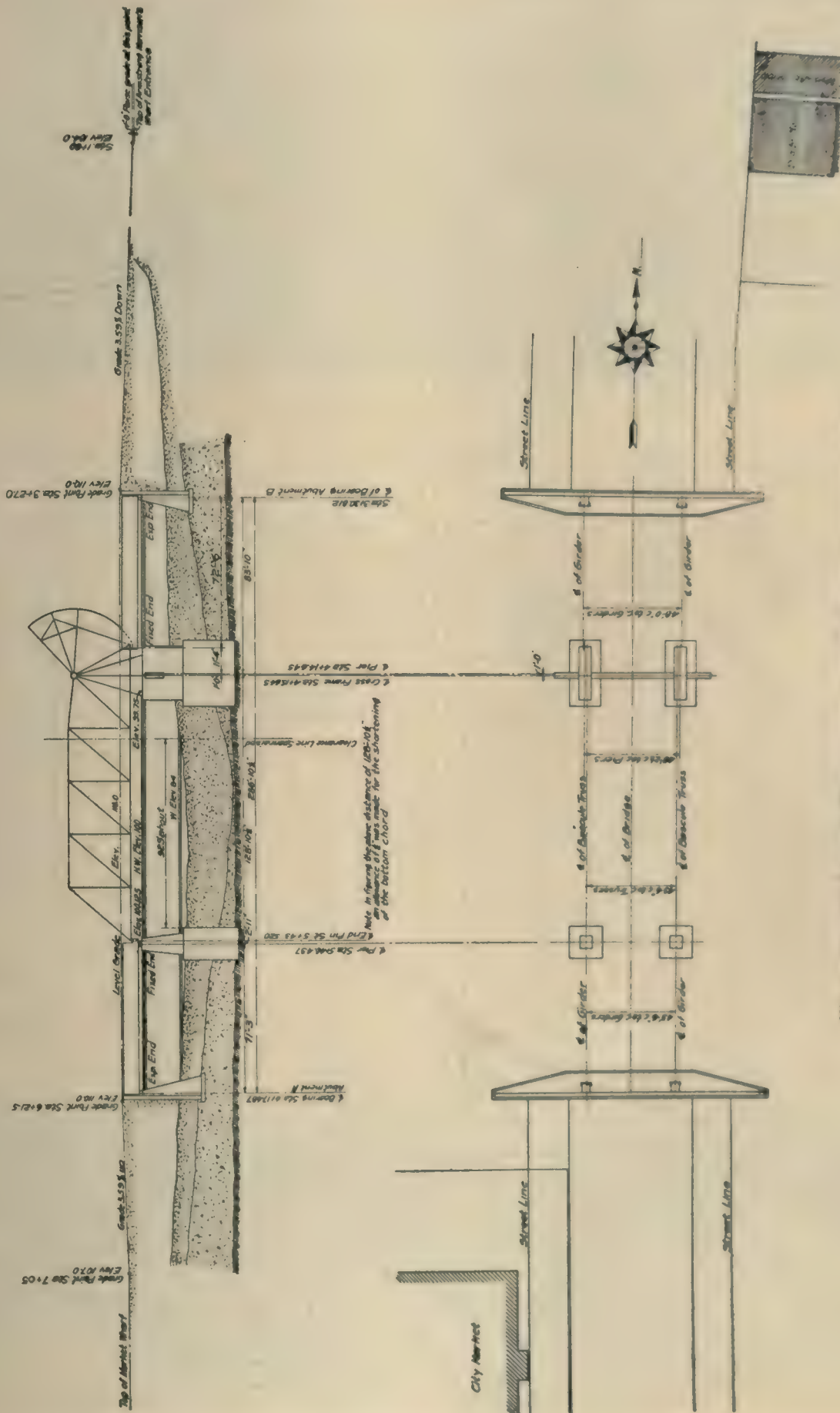
This overhead axle is of a unique type, and its special features have been covered by patent in both Canada and the United States. It consists of a large box-girder, built of plates and angles and having holes in the webs large enough to permit the entrance of a man. At each end it has a large steel casting rivetted to it in such a manner as to make the joint fully as strong as the main section of the girder. Where the casting is thus rivetted to the built girder it is flanged in four rectangular planes, but beyond the connection it is solid. Where the truss rests on the casting the bearing is a spherical surface, and where the casting rests on the journal the bearing is a cylindrical surface at right angles to the axle. The latter is fixed, and the trusses turn upon it, the bearing surfaces being well lubricated automatically. When the axle deflects, as it undoubtedly must, the bearings slip slightly and each truss adjusts itself so as to avoid all secondary stress that would otherwise be caused by the unequal bearing on its two sides.

Again, as the axle deflects, the cylindrical bearing on each support slips slightly, and the load remains vertical.

Each embankment consists of two rock walls with earth filling between. The exterior and interior faces of these walls are of large broken stones carefully laid; the interior is filled solid with broken stone of various sizes, thus reducing the percentage of voids to a minimum.

The trusses of the movable span are of the rivetted Pratt type. The lateral bracing is of the usual rivetted type. The steel bents referred to above are stayed against longitudinal wind thrust by their spread legs, and against transverse wind thrust by knee struts extending to the projecting ends of a lattice girder, which passes through the concrete piers and which is entirely surrounded by concrete to protect it from the corrosive effects of the salt water. The movable span is counterbalanced by a block of concrete in the rear overhead, so placed that the centre of gravity of the entire moving mass lies as near as possible to the axis of rotation.

The machinery for operating the bascule span consists of two electric hoists, one at each side of the bridge. Each hoist consists of a spiral grooved drum, operated through a train of gears by a No. 76 Westinghouse railway-type motor. Each hoisting motor is



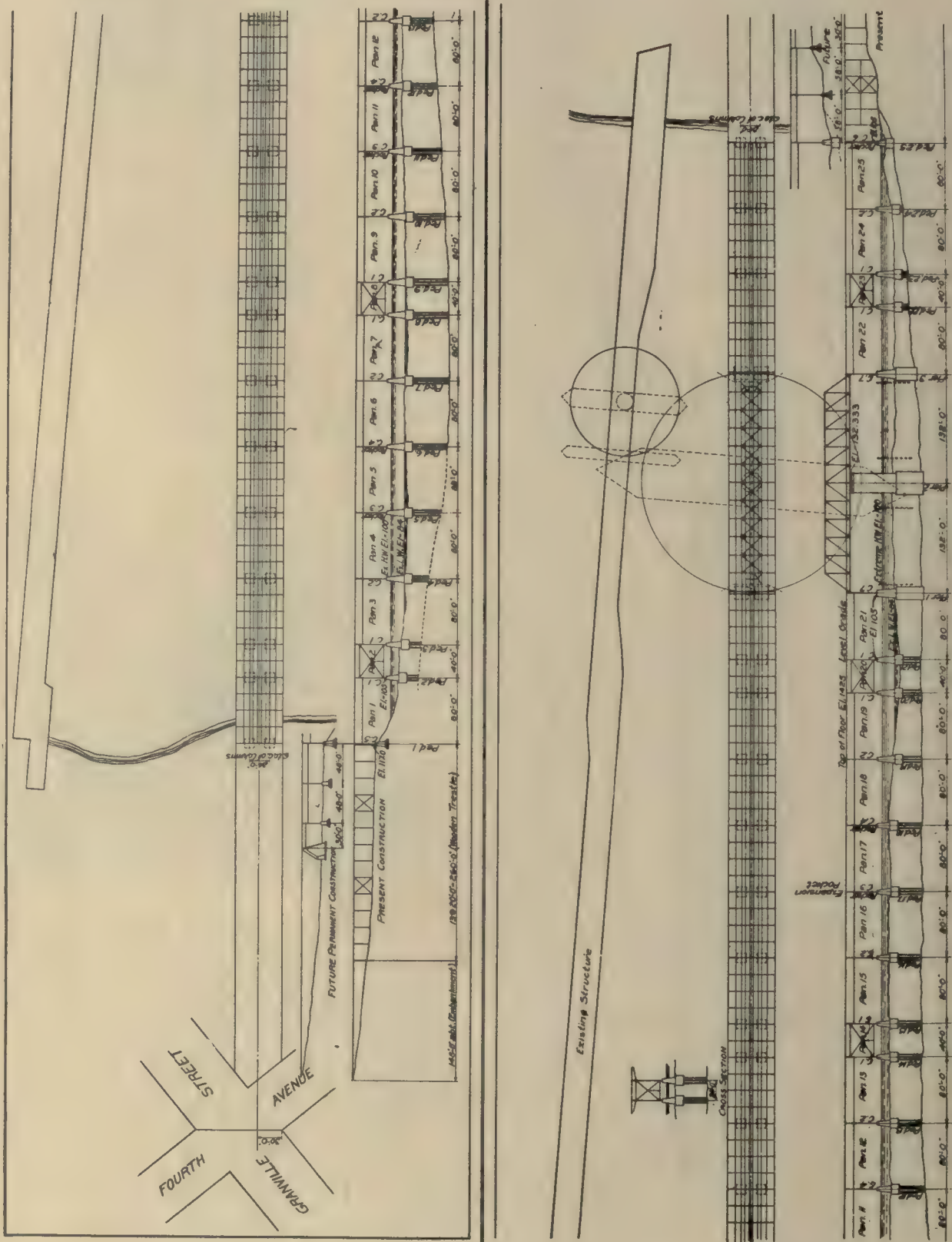


Fig. 2—General Layout Granville Street Bridge, Vancouver, B. C.



Westminster Avenue Bridge, Vancouver, B.C.

equipped with a solenoid brake, and the secondary shafts of the two hoists are connected by a steel shaft. Two pairs of one-and-a-quarter inch plow-steel wire ropes lead from each drum over a four-grooved pulley situated close to the heel of the bascule truss, one pair being connected to the upper end and the other pair to the lower end of the bascule truss arc. Each pair of ropes is so connected to a lever attached to the truss that the stress will always be equally divided between them; and each rope is so connected to the drum that any stretch or variation in the length of the rope may be adjusted. The curved members on the rear of each truss are composed of 18-inch I-beams, and the operating ropes lie between the flanges of these beams.

On the approaches at each end of the bascule span there is a counter-weighted portcullis that is to be raised and lowered vertically by a $3\frac{1}{4}$ horsepower, type K, Westinghouse motor, placed beneath the floor of the approach span. The motors at the lifting end of the bascule also operate a latch and hold the bascule span in position while it is in service.

All the motors are wound for five hundred volts, direct current. The motors which operate the hoists, connected in series parallel, are controlled by a standard street-railway-type controller, placed on the level of the sidewalk near the support of the bascule axle; each motor is provided with an automatically operated switch which throws off the current as the bascule

span approaches the end of its movement in either direction. The motors operating the portcullises are operated by starting boxes placed beneath the controller.

The Granville Street Bridge consists of a 264 foot through swing-span over the deepest water, and steel trestle at each side, the total length of the steel structure being 2,064 feet. At each end of the steel work there is a timber trestle on piles, the total length of these two trestles being 690 feet. At the outer end of each trestle is an earth embankment upheld at its inner end by log cribbing. The total length of the bridge is 3,290 feet. The width of the structure is 56 feet over all, consisting of a forty-two foot roadway with a double track electric railway in the middle and a seven-foot sidewalk on each side. The steel trestle consists of twenty deck, plate-girder spans each eighty feet long; and five deck, plate-girder, tower spans each forty feet long, as shown in Fig. 2. The girders are supported on steel bents and towers resting on concrete pedestals, which, in turn, rest on pile foundations having their tops encased with concrete contained in boxes built of 12-in. x 12-in. timbers. The swing span, which is 37 feet above extreme high water, rests on a concrete pivot pier, supported by a pneumatic caisson sunk to bed rock.

The diameter of the drum is 26 feet, and that of the shaft under coping 30 feet. This span is supported at each end by a steel bent, resting on two pedestals



Granville Street Bridge, Vancouver, B.C.

built on pneumatic caissons that, on account of the possibility of future dredging, were sunk deep into a mass of concreted gravel and boulders. The smallest square caisson that could be handled was 16 feet, which permitted a base 10 feet x 10 feet. The height of shaft of pedestals is 23 feet; average height of crib and caisson 30 feet; and each pedestal is 7 ft. x 7 ft. on top. The draw protection is built of Australian hardwood piles, driven to refusal, and sway braced and sheathed with untreated Douglas fir.

The pavement consists of 4-in. creosoted blocks of Douglas fir, resting on 4-in. creosoted fir planks, supported by 6-in. x 9-in. ties, 30-in. centres, these in turn being supported by 4-in. shimming timbers bolted to the stringers. The pavement is crowned 4-in., being level for five feet in the centre.

The stringers used in this bridge are of "Bethlehem Special" section, as in the Westminster avenue bridge.

The length of the columns in the bents supporting the steel trestle is about thirty-six feet, and they are spaced twenty-four feet centres, the longitudinal and transverse sway bracing consisting of four-angled, laced I-struts. There are three expansion points provided; necessitating six sliding pockets.

The swing span is of the centre bearing type with rivetted Pratt trusses, thirty feet deep, spaced twenty-four feet centres. The cross girders and stringers are similar to those in the steel trestle. The span is operated by a No. 12A, railway-type, Westinghouse electric motor, wound for five hundred volts direct current. The machinery is located in a house on top of the span at mid-height.

In designing this structure, the live load used was Class B. of De Pontibus, for the roadway, and Class C. of same for the sidewalks; and in addition the double track electric railway load of two coupled cars on each track for stringers and floor beams, and one car on each track for girders and columns. The electric cars are each 47 feet long over all, and their weight when loaded was taken as 74,000 lbs. each. The wheel spacing used was 5 ft.; 27 ft.; 5 ft., leaving five feet of projection at each end of car. In addition to the above, a road roller of Class A. (De Pontibus) was used in figuring roadway members, the impact being neglected in the secondary members. Both bridges were designed by Waddell & Harrington, Consulting Engineers, Kansas City, Missouri, who also supervised the erection of the entire structure. The contractors for the substructure were Messrs. Armstrong, Morrison & Company, Vancouver, B.C., who also did the assembling and erecting of the superstructure, which was fabricated by the Dominion Bridge Company, of Montreal. Work was begun on the site by the substructure contractors in May, 1908. The temporary structure at Westminster avenue was first completed, and work was then begun on the approaches and foundations of both bridges. The first steel was erected on the Granville street bridge in December, 1908. Owing to the great length of this bridge, both the substructure and superstructure work were carried on simultaneously, the substructure being practically completed in June, 1909. The bridge was formally opened in the following September. Owing to the short length of the Westminster avenue bridge, however, it was considered advisable for the superstructure contractor to await the completion of the piers and embankments before attempting to start erection. The first steel was erected in April, 1909, and the structure was practically completed by the end of the year.

The following is a list of unit prices paid to the contractors:

Mass in place of cribs and caissons of pneumatic piers, \$17.50 per cubic yard.

Mass in place of bases of pile piers and pedestals, \$13.50 per cubic yard.

Shafts of all concrete piers, pedestals, and abutments, \$10.90 per cubic yard.

Anchor bolts and their details in place, 6½c. per lb.

Foundation piles projecting below concrete bases, 32c. per lin. ft.

Rock in place in walls of earth embankment, \$2.25 per cubic yard.

Earth embankments, 75c. per cubic yard.

Timber in place in temporary bridge, including cost of metal, \$25 per M. ft. B. M.

Piles in place in temporary bridge, 20c. per lin. ft.

Untreated timber in place in trestle approaches, \$29 per M. ft. B.M.

Creosoted plank in place in trestle approaches, \$50.-65 per M. ft. B.M.

Pavement of trestle approaches, \$1.98 per sq. yd.

Metal in plate-girder spans, erected, 4.69c. per lb.

Metal in bascule span, erected, 7.44c. per lb.

Metal in draw span, erected, 6.48c. per lb.

The total cost of the Westminster avenue substructure was \$87,916.28, and that of the superstructure \$106,729.27. The cost of the bascule span superstructure and substructure was \$112,125.60, of which the steel in the spans amounted to \$62,810.

In the Granville street bridge the final estimate of the cost of superstructure was \$305,384.89, and that of the substructure \$146,098.28. The total quantity of steel in the Granville street bridge is 2,421 tons, of which 458 tons are in the draw span. The total weight of the Westminster avenue superstructure is 629 tons, including 422 tons in the bascule span. The substructure of this bridge contains 3,060 cubic yards of concrete, and that of the Granville street bridge 7,230 cubic yards.

The Granville street bridge was formally opened by Earl Gray, Governor-General of Canada, on September 6, 1909, on which occasion many high compliments were paid to the designers and contractors of this important structure.

With nearly 26 miles of street paving contracts already passed, and a large accumulation of unfinished local improvements awaiting attention, the city council of Victoria is considering a halt until the contractors have caught up.

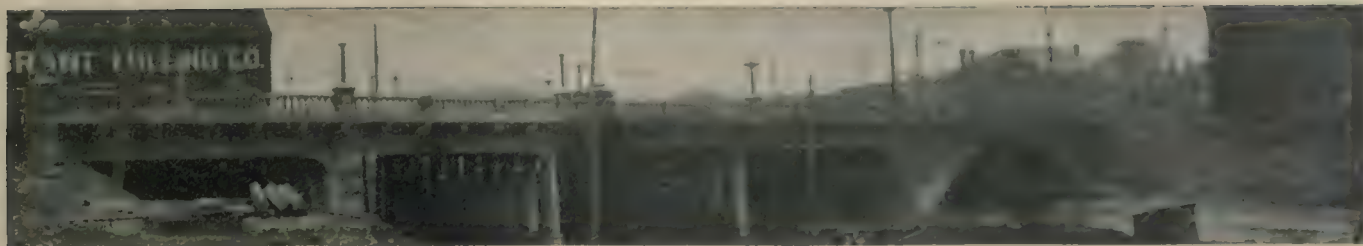
An Introduction

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Market Street Bridge and Approach, Brantford, Ont.

The Market Street Bridge, Brantford, Ont.

Monolithic Structure of Four Reinforced Concrete Girder Spans and One Arch—One of the Largest Bridges of this Type

The above bridge was built during the summer and fall of 1910 by the city of Brantford, Ont. It was designed to carry the traffic of one of the principal business streets of the city across the Grand Trunk Railway Company's tracks, and across the tracks of the Brantford and Hamilton Electric Railway Company; also over a canal, owned by the Western Counties Electric Company, which is used for power purposes. The Brantford Street Railway Company have a single track line laid over the bridge.

The Market street bridge is a monolithic structure consisting of four reinforced concrete girder spans of from 36 ft. to 46 ft. each, and one reinforced concrete arch of 60 ft. span, the length over all being 245 ft. 9 ins. The width of the roadway is 40 ft. 3 ins. from curb to curb. The sidewalks on each side have a clear width of 10 ft. 3 ins. each. Concrete balustrades bring the total width of the bridge up to 64 ft. over all.

Girders were used over the railway tracks as it was found that arch spans would not give the necessary clearance to accommodate the traffic beneath.

In general construction the street railway track and asphalt block pavement are supported by a six-inch reinforced concrete slab carried on 18 in. x 42 in. reinforced concrete girders, spaced 5 ft. 9 ins. centre to centre. They are designed to act as Tee beams in conjunction with the floor slab. Supporting the girders are square concrete columns, 20 in. x 20 in. at the neck and 24 in. x 24 in. at the base. They are placed on a pedestal wall which carries the load to the footings.

Over the arch, the pavement and tracks are carried on a similar reinforced floor slab, supported on

transverse spandrel walls which carry the load to the arch ring. The arch ring rests on plain concrete abutments.

The reinforcement in the floor slab consists of $\frac{1}{2}$ -in. deformed bars, spaced 10-in. centres. The girders are reinforced with Kahn trussed bars in cross section, varying with the length of the span. The reinforcement in each column consists of four 1-in. square deformed bars, one at each corner, tied together at 20-in. intervals with $\frac{3}{8}$ -in. round steel. The reinforcement in pedestal wall consists of $\frac{1}{2}$ -in. bars spaced 18-in. centres both ways. The arch ring is reinforced with 1-in. square deformed bars at intrados and extrados spaced 14-in. centres, except for a distance of 7 ft. from each soffit, when they are spaced 9-in. centres.

One half the width of the sidewalks for the whole length of the bridge overhangs the supports and is carried by reinforced cantilever beams, which are tied back into the main girders over the girder section of the bridge, and into the spandrel walls over the arch section, by means of two Kahn trussed bars placed in the upper section of the beams.

Wall F1 is designed to take the full thrust of the earth backing, without assistance from the superstructure of the bridge. Six reinforced revetment walls, 18-in. thick, tie the face wall to the bottom slab. This slab is reinforced with 1-in. square deformed bars placed close to the under side, and the face wall is reinforced in the same manner, with bars placed close to its outer surface.

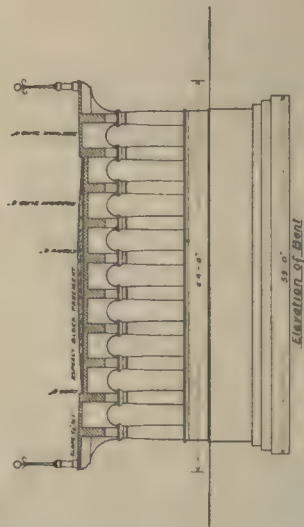
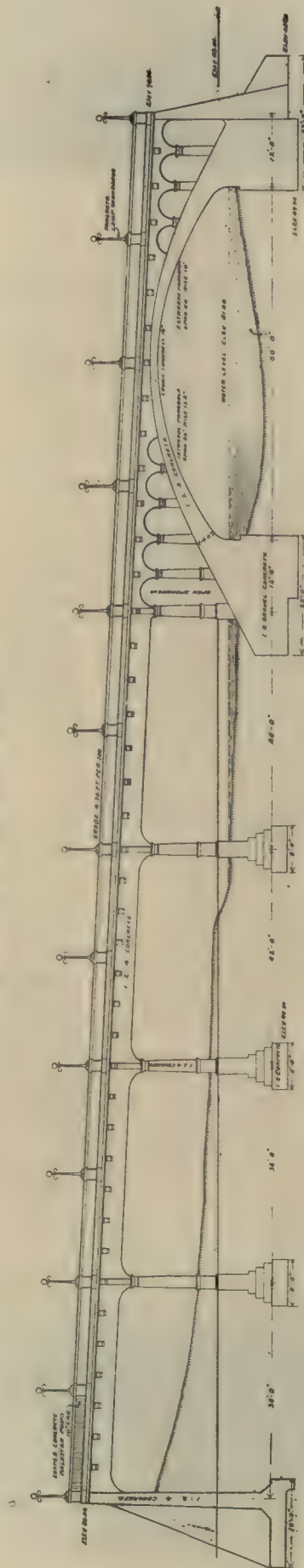
The footings of Bents G1, G2 and G3 are of plain



Water Span, Market Street Bridge, Brantford, Ont.



Plan Showing Arrangement of Floor Supports



REINFORCED CONCRETE BRIDGE

FOR

SOUTH MARKET STREET

CITY OF BRANTFORD

concrete, as are also the arch abutments and wing walls.

The footings were carried down to a firm stratum of red clay about 10 ft. in thickness overlaying the rock. In the calculations, a pressure of two tons per square foot was allowed on the foundation soil.

The concrete used throughout the construction was made from gravel obtained near the site of the bridge. For heavy mass work in the footings, arch abutments, and wing walls, it was used just as it came from the pit, in the proportion of 6 to 1. For the walls, columns, girders and arch ring it was run through a rock crusher and screen. The proportions for the work were 1:2:4, the coarse aggregate ranging in size from $\frac{3}{4}$ in. to $1\frac{1}{4}$ in. For the floor slab and balustrades the proportions were kept the same, but the size was reduced to $\frac{3}{4}$ in.

There are about 4,000 cu. yds. of concrete and 100 tons of steel in the bridge. The cost complete with

to be economically handled and roughly finished, and its resulting unsightly appearance has detracted from its desirability. It is therefore clear that there is great necessity for both protective and decorative coatings for concrete. The problem of waterproofing concrete is being studied from several standpoints besides that of applying protective coating. For instance, the endeavor to reduce the voids in concrete to a minimum, as well as to obtain uniformly fine ground cement and to eliminate the tendency of the cement to form free lime in setting, are all absolutely necessary steps in the production of a waterproof concrete and are the special business of the cement manufacturer and engineer of construction to work out.

Much experimental work is under way with regard to waterproofing concrete by means of the addition of various foreign substances in small quantities to the aggregate. Some of these materials are of mineral composition and others are organic. Many compounds are now on the market, but the composition of most of them is not published. Some analyses have been made recently on a series of compounds widely advertised for use in waterproofing, strengthening, or decorating concrete. Among the materials contained were stearic acid compounds, gums, waxes, soaps, mineral chlorides, inert pigments, and asphalt derivatives. Much interesting information is given regarding the composition of such compounds, although the names of the particular compounds are not given. The possibility of ultimate deleterious effects on concrete from the use of these internal waterproofing materials is a subject for joint study by engineers and paint chemists. In addition to proving the advantages of such materials as water excluders, it should be determined whether they may corrode the steel used in reinforcing concrete or whether they may effect the set and tensile strength of the cement itself.

It is particularly the province of the paint chemists to study the subject of paint coatings for concrete. Oil coatings have been found to be badly affected by the free lime present, which causes saponification and subsequent solution of the saponified coating. The porosity of cement or concrete surfaces causes an absorption or suction effect that renders it necessary to apply to a given area three or four times as much paint as would cover an equivalent area of wood. Two very important lines of investigation are therefore suggested—the neutralization of the free lime in the cement and concrete and the proper filling and treatment of the pores of the concrete—in order to prevent the suction of any paint that may be applied later.

Two trackless trolley lines, according to a report in the London Times, have been recently built in Bremen. The cars resemble motor omnibusses. Two trolley wires are used, one above another, about 8 inches apart. The trolley, or collector, has two rollers running on the upper wire and two bows on the lower. The wires from the collector to the car coil or uncoil automatically on a drum in the car so as to permit it to turn out for other vehicles.

The Minister of Railways, Hon. G. P. Graham, confirms the report of the resignation of Mr. H. E. Vautelet from the Quebec Bridge Commission. For some time past Mr. Vautelet has not been enjoying the best of health and he had previously intimated his intention of resigning when the bridge plan was accepted.



Constructional View of Market Street Bridge
Brantford, Ont.

pavement and electric lighting fixtures, was about \$50,000.

The bridge was designed under the supervision of the City Engineer, Mr. T. Harry Jones, by Mr. Frank P. Adams, assistant city engineer. The construction was supervised by Mr. Arthur O. Secord. The contractors were Messrs. J. Y. Harper & Son, of St. Thomas, Ont. The reinforcement throughout was supplied by the Trussed Concrete Steel Company, and the cement used was the "Blue Lake" brand, manufactured by the Ontario Portland Cement Company.

Paint Coatings for Concrete

The use of cement concrete for structural purposes has already become world-wide, and it is increasing at a rapid rate. Heretofore little attention has been paid to coatings for concrete. Enough time has now elapsed to show that cement concrete alone is not as durable as might be wished partly because the cement either contains free lime or develops free lime within itself, after setting. Furthermore, concrete in order to compete with other structural materials has had

Bridge Construction in New Brunswick

Difficulties Encountered on the Graham Brook Viaduct—Methods Employed by the Contractors—The International Bridge, another Interesting Contract

On July 13th last we published an article dealing with some of the concrete work on the National Transcontinental Railway executed by Messrs. Powers & Brewer. The article contained views of the Little River, Salmon River and Caton Brook viaducts. Herewith are shown views of the Graham Brook viaduct on the same contract. The work consists of two abutments and twenty pedestals. The amount of concrete placed in this viaduct was not large, but the work is interesting owing to the difficulty of execution, caused by the nature of the ground. The

found about two miles away and landed on the east side, as shown on the right of the first picture. A long box with an open top was constructed, with three doors hinged at the top of box and with about eight feet of wire screen, 30 mesh to the inch, as part of the bottom. The gravel was shoveled into this box and as it passed the screen a $1\frac{1}{4}$ -in. stream of water was sprayed on it, pumped from the brook below by a steam pump. The loam was washed through the screen and the waste water carried off in a ditch below the trough. The hinged doors prevented the coarse



Graham Brook Viaduct, Transcontinental Railway, Looking East



Graham Brook Viaduct, Transcontinental Railway, Looking West

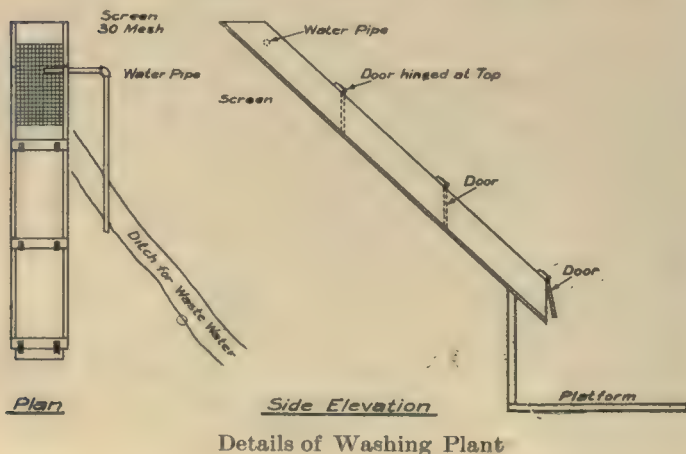
viaduct is 500 feet long, and the distance from base of rail to water is 160 feet. The flat was very swampy, and machinery and material had to be hauled on the high ground at each end of the viaduct and taken down the steep hills.

Gravel of good quality, but containing loam, was

gravel from becoming separated from the sand. Excellent results were obtained.

The mixing was started by hand but after a few days a No. 1 Smith mixer was used. The concrete was taken across the flat on a trestle, 30 ft. high, in bottom dumping buckets and placed in the pedestals by means of derricks, operated by steam.

A view is also shown of the International Bridge between Van Buren, Maine, and St. Leonards, N.B., built by Messrs. Powers & Brewer. Excavation was started on September 23rd and the bridge was completed in 52 days. Gravel obtained along the river banks was used for the concrete. The work consists of one wing abutment, one U abutment and three piers. Three of the spans will be 145 feet and one 326 feet. The foundations were carried to a depth of about 8 feet below the river bed, through gravel and blue clay, and a good bottom was reached. Sheet piling, 6 inches thick, was driven ten feet below the foundations and the piers were rippapped to prevent scour. Vulcan cement was used, and the concrete was mixed in three Smith mixers.



Coke Breeze Concrete Commended

Coke breeze as an aggregate is thought by many to be beneath notice, says Mr. Thomas Potter, M.C.I., in a paper read before the Concrete Institute. It was extensively used for many years, principally for floors, but undeservedly lost its character some time ago through a letter in the Times telling of its failure in Germany, where it had been prohibited. It was not stated of what class of coal it formed the residue, and this is an important point. Some to be seen in Scotland is quite unfit for concrete purposes, but in England this is not found. The letter referred to was followed by others saying it was so inflammable that, if exposed to a severe fire, it was second only to coal in assisting combustion.



International Bridge between Van Buren, Me., and St. Leonards, N.B.

So far as its strength is concerned, Mr. Kirkaldy made some experiments for the West Ham Corporation some years ago with the following result: A brick pier, 18 in. square and 18 in. in height, made with best stock bricks and blue lias lime mortar, crushed at the end of two years with 46 tons per square foot; a similar pier of Harold wood bricks and blue lias lime mortar crushed with 75 tons per square foot; another pier made of six parts of coke breeze to one part of Portland cement crushed with 131 tons per square foot.

As to inflammability, the tests made by the British Fire Prevention Committee with various kinds of floors, each under similar conditions, exposed for three hours to an increasing and ultimate temperature of 1,900 deg. F., and water played on them from a hose pipe, gave the following results: Coke breeze and burnt ballast equal and best; each was found, after being allowed to cool, practically free from cracks or deflection; and Thames ballast and granite chips the worst.

Mr. Potter stated that he had used some thousands of tons of coke breeze for floors, and did not remem-

ber a failure of any kind. He was aware that coke breeze is condemned by many as an unsuitable aggregate, but spoke from his own experience; and although it is not, taken altogether, the best material for floors and roofs, it has proved to be one of the best.

Reinforced Concrete Piles

Mr. H. J. F. Gourley read a paper before the Manchester students' section of the Institution of Civil Engineers recently on "Concrete and Reinforced Concrete Piles." Mr. Gourley said that to obtain wooden piles of a standard quality had been an increasing difficulty during late years, and it was necessary, there-

fore, to find materials which were at least as strong and economical as wood. The use of concrete, and recently of reinforced concrete, had become more extended and varied as the knowledge of their properties had increased, and it seemed quite natural that the question of their suitability for piling should have engaged the attention of engineers anxious to find an efficient substitute for wood. Apart from the difficulty of obtaining timber piles of a uniform quality, wooden piles might also be defective, though apparently sound, judging by their external appearance. With thorough supervision and the use of properly graded materials, there should not be any difficulty in securing perfect uniformity and soundness in concrete and reinforced-concrete piles. The load placed upon an average wooden pile might be taken at 15 tons, but on concrete piles an average load was 40 tons or more. The wooden pile, again, must always be wet. If this condition obtained the life of the pile was long, but should the pile be subjected to the partially wet and partially dry state, deterioration soon set in, and its life was short. There was no such risk where concrete piles were used.

Sewer System of the City of Winnipeg

General Principles and Features of Design—Sewer Barrels, Manholes and Catch Basins of Concrete—Cost of Labor and Material

Specially Contributed by W. Aldridge, City Engineer's Department, Winnipeg

For sewer purposes Winnipeg is divided into twenty districts, each having a distinct system of sewers discharging through a separate outlet into one or other of the two rivers at whose junction the city is situated. Into the Assiniboine there are, or will be, eight outlets, and into the Red River twelve outlets. There are also three secondary outlets—one at the west end of River avenue, one at Water street,

bard avenue which relieves the old sewers last mentioned in time of excessive storms.

The main districts are shown with approximate areas on Fig. 1. Three of the outfall sewers, Ash street, Centre street and Jefferson avenue, have not yet been constructed, but it is the city's intention to build them during the present year. The areas of the various districts are shown on the map. It will be seen that the total area within the city limits is provided for, together with about 1,000 acres north of the city, which will be taken care of by the proposed Jefferson avenue outlet, making a total of 15,000 acres provided for.

Our sewers are all combined sewers and most have been designed by the use of Adams' formula for a maximum rainfall of 1 inch in an hour, one-half running off; and it is found that this fits local conditions as well as if it had been evolved from them. It is possible, however, that this is due to the long narrow form of the districts, which increases the time of concentration, thus giving time for the lower reaches to clear before the storm water from the upper end comes down. The old wooden sewer in the business district, which discharges at the foot of Bannatyne avenue drains a district which is rapidly being closely built up and paved, and which is all concentrated about the outlet. This sewer has occasionally been heavily taxed, therefore, and it was for this reason the Lombard sewer was constructed. So that though the old formula is still in use it is now checked by the more rigorous method, taking into account time of concentration, percentage of pervious and impervious surface, rainfall, etc. We are miserably deficient, however, in satisfactory rainfall records.

The city varies from 30 to 36 feet above low water in the rivers and is therefore practically level. As a consequence our sewers are about 30 feet deep at the outlet, gradually rising to a depth of 10 feet at flush



Fig. 1.—General Layout of Sewer Districts.

and one at Boyle street, draining small sub-districts which have been cut off from the main sewer district to which they belong by railway construction or other cause. Besides, there is a second outlet at Bannatyne avenue, this being the first sewer built in the city. It takes care of the drainage of a small area including a large portion of the business districts. There is also a sewer discharging at the foot of Lom-

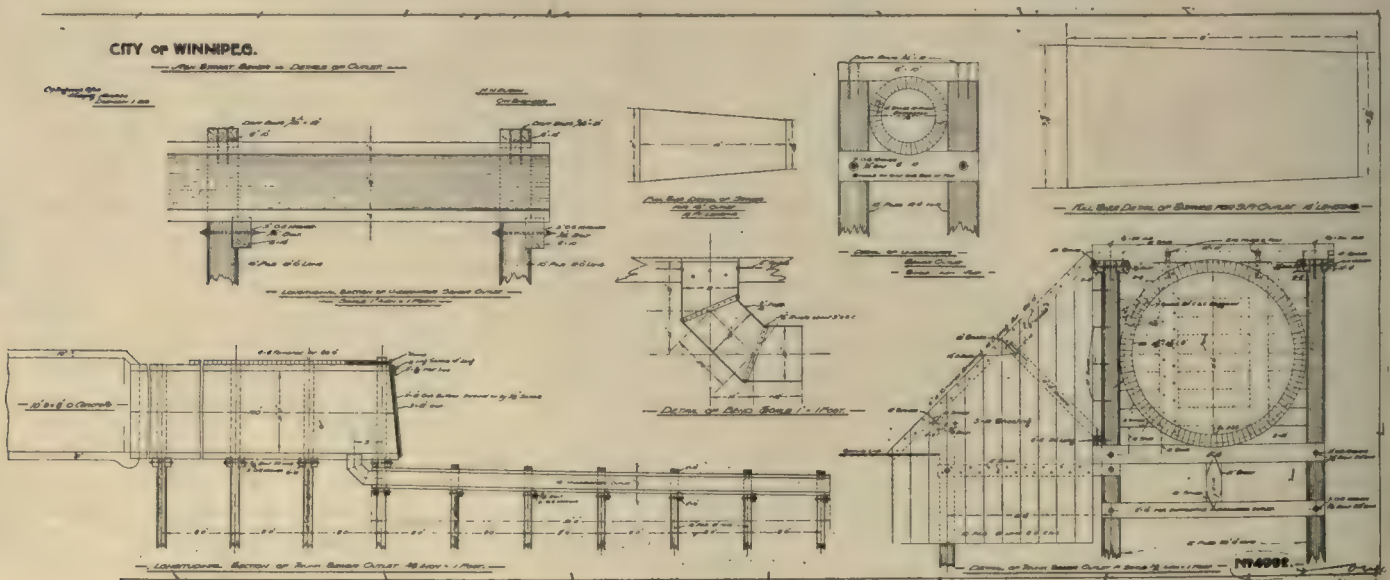


Fig. 6.—Sewer Outlet Detail.

tanks, the grades not being affected materially by surface contour. The trunk sewers are generally located about the middle of the district, as this decreases the size and depth—and therefore the cost—of sub-mains, and for the same reason the sub-mains are now generally placed in the middle of their sub-districts.

The laterals are made of 12-in., 15-in. and 18-in. vitrified pipe. The sub-mains and trunk sewers, from 2 feet in diameter up, are now all built of concrete, though some of the older sewers were of brick, and the earliest mentioned above of wood.

The sewers are designed to give a minimum velocity of 3 ft. per second, running full. Manholes are placed at all intersections and changes of alignment, and in long blocks from 300 to 500 feet apart, depending on size of sewer. Flush tanks, averaging 262 gallons capacity, are placed at all summits. This is necessary on account of long periods, especially in winter, when no storm water enters the sewer.

Our sewer outlets, from a point well in the river bank to the outfall end, are constructed of wood and are circular in form. The outer end is three or four feet above low water and is closed by a wooden door, hung from the top, which floats on the stream when running full. The main barrel is tapped about 10 feet from the end by a smaller pipe also constructed of wood, except for the bend at the junction. This small outlet extends 50 feet or more beyond the end of the main outlet. It takes the dry weather flow well out into the stream in times of low water. The main sewer barrel, from the point where it leaves the bank, to the end, is supported on piles and is protected, on the upstream side, from the spring ice-flow by a sloping ice break, constructed of 6 x 6 timber, laid so as to carry the ice over the outlet.

The sewer barrel beyond the wooden outlet is built of concrete. All sewers larger than 3 ft. are built egg-shaped, of the form shown in figure 3. The thickness of wall is the same all round, the standard thickness being as follows;

Short diameter of sewer.	Thickness of wall.
Feet	Inches
2' 0" to 3' 0"	4"
3' 0" to 4' 5"	6"
4' 5" to 6' 0"	8"
6' 0" to 8' 0"	10"

and so on.

Manholes are built of concrete rings 2ft. 6 in. in diameter, 4 in. thick and 12 in. high, except the four bottom rings on laterals. On these small sewers the four bottom rings are 6 in. thick and the three lowest are split in half. Between the two halves are inserted concrete blocks 6 in., 12 in. and 18 in. respectively, so that the manhole lengthens along the line of the sewer. This is shown clearly in figure of manhole. The covers are of the open grate type to provide ventilation.

The flush tanks are built of concrete, of the form shown in figure 5, with a short manhole shaft above. The siphon, which is automatic, is the invention of the City Engineer, Col. H. N. Ruttan.

The catch basins are built of concrete rings, similarly to manholes, and are 8 feet deep. They are connected to the sewer by 9-inch vitrified pipe connections provided with a hood trap at the catch basin end. They have closed covers. House connections are made of 6 in. vitrified sewer pipe. The sewers are ventilated through open manhole grates. A few years ago the use of the house trap was made optional with a view to improving the ventilation. Various experi-

ments have been made, mostly by private parties with council's permission, to deodorize the sewer air as it escaped at the manholes, or by means of gas jets at the top of standpipes to burn it, with more or less success.

The sewers are constructed by contract or day labor, according as the figure of the City Construction

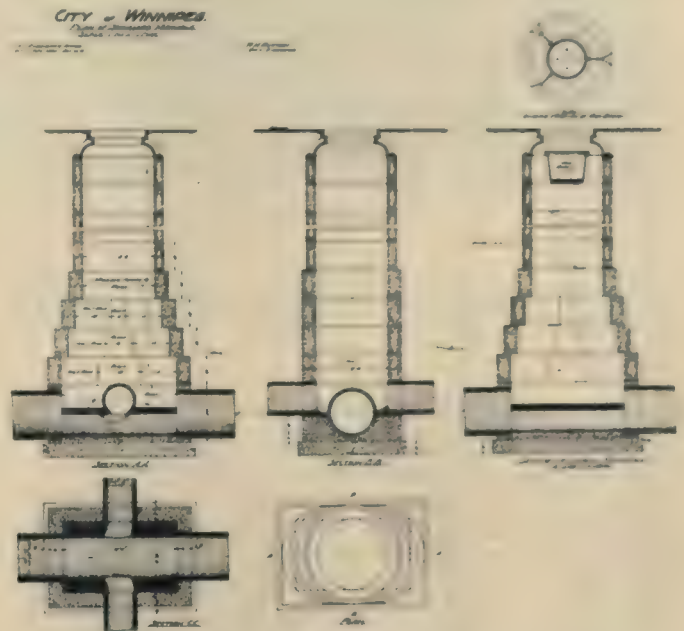


Fig. 2.—Standard Manhole.

Engineer is above or below the lowest bid received.

The ground consists of clay. There is no rock met with except an occasional boulder. In a few places quick-sand is found near rivers. The trenches usually require timbering.



Fig. 3.—Egg Shaped Sewer used by City of Winnipeg.

The city owns three Carson bucket trench machines. In one the buckets are carried on a cable and in the other two on a trestle made of A-shaped bents. These machines are used in the construction of large sized sewers.

The work is done winter or summer. The cost of winter work has been greatly reduced by the use of the Hurst frost-breaker, a machine devised by W. Hurst, late sewer foreman for the city. It consists of a chisel attached to a pile driver head which chops off huge lumps of earth down to the frost line which are lifted out of the trench by a derrick, also part of the machine. This machine is used on the wide trenches only. The cost of excavating the frost layer is reduced from \$1.50 per cubic yard by ordinary picks and shovels to 20c. to 30c. by use of the mach-

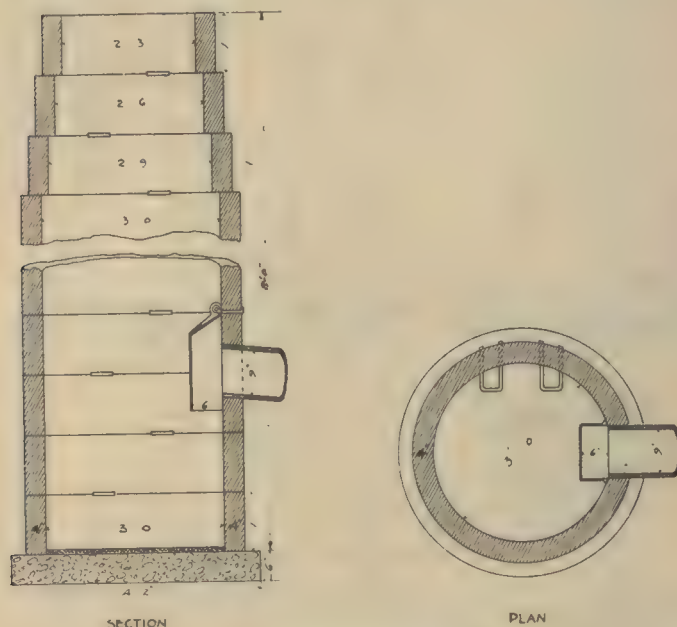


Fig. 4.—Standard Catch Basin.

ine. The excavation for laterals is done by hand.

Concrete for sewer barrel is mixed by machine and deposited by means of chutes, except of course, in tunnel work, where the concrete is hauled from machine to the shaft, lowered in barrows and wheeled to end of tunnel to be deposited by hand. The concrete rings for manholes and catch basins are moulded at the city yard and delivered to job when required.

On contract work the city supplies vitrified sewer pipe on the job, all other material and plant being supplied by the contractor.

Costs.

The city pays the following prices for vitrified salt glazed sewer pipe delivered on the job:

9-in.—23c. to 25c. per lin. foot.

12-in.—38c. to 40c. per lin. foot.

15-in.—55c. to 60c. per lin. foot.

18-in.—85c. to 90c. per lin. foot.

Junction pipes for 12-in., \$1.40 to \$1.50 each (2-ft. long.)

Junction pipes for 15-in., \$1.80 to \$2.00 each (2-ft. long.)

Junction pipes for 18-in., \$2.50 to \$2.75 each (2-ft. long.)

The costs of sewers, based on the bids of successful tenderers, are approximately as follows:

12-in., \$1.10 to \$1.40 per lin. foot, for depth from 10 ft. to 14 ft.

15-in., \$1.60 to \$1.75 per lin. foot, for depth from 12 ft. to 16 ft.

18-in., \$2.10 to \$2.35 per lin. foot, for depth from 14 ft. to 18 ft.

The above prices are made up of average of suc-

cessful bids, plus cost of pipe which the city supplies to the contractor, and 10 per cent. to cover inspection, engineering, office expenses, etc.

Catch basins complete with 9-in. pipe connection to sewer—16 ft. long—cost \$48, and manholes cost about \$6 per foot of shaft, including castings. Flush tanks cost \$130 each.

The cost of concrete in large sewers is about \$7 a cubic yard in open trench work, and in tunnel work \$9.50. Excavating with the Carson trench machine, trenches 20 to 30 feet deep, averages 75c. per cubic yard. This, of course, includes refilling. Timbering such trenches, allowing that the timber may be used three times, between \$1.25 and \$2.00 per foot of

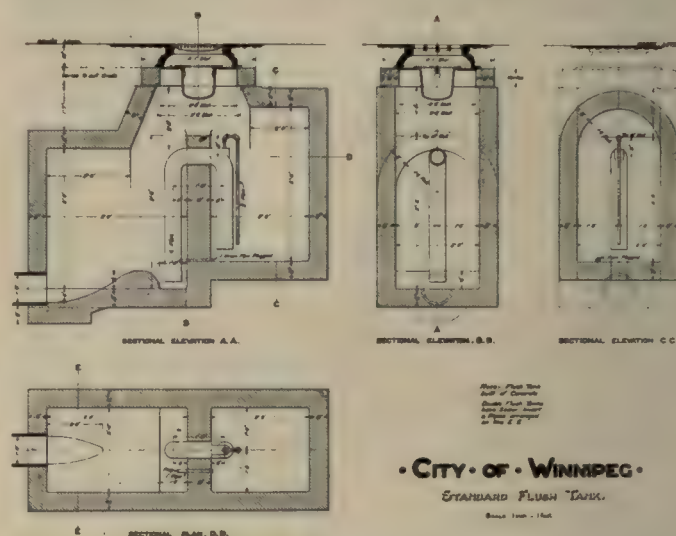


Fig. 5.—Standard Manhole and Flush Tank Combined

trench. Excavation in tunnel costs about \$1.50 per cubic yard and little or no timbering is required.

Cement cost on the job \$1.90 per barrel, sand and gravel \$1.15 per cubic yard, and broken stone \$1.85 per cubic yard on the job. Common labor was paid 20c. per hour; concrete men received 22½c. per hour.

Estimates for the current year's expenses and proposed work at Vancouver, B.C., recently passed by the Board of Works for that city, amount to nearly \$700,000, an increase over last year of \$250,000. Among the items are, street maintenance, \$160,000; street cleaning, \$75,000; street sprinkling, \$10,350, including three additional wagons; new road roller, \$7,000; portable rock crusher, \$7,500; additional tools and maintenance, \$10,000.

The first of two subaqueous rock crushers ordered by the Dominion Government for use in connection with dredging operation on the British Columbia coast will arrive on the Blue Funnel liner Ning Chow, and when put together by experts sent over for the purpose will be first employed in the harbor at Victoria, B.C. In appearance the crusher will resemble a large scow, fitted with a derrick similar to a pile-driver, from which is suspended by a cable a chisel of compressed steel weighing from 10 to 15 tons. The chisel fitted with a hard cutting point, is allowed to fall a distance of six to ten feet by its own weight on the surface of the rock, delivering blow after blow until a layer of rock three feet in thickness has been crushed, when the dredge scoops up the debris. The use of the crusher obviates all blasting and is said to be more thorough and economical.



Present Quarry Workings of Messrs. Doolittle & Wilcox, Limited

Recent Extensions to the Dundas Quarries

Description of the Modern Crushed Stone Plant Owned by Doolittle & Wilcox, Limited—Details of Operation and Equipment

During the past five years the demand for crushed stone of all sizes and for all purposes has increased enormously. This has been due in part to the increased activity in the good roads movement, the growth of the steel and iron industry, the wide application of concrete to all classes of structures and other similar contributing causes. To meet this increased demand for this product it has been necessary for the quarry operators to design and install plants capable of a greatly increased output. The design of these modern plants has been the subject of much careful study both in the United States and Canada, and the comparatively small number of them in operation at the present time has justified the expenditure involved in the installation.

Such a plant embodying the latest ideas in rock crushing and screening machinery and equipped with the best quarry machinery obtainable has just been completed by Doolittle & Wilcox, Limited, at their Dundas quarry. Owing to the many novel features in its layout, and the completeness and adaptability of the arrangement for meeting the demand of the trade, a detailed description of the plant will be of interest to our readers.

The workings are on the top of the limestone ridge running along the northern side of the Dundas valley and about a half mile from the Dundas station on the

Grand Trunk Railway. The company's sidings come off the main line tracks at a point near the station and parallel the railroad at a grade of about one per cent. for a distance of about three-quarters of a mile. The brow of the mountain at this point is about 250 feet above the level of the Grand Trunk tracks, the rock on top being covered by a deposit of clay and loam to an average depth of about 10 ft. To get at the rock it is necessary to remove this material which is handled by electric shovels and wasted.

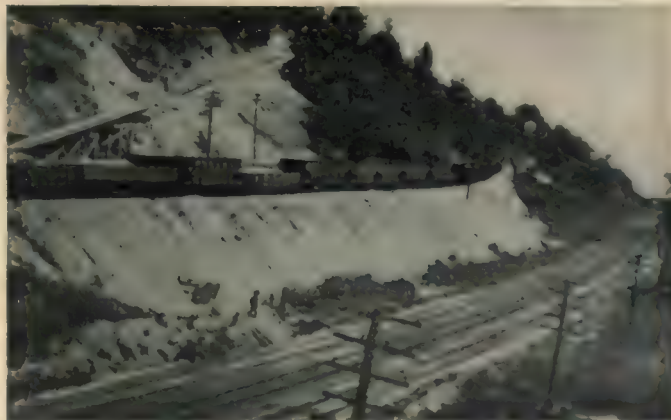
The deposit of rock is a very hard, close-grained dolomitic limestone, an average analysis of the top twenty feet running:

Carbonate of lime, 55.5 per cent.
Carbonate of magnesium, 43.5 per cent.
Silica, 0.5 per cent.
Aluminum and iron, 0.5 per cent.
The second forty feet runs about as follows:
Carbonate of lime, 52.5 per cent.
Carbonate of magnesium, 44.5 per cent.
Silica, 1.5 per cent.
Aluminum and iron, 1.5 per cent.

The extremely low silica content makes it an especially desirable rock for flux purposes in blast furnace work, while the physical properties, extreme hardness and small absorption make it admirably suit-



General View of New Crushing and Screening Plant installed by Doolittle & Wilcox



Quarry Sidings. Showing Incline above and Grand Trunk Main Line below

ed for road finishing. The beds of limestone dip at a slight inclination to the east.

The quarry property contains 150 acres, the average depth of rock in which is 200 feet, and has been run as a quarry for six years by the present owners. It has been worked in two layers each about twenty feet deep. About 750,000 tons of rock have been taken out and about 12 acres stripped. The construction of the new plant involves the abandoning of the present plants, the installation of much heavier machinery as a primary breaker, and the re-arrangement of the present crushers as auxiliaries to the large breaker and as fine crushers.

Crushing Plant.

The new crushing plant is located on the brow of the mountain, about 1,000 feet east of the old No. 8 plant. Owing to its location on top of the hill it was possible to do away with all elevating machinery and to utilize the force of gravity in every operation from the time the stone is dumped from the quarry cars into the crusher until it is loaded from the storage bins into cars on the sidings ready for shipment.

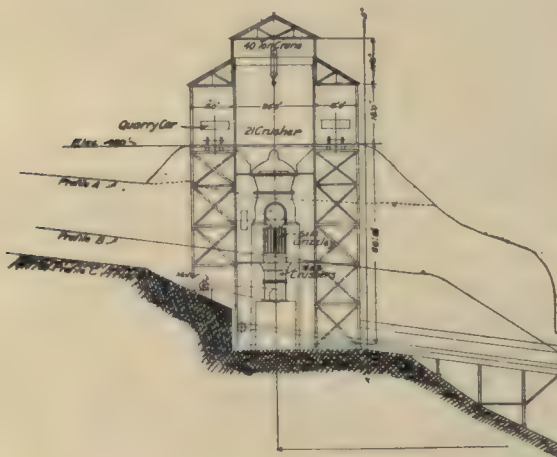
The main breaker in the crushing plant is a Mam-

moth McCully crusher manufactured by the Power & Mining Machinery Company, of Cudahy, Wisconsin. This machine is the largest size of gyratory crusher manufactured, has an opening between head and concaves 42 in. x 11 ft., weighs 225 tons and is driven by a 250 h.p. motor. The stone after its first crushing, discharges right and left over two four-inch grizzlies to a 7½ and a No. 8 Austin crusher set on each side of the Mammoth, arranged to act as auxiliary crushers to it and reduce the stone further to about 2 inches. The fine material from the first crushing taken out by the two grizzlies is collected in hoppers and discharged from these direct into two 30 in. belt conveyors leading to the screens. By taking out this fine material at this point, the load on the smaller crusher is decreased and the output of the entire plant is consequently increased. The auxiliary crushers discharge through the same chute as the grizzly hoppers into the conveyors.

The stone is taken from the crusher building on two 30-in. belt conveyors about 210 feet centres, mentioned before, and delivered into hoppers at the top of the screen building, feeding directly into four revolving screens, each conveyor supplying one pair of screens.

Screen House and Bin Building.

The screen house and bin building is a combination of timber and concrete construction, 50 ft. x 50 ft. in ground plan. The foundations are a grillage of heavy concrete slabs reinforced both ways so as to get the effect of a continuous concrete raft. Piers and columns support the building, the floor loads being carried by very heavy concrete girders approximately 2 ft. x 4 ft. in depth, running crossways of the building. The floor slab is of reinforced concrete 14 inches thick and sufficiently high above the track level to allow clearance for cars and locomotives underneath. On this concrete base is erected a timber structure of the skeleton type with a trussed roof, the whole sheeted with 1 inch lumber covered with heavy galvanized iron. The peak of the roof is about eighty feet above track level. The first twenty feet is devoted to bin space, storage being provided for about 3,000 tons of material in the bins. Above the bins is the shaking screen floor where the fine material is sized and sorted. Above this is the main screen floor, holding the four large revolving screens already mentioned. These screens are 48 inches in diameter by 28 feet long and



Cross Section of the Crusher Building and Storage Bins at the Dundas Quarry

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These crushers are all set on reinforced concrete foundations in a pocket excavated in the solid rock. The sides of the excavation are lined with a rubble and concrete retaining wall and the whole roofed over with a reinforced slab 8 inches thick, thus ensuring ample fire protection to the timber trestle work which car-

ries the quarry tracks to the crusher. In order to handle the very heavy machinery it was necessary to install a 50-ton overhead crane running on a structural steel runway. The three crushers are driven by three separate motors, 375 h.p. in all being required for this purpose.

Three loading tracks run directly under the bins lengthwise of the building with loading spouts from each bin, emptying directly into the cars. By this arrangement six cars may be loaded simultaneously and a very large output handled by a small number of men. The loaded cars are dropped down by gravity to the company's track scales.

Re-crushing.

In order to provide for any required amount of fine product, a re-crushing building and two elevators have been installed with room for two sets of crushing

rolls. Belt conveyors run from the storage bins to the re-crushing rolls which may be set to any desired size. This allows a further reduction of any surplus material which may remain in the bins, and permits the output of the plant to be regulated to suit the exact demand for any given size of stone. The re-crushed stone, after it has been put through the rolls, is elevated to the top of the screen house by two 14-in. bucket elevators, discharging into the large screens and thus distributed to the bins.

It will be seen that this entire crushing and screening plant is arranged in two halves, thus permitting any necessary repairs on any machine to be made without a shut-down. The material from the quarry can be dumped into any one of the three main crushers and can be handled to the screens through either belt conveyor. Any one or any two of the screens may be stopped for repairs without interfering with the operation of the others. And similarly with the re-crushing operations, one of the rolls and elevators may be run while the other is standing idle. It is thought that the output of one-half of the plant will be sufficient for the demands of the market for some time and that the other half will be used as a reserve plant, thus ensuring practically continuous operation.

Power.

All the crushing and screening machinery, indeed all of the quarrying machinery as well, is driven by electric motors. Power for this purpose is obtained from the Cataract Power Company on an exclusive 10,000 volt line run from the substation in Hamilton. The transformer station for the quarry is a brick and concrete building located at the end of the timber trestle forming the crusher building, and equipped with all necessary transformers, lightning arresters, etc., to transform to 440 volts for the crushing and screening motors. A line to the quarry shovels and drills is run at 2,200 volts and again transformed at convenient places to 220 volts.

Quarry Equipment.

The new quarry is to be opened up 60 feet down from the top of the rock, which will give a quarry face sixty feet deep to work on as soon as the break is made through into the old workings. In order to do this it was necessary to drive a thorough cut through the hillside for a distance of about 400 feet. This cut is about 56 feet wide and about 50 feet deep in the deepest part, but permits of the opening up of the quarry face in a straight line from the crusher and for a distance of about 3,000 feet. On account of the dip of the rock the drainage of the quarry opens out to the hillside where this cut is put through and hence prevents any accumulation of water in the quarry workings.

The rock is drilled by well drilling machines using 5-in. bits and blasted with dynamite. It is loaded by power shovels. One Marion Model 91 steam shovel, weighing 105 tons and equipped with a special manganese steel rock dipper of $3\frac{1}{2}$ yards capacity, has been installed. There is also a Thew Automatic No. 1 shovel and a No. 2 shovel of the same make, both driven by electric motors, and another No. 1 Thew steam shovel which is at present in reserve. These shovels load the blasted rock into 4-yard two-way dump cars in which it is hauled to the crusher building by three 20-ton Vulcan locomotives. Two tracks run into the crusher building so that the stone can be

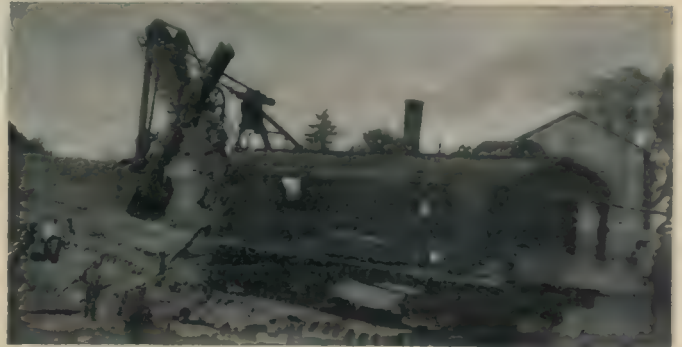
dumped from both sides of the Mammoth crusher. The equipment already installed, with some small additions in the way of extra cars and locomotives, will permit of the handling and crushing of about 4,000 tons of rock per day of 10 hours.

Incline.

The problem of getting supplies and machinery up to the top of the hill was a serious consideration, owing to the impossibility of teaming such heavy loads over the country roads. It was therefore decided to build an inclined standard gauge track down the side of the hill connecting with the sidings below. This track is about 1,400 feet long and runs on a 16 per cent. grade. A heavy duty mine winding engine with an 8 ft. drum was installed at the top of the grade, and all of the new equipment, including the 100-ton shovel and the Mammoth crusher parts, has been handled by this method direct from the railway sidings below to its place in the quarry.

Water Supply.

The quarry company has also installed a pumping station and a 1,000,000 gallon reservoir on top of the hill and built its own water service. A well equipped machine shop handles most of the repair work and has tracks on two floors connecting with the quarry tracks, thus ensuring quick transportation to and from



Taking the New Shovel into the Quarry

the shop for any heavy repair parts needed. Necessary store rooms, locomotive, blacksmith and carpenter shops, etc., complete this part of the equipment.

Toronto Business.

Messrs. Doolittle & Wilcox, Limited, have large contracts for supplying flux stone to blast furnaces and open hearth steel plants. Among other large customers being the Steel Company of Canada, in Hamilton, and the Lackawanna Steel Company, in Buffalo. This necessitates the continuous operation of the quarry twelve months in the year. Dundas is situated on the main line of the Grand Trunk and ample shipping facilities are provided for the handling of their product.

The company handles its Toronto business through the Rogers Supply Company, who have five yards distributed about the city. These are supplied with stone trestles where the stone is dumped direct from hopper bottom cars into storage bins, of a capacity of 2,000 tons, and then loaded into wagons.

The engineering work in connection with this plant was done by the J. C. Buckbee Company, of Chicago, in accordance with general layout furnished by the owners.

Subaqueous Concrete Work at Goderich

Successful Application of the Pontoon Method—Advantages of Reinforced Monolithic Concrete—Economy and Expediency of this Construction.

Mr. J. H. Tromanhauser, engineer, Toronto, has just completed at Goderich, Ont., the construction of a 500,000 bushel annex to the elevator owned by the Goderich Elevator and Transit Company. A brief description of this work, the early part of which was carried out by means of concrete pontoons, will be of special interest in this number.

originally part of the harbor, with a depth of water of about 20 feet.

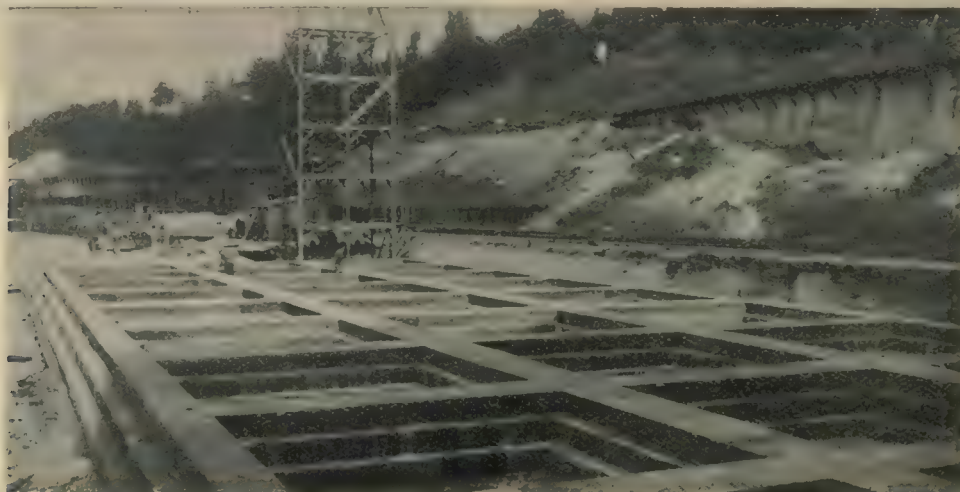
The pontoons for the concrete dock, of which there were four sections, were built on shore at a convenient spot across the harbor. They were each 54 feet by 14 feet, and about 4 feet high, all of timber and made watertight. After completion, they were launched and



Completed Concrete Pontoon Ready for Floating to Site

The elevator annex is of monolithic concrete, designed in accordance with patents controlled by Mr. Tromanhauser, and consists of a series of 27 rectangular bins arranged in three rows on 18-foot centres. The side bins are flat bottomed and 80 feet deep, and the centre bin 70 feet deep, having concrete hopper bottoms under which run two 30-inch collecting convey-

towed to the concrete mixing plant. Here the forms were set up and the concrete filled in together with the reinforcement, which proceeded as fast as the setting of the concrete would permit. The pontoons were so designed that the weight of the concrete walls would sink them about one foot for every two feet rise of the walls. This was found correct in practice. Bal-



Foundation Slab Built over Sunken Pontoons

ors by which the grain is returned to the main building through two elevator legs and spout.

The main interest in this construction, however, is centred in the dock, or wharf, which was not built on the site — but some half mile distant. This work marks the first application in Canada of Mr. Tromanhauser's patent pontoon system of subaqueous construction.

The site on which the elevator annex is built was

lasting was required as the work progressed. To prevent the concrete sections from becoming top heavy and rolling over, each section as it was completed was towed to the elevator site and sunk in position, the bottom of the harbor having been dredged previously and approximately levelled. The sections were sunk by admitting water into the compartments by means of hose. In large sizes, it is more convenient to build in sea valves for admitting the water.

Having sunk the sections, it was only necessary to drive the foundation piles through the timber bottoms and fill them up with gravel dredged from the site. The space between the shore and the concrete dock sections was then filled, and piles driven for the elevator foundation and the whole covered with the concrete slab to support the building.

The advantage of this system over the old methods of coffer dam and concrete block construction will be appreciated by the engineer and contractor who have to consider similar propositions in regard to both fresh and salt water. It is particularly valuable in latitudes where timber is open to the attack of the teredo.

The sections being watertight, any material can be used for filling, there being no tendency for sand, cement, fine gravel, etc., to be washed out, but on the contrary, to become more solid and compact with age.

In conclusion, we may remark that this system has been found more expeditious and less expensive than the usual method, and is applicable not only to dock

interstices will be entirely filled instead of being bridged over as is frequently the case with trowel work. The machine will cover a square yard of surface with concrete 1 inch thick in about two minutes. The concrete will be of a maximum density. In the construction of massive concrete, the stone could be first placed and mortar or binding material applied by the machine. How satisfactory and economical it might be in work of this character was not so apparent, in a recent demonstration, as its wonderful utility in ordinary construction, such, for example, as stucco work, small buildings or fences requiring but an inch or two of dense and impervious cement mortar. To illustrate its utility in this field, an ordinary roll of chicken wire was bent into the form of a post and upon the inside was placed ordinary sheathing paper. The hose was played over this form and there quickly resulted a strong and perfectly satisfactory hollow waterproof concrete post, 8 or 10 inches in diameter and with a uniform thickness of perhaps 2 inches. The same



General View of Elevator and Annex at Goderich.

construction, but to a wide range of work, such as piers, breakwaters, lighthouses, foundations, sea walls and cofferdams.

The Cement Gun

Perhaps no exhibit now being shown at the Cement Show in Toronto is awakening greater interest on the part of engineers and contractors than that ingenious piece of concrete machinery known as the "cement gun." Briefly stated this machine consists of an engine and compressed air tanks with tank for the dry material, cement and sand. The fact that the aggregates are mixed dry is the chief distinction between this process and former experiments, which have had to do with wet mixtures. Two lines of hose, one carrying the dry-mixed cement and sand and the other water converge in a brass nozzle, where the cement, sand and water come in contact, the flow of water being governed by a faucet attached to the hose. The gun shoots the contents with great force, the nozzle being held about 2½ feet from the surface to be covered with cement or stucco. The machine acts with such force and precision as to make a perfectly mixed and dense waterproof concrete or mortar, apparently impossible to achieve except where great air pressure is used. It is entirely automatic and its precision is in marked contrast with hand work where the personal equation is such an important factor. A surface with

process of construction was applied to small structures, making what might be termed indestructible tents or buildings of thin concrete. One of these buildings, a most flimsy affair in the way of preliminary studding, wire and paper, was filled with shavings and boards, and afterwards set on fire, the mass burning to ashes but without heating the thin walls upon the exterior surface. The machine will undoubtedly bring about a veritable revolution in the construction of very small buildings, fences, posts, stucco work and kindred operations, as it eliminates the use of forms and scaffolding, only ladders being required where it is impossible to use the machine with the workman on the ground. As stated, the water is added in the nozzle, the surface first receiving a thin coat of cement grout followed in turn by additional cement and sand until the required thickness of surface is obtained. By holding the nozzle stationary a 5-inch cone will soon protrude from the surface.

That Ireland will soon have the most important ferro-concrete bridge in the United Kingdom is claimed in a Belfast press article. This will be attended by the reconstruction of the Waterford Bridge. An interesting test of the new St. John's Bridge, Kilkenny, shows the great advantages of this type of construction. The Kilkenny bridge has a 140-ft. span and successfully withstood tests of 200 tons dead weight, which rested on the bridge for several days.

Canadian Contractors and Their Work

The Careers of Some of Our Successful Men—Brief Notes on their Early Training, Special Lines of Work, Recent Enterprises

The biographical and other information concerning prominent Canadian contractors and those identified closely with the field, given in the following pages, will doubtless be of special interest inasmuch as in the preparation of such work one always encounters an objection to anything savoring of "publicity." That we have encountered this obstacle is evidenced by our inability to secure photographs of a number of those of whom we have given the best information available. We hope to maintain this department, and trust that our contracting friends will co-operate with us by furnishing us with material from time to time. Such sketches as are here presented cannot fail to be informative, and, in many cases, of actual value to those in any way connected with this field. In the following articles we have confined ourselves almost exclusively to particulars of live, business interest. This policy will be maintained in future numbers.

J. H. McKnight Construction Co., Ltd., Toronto

The president of this firm, Mr. J. H. McKnight, is a Canadian by birth, having been born on a farm near the town of Hanover in the year 1864. He went to Toronto in 1886, immediately after which he began contracting for sewerage works. At first his operations were confined mostly to Toronto, but these he afterwards extended throughout the province of Ontario, and in 1892 he branched out into Manitoba, in which province he carried to completion a number of large sewerage contracts.

In 1894 Mr. McKnight began contracting in the United States, his first undertaking being in the city of Cleveland, Ohio, and for the next five years he carried on business in several states of the Union. For two years his work was confined principally to the vicinity of New York, and for



Mr. J. H. McKnight, Toronto

a like period he carried on business in the neighborhood of Boston, Mass., where he carried out several large contracts for the Metropolitan Water Commission of Massachusetts. He also installed a number of sewer systems for towns ad-

joining the city of Boston. In 1902 he built the sewer system of Sault Ste. Marie, where he also paved the main thoroughfare, nearly two miles long, and built the street railway system, comprising four and one-half miles, all ready for the operation of cars. During 1904-5 he constructed many miles of the sewerage system of the city of New Orleans, La., at the same time carrying on large contracts throughout Canada.

By the year 1907 the business had increased to such an extent that Mr. McKnight found it advisable to take into partnership Mr. W. E. Douglas, B.A., C.E., and a limited liability company was formed. Mr. Douglas had had a considerable amount of valuable engineering experience, having been engaged with Mr. Willis Chipman, the well known consulting engineer.

Since its inception the J. H. McKnight Construction Company, Limited, have completed a great many large con-



Mr. W. E. Douglas, Toronto

tracts, consisting of sewerage installations, pavements, dams, etc. At the present time they are engaged upon an extensive contract in connection with the construction of the trunk sewer for the city of Toronto. Of their recent work may be mentioned a large dam, tunnel and power house for the Erindale Power Company. During 1910 they had the contract for laying all the water pipe for the city of Toronto, in addition to several miles of small sewers. They also installed sewerage systems at Haileybury and New Liskeard last year.

Mr. McKnight is a man of diversified interests, but inasmuch as we are concerned primarily with his connection with our own field, it will perhaps suffice to say that for a number of years he has been interested in a considerable amount of speculative building, and that he is president of Clarke & Monds, Limited, whose specialty is concrete construction in all its various phases.

Up to date over \$600,000 has been paid over to Mr. John Gunn, the contractor for the city of Winnipeg's hydro-electric power development at Point du Bois.



Mr. Fred Holmes, Toronto.



Mr. James Pearson, Toronto.



Mr. C. R. Holmes, Toronto.

Fred Holmes & Sons, Limited, Toronto

One of the most active firms in the building field at Toronto is Fred Holmes & Sons, Limited, at present engaged in the erection of extensive additions to the Parliament Buildings in Queen's Park, costing over half a million dollars, and in building additions to the St. Michael's Hospital and the House of Providence. Among the many interesting contracts which have been completed by this firm in recent years may be mentioned the Grand Stand at Exhibition Park, the Canadian General Electric Company's building, at the corner of King and Simcoe streets, and Shea's new theatre. The president of the firm, Mr. Fred Holmes, is a native of Norwich, England, and came to Canada in 1882, since which date he has been engaged exclusively in the building trade. He takes an active interest in civic administration and is a member of the Toronto Board of Trade. Mr. C. R. Holmes, the secretary-treasurer, has been in partnership with his father for some years and now takes a leading part in the operations of the company.

James Pearson, Toronto

The practice of law is not very often combined with success in estimating for paving and other similar construction work, but Mr. James Pearson, the president of the Constructing and Paving Company, Limited, Confederation Life Chambers, Toronto, has done it, and is doing it with much success. One would think that in connection with this work his knowledge of law would bring him into conflict with the municipal authorities, but, on the contrary, it renders him immune from trouble of that kind. Mr. Pearson combines the business acumen of the contractor with the shrewdness of the lawyer, and he plays the twofold part as few men could play it. In contracting circles he subordinates his professional instincts—except upon very rare occasions, and he is known to the legal profession as a sound and capable lawyer.

Mr. Pearson was born on a farm in the County of Carleton, near Ottawa, in 1850. He is of U. E. stock and of Scotch descent. After teaching school for several years, he studied law and was called to the bar in 1878, taking up the practice of law in Toronto, where he has resided and practised ever since.

In former years Mr. Pearson was a prominent athlete and ever since the times in which he figured as a competitor he has taken an active interest in the promotion of amateur sport, both field and aquatic. He also took a course at the Toronto Military School, from which he obtained both sec-

ond and first-class certificates. His commission was in the Ottawa Rifles, from which he was transferred to the Queen's Own and at the time of retiring held the rank of second senior captain of that corps.

In law his practice has turned principally to corporation, railway and joint stock company matters. In this way he has become interested largely as a stockholder in several companies. In addition to being president of the Constructing & Paving Company, he holds a similar office in another prosperous concern, the Maple Leaf Portland Cement Company, Limited. In his early years Mr. Pearson acquired a practical and technical education which eminently qualifies him to carry out his several works successfully.

T. Cannon & Son, Limited, Toronto

The above firm have been prominently identified with the Toronto contracting field for the past 24 years, their activities having been confined principally to masonry work.



Mr. T. E. Cannon, Jr., Toronto

Mr. T. Cannon, Sr., had charge of the erection of a number of important buildings in the city, such as the Bank of Montreal, the Standard Bank, the old Traders Bank (recently demolished), Cooke's Church, Biological Building, Queen's Park, the Parliament Buildings and many others.

in which he was associated with the late Mr. Lionel Yorke.

The work carried out by this firm is distributed over a wide field and includes a number of noteworthy public and commercial buildings, among which may be mentioned the Walmer Road Church, American Watch Case Works, head office of the Imperial Bank, a number of branch buildings for the Canadian Bank of Commerce, Dominion, Imperial, Montreal, Metropolitan and Sterling Banks, the Lawlor



Mr. T. E. Cannon, Sr. Toronto.

Building (King and Yonge streets), and the residences of Sir William Mackenzie, Mr. Donald Mann, Mr. E. B. Osler, Mr. D. B. Hanna and many others. The Ross Memorial Hospital, Lindsay, and the Trinity College School, Port Hope, are among the contracts that they have carried out in the province. The Sunlight Soap Works, Toronto, is one of their many important factory jobs. The firm have an



Mr. H. N. Dancy

up-to-date office and yard at 75 Brock avenue, and their own railway siding on the C. P. R.

Mr. T. E. Cannon, jr., whose photograph is reproduced herewith, devotes the greater part of his attention to the estimating part of the business.

Mr. T. Cannon, sr., has the supervision of the actual building operations and is one of the best known figures

in the local contracting fraternity. The secretary-treasurer, E. L. Wright, is an efficient officer of the company and during many years in the accounting branch of the business has contributed largely to its success.

H. N. Dancy & Son, Toronto.

The above firm, which is one of the most substantial contracting concerns in the city of Toronto, was founded thirty years ago by Messrs. H. N. Dancy and R. C. Dancy, who started business as the firm of Dancy Bros., contracting for both masonry and plastering. The firm made steady progress, and in 1905 Mr. A. H. Dancy was admitted as a partner. The concern was then known as Dancy Bros. Company. Rather more than two years ago the masonry branch of the business was taken over by H. N. & A. H. Dancy, now carrying on operations as H. N. Dancy & Son.

Photographs of the members of the firm are shown herewith. Mr. H. N. Dancy is a native of England and was brought to Canada at the age of eight years. He en-



Mr. A. H. Dancy, Toronto.

tered upon his apprenticeship at an early age and acquired a thorough knowledge of all branches of the work. For a time he was in business at Orillia, Ontario.

Mr. A. H. Dancy, the son, is a native of Toronto and learned the trade in the regular way after taking a public school course.

Among the many important buildings that have been erected by this firm in recent years may be mentioned the new Wycliffe College, Lumsden Building, residence of Mr. J. W. Flavell, Empire Building, Toronto Lithographing Company's Building and Price's Dairy. They are at present engaged on the Administration Building of the new General Hospital and a large new residence in Queen's Park for Mr. R. J. Christie.

Wells & Gray, Limited, Toronto

This firm is composed of Messrs. John V. Gray and A. F. Wells. It is a comparatively recent addition to Toronto's engineering and contracting concerns, but by virtue of its progressiveness and a number of important contracts that it has carried out during the last year or so, a few particulars concerning the members of the firm will doubtless be of interest.

Mr. John V. Gray was born in the town of Sandwich, Ont., in 1870. After receiving his education he learned the trade of a carpenter and for several years engaged in contracting, in and around Windsor, Ont. In 1898 Mr. Gray went to Vancouver, B.C., and followed his vocation in that

city for two years. On his return he engaged in building contracting in Detroit with Robert Teakle, doing some of the largest work in the city, until 1907, when, in connection with A. F. Wells and D. C. Raymond, he went into the general contracting business in Toronto. The firm name at that time was the Concrete Engineering and Construction Company, Limited. In January, 1910, Mr. Gray and Mr. Wells sold out their interest in the old concern, and re-established themselves in the general contracting business under the name of Wells & Gray, Limited.

Mr. A. F. Wells was born in Sandwich, Ont., in 1880. After graduating from the Windsor Collegiate Institute he spent two years teaching school. He then entered the School of Practical Science, graduating in 1904. During the vacations of 1902 and 1903 he acted as assistant to Mr. F. J. Ure, city engineer of Woodstock, Ont., and after graduating was assistant to the City Engineer of Niagara Falls, Ont. for two years. In the spring of 1905 Mr. Wells passed the final examination for Ontario Land Surveyors, and in 1906 took his degree of B.A.Sc. in Civil Engineering at Toronto University. During the following year he was engaged in engineering work with the Trussed Concrete Steel Company and the late Mr. W. T. Jennings, C.E., going into the contracting business with Mr. Gray early in 1907.

R. Robertson & Sons, Limited, Toronto

The above firm is one of the oldest masonry and general contracting concerns in the Queen City. It was founded by the late Mr. Robert Robertson, Sr., a contracting mason of extensive experience in various branches of the trade in both Scotland and Canada. Since its inception the firm's attention has been devoted principally to large contracts. A number of the most notable buildings of Toronto University stand as a monument to their ability. Among these may be mentioned Convocation Hall, the University Gymnasium, the Physics Building, the Chemistry Building and Men's Residences. Other buildings worthy of mention are the McMaster University Buildings, Toronto Telegram Buildings, Toronto Carpet Works, Wycliffe College Chapel and the Dundas Central Methodist Church, London, Ont.

The late Mr. Robertson placed a high value upon the advantages of a thorough technical training and early associated his sons with him in the business, insisting on their securing a good working knowledge of their trades by means of regular indentured apprenticeship.

After the death of Mr. Robertson, Sr., in 1908, the company was reorganized and incorporated with Mr. Robert Robertson, Sr., as President; Mr. John Robertson, Vice-President, and Mr. W. E. Robertson, Secretary-Treasurer. Since then the firm has maintained the high standard of excellence set by its founder. Its progress is evidenced by the fact that it has completed or has in actual course of construction the following work: the new Provincial Museum, University Library, Thermo-Dynamics Building, Observatory, and the Pathological Building in connection with the new General Hospital.

The members of the firm are all practical men, builders of the third generation, possessing the advantages of youth and energy and an excellent reputation both in and out of the trade. Added to these things must be mentioned an up-to-date plant equal to the demands of any contract.

Hamilton Bridge Works Co., Ltd., Hamilton

The history of bridge building and the manufacture and erection of steel structures in Canada is the history of the above company, concerning whom some mention is appropriate in this number.

The works were established at Hamilton in 1873. Shortly after this time the company commenced the manufacture of metal bridges—the first in the Canadian field. Previously

they were imported from Great Britain, Europe and the United States. Great demands were made upon the plant, and large extensions have been found necessary from time to time.

About 15 years ago the company was re-organized with the late Mr. William Hendrie as president, and Colonel



Hon. Jno. S. Hendrie, Hamilton

Hendrie as vice-president and manager. On the death of Mr. William Hendrie some years ago, Colonel Hendrie became president, William Hendrie, Jr., vice-president, R. Maitland Roy, C.E., manager, and the late Charles G. Milne, B.A.Sc., chief engineer. The death of Mr. Milne, which occurred in December, 1909, was a severe loss to the company. The late Mr. Milne designed the company's present plant and also many important structures throughout the country.

Structural steel was not used extensively for buildings in Canada until 1890. The Hamilton Bridge Works Com-



Mr. R. Maitland Roy, Hamilton

pany were entrusted with the erection of the earliest and best of this kind of work. It would take too long to enumerate the many important structures built by this firm in Toronto and Hamilton. In the former city such buildings as the head office of the Traders Bank, the Toronto

General Trusts building, and the Exhibition buildings and grand stand are typical of many, while in the latter they have built practically every steel structure, or furnished practically all of the steel therefor.

A particular feature of the company's business some years ago was the design and construction of steel buildings for cement plants. Some of the first known in the province of Ontario were erected by the Hamilton Bridge Works.

In addition to an enormous amount of municipal work during the last few years, the company have carried out extensive contracts for the Canadian Pacific Railway, the Canadian Northern Railway, the Transcontinental Railway—in fact, for all the lines that have attained the dignity of Canadian railroad systems.

The works of the company, which cover about eight acres, and which have excellent transportation facilities, have been entirely rebuilt during the last ten years. An additional plant is now being erected to handle architectural and general building and highway work.

The officers of the company are as follows: President, Lieut.-Col. Hon. J. S. Hendrie, C.V.O.; vice-president, Major William Hendrie; manager, R. Maitland Roy, C.E.; secretary-treasurer, W. B. Champ; engineer, Robert K. Palmer, C.E.; superintendent of construction, W. C. Greenfield; works superintendent, A. H. Phoenix.

Lieut.-Col. the Hon. John S. Hendrie, C.V.O.

The president, Lieut.-Col. Hendrie, is a native of Hamilton, where he received part of his early education, afterwards proceeding to Upper Canada College. Later, he served his time as engineer with the old Great Western Railway. For many years he was associated with his father, the late Mr. William Hendrie, on numerous railway contracts, following which, for an extended period, he engaged in railway contracting on his own account. Colonel Hendrie is prominent in municipal and provincial administration. He has represented West Hamilton in the Ontario legislature since 1902 and has been a Minister (without portfolio) in the Whitney government since its formation. He also served for two years as mayor of Hamilton, is now chairman of the Railway Committee of the Legislative Assembly, and is also a member of the Hydro-Electric Commission.

Colonel Hendrie has been an enthusiastic military man all his life, starting as a junior officer in the 4th Field Battery and retiring about two years ago as Brigade Commander of the 2nd Brigade, Field Artillery. He is also a member of the Battlefields Commission of Quebec, and Ontario representative of the Strathcona Trust.

Mr. R. Maitland Roy, C.E.

The manager of the Hamilton Bridge Works Company is a native of Stirling, Ont., and was born in 1869. From June, 1886, to October, 1888, he was connected with the traffic and engineering departments of the Grand Trunk Railway. From the latter date until February, 1892, he was identified with the Brown Manufacturing Company, of Belleville, Ont. During this time he gained much useful experience upon the inspection of government and railway supplies, contractors' plant, bridges and structural work. Among the various contracts with which he was connected may be mentioned the government surveys of Belleville harbor and river protection works, also the extensions to Belleville waterworks, and new sewage and pumping plants for the Government institution for the deaf and dumb. From February, 1892, to January, 1898, he was employed by the Central Bridge and Engineering Company of Peterborough, Ont., as inspector, draughtsman, estimator and engineer for railway and highway bridges, and general structural work. He was also engaged upon various surveys of the Trent Canal waters and other works. He has occupied

his present position since January, 1898, and is regarded with great confidence in municipal and engineering circles. Mr. Roy is a member of both the Canadian and American Societies of Civil Engineering.

W. I. Bishop, Montreal

Among the more recent contracting and engineering firms of Eastern Canada who have made a reputation for themselves by virtue of their general efficiency and progressiveness, none perhaps is deserving of mention more than the Bishop Construction Company, Limited, of Montreal. We feel sure that our readers will be interested in a few lines concerning the president of this concern, Mr. William Israel Bishop.

While Mr. Bishop's connection with the Canadian field dates back only five years, he had previously obtained much useful experience in the United States. For three years he was with the Aluminum Company of America as engineer and superintendent of construction. Afterwards he became a member of the firm of McLaughlin & Bishop, engaged on sewerage and water power work in New York State, and later, general superintendent for the T. A. Gillespie Company, on large water power development in North Carolina. Starting business in Canada in 1906 as William I. Bishop &



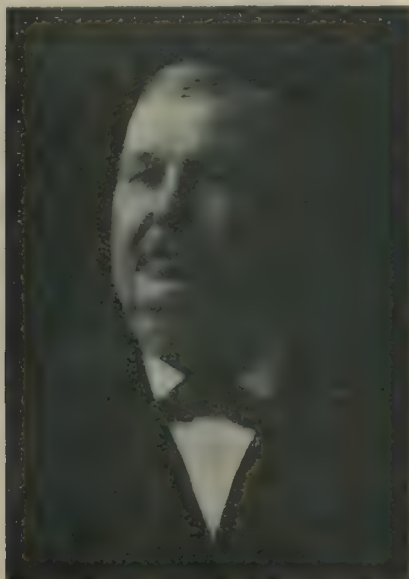
Mr. W. I. Bishop, Montreal

Company, he constructed the 33,000 h.p. water power development and large mills for the Northern Aluminum Company. Mr. Bishop afterwards organized the concern known as Rexford-Bishop, Limited. With this company was afterwards incorporated the Concrete Engineering and Construction Company, Limited. Mr. Bishop was born on July 7, 1875.

Armstrong, Morrison & Company, Vancouver

The name of W. H. Armstrong stands out prominently on every page of the history of construction in British Columbia. Mr. Armstrong has engaged in all lines of contracting in the province and has been closely identified with its growth. He is president of the firm of Armstrong, Morrison & Company, Limited, the other members of which are Alexander Morrison, W. C. Ditmars and Robert Armstrong. It would take too long to enumerate the many important works carried out by this firm, but among their most interesting contracts of recent date may be mentioned the new Granville street bridge, a detailed description of which is published elsewhere in this number. Of Mr. Armstrong's various connections it is of interest to recall that he is gen-

eral manager of the Nicola Valley Coal & Coke Company. He is president of the Keremeos Land Company, a concern with vast irrigation works, and is also interested in the Similkameen Mining & Smelting Company. The Armstrong-Morrison firm are interested largely in the Vancouver Gran-



Mr. W. H. Armstrong, Vancouver

ite Company and the Clayburn Company—the well known brick industry. Mr. Armstrong was born at Stratford on September 18, 1857. His father was associated in railway and bridge building with the late Wm. Whitehead, and he thus had every facility for acquiring an inside knowledge of every branch of the business. In the middle 70's he went west to what is now known as the Rat Portage section of the C. P. R., and was employed by Mr. Whitehead in the construction of part of that railway east of Winnipeg. In 1883 he went further west with Mr. M. J. Haney and was associated with him in the building of the Onderdonk



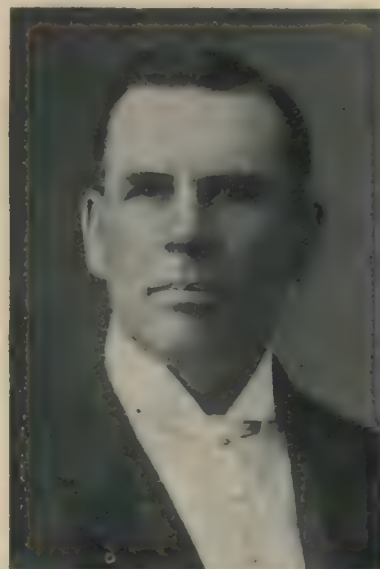
Mr. Alex. Morrison, Vancouver

section of the C. P. R. in British Columbia. When the road was taken over by the railway Mr. Armstrong remained as master mechanic and later as general roadmaster, in the latter capacity completing the last lap of the C. P. R. westward, building the line from Port Moody, the first terminus,

to Vancouver. In 1887 he left the service of the C. P. R. and at once went into general contracting, building most of the early wharves and bridges in the city. Part of this time he was in partnership with the late Dan McGillivray

Mr. Alexander Morrison.

Mr. Alexander Morrison, the second senior member of the firm, was born in 1851 at Motherwell, Scotland. Here he served his apprenticeship for five years in the building and millwright business. After this he put in several years in the shipbuilding yards on the Clyde at Govan, Scotland. In 1871 he joined in the exodus to Canada and settled in Montreal. Here he continued to follow his business as a general contractor, devoting himself mainly to the erection of industrial plants in and about Montreal. A number of such plants now stand as a monument to his skill and energy, notably the Magog textile mills at Magog, Que. In the course of a number of years he became imbued with the possibilities of the west and in 1891 removed to the then infant city of Vancouver. After looking about for some time he decided to cast in his lot with the late Dan McGillivray and Mr. Armstrong, who were then engaged in building the New Westminster waterworks. He continued with them in the capacity of shop superintendent in their steel pipe works at New Westminster until the completion of this work, when he formed the partnership with Mr. Armstrong, which still exists, and which has developed in-



Mr. T. R. Deacon, Winnipeg

to one of the most successful contracting and engineering firms in the west. From this time on the history of the two men has been so closely associated that Mr. Morrison's record is pretty well covered in the above sketch of Mr. Armstrong's career.

Mr. Ditmars, the secretary-treasurer of the company, was born at St. Catharines, Ont., where he received his education and early business training. He, also, went west in 1891 and settled in Vancouver as a representative of the Doty Engine Works, of Toronto. In 1897 he entered the service of Messrs. Armstrong & Morrison as office manager and in 1903 joined the firm as a partner.

T. R. Deacon, Winnipeg

In the contracting field of Western Canada few names are better known than that of T. R. Deacon, president and general manager of the Manitoba Bridge & Iron Works, Limited. Mr. Deacon is a director of the Winnipeg Builders' Exchange and is vice-president of the Canadian Manufacturers' Association for the province of Manitoba. Mr. Dea-



Mr. O. J. Edinger, Edmonton



Mr. A. R. Mainman, Edmonton



Mr. Thos. H. Miller, Edmonton

con is a civil engineer by profession, having graduated from Toronto University twenty years ago this spring. Under his capable direction the concern of which he is president has made rapid strides, and the creditable manner in which it has executed various important contracts in the western field has placed it among the foremost contracting companies in Canada.

Edinger-Nesbitt Construction Co., Ltd., Edmonton.

That Edmonton, Alta., is destined to become a really up-to-date city and a credit to the enterprise of Western Canada is evidenced by the class of buildings now being erected there. These compare favorably with many of those boasted by the larger eastern cities. It naturally follows that a higher standard of skill is demanded of the builders and contractors in that western country than formerly and it gives us much pleasure to introduce to our readers the members of the Edinger-Nesbitt Construction Company, Limited, one of Edmonton's progressive contracting concerns.

Mr. O. J. Edinger, who went to Edmonton some three years ago, is a practical engineer, stone and brick mason.

His success in the contracting business may be attributed largely to the valuable experience which he acquired while superintending the erection of large buildings in the United States. In 1910 he associated himself with E. M. Nesbitt, a competent and practical master builder, and built in that year the McDougall Methodist Church, the largest structure of its kind in the city, also the Union Bank, a 3-storey, cut stone and pressed brick, fireproof building.

On the first of this year Mr. A. R. Mainman and Mr. Thos. H. Miller were taken into partnership and a joint stock company was then incorporated. Mr. Mainman, who is now assistant manager, was formerly identified with the old company as accountant. Mr. Miller has a practical business experience, the result of a number of years in the wholesale and retail lumber business. For two years he was general manager and secretary-treasurer of the Edmonton Casket Box & Manufacturing Company, Limited.

The company have every prospect of a busy season's work and we feel sure that a most successful future awaits them.



Mr. E. M. Nesbitt, Edmonton



Mr. J. V. Roemer, Walkerville



Mr. C. S. L. Hertzberg, Walkerville

Trussed Concrete Steel Company of Canada, Limited Walkerville

Mr. J. V. Roemer, the secretary of the above named concern, has been connected with the company, in one capacity or another, for the last five years, during the greater portion of which his attention has been given to the United States field. Quite recently he became identified with the Trussed Concrete Steel Company of Canada, Limited, in his present capacity. He has a wide acquaintance among engineers and contractors, and is enthusiastic concerning the possibilities of the Canadian field.

Mr. C. S. L. Hertzberg, of Walkerville, Ont., engineer for the Trussed Concrete Steel Company of Canada, Limited, is a native of Toronto and was educated at the University of Toronto, graduating from the Faculty of Applied Science and Engineering in 1905. After this he was employed for two years in the engineering department of the C. P. R. on the Ontario and Eastern Division of that railroad, his duties comprising railway location, construction and maintenance of way. He then accepted a position with the Trussed Steel Company of Canada, Limited, in their drafting and designing office at Toronto. In the fall of 1907 he became identified with the Dominion Power & Transmission Company, of Hamilton, and remained with that company until April, 1908. He was then engaged by the Trussed Concrete Steel Company to open their Winnipeg office, of which he had charge until September of last year, when the company appointed him to his present position as engineer, with headquarters at Walkerville.

W. H. Ford, Montreal, General Sales Manager, Canada Cement Company

It is about a year and a half ago since Mr. Ford commenced to handle the business of the Canada Cement Company. At the time of his appointment many hopeful predictions were made concerning the company's future, and the increasing stability of the concern and its popularity among the building interests of the country must be a source of much gratification. The Canada Cement Company control



Mr. W. H. Ford, Montreal

the output of eleven mills and Mr. Ford's customers appreciate the fact that they are getting the very best possible value for their money.

Mr. Ford came to Canada from the southern states four years ago. He has had a close insight into the cement business. When he was quite a young man he took a four years'

mechanical drafting course, and upon graduating, entered the office of W. B. W. Howe, consulting engineer, Spartanburg, S.C. Mr. Howe was one of the special committee appointed by the American Society of Civil Engineers, to draft a uniform set of specifications for Portland cement. His associations with Mr. Howe, especially fitted him for a career in cement. On January 1, 1903, at the age of twenty-four, he engaged with the Carolina Portland Cement Company, of Charlestown, S.C. Shortly after this he was transferred by this company to the Atlanta (Ga.), office, as assistant manager, where he spent two years, after which he went to Louisville, Kentucky, as manager of the sales department for the Kosmos Portland Cement Company.

On the death of the vice-president of the Wm. G. Hartranft Cement Company, of Philadelphia, Mr. Ford was appointed in his stead, and later came to Montreal as vice-president and manager of their Canadian company. Before settling down in this new capacity, he spent six months in touring Canada, becoming familiar with conditions, and making himself known in every city and town in the Dominion. He still retains his position as vice-president of the Hartranft Cement Company, is a member of the Sales Managers Section of the American Society of Portland Cement Manufacturers, is on the Executive Committee of the Canadian Cement and Concrete Association, and is also a member of the Canadian Manufacturers' Association.

M. P. Cotton, Vancouver

Mr. M. P. Cotton is a member of the youngest and at the same time the most enterprising generation of builders



Mr. M. P. Cotton, Vancouver, B. C.

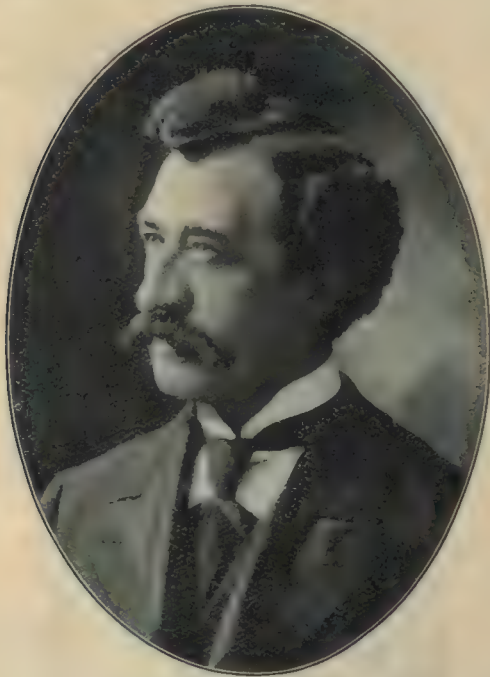
in the west. He was born at Kingston, Ont., in 1878, and received his education at the public schools of that city and at Queen's University. For ten years after leaving Queen's he was engaged as an engineer for the construction department of the C. P. R. Of the various works carried out under his direction through the prairies and the mountains are several difficult sections of road which were completed with great success. In 1907 Mr. Cotton severed his connection with the C. P. R. and accepted a position as superintendent for a prominent provincial contractor, with whom he remained for one year. He then went into business on his own account, devoting his energies almost exclusively to municipal work. The manner in which the various contracts entrusted to him have been executed testifies to his ability. Without entering into too much detail, it will perhaps be of interest to mention the Little Mountain reservoir,

which Mr. Cotton constructed for the city of Vancouver, the roadbed for the Burnaby line of the B. C. E. R., and an extensive fire protection system for the C. P. R. warehouses and wharves along the waterfront. One of Mr. Cotton's latest enterprises, a reinforced concrete wharf at Burrard Inlet, built for the North Vancouver Ferry Company, was opened on the 13th ult. Mr. Cotton's offices are located in the Carter-Cotton Building on Hastings street, Vancouver.

Anton Berg, Toronto

The name of Berg has become a household word not only among the community which is able to appreciate the merits of a good brick press, but also in the whole building fraternity. It is partly because of this, partly owing to our esteem for the man himself, and in some measure because of the fact that the Berg press has come to be recognized as the standard in its line, that we take particular pleasure in bringing Mr. Berg within the sacred precincts of our personal column.

When about thirty years of age, Mr. Berg decided to leave his native Norwegian soil and go to the United States. He made Chicago his destination, and shortly after arriving



Mr. Anton Berg, Toronto

in that city he obtained a position in McCormick's reaper factory as assistant to the master mechanic. Here he obtained ample scope for his ability, and so well did he demonstrate it that after three years one of the leading manufacturers of brick machinery engaged Mr. Berg as master mechanic, a position which he retained for about twelve years. During the time that he was with this firm he made great developments in all their machinery and was responsible for many important improvements.

After severing his connection with this firm Mr. Berg constructed a model of his now famous press, pronounced by the United States Government the highest development in the art of brick making. For a number of years Mr. Berg continued to have his machine built in the United States where at this date there are a large number being used with much success.

Mr. Berg first directed his attention to the Canadian market about six years ago. In 1908 he purchased the plant of the Canadian Shipbuilding Company at the corner of Niagara and Bathurst streets. It would take a special num-

ber in itself to contain detailed information relative to the development of the Berg industry since that time.

Associated with Mr. Berg are his three sons, all of whom have had a thorough practical training in the business. Mr. Robert Bertram and Mr. Melville Bertram have recently been admitted as partners. A period of unexampled expansion may be looked for.

Mr. Berg is 54 years of age. As may be gathered from the above, he has resided in Canada six years, in the United States eighteen years, and in old Norway thirty years.

News and Notes

Mr. A. H. N. Bruce, C.E., Ottawa, has been appointed chief engineer of the Quebec and Saguenay Railway. The company have filed plans with the department of railways for a line from the present terminus of the railway to a point about ten miles east of Murray Bay, a distance of about 65 miles, and purpose commencing construction as soon as possible.

The Ontario Government has been asked by a deputation from Northern Ontario to build a branch of the Temiskaming & Northern Ontario Railway from Charlton to Gowganda through the village of Elk Lake, a distance of about 40 miles in a direct line, in order to develop the rich mineral, timber and agricultural resources of that part of the country.

It is stated that the English contracting firm of Norton Griffiths & Company, who recently opened an office in Vancouver, are contemplating the construction of a dry dock in that city. Mr. Burton Stewart, the firm's representative, has left for England and will return in April. Mr. Stewart has already secured a number of large contracts for his company and is brimming over with optimism concerning the prospects for development in this country.

Mr. J. W. Stewart, managing director of Foley, Welsh & Stewart, railroad contractors, was recently in Vancouver and stated that the main line of the Grand Trunk Pacific will be completed to Tete Jaune Cache, at the head of navigation on the Fraser river, fifty miles west of Yellowhead Pass at the summit of the Rockies, early in November next. Rails are already laid to a point forty miles east of the summit, near the crossing of the Athabasca river, 210 miles west of Edmonton.

The Legislative Railway Committee has approved a bill to incorporate the Kamouraska and L'Islet Railway Company, which proposed to build a railway line from St. Anne de la Pocatiere, Kamouraska, connecting with the Intercolonial Railway, thence south to the Transcontinental Railway at Ste. Perpetue, L'Islet County, to connect with the Quebec Central. The line will also extend northwest from Ste. Anne de la Pocatiere to Riviere Quelle, connecting there with the steamers which run on the St. Lawrence between the North and South shores.

We have received from the John McDougall Caledonian Iron Works Company a copy of their Volute Pump Bulletin, No. 106, which we have found of much interest. The Bulletin contains well illustrated and detailed descriptions of the various Volute Pumps, with specific information regarding their uses and arrangement. The Volute was one of the first types of centrifugal pumps to be developed and has furnished the basis of published tests and of the commonly accepted notions regarding them. If designed without a correct understanding of the fundamental principles involved it will give poor or indifferent results, but it is claimed for the new McDougall Volute Pumps that they embody improvements which enable them to work efficiently up to a head of 65 feet. A high efficiency can be obtained at any head between 15 feet and 65 feet without making these pumps especially large or expensive.

Future of the Canadian Brick Industry

All Conditions Favorable for Unparalleled Development—Necessity for Maintaining High Standard in Various Products—Considerations for the Manufacturer

Specially Contributed by Anton Berg, Toronto

This industry in Canada is of infinite importance, and to-day it is conceived to be on a sound basis. The resources in this line are immeasurable; material for first-class brick of all kinds is plentiful, and in this country is manufactured the very best machinery and equipment for various kinds of brick-making. Men of ability, with capital, have been taking hold of this business and continue to promote the welfare of this industry. Such men I have found in this connection are precautions. For instance, they have made special trips across the line to look into the industry thoroughly, and to note the buildings and structures, material, etc. Hence they select unhesitatingly that which is best for themselves and the future generations of this peerless Dominion of ours. This industry is related closely to that of building and structural work, and for such an important combination it is necessary to study the future. Stepping back for a moment across the border, and viewing the brick industry, we must confess that while some are of the very best, there are many to the contrary. So-called brick are produced which are neither fit nor safe to put into high office structures, disregarding the claims of future generations. Such material, which is widely used, in spite of its short duration of usefulness, will deteriorate and go back to dust, from which state it should never have been taken.

Canadian Products Second to None.

Before entering this country, I had peculiar ideas concerning it and the people. It is surprising to find from the papers that people across the line still have these strange conceptions. I must confess that my ideas have been greatly changed, for now I believe the country to be the grandest, the best and the most resourceful. Men of ability are here in great profusion—men with broad ideas and perfect ideals for the upbuilding of this industry, and if such contend that this industry is one of the head-liners, surely our plan should be to produce the best possible. The recent development in Canada, I venture to say, is just as good as, if not better than any across the border. We manufacture brick in great quantities, material of a high-grade, standing a crushing load of from 4,000 to 9,000 pounds per square inch, brought into sound metallic mass through cohesion. With such building material, properly constructed, we can readily assume leadership in this line.

The various productions of this industry, viz., brick, sewer pipe, terra cotta, enamel-work, etc., are of the best and are manufactured on a sound basis, largely owing to the fact that the men interested are keen to serve the public interests. If the people across the line would take a trip through this great Dominion and examine things thoroughly, I believe they would conclude it much better policy to attend to their own industries and leave us to attend to ours. We can solve our own difficulties in the future as in the past, and we are quite capable of looking after the development of the industry in this country. In point, we have numerous industries planned and equipped by other than Canadian firms, which have been perfect nuisances and failures. As Canadians I believe we owe it as a duty to future generations that we develop this industry to its highest standard. In doing so, we must stand pat in support of our home manufactures.

I can point readily to Canadian industries of this kind

that stand second to none on the whole continent. For instance, take the Don Valley Brick Works, Toronto, and the Pa Prairie Brick Company, La Prairie, Que. I mention these plants especially because they are combined plants and manufacture various kinds of brick and terra cotta, and enamel-work. These contain the latest improvements, both as to machinery and kilns, and general running operations. There are numbers of brick plants of the advanced type, small and large—some making pressed brick only; some making pressed brick and stiff brick; others, paving brick, and plants too numerous to mention producing a good quality of stock or common brick. Of late years there is also manufactured a brick known as the sand-lime or silica-lime brick, which is durable and handsome. Quite a number of sand-lime brick plants are in successful operation in various parts of the Dominion. The writer's aim is not to recommend one product in preference to another, but to show each in the light of its own merits. The purpose of this article, indeed, is only to touch with pride upon the future of the industry and encourage the production of brick and building material development, the best material, which latter, in my estimation, is one of the most important considerations.

Several things must be considered in this connection. In the first place it is essential to have the right kind of material, next to have the proper machinery adapted for each kind of material. A properly constructed kiln is indispensable to the highest results. Location and convenience must be considered carefully. Business ability, and confidence in the growth of the country, are not the least important. And is it not time for the people who are now dwelling in Canada to take the first and best opportunity before foreigners come in and grasp it from our hands? I, for my part, desire no importation of brick and terra cotta from either the United States or other countries, although permissible by paying the duty. If building material should enter duty free, it would be unjust for many reasons, one of which as mentioned previously is abundance of raw material, and another, our vast field for new industries. Labor and money will easily find resources here. In the past, nearly all brick have been manufactured during the summer months, but in late years improvements have developed so that brick are made just as well in winter as in summer. This I believe to be a great improvement, since labor can be employed the year round, and building material is thus available at the early and later parts of the building season. Moreover, when brick plants are in continued operation there is always a better opportunity to keep them in first-class condition.

The attention of contractors, school trustees, and others, is directed to the advertisement in this issue of the Red Cross Sanitary Appliance Company, of Grimsby, Ont. Their "Red Cross" closets are made to fill the requirements where sewerage is not available. Their catalogue, mailed free on application, furnishes full particulars.

On Thursday, February 16th, before the Toronto branch of the Canadian Society of Civil Engineers, Mr. C. R. Young, of the firm of Barber & Young, gave an interesting address on the subject of Aesthetics in Bridge Design. Upwards of fifty excellent slides were shown and an interesting discussion ensued.

Missisquoi Marble: Origin and Progress

**A Wonderful Story of Development from Philipsburg, Que.—
Growth of the Industry—Its Excellent Resources and Equipment**

Canadian growth and development along all possible lines has, during the last decade, been so marked, that it requires more than ordinary expansion or progress to excite even passing interest, but the progress of the enterprise located at Philipsburg, Que., is remarkable, even in the Canadian century of big things.

Four thousand years B.C. the civilizations now described as ancient gave expression to their aesthetic sense by using marble in their temples, theatres and monumental piles. With almost unbroken continuity those who have sought the beautiful and the enduring have had recourse to marble, alike for exterior structure and interior decoration.

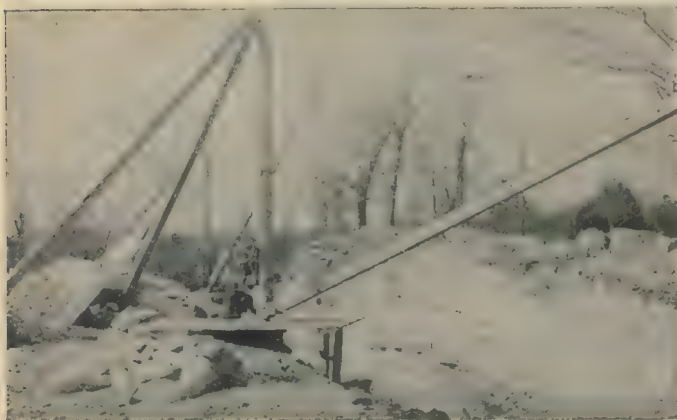
In the Canada our forefathers knew the log cabin was the ordinary habitation; the frame building, clapboard and

with modern conveniences and sanitation? And if we can no longer rest our eye on the massive oak rafters our fathers knew, are we not amply recompensed by the fireproof structure, with its hygienic appointments and elegance of finish?

To-day, all over the Dominion, buildings are in existence, in process of erection, or in contemplation, which call for the combination of fire-resistive quality, convenience, healthfulness, economy and elegance. Such structures are not only erected by the Dominion, by our provinces, and by our municipalities, but our banks, also, our insurance companies, our trust companies and public service corporations, have adopted the commendable policy of housing their activities in the highest expression of architectural skill, the consummation of which calls for marble—in the exterior sometimes; in the interior invariably, and always in the best of marble—of the kinds that are enduring; that retain their color and characteristics; that have beautiful tones, marked configuration and harmonious blending—attributes which are found in the highest state of perfection in the Canadian product.

On looking at the meaningless mass of crude material shown in the photo of the quarry in 1905, one has difficulty in establishing connection between it and the fact that to-day there are buildings all over the country—from Halifax on the Atlantic to Victoria on the Pacific—beautified by Missisquoi marble; that there are other buildings where it is now being set or erected, and that scores of specifications for still other buildings call for Missisquoi marble. But so it is. From little acorns great oaks grow, and from very humble beginnings in a little over five years the property represented by the foregoing illustration has become the modern business project representing the investment of hundreds of thousands of dollars, affording the livelihood of nearly two hundred men, increasing and diversifying Canadian activity, and placing at the disposal of the architectural profession, at moderate cost, a material unexcelled in some of its qualities and unequalled in most of them.

Let it be confessed that the promoters of this enterprise were not actuated solely by patriotic or artistic considerations. They were moved chiefly by the commercial spirit. This impelled them to the employment of the most modern methods in quarrying and the installation, in 1909, of a specially designed, electrically driven crane, with a capacity of 35 tons, a span of 100 feet, and a runway of 500 feet in



The Missisquoi Quarry in 1905.

painted, was the pretentious dwelling; the massive field-stone residence was prima facie evidence of unusual prosperity, while the cut-stone facades of old public and semi-public buildings represented the consummation of local pride. The interior was commonly of wood and of plaster, and the truly luxurious was reached when these were so fashioned as to be ornamental and decorative in effect.

From the recollections of these "good old days" we turn to the improved conditions of the present, and the prospects for the future. If the picturesque log cabin is all but gone, has it not been replaced by a structure which compensates us



Huge Block being Shipped to the United States.



A Group of Employees.

length, giving easy and economical command of the entire area presently under quarry operation.

Nature has not only been kind in the quality of the material at Missisquoi, but she has been generous in the matter of quantity. Core drilling 400 feet to the east of the present working reveals marble; core drilling 1,000 feet to the west discloses marble, while the outcroppings on the ridges north and south also show marble. The great-grandchildren of the present generation will probably have had their day before this huge deposit, even with the largest consumption, is exhausted. In variety, also, the deposit is remarkable. In many quarries the marble obtained is of only one color or color combination. In Tennessee, for instance, only two distinct varieties are obtained—a pink

The saw-mill is nearly 400 feet long, by 140 feet in width, and is built entirely of steel and concrete, including the roof. It contains eighteen gang saws of the most approved pattern, besides circular diamond saws, all of which are served by a second electric travelling crane, similar to the one over the quarry.

The company also has an extensive finishing department, containing rubbing beds, pneumatic tools, polishing machines, planers and carborundum machines, so that the material, when required, may be shipped all fitted, carved and polished ready for erection.

The saw mill and finishing shop are located within 150 feet of the quarry, the blocks being conveyed by trucks which are run down a very moderate grade.



View of the Missisquoi Marble Company's Fine Quarry at Philipsburg, Que.

and a grey. The Missisquoi quarry, however, is a stratified deposit, and from each strata, or bed, a different variety of marking is obtained, a diversity which may be still further multiplied by horizontal or vertical sawing of the bed.

An excellent material, in order to attain its proper status in general use, must be marketed in an economical way, and must be furnished promptly when called for. In recognition of this fact, and to keep pace with the ever growing demand for their material, the company, during the past year, have erected what is probably the best designed, most substantial and economical plant of its kind in existence, combining as it does the best features suggested by wide research and practical application.

The material is so fine-grained and so rich in appearance that it has been selected by American connoisseurs for such important buildings as the Second National Bank in Cincinnati and the new Hudson County Court House at Jersey City, in spite of a high American tariff.

In addition to developing the quarry, establishing the sales offices and agencies, and erecting the saw mills and finishing plant, the Missisquoi Marble Company acquired, and are the sole owners of the Philipsburg Railway, a standard gauge line running from Philipsburg to Stanbridge, a distance of more than six miles, where a junction is formed with the Central Vermont and Grand Trunk systems, and also with the Canadian Pacific Railway. The shipping facilities by rail leave nothing to be desired. There is also avail-



An Interior Glimpse of the Second National Bank at Cincinnati. The Building is finished in Missisquoi Marble and is a particularly noteworthy example of its possibilities.

able the barge route across Missisquoi Bay to Rouses Point, and thence down the Richelieu river to all points on the St. Lawrence and Ottawa rivers; or southward from Rouses Point down Lake Champlain and the Hudsons river to New York city, Philadelphia, or points reached through Long Island Sound.

The little village of Philipsburg was quite inadequate to the housing of the rapidly increasing population which the company's activities induced, and it became necessary to build camps and boarding houses and to erect tenements and cottages for the employees. The importance of having healthful and pleasant surroundings is a large factor in retaining skilful workmen.

Missisquoi marble tells a story of remarkably rapid development, one in which architects and contractors are closely concerned and on which the shareholders are justified in having high hopes.

The Missisquoi Marble Company, Limited, have offices

beyond the elastic limit or crystallized in any way, the quality yielded being very uniform.

A special feature about the mill is that it is operated entirely by electricity. When running at full capacity it will turn out 30,000 tons a year. The plant is located in the heart of the manufacturing district of Hamilton, where the company has secured about five acres of land, situated on both the Grand Trunk and Canadian Pacific Railways. The main building is of iron construction and is 316 feet long by 95 feet wide. Besides this, there are other buildings, such as offices, machine shop and storehouse.

Progressive Concern at Campbellford, Ont.

The Dickson Bridge Works Company, Limited, of Campbellford, Ont., are gradually working their way to the front rank of the bridge companies of Canada, and have made rapid advances both in their plant and output during the last



Missisquoi Marble Company's Quarry.

and agencies in all the leading cities and towns of the Dominion, where samples of the product may be seen.

Important New Industry at Hamilton

The Canada Steel Company, Limited, Hamilton, Ont., was organized last May. The plant is now completed and will be running almost immediately. The company is entirely independent of any of the recent mergers, and as they are coming into a field where the competition has been more or less limited, they have been received with much favor by the consumers of steel bars. Their mill is equipped with the most modern machinery and no expense has been spared to make it as efficient as possible. The output of the mill will consist largely of steel bars for reinforced concrete. These are made from steel which has a high elastic limit, resulting in great economy in construction. The bars are twisted hot. By this means the material is not stretched

Blocks awaiting Shipment or Sawing.

year, having turned out an average of about 100 tons per month.

The entire plant is now driven by electricity. The new equipment installed, includes Cleveland punch, coping machine, spacing table, profile punch, straightening machine, vertical reamers, overhead travellers, and two 10-ton Gantry loading cranes in their yard.

Two of the firm's largest contracts were the Wilton avenue bridge at Toronto, and the Mill Creek viaduct at Strathcona, Alta. The Wilton avenue bridge is a three-hinge arch span of 124 feet centre to centre pins, with two approach spans of 128 feet each. The bridge is 380 feet over all with 42-foot roadway, two street car tracks, and two six-foot sidewalks. Over 500 tons of steel were used in its construction.

The Mill Creek viaduct is 495 feet long, made up of 60 ft. and 30 ft. tower spans, 75 feet high at centre, 30-foot roadway with one street car track, and two 4-foot sidewalks.

Canada's Pioneer Wood Pipe Industry

Pacific Wood Pipe Company's Modern Plant at Vancouver, B.C.
—One of the Most Complete of its Kind in the Dominion

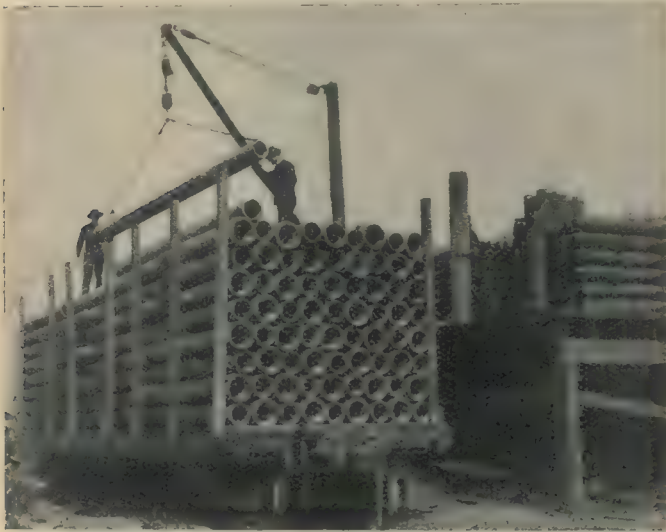
One of the pleasing effects of the tremendous development that is taking place in lumbering, fruit raising, farming, and all other lines of industry carried on in Western Canada and British Columbia, is a steadily growing appreciation of the merits of wood pipe for almost all purposes for which iron pipe is used in the east. Costing only about one-half the price of the latter, there are the added advantages that it is more easily handled, can be laid more rapidly, and does not attract the frost as iron does. To-day engineers are recommending wood pipe very generally, with the result that it is being used for city and rural water

In addition the company has under construction three miles of 18-inch pipe near Ashcroft, a long stretch of 4-foot diameter continuous stave pipe at Kamloops, and a 10 and 11-foot diameter pipe line at the plant of the Powell River Paper Company, up the coast, as well as several irrigation projects and a number of reservoir tanks.

Some Interesting Notes.

One important factor in maintaining uniform quality of product is the care taken of pipe material. All stock used is specially kiln-dried fir, carefully selected.

The plant has had to be enlarged several times to cope with the increase in orders. The present capacity is two



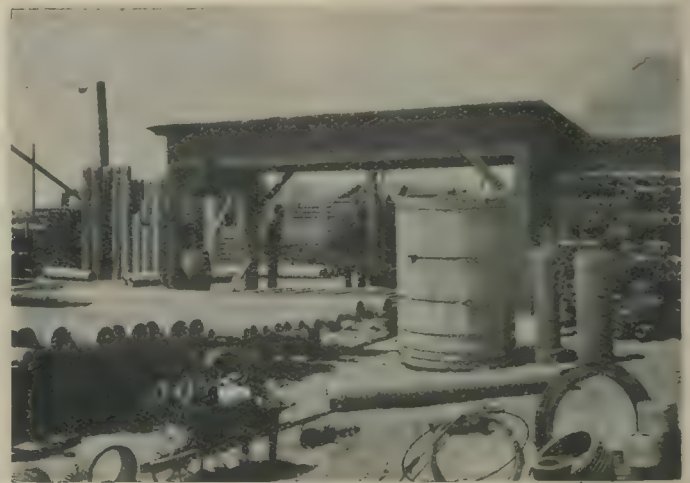
Carload of six-inch Pipe Stock about ready for shipment

mains, fire protection systems for mills and factories, power lines at development plants, extensive irrigation schemes, and for the varied needs of mines and ranchers.

Growth of Pioneer Factory.

The plant of the Pacific Wood Pipe Company, established in Vancouver over seven years ago, was the first to be built in Western Canada, and as far as can be ascertained, it was the pioneer industry of the kind in the Dominion. By always turning out a superior article the business was steadily increased, and to-day the company operates a large and complete factory equipped with a double set of machines built expressly for wood pipe winding, giving a proper and uniform tension at all points.

During the past six years the company has furnished wood pipe for many important systems, all of which are giving splendid satisfaction. The output during the past five years has been over 500 miles of wood pipe of various sizes, the 1910 output being just double the record for 1909. At present the plant is working on two of the largest contracts for wood pipe ever awarded. One of these is for the new water system being put in by Richmond municipality, about 70 miles in all, the sizes of pipe varying from 12 inches to 3 inches; the other is for Delta municipality water system, the pipe varying from 14 inches to 2 inches. The testing of both systems is about two-thirds completed and has been entirely satisfactory to the engineers in charge of the works.



Pipe Stock, Fittings and Reservoir Tank being assembled for loading

miles of wood pipe per day under "rush order" conditions, a double set of machines being operated.

The factory is most advantageously located, it being close to navigation and having the best of trackage facilities. Shipments may be made via C. P. R., Great Northern or British Columbia Electric Railways. Orders have been filled for points as far east as Ottawa and Montreal. A large and growing trade is also being done by the company with prairie towns and municipalities.

Mr. O. C. Schultz, manager of the company, has been at the head of affairs since 1908.

In the advertising section of this issue will be found the company's full page illustrated announcement, showing views of pipe, tanks and fittings ready for shipment.

Mr. John Frankman, the well known bridge contractor of Minneapolis, Minn., arrived recently in Winnipeg for the purpose of resuming operations on the construction of the Brant street bridge. The piers for this structure are already in and work will be renewed about the beginning of April. Other important contracts which Mr. Frankman has in hand are new train sheds and several bridges for the Canadian Northern Railway. Mr. Ford has incorporated a new concern which will be known as the Winnipeg Bridge & Construction Company, having permanent headquarters and staff in Winnipeg.

Modern Hoisting Machinery

It might be thought that the manufacture and sale of hoisting machinery would be at best a small business, and that the demand for such specialized machinery would be rather uncertain and spasmodic, but there is at least one concern in Canada that has found it a paying investment to concentrate on this one class of machinery, and that is Marsh & Henthorn, Limited, of Belleville, Ont. Steadily, year by year, the business of this firm has increased, and their hoists are now in use all over Canada. From time to time it has been found necessary to increase their plant until now they have about reached the limit of their present site, and it may soon be necessary to procure new quarters.

Stocks of the Marsh & Henthorn Hoisting Engines are now carried in warerooms in Montreal, Belleville and Winnipeg, and negotiations are now under way for the carrying of additional stocks in Calgary and Vancouver. This is being made necessary by the remarkable activity throughout the west in railroad construction, irrigation work, mining development, lumbering and general building operations, in all of which modern hoisting machinery is almost indispensable.

The development of the concern has been due largely to the business ability of its manager, Mr. L. W. Marsh. Starting with a very insignificant capital, the firm has risen to its present position of prominence by reason of the financial skill of its manager, backed by goods of the right quality. The citizens of Belleville recognized the talent Mr. Marsh has and made him their minister of finance for two years, after which they elected him as Mayor for another two years. At the election of the present year Mr. Marsh declined the honor in order that he might have more time for his business and military matters, he being also Major of the 15th Regiment A.L.I.

The marketing of the Marsh & Henthorn hoisting machinery is done by Mussons Limited, of Montreal. A first class machine, coupled with an excellent selling organization, makes a combination hard to beat, and the prospects are very bright for continued growth and expansion.

Canadian Engineering Instruments

The growth of Canadian industries in general and what are known as the "select trades" in particular is illustrated by the establishment in Toronto of a scientific instrument factory for the construction of all kinds of instruments pertaining to engineering and surveying.

The Consolidated Optical Company, Limited, and their predecessors, who have been well known for the past twenty years as makers of optical instruments, extended their equipment a couple of years ago to include engineers' instruments, and are now making for the Canadian trade a line of transits and levels equal to the most exacting requirements.

The convenience and desirability of a "home" factory is apparent, and it is of interest to know that the demand has exceeded the supply.

The Consolidated Optical Company, Limited, who are at present located at 61-67 Simcoe street, are erecting a modern factory building at 386 to 402 Richmond street west, of which they have arranged to take possession on May 1st.

The Railway Committee of the Legislative Assembly has passed the bill to incorporate the Richmond, Magog and Stanstead Railway Company, with headquarters at Sherbrooke, Que., and a capital stock of \$1,000,000. The company proposes to build its railway line from the town of Richmond through the counties of Richmond, Sherbrooke and Plain, a distance altogether of 50 miles, opening up what is described as a country rich in timber and mineral deposits. Branch lines may be also constructed, agree-

ments entered into with other companies, for running rights over each other's lines.

Collapsible Steel Forms

The Concrete Form & Engine Company, of Detroit, Mich., successor to the Collapsible Steel Form Company, of Detroit and Carson City, Mich., and the new Belle Isle Motor Company, of Detroit, whose advertisement appears in this issue, will no doubt find ready sale for their extensive output of collapsible steel forms, concrete machinery and marine and general utility engines. Under the new organization and management recently inaugurated every effort will be made to bring before the users throughout the country the superior merit of their line.

The collapsible steel form manufactured by this company is light and easily handled, yet combining strength and indestructibility. There has yet to be recorded a single failure to give satisfaction where this form has been used.



Fig. 1

It is entirely practical not only in building culverts, but conduits, sewers, small bridges, tunnels, etc.

The forms are constructed in three pieces, the top which is semi-circular, and two side plates. The top and one side plate are shown in figure 1. The working parts of the form are very simple and easy to operate. The top, situated between the two side plates, is held in position by arms attached to the side plates by bolts, which allow them to be lowered by pulling the draw rods which are attached to the arms. See figure 2. By pulling the draw rods the arms are lowered and the support of the top is removed, allowing the top to be lowered. The side plates are held in position by swinging braces so that when locked the sides are immovable. End plates are made which fasten on the top and side plates by keys so that they may be easily removed.

The form complete, with side, top and end plates, ready for the concrete is shown in figure 2. If the user purchases two side plates and extra standard size tops, it is possible

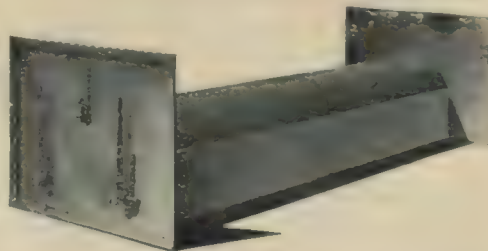


Fig. 2

to build most any size culvert required in the average work. This in itself is an economy readily appreciated.

A large and finely illustrated catalogue has just been issued, which may be had for the asking. A Commissioners' Time Book is also furnished free if desired.

Mr. James Hutcheon has been engaged as City Engineer of Guelph, Ont., at a salary of \$1,000 a year. He will have two months leave of absence each year, during which time he will employ Mr. Lindsay Malcolm, of Queen's University, Kingston, to undertake his duties.

The Lake Front Drive in Wisconsin

**A Noteworthy and Enterprising Piece of Work carried out by the
J. I. Case Threshing Machine Company — Constructional Details**

What is known as the Lake Front Drive, between Kenosha and Racine, Wisconsin, is an extension, or rather, continuation of the Sheridan drive, which leads out of Chicago toward Milwaukee. Most of the distance the road runs along the top of the bluff, overlooking Lake Michigan. The ten-mile stretch between Kenosha and Racine was partially graded some years ago, but has never been macadamized. Until the motor car traffic became heavy, the soil, which packed well in ordinary weather, was considered a fairly good road during most of the year. Latterly, however, it has become worn into ruts and holes by the combined traffic of motor and horse drawn vehicles and many complaints

proving the road. This effort did not succeed, and consequently, some months ago, the J. I. Case Threshing Machine Company, whose offices and factory are at Racine, offered to construct the road, at its own expense, if the towns would furnish the material. The proposition was immediately accepted and the work was begun at once. A part of the road is now completed and the balance is in various stages of improvement.

The bluff, along the top of which the road is located, rises about 60 feet above the lake level. The material furnished was the hard boulders, which lie at the foot of the bluff, along the narrow strip of shore between the foot of the



Before and After—Typical Transformation of Roadway effected by the J. I. Case Company

have been made of its condition, especially by automobilists.

The officials of the two townships through which this piece of road runs did not feel that they could afford to improve the road in the manner that the pleasure traffic seemed to require. It was not felt to be as important as a market road, as some others further back from the lake shore and the officials considered that the limited amounts of money at their disposal for road improvement should be expended where the greatest number of citizens, and especially the dairy and truck growing interests would be benefited. An effort was made primarily to secure subscriptions for im-

proving the road. The stone is crushed by a Case rock crusher, driven by a 75 h.p. Case traction engine, which machines were placed in position at the foot of the bluff. An inclined roadway, with a rise of 60 feet, in a distance of 130 feet, was constructed, over which to haul the crushed stone from the crusher to the roadway. The hauling was done by setting a post with a pulley attached at the top of the incline; a cable was run from a wagon at its loading point at the crusher, through the pulley at the top of the grade, to a Case traction engine operating on the level of the roadway at the top of the bluff. The cable was then hitched to an empty wagon, the weight of which pulled it back down the incline for another load, while the traction engine hauled the loaded wagon to the roadway.

In the construction, the road, which had been packed by the traffic, was regraded with a road machine to a crown of about 6 inches and the crushed stone applied to a depth of 8 or 10 inches, according to the condition of the foundation. This was thoroughly compacted with a 10-ton Case roller, and water was applied in the manner usual in the construction of macadam roads. It is expected by the Case company and by the local officials, that, owing to the excessive hardness and toughness of the stone used and the unusual amount of metal applied, the road will be more durable than most of those of macadam construction.

It is stated by the Case company that in addition to its sentiment of public spirit in offering to construct the road, the convenience to the company of a road where its automobiles may be properly tested will not be inconsiderable.



Case Roller Tender Grader and Automobile

Road Building and Contractors Machinery

The American Road Machine Company, of Canada, Limited, Goderich, Ont., are the Canadian manufacturers of the "Champion" line of street and road making machinery. The works at Goderich cover a large area near the centre of the town, and shipments are made and received over both the Grand Trunk and Canadian Pacific Railways, thus affording prompt shipment and quick deliveries to all parts of the country. Only the best material is used in the construction of the Champion machinery, and the mechanics employed by the company are men thoroughly familiar with this special line of work.

Large increases in the sales of the company during the past two seasons demonstrated that the selling end could be handled to better advantage if separated and moved to a more central point. With this purpose in view, the Hamilton Machinery Company, Limited, with offices and sales rooms at 144 York street, Hamilton, Ont., was formed to handle the entire output of the American Road Machine Company, thus allowing the manufacturers to devote all their attention to their machinery.

An Interesting Announcement

It will be of interest to the many friends and customers of the Consolidated Plate Glass Company, Toronto, to know that this firm will be moving into their fine new building at 241 Spadina avenue in June next. This progressive firm found that owing to the greatly increased demand for their goods larger premises were necessary, and they are erecting a handsome five-storey warehouse which will combine the head office, factory and warehouse under one roof. The latest appliances for the handling of glass are being installed, not only with a view to economy, but also that their customers may benefit by quick shipments. One of the features of this business is that glass is seldom ordered before required and is consequently needed at once. With this knowledge before them, the Consolidated Plate Glass Company are bending every energy to install such a system that cannot help but bring satisfaction to the customer. The building will have 50 feet frontage and will be 140 feet deep. It will contain 4,200 feet of floor space. The offices will occupy the front of the ground floor, the balance of this floor being devoted to the storing of extra large plates. At the rear will be located a large shipping room with overhead trolleys to facilitate the handling of cases. The upper floors will be used for the smaller sizes of plate, fancy and window glass, and also for factory purposes.

Fireproof Windows and Doors

Realizing the demand for fireproof windows and doors, Messrs. A. B. Ormsby, Limited, were the first to enter this market in Canada and they still hold a leading position by giving their customers the highest and best in this class of goods.

In kalameined clad doors, they make doors that are as ornamental as they are fireproof, that are made to any detail and that, when painted and grained, cannot be told from a wooden door. But they give fire protection, lower insurance rates and add to the appearance of the building in which they are installed. These doors are made by machinery. There are no seams or nail heads showing and everything is exactly to detail. Their terne clad doors bear the underwriters' label—which means the maximum reduction in insurance rates. On the sliding doors they use adjustable hangers, which save considerable time in the hanging.

Their fireproof windows are made by machinery. The sash and the moulded parts of the frames are pressed in

steel dies, thus ensuring their absolute accuracy as to form. Hollow metal fireproof windows are the only windows that have ever stood a fire test.

Skylights are given special attention. They are made fireproof, rainproof, dust and coldproof. Cornices, piping work and ceilings are looked after to the best advantage in what is one of the finest equipped factories in the line on the continent.

With two plants, one in the east and one in the west, they ship to every province in the Dominion. Among their recent fireproof work may be mentioned: Metropolitan Building, Vancouver—fireproof doors and screens; Edmonton School Board, Edmonton, Alta., new schools—fireproof doors and screens; legislative buildings, Regina, Sask.—fireproof doors; Fort Garry Station, Winnipeg—fireproof doors; Bemis Bag Company, Winnipeg—fireproof windows and doors; Lumsden Building, Toronto, and new Registry Office, Hamilton—fireproof windows and doors; Duchesneau Building, Montreal—fireproof windows and doors; Telephone Building, St. John, N.B.—fireproof windows and doors; J. J. Johnson Building, Johannesburg, South Africa—fireproof doors.

A New Reinforcing for Cement

In reinforcing concrete, economy is a very good thing, and the accurate disposition of steel is also very desirable, but heretofore these two vital elements in any system for reinforcing concrete did not appear to dwell in harmony. Now, however, our attention is called to a new system wherein economy and accuracy of design are united. These two terms are actually interdependent; for if there is an inaccuracy in design there must be a loss of efficiency and consequently of economy. If there is more steel at any point than is necessary there is a lack of economy caused by the excessive use of steel.

"A chain is only as strong as its weakest link," and so it is with a concrete structure. It is only as strong as its weakest point. There is little use in providing abundantly for tension if shear is not properly cared for; and there is not much use in providing shear members if they are not absolutely prevented from slipping and if they are not capable of transmitting the stresses from the positive tension member to the negative tension member. A system which



provides shear members to develop the strength of the positive tension member and then throws the stress back on the concrete is obviously incorrect.

Too long has reinforced concrete construction strayed from the path of the rational and common sense principles of mechanics. Now we are glad to note that it has at last come back from vague theory and uncertain assumptions to the old reliable principles of stress.

In the system before us we notice that all tension, both horizontal and diagonal, and all shear is cared for by the steel, and that the concrete is called upon to resist compression only. The units are built up from a number of flat bars of steel (usually 1-in. x 1/4-in.) clamped together and bent up at points along their length to form shear members, and are again united to form a negative tension member, both tension members varying in section according to stresses therein. The clamps are theoretically unnecessary and are provided to hold the bars together. In practice, however, they also provide additional mechanical bond. Several units can be placed in one beam and as the whole frame is a rigid truss

it is impossible to displace the steel during concreting. The system is adaptable to any form of construction—beams, bridges, culverts, retaining walls, slabs, etc. *

Patents on the above system are held in Canada, the United States and Great Britain by Mr. Sidney Burrowes, Niagara Falls Centre, Ont.

Electric Lifting Magnets

The affinity of magnets for iron and steel, although generally known for centuries, has not been commercially employed until recent years. Factory Products, Limited, of Toronto, are agents for what seems entirely new in Canada in the way of a lifting magnet. These mechanically perfect devices are made in a variety of shapes, sizes and strengths, and can be employed to handle iron and steel in any form.

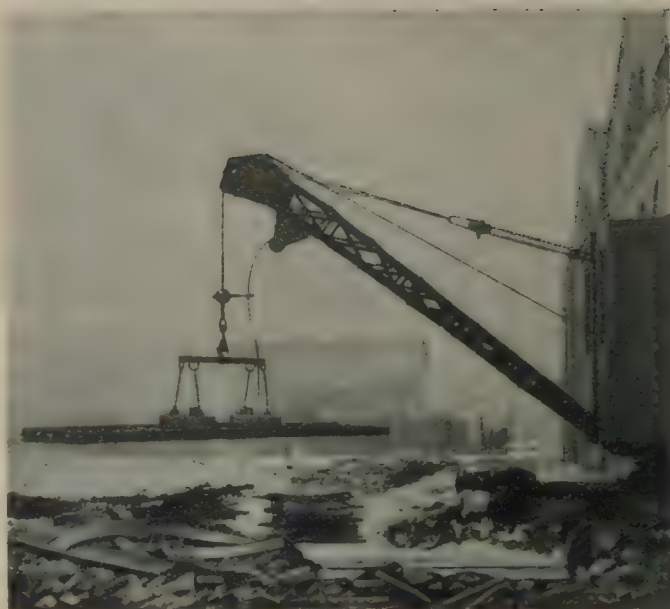
In foundries, rolling mills and engineering works where much labor is wasted in handling small material, the electric lifting magnets can effect a surprising saving. The field of these magnets is not limited to small material as one magnet is capable of lifting a bloom or ingot weighing ten tons, and when a battery of magnets are employed almost any weight of iron or steel transportable can be handled.



A 2-ft diameter Magnet holding a 3-ton casting

The question naturally asked concerning the magnet, is, "What happens when the power goes off or a wire breaks?" The possibility is no more probable than a chain or cable breaking on the ordinary crane. In some cases it is advisable to instal an additional accumulator battery to work in parallel with the dynamo so that if the power does go off the accumulator immediately takes up the load.

The smaller illustration shows the Witton-Kramer mag-



Witton-Kramer Magnetic Rail Transporter

netic rail transporter, consisting of a battery of elliptical magnets suspended from a common bar.

The larger illustration shows a magnet holding a three-ton casting in mid air.

Portable Saw Rig

The Oshkosh Logging Tool Company, of Oshkosh, Wis., are manufacturing a portable rip and swing cross-cut saw rig, a brief description of which will doubtless be of interest to our readers. The machine is equipped for power with either a gasoline engine or electric motor, and is mounted on heavy hardwood skids, thus affording a base practically as solid as a permanent foundation. The feature of the machine part of the rig is the swinging arbor, which is made to swing for cross cutting and held rigid for rip sawing, and is controlled by a lever on the side of the machine. A lever is placed in a suitable position for operating the saw when cross cutting. These machines are equipped with sliding scale for sawing various widths, also miter device for all kinds of miter sawing. The saw is covered by an adjustable saw guard which may be set to any height. Iron saw tables are made large enough. Attached to the iron tables are two side tables which facilitate the sawing of long and heavy lumber. A hook is fastened on each end of the skids which allows the handling of this rig by a team of horses.

The portable saw rig is made in two sizes. Size No. 1 carries 14-inch saws, weighs 1,800 lbs., and has a 6 h.p. gasoline engine; with the same saws and with a 5 h.p. electric motor the weight is 1,400 lbs. Size No. 2 carries 20-inch saws with a 10 h.p. gasoline engine, weight 2,400 lbs.; with the same size saws and 10 h.p. electric motor the weight is 1,600 lbs.

We have a copy of a letter from Collins Bros., general contractors, Rock Island, Ill., in which it is shown that the machine has taken the place of six carpenters in a single day. From an economical standpoint alone the Oshkosh portable saw rig would appear to be worthy of the close investigation of the contracting interests.

The Lethbridge Builders' Exchange has decided to unite with those of Edmonton and Calgary, and possibly Medicine Hat, to form a provincial Builders' Exchange. They will adopt a uniform scale of wages and adhere to the open shop.

New Building Material Firm

Elsewhere in this issue will be found space occupied by a new firm in the building material line—E. V. Albury & Company, Limited, of Vancouver and Victoria, B.C. Mr. E. V. Albury, the principal in the firm, comes from the United States, and has had a life-long experience in this particular line. Associated with Mr. Albury are Mr. Chas. H. Glasser, recently from Chicago, and Mr. Wm. Tozer, late of Liverpool, England. This new firm are British Columbia representatives for some large manufacturers in the United States and Canada, whose interests will be looked after in conjunction with carrying on a general builders' supply business. Temporary warehouses on Pender and Powell streets are at present being used until their permanent place can be completed on Harris and Ramur avenues. The new company have opened places of business in Victoria as well, and report the prospect there very encouraging.

The Perfect Brick Machine

One of the interesting events that will be found at the Cement Show is the Perfect Brick Machine, invented and manufactured by C. S. Wert, of Kendallville, Indiana. Mr. Wert, for a number of years, has been an ardent advocate of the use of cement for building purpose, and has now invented and patented, both in United States and Canada, a brick machine worthy of the special consideration of those interested in economical and time-saving devices.

The "Perfect" is an automatic brick machine of steel construction. Because of the rapidity, simplicity and durability of the work, and mechanical construction, the labor



Perfect Brick Machine

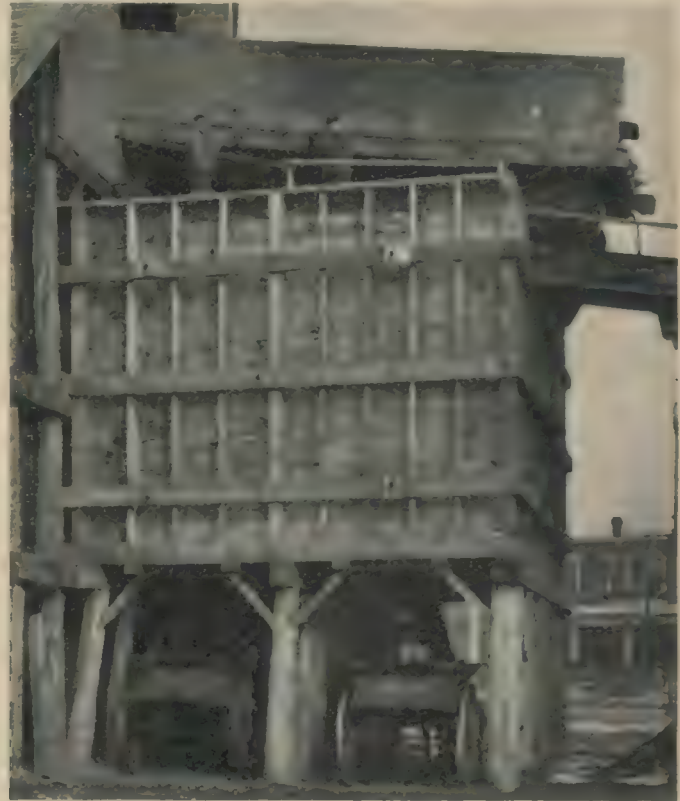
is lessened and the product manufactured at a minimum cost. The machine can be operated by either the hands or feet, or by both, the brick being released from the machine by one operation of the lever. The automatic tamper, which weighs sixty pounds, is practically lifted by an adjustable spring in the rear of the machine and can be adjusted to any stiffness the operator may desire, it not being necessary to lift one ounce of weight of the tamper, the spring doing it all. A mould of ten bricks can be molded by three strokes of the tamper operated by the foot, at which time the bricks are ready to be removed and set out to dry. It is claimed for

this machine that it will manufacture more than a thousand brick an hour. It is the only machine having an adjustable automatic foot leverage whereby the brick can be tamped without the aid of the hands.

The machine will be in daily operation at the Cement Show. It is understood to be the intention of the inventor to manufacture shortly in Canada.

Facilities for Handling Crushed Stone

At certain periods last year there was an uncomfortable shortage of crushed stone in the Toronto market, and inasmuch as the present season promises considerably greater activity than last, it is opportune to mention the unique facilities possessed by the Rogers Supply Company, of Toronto, for supplying all parts of the city promptly. The



Loading Crushed Stone into the Bins

company's yards are situated on the main line of the Grand Trunk and Canadian Pacific Railways, thus facilitating the ready switching and placing of cars, and handling of material. The delivery service is rendered still more expeditious by the chutes or bins erected at the various yards. As will be seen by the accompanying illustration, the stone, contained in hopper cars, is hauled up an incline and dropped into the bins for each size. It is then loaded into the contractor's wagon by simply pulling a lever. The advantage of such a system, compared with the common method of loading from cars, is at once apparent. The contractor can order his teams to the bins and is able to compute exactly how many trips will be necessary and what time will be involved in the work. Such a system should appeal strongly to contractors who have been accustomed to searching for their cars on public sidings and having to put up with the attendant delay and expense. The features of the Rogers Supply Company's service are an unlimited supply of stone, excellent car supply, and prompt delivery. The company have been handling the output of the Doolittle & Wilcox quarries in Toronto for some six years, during which time they have carried out many contracts.

Contracts Department

News of Special Interest to Contractors, Engineers, Manufacturers and Dealers in Building Supplies.

Information for insertion in these columns is invited from Architects, Contractors, Engineers, etc.

Waterworks, Sewerage and Roadways

Brandon, Man.

Tenders addressed to the city clerk will be received until March 17th for supply of the following goods: vitrified sewer pipe, 6-in., 8-in., 10-in., 12-in., 15-in., and junctions at price per ft., f.o.b. Brandon, freight and duty paid, all breakages to be allowed for, in car-load lots; cast iron manhole cover; cast iron catch basins and covers. Also waterworks supplies—brass goods, corporation and curb cocks and specials; lead pipe; pig lead; fire hydrants; valves, 4-in., 6-in. and 8-in.; valve casings; service boxes. Specifications, etc., at office of City Engineer, R. E. Speakman. Advertisement in this issue.

Carleton Place, Ont.

At a recent meeting of the Board of Trade and the Town Council, it was decided to correspond with the engineer who prepared the waterworks plan for the town some years ago to ascertain what improvements and changes he would suggest for the present as to the disposition of sewerage, etc., and the additional cost of construction.

Chapleau, Ont.

Tenders addressed to T. J. Godfrey, town clerk, will be received until March 27th for furnishing and erecting duplex steam pumping engine, capacity, 800 gals. per minute and one return tubular boiler. Chipman & Power, engineers, 204 Mail Building, Toronto; Geo. B. Nicholson, mayor. Advertisement in "Tenders and For Sale Department" of this issue.

Lethbridge, Alta.

T. Aird Murray, Toronto, is retained as consulting engineer for the installation of sewage disposal works here.

Niagara Falls, Ont.

Tenders are called until March 28th for construction of macadam roadway, etc. For further information see "Railroads," this issue.

Penticton, B.C.

See "Power Plants."

Peterborough, Ont.

Tenders addressed to S. R. Armstrong, secretary, will be received until March 10th for a quantity of timber at the waterworks dam. Specifications at office of Mr. W. Henderson, superintendent.

Rouleau, Sask.

Tenders addressed to W. H. Stewart, sec.-treas., will be received until April 4th for the following: electrical machinery, pole line, etc.; pumping machinery, compressed air system; producer gas plant. Also mains, c.i. or steel water mains, tested to 300 lbs. hydro-c.i. water main, tested to 300 lbs. hydrostatic pressure; 1,000 ft. 4-in. c.i. water mains, tested to 30 lbs. hydro-

static pressure; special castings, tees, etc. Also valves, hydrants, valves, etc., as follows: 22 6-in. hydrants, etc., 47 6-in. left-handed gate valves; 47 6-in. valve boxes extending 7 to 8 feet. Plans, etc., at office of the above or at office of J. Darlington Whitmore, consulting engineer, 104 Willoughby and Duncan block, Regina, Sask.

Toronto, Ont.

The Works Committee have provided for building of one thousand feet of sea wall this year and adopted city engineer's proposal to buy a quarry and gravel pit for his department's needs.

The Board of Control recommend the appointment of Mr. T. Aird Murray, consulting engineer; J. T. Sing, government engineer, both of Toronto, and Mr. J. Randolph, of Chicago, to act as a board of three experts to look into the whole waterworks system in Toronto, and bring in a report concerning the best means of meeting the city's need of pure water.

Vancouver, B.C.

The ratepayers will likely be asked in the near future to approve of a by-law authorizing the expenditure of about \$500,000 on sewer extension work. W. McQueen, city clerk.

Victoria, B.C.

Tenders addressed to W. W. Northcott, purchasing agent, were called until March 3rd for constructing about 400,000 square yards of asphalt pavement.

Wilkie, Sask.

Tenders addressed to T. A. Dinsley, sec.-treas., will be received until March 20th for the drafting of plans and specifications for, and giving detailed estimate of the cost of electric lighting and waterworks systems for this municipality.

Winnipeg, Man.

Tenders addressed to the Chairman, Board of Control, will be received until March 29th for supply of quantity of c.i. water pipe to be delivered f.o.b. city yards. Specifications at office of City Engineer. M. Peterson, secretary.

Railroads, Bridges and Wharves

Fredericton, N.B.

Tenders are called by Department of Public Works until March 13th for rebuilding Ryan Brook Mouth Bridge, Studholm, King's Co. Plans, etc., at Public Works Department, at the office of Geo. B. Jones, Esq., M.P.P., Apohaqui, King's County, and at David W. McKnight's, Esq., Millstream, King's County, N.B.

Niagara Falls, Ont.

Tenders are called until March 28th for construction of (a) steel concrete bridges and (b) a macadam roadway with the necessary drainage, being sec-

tion 4b, 5, 182 feet, etc. Plans, etc., at Administration Building, Queen Victoria Park. John H. Jackson, superintendent.

Ottawa, Ont.

This spring the C. P. R. will commence to make extensive improvements and additions to their round house beside the new Wellington street viaduct.

Vancouver, B.C.

The time for receiving tenders for clearing right-of-way on Mountain, Shuswap and Arrow Lake subdivisions of the C. P. R. will be extended from March 15 to April 15. H. Rindal, division engineer.

Tenders addressed to H. Rindal, division engineer, will be received until March 15th for clearing right of way on the mountain subway and Arrow Lake subdivisions of the C. P. R. Plans, etc., at the division engineer's office, Vancouver, B.C., also resident engineer's office, Revelstoke, B.C.

AWARDED

Calgary, Alta.

The city commissioners recommendation for the acceptance of tenders for the two new bridges over the Elbow were accepted. The Algoma Bridge Company and E. Ferndach were the successful tenderers. The cost is \$75,200.

Montreal, Que.

The C. P. R. have placed orders for about \$3,300,000 worth of rails, 100,000 tons with Consolidated Lake Superior Company, and about 10,000 tons with the Dominion Steel Company.

Quebec, Que.

The contract for the new bridge across the St. Charles river was awarded to Lemoine & Co., of Montreal. The new bridge will be of the bascule design, 150 feet in length. The contract was awarded with the provision that the corporation would attend to the Quebec approaches, which would cut off \$12,000 from the original tender. Mr. Valle, consulting engineer.

Public Buildings, Churches Schools, etc.

Belmont, Ont.

Tenders addressed to M. L. Holmes, sec.-treas., will be received until March 25th for erection of red brick school house, S. S. No. 77 South Dorchester. Plans, etc., at residence of above; or at the office of N. R. Darrach, architect, St. Thomas.

Brandon, Man.

Tenders addressed to T. Sinclair, architect, will be received until March 11th for erection of new East Ward School. Plans, etc., at office of the above.

Calgary, Alta.

Tenders were received until March 7th for erection of St. John's church. Archi-

fects, Lang & Major, Board of Trade Building.

The city of Calgary will spend approximately \$500,000 this year in the erection of new schools and improvements on those already erected.

Hamilton, Ont.

The I. O. O. F. are said to be planning the erection of a \$50,000 building. Abner Fraser, secretary.

Tenders addressed to Adam Hunter, librarian, will be received until March 18th for the several works required in the erection of new public library, Main street. Plans, etc., at office of architect, A. W. Peene, 2 West King.

Leeville, Sask.

Tenders are called until April 15th for construction of Weybridge school house by Fred Clark, secretary - treasurer. Plans, etc., at office of the Beaver Lumber Company.

Michel, B.C.

Tenders are called by Public Works Department, Victoria, until March 20th for erection of new wing and sundry alterations to new Michel School. Plans, etc., at offices of E. K. Stewart, Esq., secretary of the school board, Michel, B.C.; the government agent, Fernie; and the Public Works Department, Victoria. F. C. Gamble, Public Works Engineer.

Micksburg, Ont.

Tenders addressed to H. T. Hawkins, sec.-treas., will be received until March 6th for erection of school house No. 5 Stafford.

Oak River, Man.

Tenders are called for \$7,000 debentures for the municipality of Blanchard for erection of municipal hall here. G. McIntyre, sec.-treas., Oak River, Man.

Orillia, Ont.

The Presbyterian Building Committee although giving the plans of H. W. Angus, North Bay, the first prize, have not accepted them in their entirety. None of the eight plans submitted were suitable. It is stated that the floor plan submitted by Mayor Frost will likely be adopted as a basis. J. G. King, secretary.

Sarnia, Ont.

Tenders addressed to A. Kelly, House of Refuge, are called until March 15th for painting House of Refuge here.

South Middleton, Ont.

Tenders addressed to Geo. Fisher, secretary-treasurer, will be received until March 15th for reconstruction of school house, S. S. No. 7. Plans, etc., with above.

Simcoe, Ont.

The plans prepared for the Carnegie Library here have been approved by the Carnegie Library Trust. Specifications, it is stated, will be ready by middle of March, and tenders called for. Architects, Shepard & Calvin.

The congregation of St. Mary's R. C. Church are contemplating the building of a residence for their parish priest. L. D. Barber, Brantford, has been asked to prepare plans. It is proposed to locate the residence on the large vacant space just east of the church.

Toronto, Ont.

The plans for the improvements to Wycliffe College have been passed and

work will be commenced at once. These will consist of a new chapel and principal's residence. Estimated cost, \$40,000.

Permits were issued recently to Chester Baptist Church for Sunday School, corner of Danforth and Bowden, \$13,000; Board of Education, school, southeast corner of Dufferin and St. Clair, \$30,000.

Tenders addressed to H. F. McNaughten, secretary, public works, will be received until March 12th for additions and alterations required to building No. 5 Queen's Park. Plans, etc., at above Department. Advertisement in "Tenders and For Sale Department" of this issue.

Truro, N.S.

The council decided to erect a municipal building to cost about \$20,000.

Vancouver, B.C.

The plans for the proposed pavilion for Stanley Park will call for stone construction instead of wood.

Tenders are called for erection of new pavilion in Stanley Park. O. W. Moberg, architect. Noted previously.

Welland, Ont.

According to a letter received by the public school board from B. J. McCormick, Industrial Commissioner, the rumors that a syndicate had been formed to erect at least 200 houses this year is correct. The letter further stated that this syndicate will donate a site of two acres on the condition that a new school is erected.

Whitemouth, Man.

Tenders are called until March 8th for plans and specifications for school and basement, 40 ft. x 50 ft., etc., value \$5,000. Building material, frame, concrete, brick or stone. G. E. Saunby, secretary.

Winnipeg, Man.

Building permit was issued to A. R. McNichol for theatre on Main street, \$12,000.

The time for receiving tenders for St. Charles Country Club has been extended to March 6th. Noted in last issue, under "Business Buildings."

The Bible Society board have decided to start a campaign to raise funds to build a Bible house to cost, with site, \$60,000, towards which the parent society at London, Eng., will contribute the last \$20,000.

The securing of the Fort Osborne barracks site, which adjoins the present Parliament Buildings, to permit of the building of a new legislative hall has been abandoned for the time being. Hon. R. Rodgers, Minister of Public Works.

AWARDED

Foldens, Ont.

James A. Edwards, Ingersoll, has been awarded the contract for erection of brick church here, \$5,075. H. Pocock, London, architect.

Nelson, B.C.

The contract for the building of the isolation hospital has been let to John Burns & Son and the work will be proceeded with immediately, \$885.

Notre Dame de Lourdes, Man.

The store of Jules Wiecker was destroyed by fire on the 25th ulto. Estimators interested are Chas. Dupont and Homer street, \$60,000.

Toronto, Ont.

The contract for the construction of the Woman's building at the Exhibition grounds has been awarded to Wickett Bros., \$59,978. The estimate placed it at \$67,000.

Vancouver, B.C.

The contract for erection of proposed extra wing to the new court house on Georgia street has been awarded to McDonald & Wilson, contractors, at a figure of \$348,200.

North Vancouver, B.C.

Contract for the construction of the municipal hall building on the Lynn valley road was awarded to H. W. Young & Sons, \$8,395.

Residences

Regina, Sask.

Henry Black, contractor, will move the old building on Hamilton street once used as a church, and on the site will erect a 3-storey apartment building at a cost of about \$30,000.

Victoria, B.C.

Permits were issued recently to R. L. Spragge, dwelling on Albany street, \$2,100; Capt. James Hunter, dwelling on St. Andrew's street, \$2,700; George E. Handley, dwelling on Cedar Hill road, to cost \$4,000.

Winnipeg, Man.

Tenders addressed to J. H. G. Russell, architect, McArthur Building, will be received until March 10th for erection of a two family residence on Dorchester street for Mr. J. D. Windrum.

Tenders are called for excavating for an apartment building, according to plan and specification at 794 Victor street.

Tenders addressed to E. D. Tuttle, architect, 701 McArthur Building, will be received until March 13th for erection of residence for Mr. A. A. Miller, Horn street.

Pratt & Ross, architects, have drawn plans for the private residence for Sir D. H. McMillan, lieutenant-governor, and are calling for tenders.

Building permit was issued to A. P. Johnston, 796 Victor street, for apartment block on Agnes street, \$50,000.

AWARDED

Brockville, Ont.

The contract for addition and alterations to residence of H. A. Stewart, K.C., has been awarded to W. E. Brown, Brockville.

Calgary, Alta.

The following contracts were awarded in connection with the residence erected for Col. James Walker; general contract, Zang & Mustgrave, \$9,000; plumbing, E. J. Young, \$2,000. Lang & Major, architects.

Nelson, B.C.

The contract for the stone work in connection with the erection of apartment block on Victoria street for Mr. Kerr has been awarded to Eric Palmquist. A. Carrie, architect.

Business Buildings and Industrial Plants

Basswood, Man.

The Holmstrom block here was destroyed by fire on the 3rd inst. Estimated loss on building, about \$4,000.

Belleville, Ont.

Marsh & Henthorn, Ltd., manufacturers of hoisting engines and boilers, are seeking a location, their new plant having outgrown their present premises.

Brandon, Man.

Tenders addressed to Shillinglaw and Marshall, architects, 831 Rosser avenue, are called for erection of 3-storey building for Mr. J. Burchill, this city.

Calgary, Alta.

A company to operate and erect a large linseed milling plant in the west has been organized. Address Western Agencies and Development Co., Ltd.

Cupar, Sask.

The Beaver Lumber Company's store, Beaches' hardware store and other buildings were destroyed by fire on the 5th inst. Estimated loss, \$50,000.

Edmonton, Alta.

The Edmonton Concrete Company will erect a mirror plant in connection with their glass works on York street at a cost of \$30,000.

The Bank of British North America intend next year to erect a large business block on the site purchased recently. In the meantime they are looking for temporary premises. G. F. Laing, manager, Calgary branch. Noted in issue of December 7th.

Fort William, Ont.

Fifty feet frontage has been purchased by Sir Robert Usher, Edinburgh, Scotland, which it is thought signifies the erection of a building.

Guelph, Ont.

A modern abattoir will be constructed here by Mr. A. Barber at a cost of about \$10,000.

Montreal, Que.

It is reported that an English syndicate represented here by Mr. E. H. Ford, of the Ford Iron Company, will establish a chain of summer hotels throughout the Dominion, beginning at Senneville. Other places mentioned are Toronto, Ottawa, Vancouver, and Winnipeg.

The building to be erected for Messrs. Henry Morgan & Co., on St. Catherine street, between Mance and Balmoral streets, will be eleven storeys high with basement of steel and reinforced concrete. The building was designed by Mr. J. H. McDowell, with H. Morgan & Company.

A building permit has been asked by Mr. Peter Lyall for the erection of the National Bridge Company's building, in Longue Point Ward. The building will cost \$300,000 and is to be used as a foundry where structural steel and bridge material will be manufactured. Construction has been started.

New Westminster, B.C.

H. G. Allen, representative of the Compressed Gas Co., of Seattle, has been here looking for a possible location of a plant to manufacture acetylene gas.

The British Columbia Steel Corporation has received its Dominion charter,

capital, \$10,000,000. The plant will be erected on the Fraser river, near here. A. P. Gibbs, is interested.

New Dublin, Ont.

The store of J. S. Ransom, general merchant, was completely destroyed by fire on 1st inst. Loss, about \$12,000.

Owen Sound, Ont.

On the 25th inst. the ratepayers will vote on the by-law to loan \$30,000 to a company proposing to erect a knitting factory (50 x 100). A. D. Lake and G. A. Ward represent the company.

A dairy company, lately incorporated, will erect a dairy building, stone or cement, and stables on 3rd avenue. The charter members comprise C. Bleich, A. Nicol and P. Harwood, etc.

Regina, Sask.

Negotiations as to the location here of a nail factory from the east to handle the western trade, are reported. Commissioner of Industries, Sheffield.

Richmond, Que.

The Dunton Block, Main street, was completely destroyed by fire on the 1st inst. Total loss, \$25,000.

Sandwich, Ont.

The United States Steel Corporation is reported to be considering the erection of a plant here.

Simcoe, Ont.

Mr. E. T. Arnoldi, architect, of the firm of Langley & Howland, Toronto, is in charge of the proposed extension to the Molsons Bank here.

St. Thomas, Ont.

Architect John Findlay, successor to N. R. Darrach, is preparing plans for the erection of a two-storey store for Frank Goodwin, furniture dealer, on Talbot street.

The Merchants Bank has purchased the four-storey building at the corner of Talbot and Hincks street, and will, as soon as possible, convert it into an office building.

Sydney, N.S.

The I. C. R. station was damaged on the 1st inst. Total loss, about \$60,000.

The architects are preparing plans for the new Bank of Commerce branch, corner of Charlotte and Dorchester streets. E. B. Ireland, manager.

Vancouver, B.C.

A building permit was granted to W. D. Rorison for large warehouse on Homer street, \$60,000.

Victoria, B.C.

The sketch for the proposed combination theatre, hotel and office building on the site of the Spencer block shows a large structure of ten-storeys to cost about \$1,000,000. Mr. J. W. Weart is in charge of the project; H. S. Griffiths, architect.

The British Columbia Telephone Company have decided upon the erection of a new four-storey fireproof exchange building to cost \$65,000, at the corner of Johnson and Blanchard streets. It is the intention to have it completed by September. Thos Hooper, architect.

Wallaceburg, Ont.

A new hotel will be erected here. Those interested are Chas. Dupont and Captain Moran, Marine City, Mich.

Winnipeg, Man.

Tenders were called until March 2nd for erection of 3-storey and basement addition to building on Douglas street for Messrs. Smith & Champion. C. Elwood Watkins, architect.

Messrs. G. Gale & Sons, manufacturers of iron and brass bedsteads, will erect on the property recently purchased by them on Higgins avenue, a factory to cost about \$50,000. Mr. Turner is local manager.

Windsor, Ont.

O. R. S. Traber, Fullerton Building, St. Louis, Mo., is preparing plans for a 2-storey factory, 100 x 150 ft., for the Maloney Electric Co., cost, \$30,000. Noted in issue of February 22.

AWARDED

Chatham, Ont.

The Dowsley Spring & Axle Company have let a contract to the Blonde Manufacturing Company for extension to their present plant (135 ft. x 46). Estimated cost, \$15,000.

Ottawa, Ont.

The contracts for erection of shops, etc., for W. J. & R. Spratt, have been awarded as follows: Stone and brick and concrete, C. & W. N. Lester; F. A. Wilson, carpenter work; painting and glazing, Ritchie & Nunn; estimated cost, \$8,000. Jas. E. Wilson, Ottawa, architect.

Welland, Ont.

The Builders' Lumber & Supply Co. have been awarded the contract for the construction of Goodwin & Ross' new 3-storey business block on East Main street. This contract covers all but the steel work, which was awarded to the Hamilton Bridge Co. Work will be completed in July.

Power Plants, Electricity and Telephones

Brudenell, Ont.

At the last meeting of council a by-law was passed authorizing the Eganville and Brudenell Telephone Co. to erect and maintain a telephone line on the highways of the municipality.

Calgary, Alta.

The city will have to put in a new claim, with maps and plans, for the right to dam the Elbow river for domestic water purposes. No previous priority of claim for power will be considered.

Kincardine, Ont.

Tenders addressed to Mr. D. McNaughton, President Bruce Municipal Telephone System, Underwood, Ont., will be received until March 18th for construction of telephone system in the Townships of Bruce, Saugeen, Greenock, Kincardine and Elderslie, Co. of Bruce. Plans, etc., at office of W. L. Bland, Kincardine, Ont., and at office of the Engineer, Geo. J. Beattie, 72 Victoria street, Toronto.

Magog, Que.

An electric lighting and power plant will be installed here this summer. Specifications prepared by Messrs. Ross & Holgate, Montreal.

Ottawa, Ont.

The municipal electric commission here decided to ask the city council to

request the hydro-electric commission to investigate, and take steps to secure for Ottawa a water power either in Ontario or Quebec.

Penticton, B.C.

F. H. Latimer, C.E., writes re installation of water, light and power at Penticton that plans, etc., will be ready in about four weeks' time for iron and steel pipe fittings for water work. The power development is hydro-electric and require extensive surveys in mountains which cannot be done until snow is off. There will be about five miles of concrete conduit, the pressure pipe being under a maximum static head of about 2,100 feet, 200 kw. generator being installed at first probably in two units.

Porcupine, Ont.

This municipality is to have electric light and power as soon as possible. Messrs. Ross & Holgate, Montreal, have prepared plans and estimates for the plant and tenders were asked for during the first week in March. The mines as well as the town will be supplied with power and lighting.

Quebec, Que.

Tenders are called until March 25th by Quebec Railway, Light and Power Company for construction of about three and a half miles of double track railway from Beauport to Kent House Park. Plans, etc., at office of above, 140 St. John street. C. E. A. Carr, general manager.

Rouleau, Sask.

See "Waterworks."

Saskatoon, Sask.

Tenders addressed to Jas. Clinskill, and W. B. Neil, city commissioners, will be received until March 27th for supply of the following: A 150 kw. 2,200 volts, 60 cycle, 120 r.p.m., 2 phase generator, exciter, installed complete. Alternative tenders for the above are asked for in three phase (B) 1,250 h.p., 120 r.p.m., vertical cross compound Corliss engine with condensing apparatus and feed water heaters, installed complete. C direct connected exciter engine to run exciter for 750 kw. generator, installed complete; D one steel smoke stack with a height of 100 feet and inside diameter of 80 inches with connections, etc. Jas. Clinskill, mayor.

St. Vital, Man.

The application of the Manitoba Rural Railway Company for permission to run an electric line through the municipality, after several changes had been ordered in the original draft, was passed. Ratification of legislature still required. This agreement calls for the construction of electric railways through the municipality from Winnipeg and St. Boniface southward on both sides of the river, etc.

Toronto, Ont.

Tenders addressed to Chairman, Board of Control, will be received until March 14th for electric vehicles. Specifications obtained from Hydro-Electric System, City Hall.

Tenders addressed to G. R. Geary, Chairman, Board of Control, will be received until March 14th for pipe fittings in connection with street lamps. Specifications at Hydro-Electric System, City Hall.

Wilkie, Sask.

Tenders addressed to T. A. Dinsley, secretary-treasurer, will be received until March 20th for the drafting of plans, etc., of the cost of electric lighting, etc., for this municipality.

AWARDED

Calgary, Alta.

The city commissioners have recommended the accepting of tenders for about two hundred lamps of the same pattern as adopted in Toronto. Five globes are on each lamp post and the iron work is arranged very ornamentally. The Canadian Equipment Company and the Canada Foundry Company are the successful tenderers. The total cost will be \$11,400. Each company will supply half the number of lamps.

Vancouver, B.C.

The Canadian General Electric Company were awarded the contract for supplying 2,000 tungsten lamps for the Granville standards at \$1.25 per light. The Northern Electric Company submitted a tender of \$1.28 on the same lamp for a similar quantity.

Miscellaneous

Calgary, Alta.

Tenders addressed to W. D. Spence, city clerk, will be received until March 14th for supply for the year 1911 of general hardware, electric light materials, tools, packing, waste materials, pipe fittings, etc. Specifications, etc., at office of City Commissioners.

Toronto, Ont.

Recent building permits include: J. H. Lennox, 2 det. and 1 pr. semi-det. 2-storey brick dwellings on Hartford ave., \$8,000; Rev. Geo. Brown, 1 pr. semi-det. 2½-storey brick dwellings on north side Gloucester street, \$9,000; J. J. Downey, 1 pr. semi-det. 2-storey brick dwellings on east side Indian road, \$4,000; J. E. Merkens, 2 det. 2-storey and attic brick dwellings on Summerhill avenue, \$10,000; A. W. Reid, 2-storey brick apartments, corner Albany and Wells, \$10,000; M. A. Hunter, 1 pr. semi-det. 2-storey brick dwellings on St. Helens avenue, \$4,000; Geo. Liddiard, 3 att. 2-storey brick dwellings, northwest corner Wyndham and Brock, \$6,000; Dr. H. L. Bartlam, 3 att. and 1 pr. semi-det. 2-storey roughcast dwellings, brick fronts, on Dovercourt road, \$7,000; W. J. Griffiths, 2-storey and attic brick dwelling near Indian road, Wright ave., \$4,000; B. Kent, 2½-storey brick dwelling, near Bernard ave., Admiral road, \$7,000; R. E. McDonagh, 2 det. 2½-storey brick dwellings on Sunny side and Wright, \$7,300; McGee Estate, alterations to theatre, near King on Yonge street, \$8,000; H. M. King, 2 det. 2½-storey brick dwellings near Garden on Glendale, \$5,400; A. G. Saunders, 2-sty. and attic brick addition to 1 pr. semi-det. brick dwellings, 48-50 Lappin ave., \$4,000; S. G. Smith, 1 pr. semi-det. 2-storey brick dwellings on east side Perth avenue, \$4,000; John S. Wren, 2 pr. semi-det. 2-storey brick dwellings in south side Withrow ave., \$8,000; R. Dale, 2 pr. semi-det. 2½-storey brick dwellings, 13, 15, 17, 19 Dupont street, \$12,000; T. H. Wylie, 2 det. 2-storey brick dwellings, on Law street, \$5,000; Thos. Edwards, 3 att. 2-storey brick dwellings on southeast cor. Symington and Paton, \$6,000; W. C. Stevens, 1 pr. semi-det. 2-storey

brick dwellings near Dundas, on north side Kenneth, \$5,400; Frank Phillips, 1 pr. semi-det. 2½-storey brick dwellings on 411-3 Brunswick avenue, \$8,000; J. G. Vale, 1 pr. semi-det. 2½-storey brick dwellings near Garnock, on west side Logan ave., \$4,500; Samuel Dennis, 1 pr. semi-det. 2½-storey brick dwellings near Rideau, on east side Lansdowne, \$4,500; C. H. J. Snider, 2½-storey brick dwelling on east side Keele street, \$4,000; J. & T. H. Bishop, 1 pr. semi-det. 2½-storey brick dwellings on north side Wright ave., \$4,500; D. McLennan, 1 pr. semi-det. and 1 det. 2-storey brick dwellings, cor. West Lodge and Marion, \$6,750; James Sercombe, 4 pr. semi-det. 2-storey and attic brick dwellings on north side Gibson, \$16,000.

Vancouver, B.C.

Among the building permits were two taken out by Bentley & Wear covering extensive building operations in Kitsilano, for eight residences on Seventh avenue west, near Macdonald street, at a cost of \$24,000; another was issued to Mr. A. Mackenzie who will erect a business block at 1815 Park drive, \$10,000.

Other permits were taken out as follows: S. N. McLeod, 2525 Third avenue west, \$3,200; J. G. Gray, 2156 Eleventh avenue east, \$2,000; D. A. McIntosh, 1228 Park Drive, \$6,600; E. E. Crandall, 1126 Twelfth avenue west, \$4,500; Mrs. Mackenzie, 1145 Tenth avenue west, \$5,500; W. H. Marcus, 463 Thirteenth avenue west, \$3,500; A. Mathason, 1439 Tenth avenue east, \$2,200; Carmichael & Herbert, 2922 Third avenue west, two houses, \$4,400; H. Green, 2116 Seventh avenue east, \$2,000; Braithwaite & Glass, 2830 Third avenue west, \$2,500; D. Acorn, 1329 Stephen street, four houses, \$8,000.

Winnipeg, Man.

Tenders addressed to the Chairman, Board of Control, will be received until March 15th for supply of hardware and rubber goods required for the season of 1911. M. Peterson, secretary

AWARDED

North Toronto, Ont.

The Elias Rogers Supply Company were given the contract at \$1.25 per ton for crushed stone.

Business Notes

A. V. Campeau, plumber, Montreal, is stated to have assigned.

Eastern Paper Co., Ltd., St. Basile, Que., have registered.

H. Cauchon & Co., contractors, Beauport, Que., have registered.

The Builders Sand Company, Montreal, Arthur Laing, has registered.

Nicholson & Barry, plumbers, etc., Montreal, are stated to have dissolved.

Ford, Rolland & Son, manufacturers of paper, Portneuf, Que., have registered.

Jos. Belisle & Frere, plumbers, Montreal, Que., are stated to have dissolved.

Archambault & Dube, plumbers, Knowlton, Que., are stated to have assigned.

Belding Lumber Company, Limited, Toronto, assets advertised for sale by tender.

W. Arnold Smith, electrician, Sarnia, Ont., is stated to have assigned to Marshall A. Saunders.

Tenders and For Sale Department

To Contractors

Tenders will be received at the office of the Secretary, School of Mining, Kingston, up to 6 p.m. of Friday, March 10th, for the several trades works required in the erection and completion of the Nicol Building for the Governors of the School of Mining and Agriculture.

Plans and specifications may be seen at the University and at the office of the undersigned.

The lowest or any tender not necessarily accepted.

POWER & SON, Architects,
9-10 Merchants Bank Chambers, Kingston.

Chapleau Water Works Pumping Machinery

Sealed tenders will be received by the Town Clerk until 8 p.m., on Monday, March 27th, 1911, for furnishing and erecting Duplex Steam Pumping Engine, with a capacity of 800 gallons per minute, and one Return Tubular Boiler.

For further information apply to the engineers.

GEO. B. NICHOLSON, Esq., Mayor,
Chapleau, Ont.

T. J. GODFREY, Town Clerk,
Chapleau, Ont.

CHIPMAN & POWER, Engineers,
10-10 204 Mail Building, Toronto.

For Sale—Second Hand

No. 8 Austin Gyratory Crusher.
No. 6 and No. 3 Austin complete plant.
No. 3 Austin and 2 No. 6 Gates and No. 5 "B."
70-ton Vulcan Steam Shovel, 2-yard.
50-ton Bucyrus Steam Shovel, 1½-yard.
Loco. Crane, with 1¼-yard Clam Shell.
Little Giant Traction Steam Shovel, 1¼ yard.
Hayward Orange Peel Buckets, 1 and 1¼ yd.
Concrete Mixers, Steam Rollers, Air and Steam Drills, Air Compressors, Locomotives, Dump Cars, etc.

All our goods we fully guarantee.

Send for our February Booklet.

WILLIS SHAW MACHINERY CO.,
171 La Salle St.,
Chicago, Ill.

City of Moose Jaw, Sask.

Tenders for Garbage Wagons, etc.

Sealed tenders, endorsed "Health Department," will be received by the undersigned City Clerk until 8.30 o'clock p.m., on Monday, March 20th, 1911, for the following apparatus:

Wagons made of steel or other material, and tanks suitably designed for conveying ashes, garbage and all materials collected and removed under the supervision of the Health Department.

The lowest or any tender not necessarily accepted.

J. M. WILSON, City Engineer. W. F. HEAL, City Clerk.
Moose Jaw, March 1st, 1911 10-11

Tenders Wanted

The Town of Petrolia intends to construct about 6,000 square yards of pavement, and about 2,500 lineal feet of concrete curb and gutter combined, and invite tenders for Vitrified Brick, and any other kind of pavement.

Parties tendering must enclose a specification of the pavement they purpose laying along with their tender.

Tenders to be placed with me on or before 5 p.m., Monday, March 20th, 1910.

Any tender not necessarily accepted.
9-10 J. McHATTIE, Town Clerk.

City of Toronto

Civic Car Lines

Tenders for Rail & Ties

Tenders will be received by registered post only, addressed to the Chairman of the Board of Control, City Hall, Toronto, Canada, up to noon on Tuesday, April 4th, 1911, for delivery of Thirteen hundred and forty (1340) tons of open hearth steel rail, 80 lb. section, also thirty thousand (30,000) untreated wood ties, white cedar preferred, although other woods will be considered.

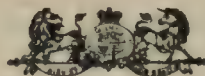
Envelopes containing tender must be plainly marked on the outside as to contents.

Specifications and forms of tender may be obtained upon application to the office of the City Engineer, Toronto.

The lowest or any tender not necessarily accepted.

G. R. GEARY (Mayor)

Chairman, Board of Control.
City Hall, Toronto, Feb. 23, 1911, 9-11



RIDEAU CANAL

Notice to Contractors

Sealed tenders addressed to the undersigned, and endorsed (a) "Tender for Timber," or (b) "Tender for Timber and Plank," will be received at this office until 16 o'clock on Monday, the 20th March, 1911, for the supply and delivery of British Columbia or "Douglas Fir" dimension timber and also for other Lumber and Timber required for use on the Rideau Canal for the year 1911-1912.

Specifications, Bills of Timber and full information can be obtained from the Purchasing Agent of the Department of Railways and Canals, Ottawa, on and after this date.

The lowest or any tender not necessarily accepted.

By order,

L. K. JONES,
Secretary.

Department of Railways and Canals,
Ottawa, 22nd February, 1911.

Newspapers inserting this advertisement without authority from the Department will not be paid for it. 9-10

City of Moose Jaw, Saskatchewan

Main Drainage Works

Sealed tenders endorsed "Tender A" and "Tender B" will be received by the undersigned City Clerk until 8.30 o'clock p.m., on Monday, April 10th, 1911.

Any tender received after the above-stated time will be declared informal.

Contract "A."

Supplying material for and constructing a Sewage Disposal Plant complete, including Pump House, Sedimentation Tanks and Percolating Filter, also the supply of materials for and the laying of a Trunk Sewer and Water Main.

Contract "B."

Supplying two Electrically Driven Centrifugal Pumps and Auto Starters complete with all piping, connections, etc.

Plans and specifications for Contract "A" may be obtained from the City Engineer, Moose Jaw, upon receipt of a marked cheque for the sum of \$25 to be held until the return of plans and specifications, and for Contract "B" plans and specifications will be sent upon request.

The lowest or any tender not necessarily accepted.

J. M. WILSON, City Engineer. W. F. HEAL, City Clerk.
Moose Jaw, Feb. 18th, 1911. 9-14

City of Moose Jaw, Saskatchewan

SEWER AND WATER EXTENSIONS

Sealed tenders endorsed "Tender 29," "Tender 29," "Tender 30" and "Tender 31," will be received by the undersigned City Clerk until 8.30 o'clock p.m. on Monday, April 10th, 1911.

Any tender received after the above stated time will be declared informal.

Contract 29.—The laying of approximately 30,700 lin. feet of tile pipe sewer, building man-holes, etc.

The laying of approximately 29,700 lineal feet of cast iron water main, placing valves, valve boxes, hydrants, etc.

Contract 29.—The supplying of approximately: 29,600 lineal feet of 6-in. c.i. water pipe.

112 lineal feet of 4-in. c.i. water pipe.

132 6-in. cast iron reverse curves.

34 6-in. cast iron crosses.

72 6-in. cast iron tees.

29 4-in. off 6-in. cast iron tees.

28 4-in. cast iron tees.

95 6-in. cast iron plugs.

Contract 30.—The supply of approximately: 26,600 lin. feet of 8-in. vitrified tile sewer pipe. 5,225 lin. ft. of 10-in. vitrified tile sewer pipe. 1,100 lin. ft. of 12-in. vitrified tile sewer pipe.

25 8-in. tees.

75 6-in. tees.

25 8-in. bends, 90 deg.

100 6-in. ¼ bends, 90 deg.

25 8-in. stops.

25 10-in. stops.

400 4-in. to 6-in. increasers.

Contract 31.—The supply of approximately:

65 6-in. 3-way hydrants.

147 6-in. gate valves.

29 4-in. gate valves.

150 6-in. valve boxes.

29 4-in. valve boxes.

88 manholes, frames and covers.

Plans and specifications for Contract 28 may be obtained from the City Engineer, Moose Jaw, and from the offices of the Canadian Engineer at Toronto and Winnipeg.

Plans and specifications for Contracts 29, 30, and 31 will be sent upon request.

The lowest or any tender not necessarily accepted.

J. M. WILSON, City Engineer. W. F. HEAL, City Clerk.
Moose Jaw, Feb. 24, 1911. 9-14

Machinery for Sale

For sale or rent 20 horsepower double drum hoisting engine; Ransome Concrete Mixer with loading hopper; also set of metal forms for 5 foot concrete pipe; also other miscellaneous plant. Address, Box 235, Contract Record, Toronto, Ont. 10-10

Sand Dredge for Sale

Hydraulic Sand Dredge in excellent condition. "A" frame, spud cutter, etc.

Accessories include 500 feet of steel discharge pipe, of which 250 feet is fitted with flexible joints; also seven pontoons to carry same.

For further information and details apply to the City Engineer of Hamilton, Canada. Hamilton, Canada, March 1st, 1911. 10-11



Tenders addressed to the undersigned and endorsed "Tender for Alterations," will be received at this Department until noon on Monday, March 12th, 1911, for the additions and alterations required to building, No. 5 Queen's Park, Toronto.

Plans and specifications can be seen at this Department. An accepted bank cheque, payable to the order of the Hon. J. A. Reaume, Minister of Public Works, for five per cent. of the amount of the tender, and the bona-fide signatures and addresses of two sureties, or the bond of a guarantee company approved by this department, must accompany each tender. Cheque will become forfeit to the Crown in the event of the successful tenderer refusing to carry out the work within ten days after the acceptance.

The Department will not be bound to accept the lowest or any tender.

By order,

H. D. McNAUGHTEN,

Secretary Public Works, Ontario.

Department of Public Works, Ontario.

Toronto, March 2nd, 1911.

Newspapers publishing this advertisement without authority will not be paid for it. 10-10



Temiskaming & Northern Ontario Railway Commission

Sealed tenders, addressed to the undersigned, will be received up to 12 o'clock noon, on Wednesday, March 22nd, 1911, for all works in connection with the construction of a passenger station at Matheson. Tenders to be marked on envelope "Passenger Station at Matheson."

Plans and specifications may be seen at the office of the architect, J. M. Lyle, 14 Leader Lane, Toronto, or at the office of the Chief Engineer in North Bay.

Certified cheque on a chartered bank of Canada, payable to the order of the Secretary-Treasurer of the Commission, for ten per cent. of the amount of the tender, must accompany same.

Lowest, or any tender, not necessarily accepted.

A. J. McGEE, Sec.-Treas.,
25 Toronto street, Toronto.

Toronto, March 3rd, 1911.

Note: Papers inserting this advertisement without authority, will not be paid for same. 10-11

City Engineer Wanted

For city of 15,000 population. Considerable permanent street work to be done. Apply, stating experience and salary wanted, Box 230, Contract Record, Toronto, Ont. 9-10

City of Brandon, Man.

March 2, 1911.

Sealed tenders, which must be endorsed "Tender for Supplies," will be received by the City Clerk, Brandon, Manitoba, until 12 o'clock at noon on Friday, the 17th day of March, 1911, for the following goods:

Vitrified sewer pipe, 6-in., 8-in., 10-in., 12-in., 15-in., and junctions at price per foot f.o.b. Brandon, freight and duty paid (all breakages to be allowed for). In carload lots.

Cast iron manhole covers.

Cast iron catch basins and covers.

Water Works Supplies.

Brass Goods—

Corporation and curb cocks and specials.

Lead pipe.

pig lead.

Fire hydrants.

Valves, 4-in., 6-in., 8-in.

Valve casings.

Service boxes.

Specifications and further particulars can be obtained from the City Engineer's office.

All goods must be the best quality of their respective kinds.

The lowest or any tender not necessarily accepted.

R. E. SPEAKMAN,

City Engineer.

Brandon, March 2, 1911.

10-11

Town of Rouleau, Sask.

TENDERS

Sealed tenders addressed to W. H. Stewart, Secretary-Treasurer, will be received in the council chamber, up to 12 o'clock noon, on April 4th, 1911, for the following:—

"Contract E."—Electrical machinery, pole line, etc.

"Contract F."—Pumping machinery, compressed air system.

"Contract G."—Producer Gas Plant.

"MAINS."

Cast iron or steel water mains, as follows:—

12,000 feet 6-inch c.i. water main, tested to 300 pounds hydrostatic pressure.

1,000 feet 4-inch c.i. water mains, tested to 300 pounds hydrostatic pressure.

1,400 feet 2-inch c.i. water main, tested to 300 pounds hydrostatic pressure.

Special castings, tees, etc., at per pound.

"VALVES."

Hydrants, valves, etc., as follows:—

22 6-in. hydrants, one steamer nozzle, and two 2½-inch nozzles; 8 feet 0-inch bury.

47 6-inch left-handed gate valves.

47 6-inch valve boxes extending 7 to 9 feet.

An accepted cheque equal to five per cent. of the amount of the tender must accompany each tender and envelopes must be endorsed with the letter of the contract referred to, or "Mains" and "Valves."

The council reserves the right to reject any or all tenders, and to waive any irregularities therein.

Plans and specifications may be seen at the Secretary-Treasurer's office, Rouleau, or at the office of the Engineer, Regina.

Plans and specifications will be forwarded from Regina on receipt of an accepted cheque for \$10, said cheque to be refunded upon return of the said plans and specifications.

J. DARLINGTON WHITMORE,

Consulting Engineer.

104 Willoughby and Duncan Bk., Regina, Sask.

J. H. CRAIG, Mayor.

W. H. STEWART, Sec.-Treas.

CRANES

For sale—McMyler derricks and Brown-Hoist locomotive cranes, equipped for clamshell buckets, hoisting engines, derricks, centrifugal pumps, diving rigs, vulcan steam hammer, 60-ton shovel, clamshell, everything almost new, guaranteed, located in Canada, must be sold by receiver to wind up.

WM. RUDDOCK,
Rose Bldg., Cleveland, Ohio.

10-10

Machinery for Sale

One Smith Concrete Mixer, one third yard capacity, with upright engine and boiler complete; two No. 6 Smart-Turner centrifugal pumps, 8-in. suction, capacity 1,050 gals. per minute; No. 5 Beatty Pump, capacity 700 to 800 gals., all necessary attachments, including foot valves. Also No. 1 Willson Flare Light (new); and 10 ft. x 12 ft. tarpaulin. Prices on application.

Canadian Contracts, Limited, Toronto,
61 Canada Life Building

10-10

New Companies

The Crescent Copper Ore Company, Limited, Victoriaville, Que., incorporated, capital, \$19,000. Incorporators, L. G. Heon, trader, and J. C. A. Bordeleau, both of Victoriaville.

La Compagnie de Ciment Asphalte et Construction Limitee, Montreal, incorporated, capital, \$100,000. Incorporators, R. T. Beaudoin, Village des Laurentides, and J. E. Desjardins, Ste. Therese, notaries.

La Compagnie Electrique et de Ciment de Drummondville, Drummondville, Que., incorporated, capital, \$100,000. Incorporators, H. Vassal and A. Mercure, manufacturers, N. Pelletier, contractor, all of Drummondville.

The Roemac Road Company of Manitoba, Limited, Winnipeg, Man., incorporated, capital, \$100,000. Incorporators, W. A. Preston, lumberman, Fort Frances, W. Blackwood, manufacturer, Winnipeg, F. H. Keefer, barrister, and E. A. Paterson, mining engineer, all of Port Arthur.

E. J. Maxwell, Limited, Montreal, capital, \$100,000, incorporated to carry on the business of lumbering, etc. Incorporators, G. W. Macdougall, K.C., Lawrence Macfarlane, C. A. Cartwright accountant, all of Montreal.

The National Brick Company, Limited, Brandon, Man., incorporated, capital, \$20,000. Incorporators, G. Ruller and S. Lyle, contractor, both of Brandon.

Business Notes

R. J. W. Fisher, hardware merchant, Chesley, Ont., is stated to have assigned.

W. Arnold, electrician, Sarnia, Ont., is stated to have assigned to Marshall A. Sanders.

The B. C. Gazette gives notice of the incorporation of the following companies: The Alberni District Electric Light & Power Company, Limited, capital, \$25,000; Consolidated Electric Heaters, Limited, capital, \$100,000; Coast Shale Brick Company, Limited, capital, \$100,000; Vancouver Pressed Brick and Stone, Limited, capital, \$100,000.

Builders' and Contractors' Supplies

Portland Cement, Lafarge Cement, Gravel,
Sand, Rubble, Imported and Canadian
Pressed Brick for front work and fireplaces.

CRUSHED STONE—Dimension and Coursing Stone, Lime
FIRE BRICK **IVORY CEMENT PLASTER**

—YARDS—

75 Brock Ave., Jarvis Street Wharf,
Avenue Rd., & C. P. R. 355 Eastern Ave.

The Contractors' Supply Co., Limited
Manning Chambers, Toronto Tel. M. 6859

Tender

A few dollars spent in advertising
your proposals in

The Contract Record

would result in additional competition,
which might save your city or town or
your client many hundreds of dollars.

Special Mantles
Stair Cases
Panelling
Veneered Doors
Glass Partitions
Bank Fittings
Office Fittings
House Fittings

—: OUR WESTERN AGENTS :—

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Dominion Trust Bldg.
Vancouver, B.C.

J. Malcolm-Suttie,
Travellers Building,
Winnipeg, Man.

Saskatoon Forwarding & Storage Co.
Saskatoon,
Saskatchewan

Walker & Barnes
Edmonton,
Alberta

Lickley's Ltd.

Mail Building

Phone Main 3166

TORONTO

We Manufacture

Frames - Sash - Doors

House Trim

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wood Flooring High
Class Interior Work

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your business are excellent

New and up-to-date Lumber Dry Kilns,
of 200,000 ft. capacity. New and well
equipped factory with latest and best
machinery. Experienced workmen under
the most expert supervision. :: ::

Give us a trial order
Our work will convince you

Georgian Bay Shook Mills

Midland, Ontario

Limited

THE H. & E. PATENT BALL-BEARING LIFTING JACKS

For Railway and Bridge Work, Contractors' and Builders' Use



Made by practical Jack Builders. Material: best grades of malleable iron and steel. Fully guaranteed as to durability and efficiency. The long even stroke of the lever, together with the design and careful construction of the jack, makes it the quickest and easiest working lifting appliance on the market. Made in plain and foot-lift styles. Adapted to all classes of work where a lifting jack can be used. Sizes from 8 to 50 tons capacity now complete. Send for prices and discounts.

To any responsible Firm or Railway in Canada any of these
jacks will be sent on 30 days trial.

MANUFACTURED BY

H. & E. Lifting Jack Company
Waterville, Que.

Stock carried by F. H. Hopkins & Company, Montreal



Contract Record

ESTABLISHED 1886

A Weekly Journal of
Building, Contracting, Engineering, Public Works
Municipal Progress, Advance Information

PUBLISHED EACH WEDNESDAY BY

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THOMAS S. YOUNG, General Manager.

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VANCOUVER - Tel. - 26 Crowe & Wilson Chambers
CHICAGO - - - - - 4059 Perry Street
LONDON, ENG. - - - - - 3 Regent St., S.W.

SUBSCRIPTION RATES

Canada and Great Britain, \$2.00 U.S. and Foreign, \$2.50

Vol. 25

March 15, 1911

No. 12

Municipal Contracting at Montreal

The city of Montreal has obtained from the Quebec legislature a charter amendment empowering the city engineer to submit a figure on all permanent works to be undertaken. So far as the making of the estimate is concerned, the city engineer is to act, we are asked to believe, in the same manner as an outsider, inasmuch as he will have to take into consideration the extent of the work, its probable duration, the cost of labor, and other matters of fundamental interest to contractors. It is contended by the city that the practice will have the effect of making contractors more careful in their estimates; that it will result in keener competition and consequently better prices; and further, that it will stifle anything suggestive of a combine, as "each tenderer will be fully aware that he is entering into competition with at least one man who, by very reason of the position he occupies, is familiar with all the details of civic work."

The above contentions are somewhat illogical—to say the least. It is difficult to understand how the engineer and the contractor compete on equal terms when the former is bidding on work which he, himself, will supervise; which he will not have to guarantee, and in connection with which he will not have to make up any loss. Moreover, the city engineer does not have to take into account the assistance entailed in connection with the work. There are many other reasons that have been advanced by our readers in comparatively recent issues of this journal and we have no intention of re-opening the whole question of the relative efficiency and economy of day labor and contract work. There will always be advocates of day labor, but we must lodge an objection to such claims as are made above. In what way, for instance, will the fact of the city engineer's submitting a bid make a capable contractor "more careful?" If the contractor is sufficiently competent and well equipped to bid on important civic work, surely he is sufficiently sagacious to devote the greatest possible care to the preparation of his estimate. The really capable estimator can come within a small margin of what it will cost

to complete a job satisfactorily and net him a working profit, and if the city engineer or any other public official likes to step in and submit a losing figure he is welcome to the contract and to the loss which it will entail. A capable man puts in a reasonable figure for good work, and an incompetent man puts in a low bid for what he is afterwards compelled to turn into cheap work.

As to "combines" they are largely mythical, conjured up in the minds of over-worked city officials and imaginative aldermen. It may be urged that Montreal's past history does not support this contention, but the statement holds good as a general principle. Combines do not work nowadays. Once in a while something of the kind is attempted, but invariably one of the party falls down or an outsider gets in—and that is the end of it. Generally speaking, contractors are clean, reliable, independent men who are doing the work for an honest figure and who want nobody's patronage. The contractor has had first rate experience and is stimulated to put the best into his work by the consideration that the greater his efficiency the better will be his reputation, and that the more expeditiously the work is carried to completion the more will it mean to his pocket. He, of all men, has the greatest stimulus to good work.

Lastly, in these competitive days, the contractor is assured of having "at least one good man up against him," whether the city engineer is competing or not. And as to familiarity with the details of civic work, that is essentially the contractor's business. In many cases it has cost him many years of study and a small fortune to acquire it.

A Noteworthy Suggestion

A member of the Alfred Rogers' staff conversing with a representative of this journal at the Cement Show the other day, made a suggestion that appeals to us to be worthy of more than passing consideration. It is that the Canadian Cement and Concrete Association erect a permanent building at the Exhibition grounds and that the convention and exhibition of the association be held concurrently with the National. The idea is one that should provide food for reflection. The financing of such a scheme would doubtless be somewhat of an undertaking, but once the industry become enthusiastic over the project, the means would readily be found. We believe that the ultimate returns would more than compensate for the outlay, for certain it is that it would raise the status of the association, stimulate public interest and result in greater co-operation on the part of the trade.

At the Scranton mine, Hibbin, Minn., all the steam and air pipes are contained within a concrete conduit extending from the power house to the shaft, a distance of 260 feet. The electric cables will also be carried in the same conduit. The conduit is made of concrete and is 4 ft. 6 in. wide at the bottom and about 6 ft. high. The walls are 6 ins. thick and arched at the top. The advantages of a conduit of this character are that the pipes are accessible at all times; they are out of the way and protected from the weather, which is not the case with pipes carried on surface trestles; the temperature of the conduit is such that condensation in steam pipes will be far less than when the pipes are exposed to the weather even though the are thoroughly boxed. Rings are anchored in the walls for supporting the pipes.

The Blumenthal Building at Montreal

Noteworthy Reinforced Concrete Structure Nearing Completion—Type of Construction Selected on Low Cost Basis—Designed according to Kahn System*

By R. E. W. Hagarty, B. A. Sc.

The only thoroughly fireproof building which could possibly have been selected for Montreal's new retail clothing store to be known as the Blumenthal Building, was the monolithic reinforced concrete structure now under course of erection at the corner of St. Catharine and Balmoral streets.

This new edifice, designed according to the Kahn system of reinforcement, will add undoubtedly another monument to the popularity and success of structural concrete in Canada's commercial metropolis.

Naturally, every merchant when considering the question of extending his warehouse, thinks first of the actual cost involved, and second, of the insurance rates, which as it happens vary in direct proportion to the chances of the entire stock being consumed by fire. However, this latter consideration is frequently not taken into account owing to over anxiety regarding minimum initial outlay. In other words, the fireproof qualities of a building too often remain at the mercy of what happens to be included in the "lowest tender." Nevertheless, in the case of the Blumenthal Building, although tenders were received from sources representing almost every type of modern building construction—structural steel, "the slow burning wood construction," terra cotta and steel with concrete fireproofing—yet, it is a somewhat noteworthy fact that the reinforced concrete tender secured the contract on a purely low cost basis.

The building has a frontage on St. Catharine street of 86 feet and measures 108 feet in the direction of Balmoral street. Thus the floor plan is rendered rectangular. Since there is no light-court opening in the centre, the building will have a gross area of 9,288 square feet for the entire seven floors of its height. Hence the total floor area will be 74,304 square feet.

A section taken longitudinally through the structure shows each floor, except the first, at a uniform elevation. Owing to a grade in St. Catharine street, the elevation of the main entrance vestibule, measuring one panel across by two panels deep, is placed 1 ft. 6 in. above the main floor level, while at the rear of the building is situated a small mezzanine floor.

From the basement to the ground floor measures 17 ft. 6 in., and from the ground floor to the second floor 19 ft. All the remaining storey heights are 13 ft., giving a total height of 101 ft. 6 in. to the level of the top of the finished roof. Rising above this elevation is a 7 ft. parapet wall, making an overall height of 108 ft. 6 in.

Elevator Service.

An efficient elevator service, consisting of one freight and one passenger car has been provided. With this arrangement there is an elevator ratio of approximately 743 considering the gross floor area. This compares favorably with modern building practice. The freight car is located at the rear corner of the building on the Balmoral street side, and will operate from the basement to the seventh floor inclusive. The

passenger car will operate between the same limits on the opposite side of the building about half way between front and rear.

General Specifications.

The following is an extract from the general specifications under which all Kahn System buildings are constructed:

1. Cement.

1. All cement furnished for this work is subject to inspection and tests as hereinafter specified.

2. Inspection and tests shall be conducted by laboratory selected by architect and at the cost and expense of the contractor.

3. All inspection and sampling shall be made by the laboratory at the point of manufacture sending samples to its laboratory for tests, and only cement that has been previously accepted will be allowed on the work.

4. The acceptance or rejection of cement used under this specification shall be based on the following requirements:

- (a) Fineness of grinding.
- (b) Time of setting.
- (c) Specific gravity.
- (d) Constancy of volume.
- (e) Chemical composition.
- (f) Strength—cohesive and adhesive.
- (g) Microscopic test.

(a) **Fineness of Grinding.**—After being gently shaken for five minutes, the cement must not leave more than eight per cent., residue on a sieve having between ninety-six and one hundred meshes per linear inch, the size of the wire being 0.0045 inches; or after being gently shaken for ten minutes must not leave a residue of over 24 per cent. on a sieve having between 192 and 200 meshes to the linear inch; the size of wire being 0.00235 inches.

(b) **Time of Setting.**—On being mixed for three minutes on a non-absorbent surface with the proper percentage of water to produce normal consistency, the paste shall not develop initial set under twenty-five minutes or final set under four hours, or over ten hours. The paste to be kept in a moist atmosphere at about sixty-five degrees Fahr. during the test, and results taken with Vicat apparatus.

(c) **Specific Gravity.**—The specific gravity on fresh cement must not be less than 3.15 or more than 3.25. On seasoned material the specific gravity must not be less than 3.08.

(d) **Constancy of Volume.**—A pat about three inches in diameter, one-quarter inch thick at center and tapering to a thin edge made from paste mixed for three minutes on a non-absorbent surface with proper percentage of water to produce normal consistency, shall be placed on a glass plate and allowed to set in moist closet at a temperature of 65 deg. F. for twenty-four hours; it shall then be placed in cold water, which shall be raised to boiling point and kept boiling for three hours. The pat after boiling shall

*The Blumenthal Building was designed by Mr. Hagarty for the Trussed Concrete Steel Company of Canada, Limited.—Ed.

show no signs of cracking, warping or similar indications of disintegration.

(e) **Chemical composition**—Shall be within the following limits:

Silica, 21 to 24 per cent.

Alumina, 5 to 10 per cent.

Iron oxide, 2 to 4 per cent.

Lime, 60 to 65 per cent.

Magnesia, not more than 3 per cent.

Sulphuric anhydride, not more than 1.75 per cent.

Alkalies, not more than 3 per cent.

(f) **Strength**—Cohesive: The cement shall be mixed for not less than three minutes on a non-absorbent surface with water to produce a paste of normal consistency; it shall then be pressed into oiled moulds with the fingers, but in no case rammed. The tests specimens (briquettes) shall be placed in moist closet maintained at a temperature of 65 deg. F. for twenty-four hours, after which the moulds shall be removed and the briquettes placed in cold water until tested. The average of five briquettes broken at each period must exceed the following values:

2 days after gauging—275 pounds per sq. in.

4 days after gauging—400 pounds per sq. in.

7 days after gauging—500 pounds per sq. in.

28 days after gauging—600 pounds per sq. in.

There must be a rise in strength of at least fifty pounds between each period; the stress to be applied at the rate of 100 pounds per ten seconds.

2. Sand.

The sand shall consist of grains of any moderately hard rock that is perfectly sound. Any sand showing signs of disintegration shall be unconditionally rejected.

The sand shall be well graded from coarse to fine.

Any sand containing over 5 per cent. of loam or clay, or foreign matter of any kind, will be rejected.

3. Broken Stone or Gravel.

The aggregate shall be composed of broken stone or screened gravel. The broken stone shall be of a hard close-grained quality, free from dust and crushed so that its largest dimension shall pass through a ring one inch in diameter. Gravel shall be free from dirt and sand and shall range in size from that of a pea to an inch. Disintegrated stone or broken stone containing mica shall be rejected.

4. Proportions.

All concrete for slabs and beams shall be proportioned of one part Portland cement, two parts sand and four parts broken stone or screened gravel.

All concrete for columns shall be proportioned of one part Portland cement, one and one-half parts sand, and three broken stone or gravel.

Gravel which has not been screened may be used as follows:

For slabs and beams and reinforced footings in proportion of one part cement to four parts unscreened gravel.

For column, 1 part cement to 3 parts unscreened gravel.

For plain footings and mass concrete generally, 1 part cement to 6 parts unscreened gravel.

If the gravel is used without screening it shall be examined from time to time, and in case its composition is not such as to give the required proportions, sand or broken stone shall be added as may be necessary.

5. Reinforcing Steel.

Steel used shall be medium open hearth steel to

be rolled from new stock and to meet the manufacturer's standard specifications.

Ultimate strength 60,000 to 70,000 lbs. per sq. inch.

Elastic limit not less than half the ultimate strength.

Minimum elongation twenty (20) per cent.

Bending test 180 degrees to a diameter equal to thickness of piece tested without fracture on outside of bent proportion.

All steel shall be free from paint, oil or heavy rust or scale.

6. Reinforcement for Solid Slabs.

For solid concrete slabs, the reinforcement shall be a steel fabric made of open hearth steel and provided in flat sheets. The main tension members shall be at right angles to the supports, have a maximum spacing of 8 inches and shall be accurately spaced by rigidly attached cross members, preferably made from same sheet of metal. The cross members shall not be



Blumenthal Building, Montreal, when Completed.

spaced farther apart than the spacing of the main tension members.

7. Reinforcement for Beams.

For joists, beams and girders no reinforcement shall be considered that does not provide for shearing stresses as well as direct tension. Shear members shall be inclined at an angle of 45 degrees, pointing up and towards the supports and shall be rigidly connected to the main tension member by shearing up its flanges. There shall be sufficient shear reinforcement so that the concrete will be obliged to resist only direct tension and shear up to 30 pounds per square inch.

8. Minimum Protection.

The minimum protection for reinforcing steel which shall be taken as the distance from the surface of the steel bar to the nearest concrete surface shall be:

(a) For slabs— $\frac{1}{2}$ inch.

(b) For beams, girders and columns— $1\frac{1}{2}$ inches.

Steel shall be placed in exact accordance with detail drawings.

9. Basis of Calculation.

In the calculation of stresses the following assumptions shall be made:

Modulus of elasticity of steel, E_s equals 30,000,000.

Modulus of elasticity of concrete, E_c equals 2,000,000.

$$\text{Whence } \frac{E_s}{E_c} \text{ equals } m \text{ equals } 15$$

The value of m given above remains constant at working stresses.

A plane section before bending remains a plane section after bending; that is, the stress in any fibre is directly proportional to its distance from the neutral axis.

The tensile strength of concrete shall be neglected.

10. Allowable Stresses.

The following maximum stresses based on figuring



Blumenthal Buildings under Construction

full live and dead loads shall be used in the design of reinforced concrete work:

Steel in tension equals 16,000 lbs. per square inch.

The extreme fibre stress in concrete in compression in slabs, beams and girders equals 750 lbs. per sq. in.

Concrete in shear equals 50 lbs. per square inch.

The minimum longitudinal reinforcement in any column regardless of the load carried by same, shall be one per cent. of the cross sectional area.

For columns reinforced with longitudinal bars tied at intervals of not less than the diameter of the column, the safe load shall be computed as follows:

Safe load (in pounds) equals 500 A_c plus 7,500 A_s .

A_c equals net cross sectional area of column in square inches.

A_s equals cross sectional area of longitudinal reinforcement in square inches.

For columns reinforced with longitudinal steel and with spirally wound hooping the safe load shall be computed as follows:

Safe load = $f_c A_c + m f_c (A_s + 2.4 A_s')$.

Where f_c equals allowable stress on concrete in compression, to be taken at 750 lbs. per square inch.

A_c equals net area of concrete enclosed in hooping.

A_s equals cross sectional area of longitudinal reinforcement.

A_s' equals cross sectional area of imaginary vertical rods having same quantity of steel as the hooping per lineal foot of column.

For wall columns the above safe carrying capacities shall be reduced 20 per cent.; for corner columns reduced 30 per cent.

The stresses allowed above shall be used only in the case where the unsupported length of the column is not greater than 15 times the least diameter. Where the length exceeds this limit the allowable stress shall be reduced according to the standard formulas.

Where columns are subjected to loads of known eccentricity the combined stress in the extreme fibre due to direct compression and bending moment shall not exceed that allowed in slabs and beams.

11. Bending Moment Formulae.

1-12 W_1 for both continuous ends.

1-10 W_1 for one continuous end.

1-8 W_1 for free ends.

Top reinforcement over supports 50 per cent. of required steel area at centre.

12. T-Beams.

If the slabs, beams and girders in the floor construction are poured in one continuous operation the width of the adjacent floor slab on each side of beam or girder that may be considered to act as the compression flange of same shall not exceed twice the width of the beam or girder or five times the thickness of the slab.

Structural Design of the Blumenthal Building.

Speaking generally, the Blumenthal building has been designed according to a specified floor load of 125 pounds per square foot, although certain concessions were made in one or two cases to meet architectural requirements, reducing the load slightly below this amount.

A four-inch floor slab reinforced with No. 5 Kahn rib metal is used throughout except on the roof, where No. 8 rib metal is sufficient owing to the reduction in the live load to 45 pounds per square inch.

The main beams of the building measure 6 in. x 21 in. with header beams 12 in. x 23 in.

Tee action was allowed in the design wherever possible, although it was not considered expedient to permit the general use of compression steel; hence a few beams were necessarily increased in width where openings due to the elevator shaft deprived the designer of slab action.

In one case it became necessary to use a small amount of compression steel in order to limit the maximum depth to 23 inches. However, if it had not been considered good practice to adhere rigidly to the specifications (invariably of an arbitrary nature) one might have safely depended upon the compression in the concrete even in the case mentioned. Hence, the use of compression steel was merely a safeguard and did not strictly form a portion of the design proper, and may not, therefore, be cited as a precedent in favor of the general adoption of such a procedure.

The beams of the outside panels on the ground floor frame into the top of a retaining wall; but, in the upper storeys the skeleton construction is used. The 12 in. brick curtain wall is carried by 12 in. x 21 in.

and 12 in. x 23 in. beams framing into the columns. These also carry the floor beams in all storeys above the first. The elevator beams at the roof were designed to carry the hoist beams by allowing 800 pounds per square foot for the shaft openings and assuming this amount concentrated on the diagonal two-thirds of the way from front to back of the elevator.

Kahn trussed bars of size varying from $\frac{3}{4}$ -in. x 2-in. to 2-in. x $3\frac{1}{2}$ -in. form the main portion of the beam reinforcement. Where concentrated loads came at or near the center of the span, "Center Sheared Kahn Bars" were used, although in the ordinary case it was more economical to allow the Kahn System Cup Bars of two-thirds the span length to accommodate part of the required steel area, provided the prongs of the ordinary trussed bar were sufficient to assist the concrete in resisting the abutment shear.

Columns, Foundations and Retaining Walls.

The columns, which are 17 ft. 4 in. center to center, are arranged in four rows 21 ft. 10 in. apart running longitudinally through the building.

The "hooped" design has been used throughout with the exception of a number of the roof columns.

The basement columns are built square and vary in size from 26 in. to 30 in. outside dimension (the 30 in. size being used only on two of the four columns, which support the roof tank). The size decreases 2 in. per floor with the minimum of 14 in. at the roof. The reinforcement consists of $\frac{3}{4}$ -in., $\frac{7}{8}$ -in., 1-in. and $1\frac{1}{8}$ -in. round rods with $\frac{3}{8}$ -in. wire hooping with $1\frac{1}{2}$ -in. pitch. The interior columns above the ground floor are built octagonal, giving an apparent reduction in the actual size.

Four of the columns are designed each for an extra load of 50,000 pounds, for the support of a water tank on the roof. Around the outside of the building is located a retaining wall extending over 16 feet below the ground floor level to suitable foundation. The reinforcement consists of $\frac{3}{8}$ -in. Kahn System Cup Bars.

The columns are supported on open caissons sunken to hard pan and filled with concrete to a depth varying from 40 to 47 feet. In sinking the caissons it was found expedient to use Carnegie sheet steel piling, all of which was successfully removed under the direction of Mr. Herbert P. Beck, C.E., general superintendent for the contractors.

The architects for the building are Messrs. Mitchell and Ogilvy, Montreal. The architectural features of the Blumenthal building will be fully as elaborate as those of other reinforced concrete structures which have been erected in Montreal, notably the Jacobs Building, Canada's largest concrete building, recently completed. The contract was awarded to T. J. Loomis & Sons, Montreal. The steel reinforcement and structural design was supplied by the Trussed Concrete Steel Company, Walkerville, Ontario.

An Ancient Specimen of Concrete

The oldest piece of cement in the world, so far as is known, was shown by Alfred Hopkins, the New York architect, at the Seventh Annual Convention of the National Association of Cement Users in the Concert Hall of Madison Square Garden. Mr. Hopkins is somewhat of an antiquarian. He spent last summer in prowling about the ancient Greek and Roman ruins in Sicily, where many of the great works of the ancients remain in a wonderful state of preservation. Among the places he visited was Salunto, one of the

oldest Roman strongholds on the island in the pre-Christian era. There he found huge blocks of stone still bound together by a cement which has defied the wind and weather of more than two thousand years. In construction he found the cement on analysis to be wonderfully like that of to-day. A natural binding material had been used, but instead of the trap rock of to-day he found that the ancients had used a black rock known as Travertine, a popular building rock of the time and a white rock known to-day as Selcite. In other sections of the cement broken tiles and marble had been utilized. The ruins in which he found this example of building materials used by the old Romans dates from at least 200 B.C., and may be even older.

City Engineer Childs, of Calgary, has plans for extensive sewer work in that city, and a by-law will shortly be submitted to raise \$309,800 in this connection. Calgary will possess 75 miles of sewers by the end of 1911.

The value of the building permits issued at Toronto during February, 1911, exceeds that of February, 1910, by nearly \$100,000. The totals for the first two months of the respective years, however, are \$1,428,170 and \$1,542,528.

Calgary, Alta., is on the verge of a building boom. The returns for February were \$333,660, compared with \$169,800 last year. The totals for the two months of 1911 are \$629,700, as against \$276,300 for January and February of 1910.

Judgment has been given against the Vogel Company of Canada, Limited, in the action instituted against them by Messrs. Boivin, Wilson & Co., Montreal in connection with the collapse of a large water tank which occurred at the building of the latter company in April, 1907, causing considerable damage to the stock and killing a girl. The amount of judgment was \$9,500.

A new \$1,000 building is projected for Vancouver by Mr. J. W. Weart of that city. The building will be known as the St. Regis and will combine a theatre, hotel and offices. It will be ten storeys high.

In the year 1909, 111,869 barrels of cement were imported into New Zealand at an approximate value of \$235,000. This is an opportunity for Canadian manufacturers. Canada has a preference of 2s. a barrel as against foreign countries.

Reinforced concrete construction being monolithic in nature, there are no joints, and each member is continuous through all other members. Any shock or jar will be distributed with no damage to any part. As a common everyday illustration there is no better example than the use of concrete structures for railroad bridges and viaducts under heavy traffic.—D. V. Moore.

Despite the prevalence of severe weather at Prince Rupert the grading of the streets and the construction of sewers has been pushed with great energy. The difficulty of street making is almost beyond belief. Often holes 40 feet in depth have to be filled, while cliffs 100 feet high have to be dynamited. A big influx of population is looked for this spring.

Cement Show and Convention at Toronto

Evidences of Progress in every Department of the Industry — An Instructive Address from the President — Details of Successful Meeting

The third annual convention and exhibition of the Canadian Cement and Concrete Association were held in Toronto last week. The show was opened on the evening of Monday, March 6th, by Hon. G. P. Graham, Minister of Railways and Canals, who was received by Professor Gillespie, president of the association. A raised platform had been erected for Mr. Graham in the tastefully decorated booth of Alfred Rogers, Limited. There was an excellent attendance on the opening night, and the St. Lawrence Arena, where the show was held, presented quite a festive appearance, the national colors exhibited contributing greatly to the effectiveness of the decorations. Hon. Mr. Graham, who was received with much enthusiasm, reviewed briefly the progress of the industry in recent years. It was



Professor Gillespie, who was re-elected President of the Canadian Cement and Concrete Association.

but a decade, he said, since the annual output amounted to only 400,000 tons, whereas last year it totalled nearly 5,000,000. Neither had quality been sacrificed to quantity. In his opinion Canadian cement was second to none. The speaker referred to the inroads made by cement in the department of which he is head. There, he said, it was recognized as practically the only material for most of their most important work. The government was now considering extensive harbor construction at Halifax in which cement would be employed throughout. Cement was becoming indispensable in every great work. In the construction of the Quebec bridge 5,000 cubic feet of cement would be used in each caisson. During 1911 the Dominion government itself would be a customer for 280,000 barrels. Mr. Graham referred to the making of cement railway ties as one of the most interesting of recent innovations with this material. Cement, indeed, was being put to so many novel uses that the speaker suggested humorously the possibility of some enterprising breakfast food manufacturer bringing out a patent preparation of which cement was the chief ingredient. The band of the 48th Highlanders, which was in attendance, rendered a capital programme during the evening.

The convention was opened on the afternoon of Tues-

day, March 7th, by Professor Gillespie, who spoke as follows:

Professor Gillespie's Address

Failures and the Lessons Which They Teach.

It is a truism often repeated that the public has a short memory. The lessons to be derived from great disasters are soon forgotten, except by a very small number. The fatal Iroquois Theatre and Collinwood school disasters of a few years ago, so costly in child life and so much in the public mind for short intervals, showed the necessity of safeguarding the occupants of public buildings. For a time our civic authorities were active in having places of public entertainment carefully inspected. Much was heard for a season about fireproof curtains, accessible exits, fire drill and fireproof schools, but soon the public relapsed into its old ruts. Inspection became less searching and the authorities more forgetful and the public continues to run daily the same risks that the victims of these disasters ran. It sends its children to the same schools and attends itself the same places of public worship or entertainment and only becomes conscious as to the chances it is taking when some other horrible calamity occurs. Truly, the public has a short memory.

It is chiefly because humans are humans and not machines that we continue to take chances. A machine can be constructed to do a given thing in a specified way an endless number of times. Whether its work be punching or drilling or cutting, it does it with machine-like precision. It never tires, never grows careless and is never actuated with a spasm of over-zealous indolence. It is never tempted to scamp its work. It is never influenced by the desire to make excessive profits and never knows the flattery of the multitude or the sting of adverse criticism. It never forgets, never flatters, never tempts, never cajoles, never bluffs and never pleads. But men are differently constituted. They possess the human traits. They are influenced by example, possess passions, and emotions, cherish hatred, remember injuries and forget the lessons which great crises in their experience ought to impress on them. The attention of engineers, architects, builders and building departments has been called to the lessons which are taught by the failures of structures designed and erected by them or under their supervision. It is not that the field is a new one that this paper is devoted to so hackneyed a topic, but to emphasize once again, firstly, those elements which have contributed to failures, and secondly, those corrective or precautionary measures which will tend to prevent their re-occurrence.

Especially in the use of reinforced concrete has the general reader's attention during the past five years been called to a rather large list of failures, all of them more or less serious, and not a few of them having fatal results. Reinforced concrete has been comparatively new in the building art and in its fabrication is very different from other materials with which the constructor is familiar. Unlike steel or wood, its strength increases with age. It is poured into forms, at which time it is plastic, and has to be sustained until it acquires sufficient strength to support itself. It consists of two materials, not one, and since the disposition of these, with respect to each other vitally affects the strength of the product, exercise for great care in this placing is necessary. More perhaps than of any other building material is this true—it possesses great capacity for injury in the mak-

ing and placing. Following are cited a number of failures of reinforced concrete structures which during the past twelve months or so have occurred, and reference to which in the engineering press has come to the writer's notice. They represent typical cases and an examination of the list will enable us to classify the causes under a few general heads.

Typical Cases of Failure.

The comparatively recent announcement that the great dam across the Colorado River at Austin, Texas, is to be rebuilt has served to recall its failure over a decade ago. It will be remembered that that failure was announced to the world at first as a serious reflection upon the engineering profession because some hydraulic engineers of eminence had been connected with the work. Subsequently, however, when the whole history had been investigated, it was found that the authority of the engineers had been interfered with to such an extent by the city officials in control, that their responsibility had been practically nullified. Indeed, one prominent engineer had resigned rather than have his name further connected with a work over which he had no control.

On February 28, 1910, a reinforced concrete arch of three-span over the Flat Rock river at Edinburgh, Ind., collapsed during an unusually heavy flood. The design had been furnished by a well-known bridge company, but the bridge commissioners, in their desire to economize, and with a wisdom commensurate with their experience in such matters, decided to omit the piling underneath the abutments and to carry them instead to a somewhat greater depth. And so the bridge was built. The materials supplied and the workmanship throughout seemed to be excellent, but in the season of heavy floods, the piers were undermined by scouring and the structure collapsed. There does not appear to be any other cause of failure than the insufficiently supported piers, and the responsibility, of course, must rest on those who ordered the modification of the original plan.

A concrete dam at Fertile, Minn., was washed out by floods early in April, 1910. The trouble is attributed to the fact that the foundations were not laid sufficiently deep to prevent scouring and undermining, and failure ultimately ensued.

The partial failure of the Bayle reinforced concrete dam at Austin, Pa., in January, 1910, exemplifies a trouble of a slightly different character. The dam was completed in December, 1909, at a cost of upwards of \$70,000. On completion, it was observed that there was one small crack 1/16 in. wide, extending from the top of the dam to the ground level. Subsequently, others, similar in appearance, developed, and during a heavy freshet on January 23, 1910, a section of the dam, between vertical cracks, under the thrust of the impinging water, slid forward some 18 inches. This movement covered a period of some eight hours and then stopped. Investigation disclosed the information that the failure was due primarily to the fact that the dam was founded upon a bed rock, the successive strata of which were separated by layers of shale or clay. The impounded water, having worked itself under the foundations, had softened the clay with the result that the upper stratum carrying a portion of the dam had moved forward on the lower. It was stated that the weakness of the concrete was doubtless due to the fact that much of it had been hurriedly placed, part of it in freezing weather. The anchor bolts, which had been grouted into the foundation rock, had moved outward with the rock into which they were anchored.

On April 7, 1910, the collapse of a concrete roof under construction at the new car barn of the Shore Line Electric Road at Saybrook, Conn., took place, and resulted in the death of one man and the injury of two others. The roof was a 4-in. slab of reinforced concrete, on girders about

8 ft. on centres and of 37 ft. span. The last work had been completed about ten days and the forms were being removed. It was believed that the premature removal of the forms and the excessive loading of the green roof slab with roofing material, were the joint causes of the accident.

On July 13, 1910, one of the columns of the concrete groined arch roof to the filter chambers in course of construction at Owen Sound, Ont., collapsed while the centering beneath was being removed. Two men were quite seriously injured. The accident apparently was due primarily to the early removal of forms, combined with the fact that the 18 in. x 16 in. columns on two sides of the square roof of the arch were quite incapable in themselves of resisting the arch thrust. The forms were removed in only four days after pouring, notwithstanding the fact that seven days was the minimum specified time for removal.

The upper part of a reinforced concrete chimney under construction at the plant of the American Woollen Company, South Royalston, Mass., collapsed on April 9, 1910, causing the death of two men. The chimney was to have been 105 feet high with an inside diameter of 4 feet and an outside diameter of 4 ft. 8 in. at the bottom, and with wall varying in thickness from 8 in. at the bottom to 4 in. at the top. The forms used in construction were in two sections, each 3½ feet deep. The procedure was to fill the upper form, then to loosen the lower and set it above the upper for filling. This took one day. Next morning the form in the lower section was loosened and it was placed on top and filled. Thus, the concrete in any 3½ ft. vertical section had less than 24 hours in which to set before its side-supporting forms were removed. The accident occurred when a height of about 70 feet had been reached, the section last uncovered, then only twenty hours old, caving in and carrying the workmen to the ground with it. It is reported that the temperature the day before the break had taken a sudden drop, but it was not at any time below freezing. The failure was undoubtedly due to loading a very green concrete before it had acquired sufficient resisting power, as the materials were good and the design and execution satisfactory.

A reinforced concrete grain elevator of typical design failed under a normal pressure of grain at Springfield, Ohio, on October 24, 1910. As has been rather common in elevator construction where a battery of cylindrical units has been constructed, the unused spaces, external to the cells, but lying within the tangent walls, had been utilized as auxiliary bins. No one saw the beginning of the collapse so that its exact behaviour cannot be stated, but from the appearance afterwards it was evident that the lower section of the wall where the pressure was greatest, was forced out under the pressure of the wheat. This portion sheared off clear at the line where the straight wall connected with the circular wall of the larger bin. The weak point in the structure was that the horizontal rods in the straight wall were not connected to those in the circular, nor were they tied back for any distance into the concrete of the circular walls. It was stated that the plans showed the rods in the straight walls securely fastened into the circular lines and that the failure to so fasten them was due to the negligence of the foreman.

On November 22, 1910, a four-storey reinforced concrete building being erected for the Henke Furniture Company, Cleveland, Ohio, suddenly collapsed, throwing one of the walls over a two-storey frame building next door and so crushing the structure as to cause the death of four of its occupants and the serious injury of seven others. It was of reinforced concrete column and girder construction with hollow tile and concrete floor system, and brick curtain walls varying in thickness from 21 in. at the basement to 13 in. at top floor. A commission of inquiry was immediately appointed on which were representatives of the Builders' Exchange, the Cleveland Engineering Society and the Cleveland

Chapter of American Institute of Architects. This commission was empowered to take evidence and to consult every available source of information that might explain the cause of failure. After the wreck had been carefully examined, the design checked over and the witnesses examined, the finding was announced. The failure, it stated, was due primarily to the premature removal of forms in the third storey. It fixed the responsibility on the architects, the contractor, the owner and the Department of Buildings for the city of Cleveland. The architects were adjudged responsible in that they did not give sufficient consideration to the removal of forms, in that they did not give sufficient attention to the materials and in that they did not give adequate supervision to the work of construction. The contractor was adjudged culpable in that he employed foremen who were entirely ignorant of the intent of plans and specifications or of the nature of the materials they were handling. In consequence, the sand was inferior, the forms were removed prematurely, and that regardless of weather conditions, the green concrete was regularly overstrained, the members were not of the sizes called for in the plans, the concrete composing them was open and porous and sawdust and shavings were found in the bases of columns. In addition, it developed that less cement had been delivered to the building than would have been necessary to construct it had it been built as planned.

The owner was deemed responsible in that he had not employed a special concrete inspector in the work as required by the building regulation.

The Department of Buildings was held responsible in that it had ignored the requirements of that portion of the Building Code which makes it necessary that the owner employ a special reinforced concrete inspector. It thus appears that the Building Department rather than the Building Code was at fault.

Causes of Failure.

I have chosen to classify the cause of failure in the above cited cases as follows:

- (1) Interference with a suitable design by those in authority, but not possessing a knowledge of engineering practice.
- (2) Defective design.
- (3) Inferior materials.
- (4) Ignorant or wilful disregard of specifications and plans.

The first of these is unfortunately of too common occurrence. In all human probability the Austin dam and the Edinburgh arch would be standing to-day but for the intervention of the "cock-sure aggressive" individual who, when clothed with a little brief authority becomes a paragon of wisdom on everything under high heaven. This type is found frequently in our municipal councils, and it is to be regretted that engineers of wide experience and good judgment sometimes permit themselves to be dominated by them. An engineer's judgment may be in error, but is it not more likely to be productive of good results if it be corrected through consultation with other engineers of equally good standing than if it be reversed by men entirely untrained in the problems of design and construction.

Fortunately, the day of unsafe design in reinforced concrete like the design in wood or steel has been reduced or is being reduced to a standard based on the proportion and strength of materials which constitute it. There is, therefore, no reason to-day why the average practising engineer should not acquaint himself with concrete designing, so that, at least, he can finish his plans with some such detail as he does those for his structures in steel. He may, if he prefers, leave the details to his contractor, who like the contractor for steel, can make them according to the standards of his practise. He must exert every care in in-

forming himself as to the character of the materials he must employ and of the foundation upon which he proposes to erect his structure. The dams at Fertile, Minn., and at Austin, Pa., furnish illustrations where disaster might have been averted by a careful examination of the underlying strata prior to construction. The designer must recognize, too, that the safety of his design depends upon the constructor as well as upon himself, since concrete construction is not fixed as is that in steel. An editorial in the Engineering News, speaking of this phase of a designer's responsibility, asserts that "the design cannot be sent from the drawing table with perfect confidence in its precise reproduction in the structure. It is the joint product of the man in the office and the man in the field, and any design which fails to recognize this is a poor one no matter how nearly it may conform to accepted standards. No engineer who is not prepared to supervise the construction of a reinforced concrete structure is justified in designing that structure as closely to the safety limits as he is when the construction is to be under his eye."

The prevention of the utilization of inferior material is the work of the engineer, the architect and the inspector. No reinforced concrete work of any magnitude should be constructed without a capable conscientious inspector. The Henke building suffered from inferior material as it did from almost every other malady to which reinforced concrete is heir. The remedy for this is vigilant, constant inspection. Failures resulting from the premature removal of forms could invariably have been prevented by the exercise of intelligence and a little precaution. The Henke building disaster, the Owen Sound filtration plant accident, the car-barn roof failure at Saybrook, Conn., and the chimney collapse at South Royalston, Mass., were all preventable if careful examination had been made before stressing the concrete, which, possibly, due to temperature conditions had not yet acquired its preliminary strength. The failure of the grain elevator at Springfield, Ohio, was due to the ignorance of a foreman. Any foreman who appreciated the proportions of the materials he was handling would not make the blunder that was made.

The remedy for these evils is the employment of the experienced, intelligent, painstaking inspector. He sees that the forms are cleaned before the concrete is poured, that the ingredients are correctly proportioned, that the steel is properly placed and in correct amount, that the members are of dimensions called for by the plans, and that the forms are not removed until the material has acquired sufficient strength to be self-sustaining. The capable inspector is essential to safe construction.

Instructive Addresses.

Mr. R. F. Havlick, of the engineering department of the Ideal Concrete Machinery Company, South Bend, Ind., gave a comprehensive address on the subject of concrete blocks, and afterwards showed some fifty excellent lantern slides illustrative of the possibilities of this material. Following this, Mr. H. P. Bowes, superintendent of the Warren Bituminous Paving Company, Toronto, gave a paper entitled, "Grading Stone Aggregate," also illustrated by lantern slides. A brief discussion followed, in which Professor Gillespie, C. R. Young and others took part. Mr. Bowes' paper will be found in another column.

At the evening session the members were treated to an interesting description of the methods of manufacture of Portland cement, by Mr. W. M. Kinney, assisting inspecting engineer for the Universal Portland Cement Company, Pittsburgh, Pa. The remainder of the evening was taken up with an instructive paper by Mr. C. W. Noble, Toronto, on the "Prevention of Corrosion in Metal Lath," and an address by Mr. J. M. Carrere, Blanc Stainless Cement Company,

Allentown, Pa. Mr. Carrere's subject was "The White and the Gray."

On Wednesday, March 8th, Mr. Richard L. Humphrey, President of the National Association of Cement Users, and Director of the United States Structural Materials Testing Laboratories, Pittsburg, Pa., spoke at some length on the progress of cement construction in the United States and the development of the National Association. At this session an instructive paper was also given by Mr. E. A. James, editor of the "Canadian Engineer." Some discussion ensued. Messrs. Humphrey and J. A. Jamieson taking part. Mr. C. S. Hertzberg, engineer of the Trussed Concrete Steel Company, Walkerville, Ont., gave a paper entitled, "A Few Points on Reinforced Concrete Design." This was discussed by Messrs. G. Kahn and C. R. Young.

In the evening an enjoyable smoker was held at the St. Charles Hotel. An excellent musical programme was provided, also refreshments, and in addition Messrs. R. L. Humphrey and J. A. Jamieson, among others, gave interesting addresses. The former spoke forcibly on the necessity for co-operation. He urged that the association endeavor to obtain standard specifications in Canada for concrete products, and that the members of the association work more closely together for the common good of the industry. As an instance of what might be done in this way he cited the attainments of the N. C. U. A. These had only been accomplished after considerable sacrifice and much hard work.

The committee on specifications met on Thursday morning, March 9th, and the specifications as proposed were adopted. These will be given in a later issue.

At the annual meeting of members at the afternoon session, the following officers were elected: Honorary president, Hon. G. P. Graham, Ottawa; president, Professor Gillespie, Toronto; vice-president, Kennedy Stinson, Montreal; secretary-treasurer, Wm. Snaith, Toronto; directors, T. L. Dates, Owen Sound; W. H. Ford, Montreal; Ivan S. Macdonald, Toronto; James Pearson, Toronto; C. F. Pulfer, London; D. C. Raymond, Toronto; J. A. Jamieson, Montreal; C. C. Lapierre, Montreal; Alfred Rogers, Toronto; C. R. Young, Toronto; Gustave Kahn, Walkerville; George Benoit.

A joint meeting with the Engineers' Club of Toronto, was held on Thursday evening, March 9th. The members of the Cement Association were received on behalf of the club by Dean Galbraith, who spoke in his usual cordial manner. At this meeting, which marked the close of the association's convention, Mr. Humphrey gave an excellent address on building by-laws and reinforced concrete (illustrated by lantern slides), and Mr. Frank Barber, of Messrs. Barber & Young, bridge and structural engineers, Toronto, a paper entitled, "The Adaptation of Concrete for Long Span Bridges." Mr. J. A. Jamieson, Montreal, also spoke on the subject of "Specifications."

A description of the various exhibits will be published in our next issue.

Dominion Bridge Company at Winnipeg

The Dominion Company, Limited, of Montreal, have recently built a considerable extension to their Winnipeg works. Since 1906 they have had in Winnipeg a small shop, of about 4,000 tons capacity per annum, in which was fabricated some of the simpler structural steel work required in the west. The drawing and engineering work, however, was all done at the head office in Lachine. In 1910 it was seen that this method would not supply the rapidly increasing demand for steel in western Canada. The shop, therefore, was greatly enlarged and is now fully equipped to turn out about 18,000 tons per annum. A complete engineering and draughting office is being established in Winnipeg, and it is intended that this plant will take care of the western

work. The high class buildings which are now being erected in all the cities in the Canadian West call for a great amount of steel work, and the short building season necessitates a quick delivery of material for which this company has always been noted. In its three plants at Lachine, Winnipeg and Toronto the Dominion Bridge Company now has an annual capacity of over 80,000 tons of bridge and structural steel. Mr. George E. Bell, late of the Montreal contracting office of the company, has recently been appointed local manager in Winnipeg.

Terra-cotta Fireproofing

Porus terra cotta is coming into greatly increased favor for the fireproofing of important buildings, and inasmuch as there are not many firms making a specialty of this kind of work, it will perhaps be of interest to mention Mr. Robt. Bennett, who may be termed an expert in this line by virtue of 25 years' experience in the United States and Canada. Last year he obtained contracts in connection with the Molsons Bank, Toronto; McLaughlin Automobile Garage, Oshawa; Lincoln Paper Mills, Merritton, Ont.; Upper Canada Bible Society's building, Toronto; Lumsden Building (10 storeys), Toronto; Hobberlin Building, Toronto; Oakwood High School, and Annette Street School, Toronto. It may be of interest to refer to the Lumsden Building, in which Mr. Bennett engaged to construct the ten floors of terra cotta arching within eight weeks from the date of commencement. He completed the work in seven weeks and three and one-half days. Mr. Bennett employs a large staff of competent men and is well known to the Toronto building trade.

The Allied Trades and Labor Association of Ottawa, representing 300 international union men of the city, have asked the Board of Control to legislate with a view to preventing work being done for the corporation outside the city. The objection was made that a contract for hydrants and valves had been sublet by a local concern to a firm in Brantford.

The Minister of Marine has approved plans for the continuation of the extensive improvement works on the Montreal harbor. The total outlay during the present season will be between \$1,500,000 and \$2,000,000. Under the heading of entirely new works is the construction of four new sheds in reinforced concrete on the Tarte pier. As is well known, this season's work is a part of a general scheme involving, through annual instalments, a total expenditure of about \$18,000,000.

The J. I. Case Threshing Machine Company, of Racine, Wisconsin, have entered two Case cars in the 2,300-mile reliability run conducted by the Modern Power Publishing Company, of Winnipeg, Man. This tour covers the three provinces of Manitoba, Saskatchewan and Alberta. The cars leave Winnipeg about the first of August and proceed west from Brandon 133 miles, then northwest to Saskatoon, and from there almost due west to Edmonton. From Edmonton the tour proceeds south to Calgary, back east through Regina, and then back to Winnipeg. This tour will last about two weeks.

We are indebted to the Wm. T. Comstock Company, 23 Warren street, New York, for a copy of "Garages and Motor Boat Houses," an excellently illustrated and informative work that will doubtless receive careful study on the part of architects and builders. The book contains a large number of designs for both private and commercial buildings, showing the latest ideas in their planning and construction. The designs are contributed by prominent architects from different sections of the United States and are suggestive of the best practice in this line of work.

Effect of Hypochlorite of Lime on Metals

Wrought Iron Pipe and Copper Tank Lining Affected Most Readily—Brass Pipe Very Slowly—Tin Resists Action Well

By Harold C. Stevens

The Board of Water Supply of the city of New York, in connection with the design of sanitary works for the protection of watersheds through which the Catskill aqueduct is being constructed, has had occasion to seek information regarding the effect of hypochlorite of lime solution upon metals, and in the operation of the works has gained further information. Systematic observations have not been made, and the corrosive effects under apparently similar conditions have differed quite widely; but the data obtained are useful in that they indicate in a general way what may be expected.

Wrought Iron Pipe Suffers Most.

Wrought iron pipe is most readily affected. The inverts of 2-in. pipes having a trickling flow of a 1 per cent. solution through them have been completely rusted through in about four months. Three-inch galvanized iron pipes, conveying at different times 1 per cent. and $\frac{1}{2}$ per cent. solutions and flowing full, were replaced after about a year's service, not on account of rusting through, but on account of clogging due to the formation of tubercles and the accumulation of a deposit of lime. These pipes probably lasted longer than would have been the case with the plain wrought-iron pipes, because zinc is quite resistant to corrosion, and, where galvanizing is perfect, would prevent the formation of tubercles long enough to permit the coating of lime to form and prevent further corrosion. The galvanizing of commercial pipe is far from perfect, however, and also in making joints the zinc coating is necessarily injured, so that only a partial protection of the iron results. Galvanized stove pipe has remained in serviceable condition for four months, while plain iron stovepipe in the same place has been ruined. The galvanizing, however, now shows rust specks all over.

Brass pipe is corroded by hypochlorite of lime solution, but very much less than iron; in fact, very slowly. Tubercles do not form and the pipe becomes coated with a smooth layer of lime that protects that brass from further action. The effect on the flow in this case is due only to the gradual reduction in the size of the duct. It seems reasonable to expect that brass pipe, say 2 inches in diameter, would last two or three times as long as iron pipe, before renewal or cleaning would become necessary. Moreover, the coating in brass pipes could be cleaned out with acid and the pipe be made as serviceable as originally, with threads uninjured, whereas iron pipe so cleaned would be found rough and a great deal damaged.

At Board of Water Supply plants, where a 2 per cent. solution was used for one month and a 1 per cent. solution thereafter, bronze float valves are practically perfect after four months' service with a trickle of solution flowing through them, but the seats have become coated with lime and consequently do not close properly. On scraping off some of this coating the bronze appears to be intact. A long brass valve stem in a hypochlorite of lime solution tank after three months showed general pitting, but to a very slight depth. A brass screen of about No. 18 wire immersed in the solution was destroyed in less than four months, while another, under almost like conditions, has remained

in good condition. The screen destroyed was made of very soft brass.

Copper Tank Lining Destroyed in Three Weeks.

From such observations as were available at the time of designing certain of the Board of Water Supply plants, it was thought that copper of about 20 gauge would be a good material for orifice cans, floats, and for lining small tanks. Its value was much over-estimated, however, for in one case a copper tank lining was eaten through in less than three weeks; and in another case an orifice can became leaky in about three months. Floats made of No. 22 copper have become leaky in about three months, being badly pitted on all the surface in contact with the hypochlorite of lime solution. The leaky orifice can was effectively repaired with solder which has resisted corrosion very well. It has not been pitted and the only effect upon it that has been noted has been a blackening of the surface.

Tin appears to resist the action of hypochlorite of lime solution very well. Two ordinary tinned copper ball floats, in solution of $\frac{1}{2}$ per cent. to 1 per cent. strength, lasted for 19 months, and one was still serviceable. A similar larger float, in 2 per cent. solution for one month and in 1 per cent. solution thereafter, has been in service for four months and appears to be in perfect condition. There is a slight coating on the surface, but if this is scraped off, bright tin appears underneath.

Bronze orifice plates made of "Worthington anti-corrosive metal" have stood well. The edges are not quite so sharp as originally, but the discharge coefficient has increased during nearly two years of service only about 3 per cent. Part of this effect can be attributed to wear rather than corrosion.

The effect of hypochlorite on one large metal main was to detach the organic matter, which quickly appeared at the reservoirs. The next gauging of the pipe showed an increase in carrying capacity of about 6 per cent. from the previous year, whereas theretofore there had been an average yearly reduction of about 4 per cent. in carrying capacity. It is to be expected that similar effects would always be observed in supply mains leading from reservoirs, for in such cases vegetable growths have a large effect on the carrying capacity. No observations have been made on the corrosive effects in metal mains, but a strong hope seems justified that no material damage will result, since the dose is minute and by far the greater part of the applied chemical is taken up by organic matter in the water before it has a chance to come in contact with the pipe. The point of application of the chemical would, of course, have an effect on the results. A relatively long period between the application of the dose and the entrance of the treated water into the pipe would lessen the tendency of action on the pipe.

Wood Rapidly Affected.

Wood is readily affected by hypochlorite solution. Mixing tanks of white pine began to show serious damage within a month, the end grain at the rabbet being affected most and so softened that it could be crushed or scraped out. Storage tanks containing 2 per cent. solution were not much affected during the same time. All tanks, however, were

lined with cement mortar shortly afterwards. Wooden stilling boxes have lasted for nearly two years in solutions of $\frac{1}{2}$ per cent. and 1 per cent. strength, but at the end of a year and a half the wood was found to be so softened that the edges could be broken off with the hand. Wooden floats boiled in paraffine and coated with a thick layer of paraffine have been used successfully. They appeared to be entirely unaffected after many months of service.

Effect of Electric Current on Concrete and Steel

An interesting research has been carried out in the Natural Philosophy School of the University of Melbourne by the aid of funds furnished by the Government of Victoria, Australia, with the object of determining the effect of electric currents on reinforced concrete.

According to the Engineering News, which publishes full details, the series of tests tends to prove:

- (1) That rusting and pitting of reinforcing and structural steel occurs at the anode.
- (2) That this rusting by its growth causes rupture of the concrete and the development of large cracks.
- (3) That very small currents, e.g., 0.02 amps., will cause such rusting and cracking.
- (4) That when steel is cathode no rusting of the steel or cracking of the concrete will occur with currents up to 0.06 amps. during 200 days.
- (5) That sandstone and brick will behave similarly to concrete, showing even less resistance to cracking.
- (6) That damp earth supplies sufficient moisture to concrete to render it conducive to a current which will cause cracking.
- (7) That alternating currents of the magnitude of 3 amps. will produce cracks by thermal action, but no rusting.
- (8) That the thermal action, when measured by a thermometer, of currents of the magnitude of 0.05 amps. is negligible in blocks of concrete.

Fire Resistance of Bricks

In the Proceedings of the Engineers' Society of Western Pennsylvania particulars are given of experiments conducted on different classes of bricks. It was found that with mixtures of magnetite and marble with kaolin, the refractoriness of the magnetite brick decreases as the amount of clay increases, and the same applies to the addition of lime. With mixtures of alumina and silica, additions of kaolin bring down the melting point of pure alumina considerably below the normal value of about 2,000 deg. C., and if quartz be added with 9.1 per cent. alumina the melting point is reduced to about 1,566 deg. C., after which a very small amount of alumina raises the melting point rapidly to 1,790 deg. C.—the melting point of pure silica. In the case of a silica brick with a certain amount of clay introduced as a binder, it was found that as the amount of clay is increased the refractoriness rapidly falls off after the added amount reaches 6 per cent. This points to the desirability of making bricks either very high in silica or entirely of clay. Other investigations indicated the effect of potash, soda, lime, magnesia, and iron on the melting point of clay. Slight additions of the fluxes named reduced the melting point, the reduction being proportionate to the quantities added.

Tests of Structural Materials

The eighth annual report of the United States Secretary of Commerce and Labor, just to hand from Washington, contains the following information in regard to a portion of the work of the Bureau of Standards:

The work of testing of engineering instruments and structural and other materials has steadily advanced. Additional space for the work has been provided and the erec-

tion of machines and instrument is now under way in the new laboratory. A 100,000-pound universal testing machine already erected, has shown accurate and reliable results. The Bureau has also installed a 1,000,000-pound Riehle crushing machine for testing stone, brick, terra cotta, cement, and concrete, and for determining the moduli of elasticity of building materials and structural forms. A 2,400,000-pound Emery machine will soon be installed for investigating physical properties of materials and the constants required by engineers in computing structural designs. The construction of the large Emery machine for testing full-sized structural members and shapes is well advanced and the foundation is in place. Freezing chambers and special furnaces for fire tests of ceramic materials are being built. Investigations are also in progress as to methods of testing torsion, cold-bending, alternating impact, alternating stress, and hardness.

A new method of determining stresses and strains in large structural members used in bridges and buildings has been devised and tested on the Rock Creek Bridge, at Washington, D.C., and on the Ohio River Bridge, at Beaver Falls, Pa. This new method promises fruitful results in testing the safety of bridges and buildings while under construction and without the use of large testing machines. The method is also applicable to a study of lap-welded boilers and the deformation resulting from stresses.

The bureau tests have covered a wide range of metals and structural materials and have been made for all the government departments. The number of tests of miscellaneous materials has increased 50 per cent. With special equipment the bureau is to make investigations and assist in preparing specifications for government materials and to aid in the adoption of uniform standards in the industries.

The bureau tested four times as many engineering instruments as in the previous year, including anemometers, pressure gauges and water-current meters. The Geological Survey has transferred to the Bureau the Chevy Chase Lake station for calibration of water-current meters. The station has been improved and an investigation of Price meters is now in progress.

To Prevent Dusting of Concrete Floors

To prevent dusting of concrete floors already laid the following remedy is recommended by Mr. Albert Moyer:

Wash the floor thoroughly with clean water, scrubbing with a stiff broom or scrubbing brush, removing all dirt and loose particles. Allow the surface to dry. As soon as dry apply a solution of one part waterglass (sodium silicate), and three to four parts of water, the proportion of water depending upon the porosity of the concrete. The denser the concrete the weaker the solution required. Stir well, and apply this mixture with a brush (a large whitewash brush with long handle will be found the most economical). Do not mix a greater quantity than can be used in an hour.

If this solution is sufficiently thin, it will penetrate the pores of the concrete. Allow the concrete surface thus treated to dry. As soon as dry, wash off with clean water, using a mop. Again allow the surface to dry and apply the solution as before. Allow to dry and again wash off with clean water, using a mop. As soon as the surface is again dry, apply the solution as before. If the third coat does not flush to the surface apply another coat as above.

The sodium silicate, which remains on the surface, not having come in contact with the other alkalis in the concrete, is readily soluble in water and can therefore be easily washed off, thus evening up the color and texture of the floor. That which has penetrated into the pores, having come in contact with the other alkalis in the concrete, has formed into an insoluble and very hard material, hardening the surface, preventing dusting and adding materially to the wearing value of the floor.

Grading of Materials in the Aggregate

Success or Failure in Construction Dependent Largely upon Scientific Mixture of Constituents—Satisfactory Practice and Otherwise—Recent Tests

By H. P. Bowes, Supt. Warren Bituminous Paving Company, Toronto*

The firm with which I am connected, namely the Warren Bituminous Paving Company, have made a specialty of the grading of the materials used in the surface coat of roadways and have met with a great deal of success.

The specifications for the grading which they have adopted call for the mineral aggregate being proportioned to size so as to produce a mass having 21 per cent. or less of voids at the time of construction. They have found that any method of construction calling for the use of mineral aggregate will reach a degree of perfection proportionate to the ability in so grading or arranging the mineral constituents as to reduce to a minimum the existing voids. Then with the addition of the proper mortar a mass will result which will not only be dense but nearly waterproof. Upon the other hand the farther these principles are receded from, the more certain failure is courted. It would then seem that the paramount principle is the proper grading of the mineral constituents.

Perhaps this subject really applies more forcibly to reinforced concrete work where great strength is required for the least possible weight. For large and important structures it pays from an economic standpoint to make very thorough studies of the materials of the aggregates and their relative proportions. This fact has been seriously overlooked in the past and thousands of dollars have sometimes been wasted on single jobs by neglecting laboratory studies or by errors in theory.

Since cement is always the most expensive ingredient, the reduction of its quantity—which may very frequently be

shows the dry materials and the mixture when the stone has been graded somewhat.

It is obvious at a glance that the uniform stone measured in figure 1 contains less solid stone than the graded stone measured in figure 2. The spaces between the stones in the first case are very nearly equal to the volume of the solid particles, and as the measure of sand is one-half that of the stone and the particles of cement fill the voids in the sand, this sand and cement mixes in between the stones filling the spaces or voids and resulting in a mixture but very slightly greater in volume than the stone alone.

In the second case, figure 2, the spaces between the large stones in the stone measure are filled with graded smaller stones so that there is a much smaller volume of spaces or voids. Hence when the sand and cement, which are identical with that in figure 1, are mixed with it the volume of the mixture becomes considerably larger than the original bulk of the stone. Consequently, if we are tied to definite proportions of materials, more concrete will be made with graded stone than if the stone has been screened to a uniform size.

If, on the other hand, the proportions of the materials are changed on account of the fewer voids in the mixed stone, and less sand and cement are used, a saving in these materials results.

Proportioning by Void Determination.

The method often used in determining the voids in stone and sand, by finding the quantity of water that can be poured into the voids of a unit measure of stone or sand,

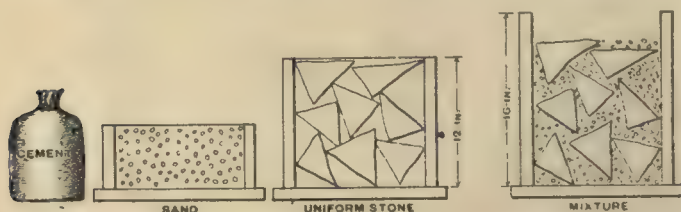


Fig. 1—Diagram illustrating measurement of dry materials and mixture when broken stone is of uniform size.

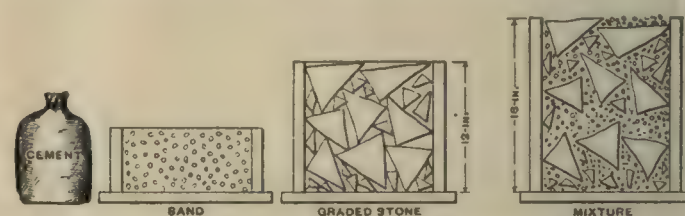


Fig. 2—Dry materials and mixture when the stone is of varying sizes.

made by adjusting the proportions of the aggregate so as to use less cement and yet produce a concrete with the same density, strength and impermeability together with the reduction of size—is of the utmost importance.

If gravel or stone, having particles of uniform size, is used, it must be recognized that the work will cost 10 per cent, or upwards more on account of the additional quantity of material required to make a given volume of concrete.

In measuring the gravel or stone before mixing there will be less solid matter in the measure, and consequently more sand and cement will be necessary to fill the spaces between the stones. This fact, which is often overlooked—even by experienced men, is illustrated in a somewhat exaggerated fashion in figures 1 and 2. The proportions of this particular mix are 1-2, $\frac{1}{2}$ -5.

Here figure 1 illustrates the measurement of the dry materials and the mixture produced therefrom when the stone has been screened to one uniform size, while figure 2

and then the amount of sand or cement as the amount required to fill the voids in the stone or sand, is not satisfactory. The greatest inaccuracy of this method is due to the difference in compactness of the material under varied methods of handling and to the fact that the actual volume of voids in a coarse material may not correspond to the quantity of sand required to fill the voids; for the grains of sand separate the stone, and with most aggregate a portion of the sand is too coarse to get into the voids of the coarser material. That is, in a mass of graded stone many of the individual voids are so small that the larger grains of natural bank sand will not fit into them but will get between the stones and increase the bulk of the mass. This increase in bulk means that more sand is required than the actual volume of voids in the coarser material.

Perhaps the most practical way of obtaining the desired proportions is by

Volumetric Proportioning by Trial Mixtures.

An accurate and simple method to do this is by trial batches. The apparatus is easily obtained at any time, con-

* Read before the Canadian Cement and Concrete Association, March 7th, 1911

sisting as it does of a scale and a cylinder which may be a piece of wrought iron pipe 10 to 12 inches in diameter capped at one end. Measure and weigh the cement and stone and water, and mix on a piece of sheet steel or other non-absorbent material. The mixture should be of the same constituency as intended to be used in the work. The mixture is placed in the cylinder, carefully tamped and the height to which the pipe is filled is noted.

The pipe should be weighed both before and after being filled, so as to check the weight of the material. The cylinder is then emptied and cleaned.

Mix up another batch, using the same amount of cement



Fig. 3 - Large stones with voids filled with sand

and water, slightly varying the ratio of the sand and stone, but having the same total weight as before. Note carefully the height in the cylinder again which will be a guide to the other batches to be mixed. Trials are made until a mixture is found that gives the least height in the cylinder and at the same time works well while mixing, all the stones being covered with mortar, and which makes a good appearance.

This method gives fairly good results but does not give the changes in the physical sizes of the sand and stone so as to secure the most economical composition as would be shown by a thorough mechanical analysis.

Mr. A. E. Schutte in studying the proportions of materials for bituminous macadam pavement for the Warren Brothers Company has very effectively developed the method of volumetric synthesis with dry materials. His experiments included various classes and sizes of stone, sand and screenings, ranging from three inches in diameter down to that which passes a 200-mesh sieve. He found that the best method for compacting dry materials such as sand, gravel or broken stone, is to place them in a vessel the shape of a cone, with the largest diameter at the bottom. The cone is filled with the coarsest material and taken by a laborer who compacts it by repeatedly striking the cone against the ground, keeping the measure full by adding new material of the same kind. When it ceases to settle the contents are emptied and mixed with a portion of a finer material replaced in the measure and compacted as before.

By repeated trials are determined the exact size and maximum volume of successive finer materials which may be added without appreciably increasing the bulk of the coarsest after thoroughly compacting. Mr. Schutte has found that for different shapes of particles the proportions of each size must be varied, but having determined the required percentages for a certain stone, that is for a stone from a certain quarry, the proportion of the sizes from day to day need be varied but little.

Effect of Grading Aggregate on the Density of Concrete

The fact that the densest mixture is secured with particles of different sizes is very evident from Figs. 3 and 3a. It follows that the least density, and hence the greatest percentage of voids, occurs when the grains are all of one

size. The converse of this proposition that the smallest percentage of voids occurs in a mixture graded so that the voids of each size are filled with the largest particles which will enter them, is illustrated in figure 4. This is very important in its application to the selection of materials for concrete. The mass of this last mixture is evidently denser; that is, it contains more solid material. This relates directly to the differences between mortar and concrete. The substitution of stones for small masses of sand reduces the voids and consequently the quantity of cement required. Extending this principle to the fixing of the proportion of sand and stone it is evident that for maximum economy

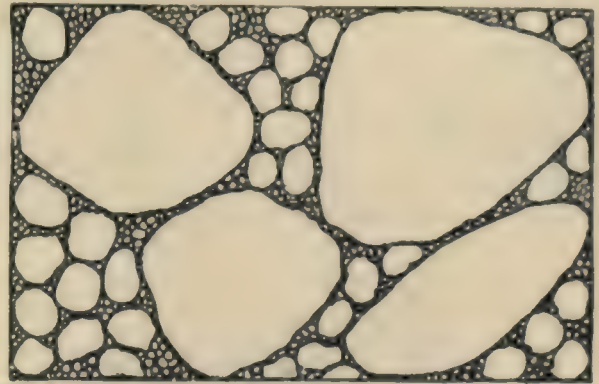


Fig. 3a. - Large stones filled with small stones and sand.

and equal strength there should be used the largest possible quantity of stone in proportion to the sand.

Mr. Fuller, who has experimented a good deal along this line, found that by grading the materials of his aggregate, figuring at a point where he only required one part of sand to five parts of stone, that for this mix the modulus of rupture was 504 lbs. per square inch. As he increased the amount of sand the strength decreased; when he reached equal parts of sand and stone the modulus of rupture was 355 lbs. per square inch, and when he had twice as much

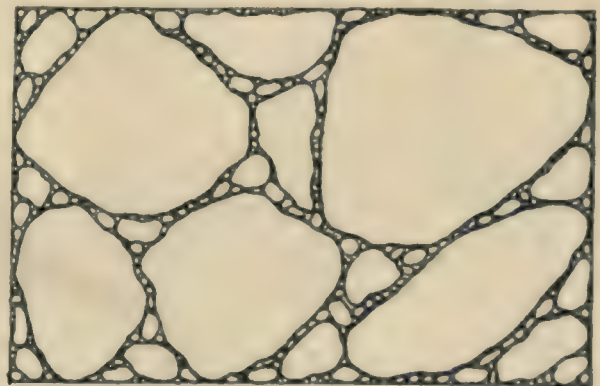


Fig. 4. Large stones, with voids filled with medium sized stones surrounded by smaller stones and sand so as to give graded mixture

sand as stone the modulus of rupture was 210 lbs. per square inch. The total amount of aggregate in each case was the same, namely, 1 part cement to 6 parts sand and stone.

In 1901 tests were made at the New Jersey Water Company's reservoir on the comparative strength of different proportions of concrete aggregate. These tests indicated that for the materials used there was a certain mixture of sizes of the aggregate which, with a given percentage by weight of cement to the total aggregate, gave the highest breaking strength. In practice it was also found that the concrete made with this mixture worked more smoothly in placing. These tests led to a more extended series of experiments by Mr. Sanford Thompson and Frederick Taylor at Jerome Park reservoir, New York. The method of

procedure and results of tests are given by Wm. B. Fuller and Sanford Thompson (Transactions of American Society Civil Engineers, Vol. 59, page 67, 1907). The mechanical analysis diagram of their tests furnished a ready means of studying the effect of various sized particles on the density of concrete. For this purpose crusher run stone and bank gravel were screened into twenty-one sizes ranging from 3 in. down to that passing a 100 mesh sieve. Over 400 tests were made with different combinations of the sizes of stones to obtain the proportions which would produce the densest concrete mixture. From these tests they derived the following laws:—

(1) Aggregate in which parts have been specially graded in sizes so as to give when water and cement are added an artificial mixture of greatest density produces concrete of higher strength than mixtures of cement and natural materials in similar proportions. The average improvement in strength by artificial grading under the conditions of tests was about 14 per cent. Comparing the tests of strength of concrete having different percentage of cement it is found that for similar strength the best artificially graded aggre-

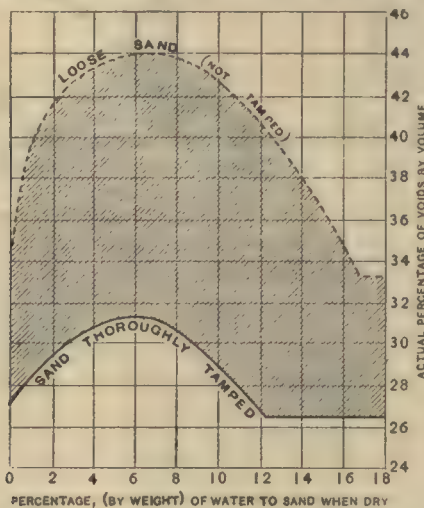


Fig 5.—Percentage of absolute voids in a natural bank sand, containing varying percentages of moisture.

gate would require about 12 per cent. less cement than like mixtures of ungraded material.

(2) That the strength and density of concrete is affected but slightly, if at all, by decreasing the quantity of medium stone of the aggregate and increasing the quantity of coarsest stone. An excess of stone of medium size on the other hand appreciably decreases the density and strength of the concrete.

Perhaps it might be worth while calling attention to the effect which dampness has on the volume of sand and stone screenings and stone, especially sand and stone screenings, and hence the allowance necessary to make for this. This diagram, figure 5, was plotted by Mr. Fuller from experiments from a single sample of natural sand mixed by weight with varying percentages of water, and illustrates the effects of moisture upon the actual percentage of voids in sands loose and tamped. The volume produced by varying degrees of compacting are located between two curves. It is noticeable that both loose and tamped sands increase in volume with the addition of water, and reach a maximum at about 6 per cent. of water, then decrease to slightly less than their original bulk. The same sand it may be seen may contain from 27 to 44 per cent. of absolute voids according to the percentage of water and degree of compacting. The percentage of water by weight which will give the greatest bulk corresponding of course to the largest percentage of voids varies with different sands from 5 to 8 per cent.

In Fig. 6 there is shown an ordinary stone crushing outfit with a sectional screen of three different sizes of mesh. The screen used by the Warren Brothers Company is composed of one screen within the other. The stone is of course delivered into the end of the screen, which contains the smallest openings. The inside screen of the first section would be about $\frac{1}{4}$ in. mesh, and the outside about a ten mesh and not quite so long as the $\frac{1}{4}$ in. section, so that the fine material passing the ten mesh would fall directly into a bin below and the $\frac{1}{4}$ in. be delivered from the end of the outside screen to another bin. Similarly with the other two sections the second section would be about $\frac{3}{4}$ in. inside and $\frac{1}{2}$ in. outside and the third $1\frac{1}{2}$ in. inside and 1 in. outside. This of course only permits the grading of the stone into six different sizes.

The bins for receiving have a chute at the bottom with a slide to control the flow of the stone. Below these bins is a hopper set on a six beam scale so that the desired amount of each size of stone can be drawn into the hopper without changing the weights on the beams. Of course this method would not be applicable to concrete work un-

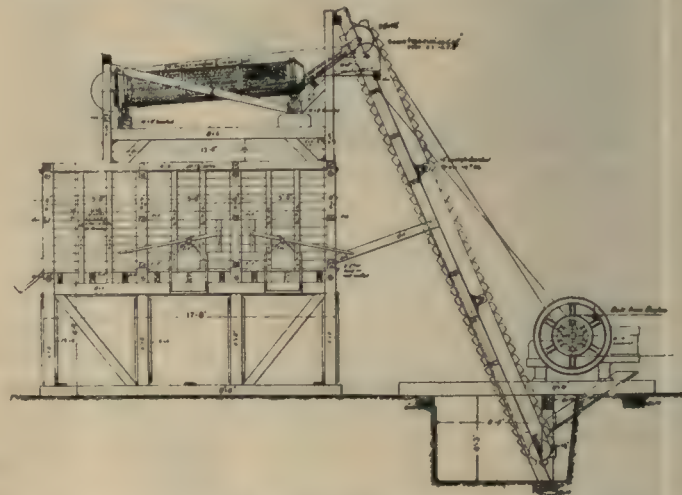


Fig 6—Small crushing plant with elevator, screen, and portable bins.

less the mixer was set directly below the hopper, for if the materials are loaded into wagons or carts and dumped in piles the large stones roll to the outside of the pile and very little good results from the previous grading.

The only feasible manner to take care of the different sizes of stone, if the screens are not near the work, is to use bins to hold the different sizes.

Figure 7 shows a sawed section of bitulthic pavement taken from Palmerston Boulevard, Toronto. This shows the grading of the different sizes of stone in the pavement and the way in which they inter-mix with each other. The sizes of stone in this sample range all the way from 200 mesh material up to $1\frac{1}{2}$ in.

Professor Gillespie and the writer recently crushed two blocks of concrete. One was made of an aggregate of one inch stone and sand (1:3:5), the total aggregate when dry weighing thirty pounds. To this was added five pounds of cement mixed with water and placed in a box eight inches square. The other sample was made of a graded aggregate of the following proportions: 1-in. stone 3 lbs.; $\frac{3}{4}$ -in. stone 7 lbs.; $\frac{1}{2}$ -in. stone 6 lbs.; $\frac{1}{4}$ -in. stone 5 lbs.; 8 mesh material $\frac{1}{2}$ lb.; 16 mesh material $1\frac{1}{2}$ lbs.; 20 mesh material $1\frac{1}{2}$ lbs.; 50 mesh material 3 lbs.; 80 mesh material 1 lb.; 100 mesh material 1 lb.; 200 mesh material $\frac{1}{2}$ lb.; total 30 lbs. as before.

This mixture was mixed with the same amount by weight of cement as the previous sample and put in the

same sized box. The two samples were kept side by side as they dried so that all conditions, except the grading of the aggregate, were identically the same in each case. The blocks were only six days old when crushed, this accounting for their comparatively low strength. For the ungraded sample the load at point of failure was 560 pounds per square inch and for the sample with graded aggregate 679 pounds per square inch—a gain in strength, by grading the aggregate, of 21 per cent.

I have given this paper not with the feeling that what little I know would help you very materially, but in the

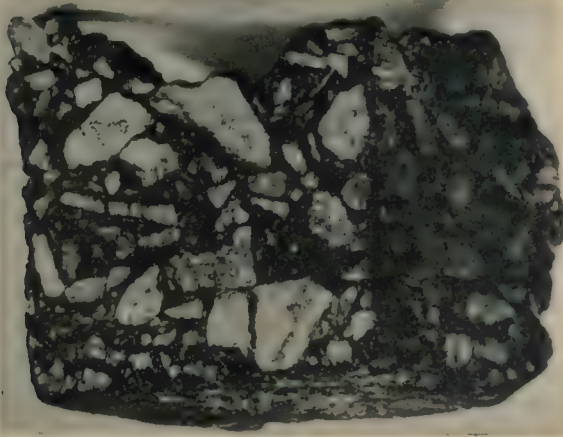


Fig. 7—Sawed section of Bitulithic Pavement.

hope that perhaps some of you who have not been interested in this branch of the subject might appreciate better the advantages obtained by a scientific mixture of the aggregate and that you might realize the field for research that there is in this work. I am indebted to Taylor & Thompson's book on concrete for some of the foregoing illustrations and also for a number of useful pointers.

Contractors' Suit at Edmonton

At Winnipeg judgment was delivered recently in the action of Grace vs. Osler, the decision being in favor of the defendants. The plaintiffs were Wm. Grace & Co., who contracted to erect a five-storey building on the corner of Portage avenue and Main street, Winnipeg, for Messrs. Osler, Hammond & Nanton.

After the walls were up and the roof and concrete floors an accident occurred to the basement walls resulting in considerable damage, and the owners terminated the employment of the plaintiffs under the provisions of the contract and completed the building themselves, on the ground that the damage was due to the default of the plaintiffs, and that they had refused to repair it except as extra work, for which they should be paid.

Plaintiffs sued for a balance of \$48,000, claimed to be due under the contract for work done and materials supplied, including a large amount of extras, up to the time their employment was terminated. They charge that the accident to the walls was due to the negligence or lack of judgment of the architects, and that they were not responsible therefor.

On the question of delays the finding is in favor of the plaintiffs, and states that much of the extra work was ordered; that the architects were dilatory in the supply of plans and details, and that there was delay in the supply of cut stone.

The judgment concludes as follows:

"On the facts as well as the law, I think the plaintiffs are not entitled to unliquidated damages for non-completion to time. The result is the plaintiffs' claim should be dis-

missed with costs to be added by the defendant to the amount recovered upon their counterclaim.

On the counterclaim there will be judgment referring it to the master to take the following accounts:

1. To find the amount earned by the plaintiffs for work done and materials provided in the execution of the contract, including extras properly ordered, up to the time defendants terminated plaintiffs' employment.

2. The value of the extras ordered or partially so up to that time by plaintiffs.

3. The reasonable cost of restoring and rebuilding the damaged foundation walls in accordance with the original plans and specifications, not including levelling up the building.

4. What it would have cost at that time to have levelled up the building.

5. The amount of damage to the adjoining Canadian Northern Railway building caused by the subsidence of the defendants' building.

6. The reasonable cost of completing the building after the defendants terminated plaintiffs' employment according to the original plans and specifications.

7. The reasonable cost of completing any extras ordered and begun by the plaintiffs and finished by defendants.

Further directions and costs of reference and of counterclaim were received.

Among the recent important contracts secured by the Carter-Halls-Aldinger Company, Limited, Winnipeg, may be mentioned the administration building, which the provincial government of Manitoba is building at the new Agricultural College, at St. Vital, a beautiful location on the Red river just outside of Winnipeg. The contract price for the building is \$229,000. The structure will be fireproof, faced with stone and pressed brick. It is the first of a number of buildings to be erected by the government in this connection. The Carter-Halls-Aldinger Company also have under construction at Winnipeg an 8-storey reinforced concrete building with ornamental terra cotta front, for the Gowans-Kent Company.

It is reported in Montreal that the Canadian Pacific Railway will have work started in the spring on a line paralleling the Grand Trunk to Toronto. It is said that the new line will commence at Bathurst, ten miles west of Smith's Falls, and proceed southwesterly to Belleville. The whole of this line, it is said, will be double-tracked, and as the line between Smith's Falls and Montreal is double tracked already, the C. P. R. will have a double track all the way between Montreal and Toronto; and an alternative route between Smith's Falls and Toronto and will reach all the important industrial communities between Montreal and Toronto now served by the Grand Trunk alone.

Among the out of town visitors at the Cement Show last week may be mentioned Mr. T. R. Van Hamm, of the editorial staff of Rock Products, Chicago; C. F. Till, representing H. C. Hitch & Company, general contractors, Montreal; Chas. Warnock, of Robt. W. Hunt & Company, Montreal; Jas. A. McNair, president of the Dominion Glazed Cement Pipe Company, Vancouver; J. A. Jamieson, consulting engineer, Montreal; C. Erland, London, Eng.

The journalistic field was well covered at the Cement Show. In addition to the Contract Record, the following had booths: Canadian Engineer, Construction, and the Builder and Contractor. The Canadian Engineer issued a daily bulletin, a breezy little publication which was well received by the exhibitors.

Advantages of Reinforced Concrete Work

Its General Safety and Expediency—Progress Somewhat Retarded in Canada by Improper Building By-laws — Practical Pointers — Care in Estimating

By C. A. P. Turner *

In dealing with the subject of reinforced concrete, I shall endeavor to discuss:

First, its field of usefulness in reducing the enormous fire loss incident to cheap timber construction in Canada and the United States;

Second, the safety of the construction, in treating of general types;

Third, the objection to its adoption held by old-fashioned architects and engineers;

Fourth, the obstacles placed in the way of its adoption through ignorant legislation or ill-advised building laws, which in many cities encourages more dangerous types of construction.

Finally, I shall endeavor to bring out the useful points and hints to the builder, which may aid in securing satisfactory work.

Heavy Fire Waste.

A statement given in the bulletin of the United States Geological Survey, treating of the fire tax and waste due to this cause, is as follows:

"The total cost of fires in the United States in 1907 amounted to almost one-half the cost of new buildings constructed in the country for the year. The total cost of the fires, excluding that of forest fires and marine losses, but including excess cost of fire protection due to bad construction, and excess premiums over insurance paid, amounted to over \$465,425,000, a tax on the people exceeding the total value of the gold, silver, copper, and petroleum, produced in the United States in that year.

"The actual fire losses due to the destruction of buildings and their contents amounted to \$215,084,709, a per capita loss for the United States of \$2.51. The per capita losses in the cities of the six leading European countries amounted to but 33 cents, or about one-eighth the per capita loss sustained in the United States. In addition to this waste of wealth and natural resources, 1,449 persons were killed and 5,564 were injured in fires."

The remedy for this great loss, both in life and property, evidently lies in better building—in building non-combustible types of construction. Now this question involves the question of cost and under the present conditions, reinforced concrete is the material to which we must look to solve this problem of better building on an economic basis.

In many sections of Canada, a reinforced concrete building, economically designed, can be put up to compete with heavy timber mill construction. For lighter buildings, the cost of reinforced concrete is greater than timber, but for high office buildings, which are usually constructed with structural steel frame, a material saving can be secured by the use of reinforced concrete construction.

Properly designed, reinforced concrete may be more quickly and safely erected than any other type of building. This statement is made as the result of the writer's experience in the past twenty years in structural steel designing, and for the past ten years in the design of reinforced concrete construction, and he believes that with this experience he has thoroughly familiarized himself with the advantages and disadvantages of both types.

As regards safety of construction, there have been admittedly a number of failures in the erection of reinforced concrete buildings. There have also been failures in the erection of steel work and in the erection of timber construction—in fact, wherever ignorance of proper design and scientific methods of erection have been displayed in the design or execution of the work. In the history of concrete work, however, the following general statement may be made:

As far as the writer is aware, no failures have occurred in floors reinforced in multiple directions. Practically all failures have occurred with one-way reinforcement, and where there was an insufficient lap of the reinforcing metal over the support. In other words, safe concrete floor construction requires ample lap of the reinforcement over the supports and the thorough tying of the work together.

In the line of column construction, the writer does not know of a single failure where the column was well hooped and reinforced with a reasonable proportion of vertical steel. There have been a number of failures where an insignificant amount of hooping was used and a large amount of vertical reinforcement. Difficulty has occurred with columns which had a reasonable amount of hooping and an insignificant amount of vertical steel. These failures occurring with certain specific types or classes of design which are, from the engineering standpoint, inherently objectionable, have led to unwarranted general condemnation of reinforced concrete by those interested in other types of construction.

Thus it is evident that every one engaged in the reinforced concrete field is injured more or less by every failure, no matter what the cause. This being the case, it is incumbent on those who are commercially interested in the business, to point out questionable methods of design and construction and the risk involved.

Defective Building Ordinances in Canadian Cities.

Unfortunately for those engaged in this line of business, municipal building regulations are frequently adopted, covering this class of construction, which have been formulated by those lacking in familiarity with the first principles of concrete construction. Thus you could find a few years ago, one city allowing for hooping and refusing to allow any value for vertical steel in the reinforcement of columns. You would find another city allowing high values for the vertical steel and absolutely nothing for the hooping. You would find one city requiring all beams to be designed as simple beams, while another city would demand continuity in beam design where practical.

The recent failure of the Henke building in Cleveland, is an example of the direct result which may be expected from improperly drawn building ordinances. In Cleveland, columns of moderate size designed in accordance with the Cleveland code, involve a high percentage of vertical steel and an insignificant amount of hooping. In the cold season of the year, column failure might occur during the sweating period of concrete which had been chilled and a complete collapse result as exhibited in this case. This collapse would never have occurred with a column designed with a suitable amount of hooping combined with a smaller amount of vertical steel.

The building codes of Toronto and Montreal seem open to the same serious objection as the old code of the city

* Presented at the C. N. A. B. Convention, Winnipeg, Feb. 13-16.

of Cleveland. In Chicago and New York, building ordinances have been devised by those radically antagonistic to reinforced concrete, with the result that columns constructed for a tall building in accordance with the code of New York and Chicago would assume ungainly proportions.

The difference in the value of a reinforced concrete column, thoroughly hooped and vertically reinforced, and the ordinary type with the small amount of vertical steel with ties at intervals of a foot, will readily run four to five hundred per cent. For example, the writer has tested full sized columns, having a $14\frac{1}{2}$ in. core, to 700 tons total load. A column having the same gross area with ordinary reinforcement, ties one foot centres and the same vertical steel, could not be expected to run over 200 or 250 tons.

Differences of this kind in the absolute value of the member under test should be properly considered in any rational code of building laws and failure to do this involves the expenditure of large sums which, as under the old code of Cleveland and under the present codes of Toronto and Montreal, are really wasted in the design of the work.

The general object of the building department should be to insure safe construction, rather than to see that a certain set of rules which do not of themselves produce this result, are followed.

Arbitrary Rulings.

In one of the large southern cities, the writer submitted a design which he guaranteed to the owner to have a test capacity of 1,000 pounds per square foot. The engineer of the Department of Buildings endeavored to figure this in accordance with his code as he interpreted it, and required no more steel but a different distribution of the same, which the writer could not guarantee for a test of more than six hundred pounds per square foot. He placed the facts squarely before the inspector and asked whether the department would assume the responsibility. "No, the department did not assume any responsibility at all in the matter." They were sorry that their code required more steel in certain parts and less in others, and our only way, if we were to make good our guarantee, was to add \$1,000 worth of steel to the design of the building, simply to comply with the letter of the building code as interpreted by this particular engineer.

Many times, in the construction of this class of work, the contractor arbitrarily adds from one to five thousand dollars to the cost of the building in order to comply with the letter of some ordinance which insures expensive construction rather than safe construction to the business man putting up the building.

No body of men can bring more influence to bear on this question of reasonable and proper building requirements than the Canadian National Association of Builders.

An objection to the adoption of reinforced concrete frequently urged by the old-fashioned engineer and architect is that the contractor is so dishonest that he will skin a little cement here and there, and the integrity of the resulting structure will be doubtful.

Unfortunately, this old-fashioned engineer and architect is not sufficiently familiar with the first principles of reinforced concrete construction, and his objection on this score is rather amusing, since if he credits the average contractor with any intelligence whatever, he should be aware of the fact that it is impossible to reduce the necessary amount of cement in the mix without requiring the temporary work or timber forms to be left in place a greater length of time than would be required with a richer and better mixture. What the contractor could possibly save in cement he would lose four times in the additional amount of lumber required for centering and the additional time that it would require to finish the building. In other words, reinforced concrete construction is a line of business in which the work can be

executed honestly at a lower cost than would result from an attempt to dishonestly use an insufficient amount of cement in the mixture, and there are few contractors who are so ignorant, after they have put up three or four buildings, that they fail to appreciate this fundamental of concrete construction.

On this question of dishonesty, of which the old-fashioned engineer and architect is wont to accuse the general contractor, on general principles if for no other reason, a word or two may not be amiss.

The writer's business is to a large extent, that of consulting expert for a large number of general contractors and builders. He has learned to appreciate their integrity by constant dealing with them. They desire to do work which will be creditable to their reputation as constructors. They have learned the lesson that a good reputation as a builder is a most valuable asset commercially, and that they cannot afford to lose this reputation by failure to make good. They have learned it to be a fact that the larger profit in the line of construction is secured by scientific and systematic management of the work; by looking sharply after the purchasing, seeing that the materials are delivered when they are needed to push forward the work, and suitable equipment is supplied and on the ground for the economic execution of the work, and that everything is carried on in an orderly and systematic manner, planned and laid out in advance. By so doing, the cost of executing the work may be kept down to a minimum.

These men, in paying the bill for the cost of construction, are inclined to check up rigidly with cold figures their ideas of theoretical economy as to what the work has actually cost, by carrying it out along different theoretical lines. They pay the bill, and in doing so, the results secured guide them in their judgment.

We might compare this class of men with some of those who pose as concrete experts in the engineering profession to-day. While I will not accuse these men of technical dishonesty, their business methods savors somewhat of the faker.

Concrete Experts, and Imitators.

About three years ago, a prominent structural bridge engineer in the United States, a man who has earned considerable reputation in the line of steel bridge work, delivered a lecture in one of our state universities, and when asked about concrete as a structural material stated to the boys that he was not familiar with what concrete men were doing in this line, but he did not think it amounted to very much. Since that time he has seen a great light. He has suddenly concluded that there was money in the concrete business, and after the six-day consideration, which it probably took to arrive at this conclusion, he came out as a full fledged concrete expert.

One of his early pieces of work in a large Pacific coast city was a report as expert on a reinforced concrete viaduct, designed on the Kahn system. Now this particular viaduct had been tested by the contractor with five times its working load on the sidewalk and five times its working load over a full panel of the roadway, and it had stood this test without injury and without indication of weakness. The design of this viaduct did not harmonize apparently with the peculiar theoretical notions of this expert without experience. Accordingly he directed that the viaduct be strengthened. What it would carry or might be tested to, cut no figure with his theories. The concrete was drilled into and additional rods added with the net result that, figuratively speaking, he had cut the liver out of the concrete and added a considerable amount of steel, and undoubtedly reduced the resulting strength of the structure from ten to twenty-five per cent. at an expenditure of approximately \$40,000. When it came up for trial as to who is to pay this

expenditure, the contractor or the city, unless this expert is able to hypnotize the judge into believing that his theoretical notions as to the strength of the structure are more reliable than the determination of its actual strength by the law of gravitation in applying the actual test, then we may be certain that the taxpayers in that city will have a large bill to pay for the absurd recommendations of this so-called expert. It is fair to point out that this "expert," with practically no experience in the line of concrete work worth mentioning, has earned deservedly a high place in the American Society of Civil Engineers by his work in the field of steel construction, but work in this line does not qualify an engineer to assume the role which he has assumed in the line of concrete construction.

I brought up this instance which comes to my observation in order that your attention might be called to the class of men who too frequently are called in by municipalities to formulate a code governing the execution of reinforced concrete construction.

Men posing as experts, who are not actively engaged in the business and have no experience in this line of construction, are too frequently selected as experts to draw up rules and regulations governing the expenditure of the funds of the business man; putting up fireproof buildings. A large waste is occasioned thereby, and frequent accidents and loss of life are incurred through ignorant rules formulated by such men. Your influence as builders, through your various exchanges, can do much to remedy such conditions.

The credit for the advance of reinforced concrete must be given, not to the engineers and architects, but rather to the builder. Thus, engineers who have taken an active part in the promotion of this important industry have in nearly all cases been forced, in the early days of their career, to take contracts and guarantee their work, and stand behind it to the extent of every dollar they possessed. The humbug engineer to-day, who has had no experience, assumes no responsibility for his work, but merely tries to play on the fears of the prospective client that the general run of builders are indeed an unprincipled lot and in this way hopes to cover his own ignorance of construction, and the imposition he is practising on his client, by assuming the role of an expert, with no experience behind him to warrant his pretension.

Adequate Fireproofing.

A few words may not be amiss from the fireproof standpoint. In the Engineering News of February 2nd, the collapse of the Chamber of Commerce building in Cincinnati, Ohio, was quite fully discussed. This was of structural steel and tile, one part only not being well protected by fireproofing, namely, the trusses supporting the loft. A slight fire wrecked the trusses and they crashed down through the building, causing the destruction of almost a half million dollars worth of property and a number of lives.

The writer has seen many such structures where a moderate fire would wreck the column protection and cause the collapse of a large section of the building. This, because the building happened to have a structural steel skeleton, has given the owner a false idea of his security. A few actual fire tests in a finished structural steel and tile building, such as have been required of us in putting up concrete buildings, would emphasize this point. For example—test consisting of nearly a couple of cords of pine wood split into two inch square fagots, cob-piled, and thoroughly wet down with kerosene, the piled wood being within five feet of the bottom of the slab, and the hose being turned on after the floor was heated to pretty nearly a white. This was applied to a reinforced concrete building in which the floor had been loaded to about three times its working

capacity under this test and returned to nearly its original position after the test and without material injury. Tests of this character would soon bring out the weakness of various so-called fireproof constructions and you would find that the better classes of reinforced concrete will stand such tests much better than any other type of reinforcing in use to-day.

Concrete construction possesses many things which recommend it to the Canadian contractor. First, he avoids many of the delays incident to structural steel construction. He eliminates the iron workers union in putting up the building. He can obtain steel rods as a rule on short notice from the mill. In fact he can obtain the necessary materials of construction to put up a reinforced concrete building in less time than is required to secure materials for any other type.

Constructional Pointers.

Under useful hints to the building of reinforced concrete, the first point which should be clearly born in mind, is that the strength of the concrete depends on the strength of the mortar matrix. That is, the proportion of the cement to sand in the mix. The coarse aggregate is merely a space filler and bears no relation to the strength of the concrete, where the strength of the aggregate is equal to or more than the strength of the cement matrix.

The point which the writer wishes to bring out clearly here is that the 1:2:4 mix, means a concrete of one cement, two sand and four of stone. These proportions cannot be interpreted to mean one cement to six parts by volume of gravel, where the proportion of the sand and stone in the gravel is indefinite.

In mixing, sufficient water should be used so that the concrete is plastic and will flow readily into place. In the summer season it is frequently best to wet down the stone pile, as during your long summer days the stone may absorb sufficient heat to set up the cement before the concrete can be placed in the work. Wetting the rock pile down will eliminate this difficulty.

In splicing, it is always best to splice a slab or beam vertically. A long inclined splice is invariably a source of weakness, since the inert material in the concrete rises to the surface and prevents a good bond between the new and old work.

In casting a column, it is best always to fill the column from the center. The writer has seen cases where the concrete was poured in from the side of the column and the space between the hooping, and the form filled up more rapidly than the centre of the column, the mortar was strained from the coarse aggregate, flowing to the centre of the column and leaving the outside face of the column full of voids and the fireproofing portion outside of the hooping being of no strength whatever, making it necessary to remove it and recast the outer shell of the column.

The foreman or superintendent in charge should be trained to see that in all cases there is ample lap of the reinforcing metal over the support. Failure to do this frequently results in difficulty and trouble.

In handling work in hot weather the superintendent should see that the concrete does not dry out too rapidly, while in cool, frosty weather, as soon as the temperature reaches 40 deg. above zero, it is good policy to commence heating the water. Warming the water used in the mix up to about 120 deg., the concrete will then set up nearly as rapidly as during the summer season. When it gets colder than this it is necessary not only to heat the material, but also to see that the concrete is dried out and hardened by artificial heat. The cement, in cold chilly weather, unless the materials are heated and artificial heat applied, lies dormant and does not cure, or is liable at any rate to cure so slowly that the number of days which the forms are left in place has little to do with the time when they may be

safely removed. In other words, the proper time to remove forms is when the concrete has become hard and rigid, irrespective of the number of days which the forms have remained in place. Frozen concrete cannot be detected as a rule from concrete cured by ordinary inspection. Cutting out a chunk, placing it on the hot stove and seeing whether it sweats and softens up is the only reliable guide to determine whether the concrete has been merely stiffened up by frost or has actually cured to an extent which would warrant one in trusting its strength.

Care in Estimating.

In estimating the cost of work, a word of caution may not be amiss to those who have had a limited experience in putting up reinforced concrete. Too often a contractor, who is a novice, has been imposed upon by the vender of reinforcement leading him to believe that centering may be put up at a far smaller figure than its actual cost—in that way misleading him into making a proposition for work which will not pay the cost of its execution. The writer has seen numerous cases where the general contractor in this way has put in an estimate much lower than he should have done. In nearly all cases, however, the contractor has been game enough to make good at his own expense, charge the bill up to experience, and keep clear of the same mistake a second time.

Steel Window Frames

The effort to eliminate the immense waste of property and value due to fire losses has led to the development of fireproof construction, an effort which has been immensely aided by the increasing use of concrete, both plain and reinforced, in building construction.

The constructing engineer, in his search for fireproof materials, had been led to abandon certain natural stones, which either crack and break under the action of heat, or are so materially reduced in strength as to render their continued use a matter of uncertainty. He has also found that the true fireproof materials are those which have already been through the fire, and have consequently been tested and have developed the resistance to heat which is absolutely essential. Thus brick, cement, cinder, etc., together with certain other materials such as sand, certain kinds of stone, and, in general, the materials of concrete, are available within their structural limitations.

When the use of the reinforcement of steel, imbedded within the concrete structure, was found to give the necessary tensile resistance, the field for genuine fireproof construction was opened. The steel necessary for strength could be so protected from heat as to remove its former weakness under the action of fire, while the wide applicability of concrete made it possible to abandon the use of combustible wood almost entirely.

The one detail in building construction for which wood retained its usefulness for some time appeared in the construction of window framing and sash. Concrete was here inapplicable, while the earlier attempts at the production of steel sash resulted in forms by no means so desirable as the wooden ones then in use.

A steel sash must be as light in weight as is consistent with strength, and it must offer the minimum obstruction to the passage of light. It must be stiff enough to resist the pressure of heavy wind and strong enough to carry the weight of heavy glass. With these fundamental requirements come also those of tightness against weather and provision for ventilation.

To meet these conditions means that the sash must be manufactured according to mechanical principles, using rolled sections specially designed for the purpose to insure lightness, strength and proper methods of puncture. It involves standardization of sizes, forms and construction, to

meet the requirements of the architect, owner and builder, and to permit the use of proper sizes of glass. In short, it takes the manufacture of sash out of the scope of the wood-working mill, and compels the organization of a metallic sash manufacturing industry.

Such a development completes the possibility of the fireproof building and removes the last reason for the employment of any combustible material.

It also removes what has repeatedly been shown to be a serious menace to a building from without. It is of small avail for one owner to be careful in using fireproof construction if the fire in his neighbor's property can enter through his windows and work internal damage to the building in which the fire could not have originated.

Canadian Railroad Development

A recent report of the House of Commons by the Department of Railways shows that 53.75 miles of the Atlantic, Quebec & Western Railway have been completed and that there remains to be constructed 48.65 miles. The department estimates that the cost on completion will be \$769,508. W. L. Browne, New Carlisle, Que., is chief engineer.

Surveys for the main line of the Canadian Northern Ontario Railway, extending from Ottawa to Port Arthur, have been completed, and the exact location of the road, decided upon. It is believed that the work of construction will be commenced this year and that the road will be open for traffic at the end of three years.

It is reported that the Hill interests have broken off negotiations for the use of joint terminals in Winnipeg with the Canadian Northern Railway. It is said that a \$1,000,000 station will be built in Winnipeg this spring for the Great Northern, Northern Pacific and Midland Railways. Three years ago the Hill interests purchased a right of way into the heart of the city at a very high figure. They will now construct a line from Emerson, where the lines enter Canada to Winnipeg.

The Canadian Pacific Railway, F. P. Busteed, general superintendent, Vancouver, B.C., has taken tenders for the construction of 30 miles of the Kootenay Central south from Golden, B.C. Ten miles of the grade out from Golden were completed several years ago and the new section will be an extension through the Columbia River Valley. The southern terminus will be Galloway station, on the main line of the Crow's Nest Pass Railway, near Cranbrook. The contract for building 30 miles of this line north from Galloway was awarded last year to Foley, Welsh & Stewart, and this work is nearing completion.

Among maintenance of way and improvement works to be undertaken by the Grand Trunk this year is the laying of 100-lb. steel rails on their double track line between Niagara Falls and London, Ont., in place of the 80-lb. rails now in use. Hundred-pound rails were laid throughout on the Montreal-Toronto line last year, and work on the Niagara Falls-London line will be undertaken this year as soon as the frost is out of the ground and the track settles. The company is also figuring on putting in automatic block signals between Toronto and Niagara Falls, said to be the busiest section of track in Canada. Extensions are also planned to the telephone train despatching service, present expectations being to add some 250 or 300 miles of wire between Toronto and Sarnia, and completing the service on the northern division, half of which was inaugurated last year. The plans also include putting in rock ballast on the line between Montreal and Toronto.

The Ontario Good Roads Association

Representative Gathering at Annual Meeting in Toronto—Instructive Addresses by well known experts—Importance of Organization—Resolutions Adopted

The annual meeting of the Ontario Good Roads Association was held in Toronto on March 1st, 2nd and 3rd. The attendance was large, about 500 representatives being present from the various towns, townships and counties of the province.

The morning session on March 1st. was devoted to the appointment of committees and preliminary business of the association. J. F. Beam, of Black Creek, read a paper describing briefly the good roads movement in Ontario and advocating the appointment of a highway board for the province, similar to the Hydro-Electric Commission.

At the afternoon session on Wednesday, the progress in road construction was reviewed by the president, Mr. W. A. McLean, Provincial Engineer of Highways, followed in an address in which the principles of road organization in England, France, Germany and various of the States were described. The importance of organization was emphasized, and to this end every municipality should place their road work in charge of one superintendent. Mr. T. E. Kennedy read a paper on road management, and Mr. C. R. Young, C.E., of Toronto, discussed the construction of highway bridges from the investment point of view.

At the Thursday morning session Mr. L. J. Street, C.E., of Toronto, discussed shop fabrication and erection of highway bridges. This was accompanied by a series of interesting samples of defective work. Mr. M. M. Macwell, secretary of the Ohio Good Roads Association, described the work carried on in that state and urged that greater system be applied to all road work. Mr. H. J. Bowman, C.E., of Berlin, read a paper, "County Roads; Reasons for and Against," which was the result of replies received from various counties as to why they had not undertaken a system of county roads. The reason given in the majority of cases was "lack of funds."

At the afternoon session on Thursday, Mr. G. C. Diehl, Engineer of Erie County, Buffalo, reviewed the highway system of that state, under which fifty million dollars have been appropriated for state road construction. Mr. R. H. Jupp, County Engineer of Simcoe, read a paper on the cost of haulage, contrasting the excessive cost of teaming over the wagon roads with the present scale of railway rates. These were followed by addresses by Messrs. E. M. Young, Prince Edward County; W. R. Cummings, Carleton County; John A. Sanderson, Warden, Leeds and Grenville; Geo. M. Fox, Warden of Wellington County; W. B. Russ, Lincoln County; J. L. Taylor, Wentworth County, and others, with respect to the advantages of county road systems.

On Friday morning, Mr. H. S. Carpenter, Superintendent of Highways, Saskatchewan, addressed the convention on the progress made in the prairie provinces under pioneer road building. Township road improvement was dealt with by Mr. R. W. Longmore, reeve of Ernestown; Wm. B. Bridgman, reeve of Saltfleet, and F. H. Lowery, reeve of Niagara township. The advanced system in each of these townships was described.

The officers elected were: Honorary president, W. H. Pugsley, Richmond Hill; president, T. L. Kennedy, Dixie; first vice-president, A. M. Rankin, Collins Bay; secretary-treasurer, J. Farewell, K.C., Whitby; assistant secretary, W. A. McLean, C.E., Toronto.

The resolutions adopted at the meeting are given below, owing to pressure of space we are compelled to with-

hold a number of valuable papers. These will be given in later issues.

Report of Committee on Resolutions.

Whereas it is the opinion of the Ontario Good Roads Association that progressive legislation is urgently necessary to meet the growing demand and need for good roads in the province of Ontario, be it therefore resolved that the following measures be recommended to the government of this province for consideration:

First—That the present provision for provincial co-operation in the building of county roads be extended to provide provincial co-operation in the maintenance of such roads after construction, and that to obtain a revenue for this purpose a tax of 50 cents per horse-power be levied upon motor vehicles.

Second—That the proportion of provincial expenditure on county roads be increased from one-third to one-half in the case of roads built according to a standard to be fixed by the provincial department of public works.

Third—That the provision of the Highway Improvement Act be extended to townships in counties in which county road systems have been established under the act.

Fourth—That a system of provincial highways be assumed and built by the province.

Fifth—That this association do hereby endorse the steps already taken toward the establishment of provincial stone quarries for road purposes in connection with the provincial prison farm at Guelph.

Sixth—And whereas certain counties have made application for the diversion to drainage of funds set apart for roads under The Highway Improvement Act, be it further resolved that the opinion of this association be restated in accordance with the resolution of last year as follows:

Whereas the object of the Highway Improvement Act is to encourage road construction, not to distribute a provincial surplus:

And whereas land drainage is of local value and good roads general benefit to the province:

Be it resolved that, while the Ontario Good Roads Association does not oppose additional provincial aid to drainage, this association is nevertheless strongly opposed to legislative action such as will prevent any future council of these or other counties completing the highway system of the province; such as will divide councils upon the relative desirability of drainage and good roads; or will in any way impair the future usefulness of the act to aid in the improvement of public highways.

Seventh—That the Dominion government be asked to establish a Bureau of Highways along the lines of the office of public roads in connection with the United States Department of Agriculture.

Eighth—That in the opinion of the Association a Highway Commission should be appointed for this province.

Ninth—Be it further resolved that the secretary be hereby instructed to forward copies of these resolutions to the Premier, Sir James Whitney; to the Hon. Dr. Reaume, Minister of Public Works; and to each member of the Legislature of Ontario.

J. E. FAREWELL, K.C.,
Secretary,
Whitby.

T. L. KENNEDY,
President,
Dixie, P.O.

Canadian City Engineers

Angus Smith, Victoria, B.C.

Mr. Angus Smith, city engineer of Victoria, B.C., was born in Kent County, Ont., on August 31st, 1868. After graduating from the Collegiate Institute at Ridgetown, Ont., he entered the School of Practical Science, now the Department of Applied Science, University of Toronto, taking the full course in civil engineering, and graduated in May, 1894. Mr. Smith was commissioned a provincial land surveyor for Ontario in 1896, and is a member of the Canadian Society of Civil Engineers.

During the vacation of 1893 he was engaged as assistant engineer on the construction of a waterworks system for Dolgeville, N.Y., and after graduating in 1894 was assistant on the Penn Yan, N.Y., waterworks system, upon which he prepared an interesting paper for the Canadian Society of Civil Engineers. During the next five years, until 1900, he engaged in private practice as a civil engineer and surveyor at his home town, Ridgetown, Ont., where he soon made a reputation as a drainage engineer throughout Western Ontario.

From 1900 to 1906 he was engaged as city engineer of



Mr. Angus Smith, City Engineer of Victoria

Stratford, Ont., during which time the city began and carried out its extensive paving programme, sewage disposal plant, trunk sewer, development of its water supply and many other important works.

In 1906 he went west to Regina, Sask., and has had the pleasure of seeing its municipal condition change from that of a town to the proportions of a city. The works carried out there under his supervision amounted to over \$1,000,000. While in the prairie country, Mr. Smith superintended the installation of a complete waterworks system for Francis, Sask., and advised the city of Moose Jaw, Sask., in connection with its proposed paving plans, street railway undertaking, and the development of its water supply.

In March, 1910, Mr. Smith went farther west to Victoria, where as city engineer he has the supervision of all public works. Last year Victoria made a record in municipal improvements. The city has a municipal wood block creosoting plant and is undertaking the construction of the Dal- las road sea wall and groynes for foreshore protection.

In the various cities in which he has been engaged.

Mr. Smith has been instrumental in initiating the most up-to-date engineering ideas. He is considered by the profession to possess the characteristics that will make him one of the foremost engineers of the west.

Personal News and Notes

Mr. W. J. Laughlin, contractor, Chilliwack, B.C., has been appointed building inspector for that city.

Messrs. T. Aird Murray and J. G. Sing, of Toronto, and J. Randolph, Chicago, have been appointed a commission to investigate and report upon the Toronto water supply.

Messrs. Purdy, Leach and G. S. Andrews have been appointed to work in conjunction with Building Inspector Jarrett, of Vancouver, to revise the building by-laws of the city.

City Engineer Clement, of Vancouver, has tendered his resignation, to take effect March 31st. He has occupied the position for five years. Mr. Fellowes, of Westmount, Que., who has been appointed supervising engineer, assumes his duties on May 1st.

Mr. F. T. Wilson, resident engineer for the C. P. R. at Vancouver, has resigned his post in order to engage in private practice in that city. Mr. Thos. Lees, resident engineer at Brandon, Man., will succeed him at Vancouver, while Mr. V. J. Melsted, Winnipeg, will succeed Mr. Lees as resident engineer at Brandon.

The late Mr. John Carrere, the prominent New York architect, was a member of the firm of Carrere, Hastings & Bird, the designers of the new Bank of Toronto building at the corner of King and Bay streets, Toronto. The deceased architect was 53 years of age. His death was occasioned by injuries received in a taxi-cab accident.

Mr. Kennedy Stinson, of Montreal, informed us at the Cement Show last week that Mr. Wm. Van Horne, of the C. P. R., had just purchased the patent rights for manufacturing the Pauly concrete hollow tile in Cuba. A large plant will be erected and several thousand homes constructed of the material manufactured therein. Mr. Stinson has the Canadian agency for Pauly tile.

Mr. L. R. Voligny, Dominion Government Engineer, now in Edmonton with a party of surveyors, will continue the preliminary surveys of the Saskatchewan river from Fort Pitt to Lake Winnipeg. He states that the Dominion Government will be in a position at the close of 1911 to commence actual construction work on the project of making the river navigable from Edmonton to Lake Winnipeg. If the project is undertaken it will take several years to carry it to completion.

Master Painters' Convention

At the third annual convention of the Master Painters and Decorators of Western Canada, held recently in Winnipeg, Mr. W. R. Talbot, Winnipeg, was elected president; Mr. A. Malcolm, Hamiota, vice-president, and Mr. Wm. C. Clark, Winnipeg, secretary-treasurer.

Vacancies on the executive committee were filled by Frank Baxter, Winnipeg; J. E. Crane, Brandon; A. J. Hunt, Dauphin. Organizers, A. J. Sloan, Winnipeg, for Manitoba; D. C. Andrews, Saskatoon, for Saskatchewan; A. Desilets, Edmonton, for Alberta; B. H. Short, Cranbrook, for British Columbia; W. A. Longley, Kenora, for Ontario.

The next annual meeting will be held in Winnipeg.

The annual meeting of the Dominion Land Surveyors' Association was held at the Carnegie Library, Ottawa, March 7th and 8th, under the presidency of Mr. Thos. Fawcett.

Contracts Department

News of Special Interest to Contractors, Engineers, Manufacturers and Dealers in Building Supplies.

Information for insertion in these columns is invited from Architects, Contractors, Engineers, etc.

Waterworks, Sewerage and Roadways

Battleford, Sask.

A waterworks system will be installed this spring. Estimated cost, \$100,000. H. C. Adams, secretary-treasurer.

Berlin, Ont.

The council will call for tenders for the paving of King street very shortly.

Brantford, Ont.

Tenders will be called shortly for the paving of Market street between Colborne and Erie avenue.

Calgary, Alta.

Tenders addressed to W. D. Spence, city clerk, will be received until March 15th for the construction of curb and gutter on the various streets along the boulevards.

Tenders are called by City Commissioners until March 24th for supply of vitrified sewer pipe and conduits. Specifications obtained from the above or from city engineer. W. D. Spence, city clerk.

Coldstream, B.C.

Tenders addressed to Jas. C. Kennedy, C.E., 413 Pacific Building, Vancouver, will be received until March 15 for special castings and stop valves for the municipal domestic waterworks. Specifications at offices of the above. E. Henderson, C.M.C.

Compton, Que.

A meeting of ratepayers will be held on the 1st of May to discuss the building of permanent roads in the township of Compton.

Cranbrook, B.C.

The ratepayers defeated the by-law to raise \$100,000 for sewerage purposes.

Guelph, Ont.

Tenders are called until March 30th for construction of about 26,000 square yards of pavement, etc. T. J. Moore, city clerk; J. Hutcheon, city engineer. Advertisement in "Tenders and For Sale Department" of this issue.

London, Ont.

Tenders are called until March 30th for supply of steam road roller and crushed stone for the county of Middlesex. Charles Talbot, county engineer; T. C. Robson, county clerk. Advertisement in "Tenders and For Sale Department" of this issue.

Medicine Hat, Alta.

The city council has passed by-laws to provide for the following street improvements: Concrete sidewalks, \$83,500; curbs and gutters, \$17,500; sidewalks, \$5,500; sewers, \$51,500.

Melville, Sask.

J. L. White, of Sioux City, S.D., is in charge of the installation of a water system here. L. Benoit, Melville, is interested.

New Liskeard, Ont.

Tenders are called until March 20th for pumps and motors in duplicate with connections for sewage outfall works. Plans, etc., on application to C. H. Fullerton, town engineer. P. Craven, clerk.

New Westminster, B.C.

City Engineer Blackman in his report dealing with permanent improvement to roads, etc., estimated the cost of drainage necessary for some streets at \$3,507 per mile; cost of storm sewers at \$7,000 per mile; road and curb and gutters, \$5,280. The cost of grading for an average road at \$3,520 per mile. Estimated cost of metalling, allowing for metal saved from existing roads, \$14,080 per mile.

North Vancouver, B.C.

Tenders were called until March 13th for supplying material and constructing storm sewer on five streets. Geo. S. Hanes, city engineer.

Ottawa, Ont.

Sparks street will be repaved by day labor, at an estimated cost of \$25,000. City Engineer N. J. Ker.

The city of Ottawa was given power by the legislature to spend \$400,000, of which \$300,000 is for new sewage works, without submitting by-laws to the people.

Prince Albert, Sask.

Tenders are called until April 15th for construction of main intercepting sewer, etc., by City Commissioners A. Holmes, C. O. Davidson and F. A. Creighton. Advertisement in "Tenders and For Sale Department" of this issue.

Rosthern, Sask.

A survey preliminary to the securing of estimates will be made for the installation of a waterworks and sewage system. Government Engineer, Mr. Murray, Regina, will make the estimates.

Saskatoon, Sask.

Tenders addressed to W. B. Neil, city commissioner, and James Clinkskill, mayor, will be received until April 14th for the following—contract number 78, pipe laying; number 79, furnishing concrete sewer pipe; 80, furnishing c.i. sewer pipe and specials. Tenders are also called until March 31st for installation of a mechanical water filtration plant for the city.

Sault Ste. Marie, Ont.

Tenders are called until March 20th for construction of cement concrete sidewalks, etc. W. H. Munro, mayor; W. F. Grant, C.E., town engineer. Advertisement in "Tenders and For Sale Department" of this issue.

Scotstown, Que.

The citizens are considering the installation of a water and sewerage system to cost about \$40,000. A. Dufresne, engineer, Sherbrooke, has prepared plans.

Toronto, Ont.

City Engineer Rust recommends that Bloor street be widened from 66 to 86

feet between Dundas street and High Park avenue. Cost, \$132,000.

Tenders addressed to the chairman of the board of control will be received until March 28th for steel extensions for manholes on 6-ft. steel pipe line. G. R. Geary, mayor.

Vancouver, B.C.

For the purpose of completing the sewerage system of the city the council will ask the executive for the right to submit a by-law at the forthcoming election asking authorization to float a loan for sewer purposes and surface drainage of \$300,000. Of this sum the council estimates, on the opinion of the city engineer, that \$250,000 is now needed to complete the sewer system, while \$50,000 will provide surface drains.

Verdun, Que.

The purchase of the necessary materials to make the necessary repairs to the streets and sidewalks has been authorized by council.

AWARDED

Lethbridge, Alta.

The Lethbridge Iron Works got the contract for supplying manhole covers at \$3.20 per 100 lbs. The price was 10c. a cwt. higher than the Canadian Iron Corporation, but as they delivered them to any part of the city they were given the contract, the difference on the whole contract of \$898.56 being only \$28.08.

Railroads, Bridges and Wharves

Brantford, Ont.

Tenders addressed to J. A. Smith, tp. clerk, will be received until April 3rd for construction of four concrete bridges for the township of Brantford. Advertisement in "Tenders and For Sale Department" of this issue.

Calgary, Alta.

The location of the G. T. P. Railway's proposed bridge over the Bow has been approved.

Crediton, Ont.

Tenders addressed to Henry Eilber, clerk township Stephen, will be received until April 3rd for construction of cement abutments and floor of bridge across the Aux Sable river, etc. Plans, etc., at office of the above.

Chateauguay, Que.

Tenders for construction of wharf here have been called until April 4th by Public Works Department, Ottawa. Plans, etc., at this Department, at the office of J. L. Michaud, Esq., District Engineer, Merchants Bank Building, St. James street, Montreal, and on application to the local postmaster.

Fork River, Man.

Tenders are called until March 18th for construction of a Howe truss bridge, 83 ft. span, across the Fork river. Plans, etc., at office of Public Works Department, Winnipeg, and D. F. Wilson, sec-

retary-treasurer, Massey River Mun., Fork River.

Guelph, Ont.

The erection of a new bridge on Neeve street has been recommended. J. T. Hutcheon, city engineer.

Lambton Mills, Ont.

The C. P. R. plans to build a spur line from a point west of the Humber river to the village of Emery, connecting there with the North Bay-Sudbury line. The survey has been laid out.

London, Ont.

Tenders are called until March 25th for construction of 22 stall engine house with machine shops. A. L. Hertzberg, division engineer, Toronto. Supt. McNeillie; T. Murphy, Montreal, general superintendent of transportation.

Owen Sound, Ont.

Tenders are called until April 7th for material, etc., in connection with two bridges, steel superstructure, concrete abutment, etc., for this municipality. J. K. Leslie, chairman of works; R. McDowall, C.E., town engineer. Advertisement in "Tenders and For Sale Department" of this issue.

Strathmore, Alta.

The C. P. R. management has decided to provide very complete operation headquarters here, it being the intention to erect a large administration building, as well as residences for various employees, and a mess hall. This work will be proceeded with at once, at a cost of about \$25,000. C. W. Peterson, superintendent of irrigation.

Toronto, Ont.

The Board of Control have decided to advertise for tenders for the construction of new docks at Ashbridge's Bay. City Engineer Rust submitted plans and specifications for the work, which were approved. Estimated cost, \$135,000.

AWARDED

Edmonton, Alta.

A sub-contract for forty miles of the Canadian Northern, west of the Pembina river, on the contract for 200 miles, held by the Cowan Construction Company, has been awarded by Chas. J. Merry, to Jas. O'Connor, former sub-contractor on the Grand Trunk Pacific. Work is to be commenced at as early a date as possible.

Sherbrooke, Que.

The contract for the construction of the reinforced concrete free bridge between St. Johns and Iberville, has been awarded to Messrs. F. Lemoine & Son, of Montreal, for the sum of \$154,000. The contractors have agreed to take from the two municipalities the old iron bridge bought from the county of Monongahela, Pittsburg, Pa., shipped last fall to St. Johns.

Winnipeg, Man.

The C. P. R. construction department have awarded contracts for grading, concrete, culvert and bridging on new branch lines and second track on main line for 344 miles of work in the west as follows: To Foley, Welch and Stewart, two lines out of Swift Current, 80 miles, one line out of Moose Jaw, 35 miles, one line east from Lacombe, 60 miles. To W. A. Dutton, three branches out of Wilkie, 82 miles. To Janse, MacDonald and Company, two lines in British Columbia, 54 miles. To J. G. Hargrave, second track from Moose Jaw

west, 23 miles, east from Moose Jaw, 10 miles.

Public Buildings, Churches Schools, etc.

Aylmer, Ont.

The ratepayers will vote on a debenture by-law to loan \$4,000 for remodeling the town hall. D. C. Davis, clerk.

Amherst, N.S.

Competitive plans are invited until March 31st for a 12-room school of brick with stone or cement trimmings, to be heated by low pressure steam, at a cost of not over \$35,000. Architect submitting successful plans will have the inspection if satisfactory arrangements can be made with council. W. Fred Donkin, town clerk.

Berlin, Ont.

Mr. Moogk has been instructed to prepare a plan for isolation hospital providing for extra storey.

Burnaby, B.C.

The design of Messrs. Somerville & Putnam, architects, of Vancouver, for the new municipal hall, has been provisionally accepted. Estimated cost, \$26,220.

Brandon, Man.

Plans for the new hospital are nearly completed. Tenders will be asked at once. Time for receiving them will be short as the building must be completed this year if possible. Capt. Donnelly is in charge of preliminary work. T. Hooper, provincial architect.

Battleford, Sask.

Tenders addressed to R. C. Desrochers, secretary, Department of Public Works, Ottawa, will be received until April 4th for construction of hot water heating apparatus in new public building here. Plans obtained on application to Mr. F. B. Latimer, architect, Battleford, Sask., and at the Department of Public Works, Ottawa.

Carleton Place, Ont.

Tenders addressed to W. H. Allen, secretary, will be received until March 20th for erection of Zion Presbyterian Church. Plans, etc., at office of above and at office of the architect, J. A. Ewart, Sparks Chambers, Ottawa.

Cedar Cottage, B.C.

The Roman Catholics will erect a new church here.

Chatham, Ont.

Tenders addressed to Jas. L. Wilson & Son, architects, will be received until March 18th for erection of concrete, cut stone and brick church; also for a rectory of similar construction to be built at Pain Court. Plans, etc., at office of architects.

The public school board decided to have a new public school this year. Inspector Smith. Capt. J. S. Black is interested.

Chelmsford, Ont.

Tenders addressed to Rev. Father S. Cote, will be received until April 1st for the basement of stone church to be built here. Plans, etc., at office of the North Bay Times.

Calgary, Alta.

The Fourteenth Avenue Methodist Church will be rebuilt at a cost of \$35,000. Rev. C. W. Bishop, pastor.

An option of four lots at the corner of

Sixth avenue and First street east has been secured for the erection of new fire hall.

The Calgary Golf & Country Club will erect their new club house this year.

Cobalt, Ont.

Tenders addressed to R. P. Courbon will be received until March 15th for erection of Roman Catholic College at North Cobalt, Ont. Plans, etc., at offices of the architects, Moran & McPhail, architects, Haileybury, Ont.

Fort Frances, Ont.

In the recent plebiscite taken in regard to new school, the ratepayers voted in favor. Mr. Bruce Lyod, secretary-treasurer, public school board.

Fredericton, N.B.

Tenders addressed to A. H. F. Randolph, president board of hospital trustees, will be received until March 21st for labor and materials required in improvement, etc., of the contagious wing of the Victoria Public Hospital here. Plans, etc., at office of above.

Grand Valley, Ont.

Mr. Gray, of Harriston, has been instructed to prepare plans for the library building, which will be sent to Mr. Carnegie for his approval. Estimated cost, \$6,000, including heating.

Goderich, Ont.

The council is calling for competitive plans for the proposed new municipal buildings here. L. L. Knox, town clerk. Advertisement in "Tenders and For Sale Department" of this issue.

Galt, Ont.

The \$25,000 by-law for hospital improvements will go to the ratepayers on April 8th.

Hamilton, Ont.

The Board of Education have decided to ask permission to issue debentures for \$150,000 for a twenty-room school on Sherman avenue. The building committee was empowered to invite tenders. F. J. Howell, acting chairman.

Kingston, Ont.

A by-law will be voted on to raise \$40,000 for school purposes. W. Sands, city clerk.

Little Bras d'Or, N.S.

Work will be commenced on a \$20,000 church for the Roman Catholic congregation here. Rev. Father McIntosh, chairman of building committee.

Merritt, B.C.

Plans for erection of municipal hospital will be prepared soon.

Moose Jaw, Sask.

Tenders for erection of brick veneer church at Wesley are called until March 17th by W. H. Beesley, Box 1028, this city. Architect, Mr. Zimmerman, Moose Jaw.

The public school trustees are calling for competitive plans for two fireproof schools of 12 and 8 rooms, until April 1st. Premiums of \$100 and \$75 respectively will be given for plans submitted. Clifford Kempton, secretary, treasurer.

Merritt, B.C.

It is likely that a new school will be erected here shortly. School Inspector, Pollick.

Maisonneuve, Que.

Plans are being prepared by C. A. Reeves, architect, Montreal, for the post

office here. Plans call for a building 3-storied high of dressed Montreal limestone on reinforced concrete foundations with frontage of eighty feet by depth of 100 feet. Estimated cost, \$60,000.

Ottawa, Ont.

Plans are being prepared for a new theatre on Sparks street for Mr. B. F. Stapleton, 546½ King Edward avenue.

Competitive plans are being submitted for the new Congregational church and it is expected that the architect for the new structure will be chosen very soon.

Owen Sound, Ont.

The public school board have under consideration the erection of a new school. Dr. Howey, chairman of special committee.

Paris, Ont.

Tenders for erection of school in S. S. No. 13, Brant County, addressed to Robert McCormack, secretary, Paris, will be received until March 18th. Plans, etc., at office of Taylor & Taylor, architects, Hope Chambers, Brantford.

Pembroke, Ont.

The council have chosen the Moffat site for the new Carnegie library. Plans, etc., have been approved and it is thought work will be commenced at once.

Portage la Prairie, Man.

Tenders addressed to R. C. Desrochers, Secretary, Department of Public Works, Ottawa, will be received until April 3rd for erection of public building here. Plans, etc., at this department, on application to Mr. J. E. Cyr, Superintendent of Public Buildings for Manitoba, post office building, Winnipeg, and at the local post office.

Regina, Sask.

The members of St. Paul's church have decided to erect a parish hall to cost about \$12,000.

Tenders are called until March 24th for erection of new church on Victoria avenue for First Baptist Church. H. A. Couse, secretary building committee.

Royal Oak, B.C.

Tenders for erection of municipal building for South Saanich were called until March 13th. J. C. M. Keith, architect.

Saskatoon, Sask.

Preliminary sketches for a civic building were submitted to council. They call for a building about 110 x 160 feet, of brick and stone.

The public school board at a recent meeting decided on the erection of three new schools of eight rooms each, capable of enlargement, at a cost of \$160,000, the purchase of three new sites costing \$8,000, and improvements to existing schools. A by-law was ready to raise \$200,000 on debentures to pay for the same.

Simcoe, Ont.

Tenders are called until March 31st for erection of public library here. Advertisement in "Tenders and For Sale Department" of this issue.

St. John, N.B.

Tenders addressed to H. H. Nott, architect, will be received until March 16th for repairing and heating the building, corner of Union street and Hazen avenue for the Board of School Trustees.

St. Thomas, Ont.

The board of education have instructed architect John Findlay to prepare plans, etc., for the proposed addition to the Scott street school.

Strathcona, Alta.

A new theatre on Whyte avenue to replace the Bijou will be erected in the spring. Manager McKerman of the Bijou, is interested.

Sydney, N.S.

Messrs. Butler & MacDonald have completed plans for the new Presbyterian Church at Gabarus, to replace the one burned recently.

Tilbury, East, Ont.

Tenders addressed to Jas. L. Wilson, architects, Chatham, will be received until March 25th for all trades required in erection of new brick school in S. S. No. 3 near Fletcher Station. Plans, etc., with David Fletcher, and at office of the above. J. J. Irwin, J. A. Williams and Geo. Holmes, trustees, Tilbury, East.

Toronto, Ont.

Plans for the new No. 3 Police Station, Claremont street, have been approved. Work will be commenced in the summer.

The property committee recommended that tenders be called at once for the construction of a seventeen-room school on Caledonia road.

Vancouver, B.C.

The Lester School of Music will erect an academy, etc., near Burrard at a cost of about \$60,000.

The Strathcona Institute and Seaman's Institute have amalgamated and have appointed a joint committee to report on a building for both societies. Mr. John T. Stevens, chairman of house committee.

The rough plans for the new armory here have been sent to Ottawa for approval with a petition for the building to be erected. Col. Fiset, deputy minister of militia, Ottawa. Estimated cost, \$1,000,000.

Victoria, B.C.

The provincial department of public works is calling for tenders for 1,500 school desks and 240 single rears, to be delivered here or in Vancouver before May 14. Tenders have to be in by March 22.

Welland, Ont.

As soon as arrangements can be completed, the Sons of England will erect a large lodge and office building.

The Salvation Army have purchased land and will erect a barracks to cost about \$10,000.

The council voted \$22,000 for the new school. H. A. Sidey, chairman of public school board; inspector Marshall.

The public school board are calling for competitive plans for proposed new 8-roomed school until April 1st. Estimated cost about \$20,000. J. McCaw, secretary, public school board.

Winnipeg, Man.

Tenders will be called shortly for the Y. M. C. A. building. Cost, about \$275,000. Mr. Patton, secretary.

It is expected that the contract for dormitory in connection with the new Agricultural College will be let soon. Estimated cost, \$500,000; also the contract for heating plant, which is figured to cost about \$60,000. Hon. R. Rogers, minister of public works.

Winnipeg Beach, Man.

Tenders addressed to J. D. Forster, secretary-treasurer, will be received until March 20th for erection of municipal hall here. Plans, etc., at office of the clerk.

West Toronto, Ont.

The trustees of S. S. No. 29 have been instructed to purchase the property on the northeast corner of Herbert street and St. John's road, as a building site for the new school. Mr. Clouston, chairman.

AWARDED

Carleton Place, Ont.

David Moffatt, of Carleton Place, has been awarded the contract for the erection of the Masonic temple.

Chilliwack, B.C.

C. L. Street has obtained the contract for the erection of the new hospital here.

Calgary, Alta.

The contract for the St. John's church in East Calgary has been let to Messrs. Zank and Musgrave, \$14,000. Messrs. Lang and Major, architects.

Fort William, Ont.

The Northern Engineering Company have the erection of the fireproof theatre this season at a cost of about \$60,000. W. J. Ross, M. C. Worth, architect.

The library board accepted the tender of M. H. Braden for about \$36,000 for erection of library. The building is to be of pressed brick and stone.

Nanaimo, B.C.

Jeffrey Planta has been awarded the contract of building a convent on Wallace street, \$25,000.

Quebec, Que.

Emile Dube, Fraserville, Que., and Joseph Goselin, Levis, Que., have been awarded the contract for restoration of the customs house here, \$135,369.

Strassburg, Sask.

Storey & Van Egmond, architects, Regina, have awarded to Thomas James the contract for the new brick school building here.

Warren, Man.

M. S. Peacock, Warren, has been awarded the contract for erection of consolidated school here, \$8,100. Ralph Smith, Winnipeg, architect.

Winnipeg, Man.

H. Bruce and A. Bostrom were awarded the contract for the construction of the public baths at a cost of \$44,880.

The contract for the new club house for the St. Charles Country Club was awarded to Claydon Bros. The building will be 140 feet in length by 70 feet in width. The contract calls for completion by September 1, 1911.

Residences

Brantford, Ont.

Tenders addressed to D. W. B. Lins will be received until March 25th for erection of residence. Plans, etc., at 321 Colborne street. Geo. W. Hall, architect.

Calgary, Alta.

Building permits were granted to William Jamieson for new residence in Mount Royal, \$14,000, also to Consolidated Estate and Building Company for the erection of five new houses, the cost per house estimated at \$2,000.

Chatham, Ont.

Tenders addressed to W. McNeillage, Lot 11, Con. 5, Chatham Tp., will be received until March 18th for erection of residence near Darrell Station, P. M. Ry. James L. Wilson & Son, Board of Trade Building, Chatham, architects.

Ottawa, Ont.

Messrs. Nimmo and Soper contemplate constructing twelve new houses on the Glebe very shortly.

Wolf Shenkman is preparing to erect two tenement houses and an apartment house on Sandy Hill.

A large 4-storey block will be erected by Mr. Donald Fraser, contractor, on the corner of Albert street and O'Connor. Cost, \$95,000.

Plans are being prepared by Horwood, Taylor and Horwood, architects, for an apartment house on Cooper street for J. A. Seybold.

A local investor through D. J. Mc-A'Nulty has purchased property 100 feet square on the corner of Daly avenue and Fried and will erect a large apartment house on it.

Regina, Sask.

Tenders will be received until March 16th for erection of house for J. W. Thomas, Esq., also for house for S. Young, Esq. Architects, Storey & Van Egmond.

Victoria, B.C.

Plans for a handsome new house have been completed by W. D'O Rochfort, for Mrs. Pigott.

Messrs. Dinsdale & Malcolm, contractors, will erect on the corner of Field and Douglas streets a new apartment house to cost about \$20,000.

Business Buildings and Industrial Plants

Calgary, Alta.

The plans for the new C. P. R. colonization building are nearing completion. It is understood that the building will cost in the neighborhood of \$80,000, and will be three or four stories high.

Campbellton, N.B.

Tenders addressed to A. W. Campbell, chairman government railways managing board, will be received until March 25th for construction of brick and stone passenger station here. Plans, etc., at office of local agent, I. C. R., at office of chief engineer, Moncton, and with the secretary of the department of railways and canals, Ottawa.

St. John, N.B.**Edmonton, Alta.**

Tenders are called until March 15th for erection of 6-storey brick and stone building for Mr. R. Telger on First street. H. A. Magoon, architect.

Plans are being prepared by Barnes & Gillies, Edmonton, Alta., for a wholesale and office building to cost about \$160,000. Adams Bros., Winnipeg, are interested.

Field, B.C.

The C. P. R. will erect a new station here.

Golden, B.C.

Tenders are invited by the C. P. R. management for the erection of six

chalets of Swiss design at the Swiss village "Edelweiss" near here. Plans, etc., on application to J. S. Dennis, manager, Irrigation Alberta and B. C. Lands, C. P. R. Co., Calgary, Alta.

Grand Valley, Ont.

Wm. McIntyre will erect on corner of Main and Miller streets a building of pressed brick, two storeys high. It is stated that the Traders Bank will occupy it.

Halifax, N.S.

The Railway Commission and the Halifax Board of Trade discussed plans for a new terminal. Mr. Kennedy, engineer of Montreal Harbor, presented the plans he had prepared, which were approved with minor changes. The plans propose the complete removal of the present wooden wharves, and their replacement by immense concrete structures. Mr. Campbell, chairman of the railway board, stated that the board would recommend to parliament that the terminals, as per Mr. Kennedy's plans, be slightly modified to meet Halifax requirements be built. He estimates that the total cost would be from one million and a half to two million dollars.

Hamilton, Ont.

It is rumored that the Grand Trunk are trying to secure a block of land on Ferguson avenue for a new station.

Lachine, Que.

Mr. C. Manuel, Montreal, representing an English syndicate, has just concluded arrangements for the erection of a large automobile factory here.

Lethbridge, Alta.

Tenders addressed to W. T. Williams, were received until March 11th for erection of brick business block on site of Balmoral hotel for the executors of the Wm. Henderson Estate. Plans, etc., at office of the above.

London, Ont.

Tenders are called until March 15th for erection of store on Dundas street. Plans, etc., with John Lightfoot, 698 Dundas street.

Medicine Hat, Alta.

The Medicine Hat Milling Co. will erect another flour mill here, it is stated.

Moose Jaw, Sask.

The application of Willoughby, Pickett and Craig for building lots was granted. Noted in issue of March 1st.

Ottawa, Ont.

J. Y. Caldwell will erect a building with stores and apartments on Wellington street.

A brick fireproof building, 4 storeys, will be erected on Sparks street for Messrs. Munroe & Shaver. Plans are being prepared.

A company is being organized as a branch of a Detroit automobile concern, which will take over the Watson Carriage Company's plant and enlarge it.

C. Cambie, local manager of the Bank of Commerce, has confirmed the report that the bank has purchased a lot with 66 feet frontage on Sparks street and will have plans prepared at once for erecting a bank building.

C. P. Meredith is preparing plans for erecting a two-storey brick addition to a commercial building on Sparks street, formerly occupied by Maxwell Harris

Company. The building is to be constructed for Hugh Carson.

Regina, Sask.

Credit Foncier F. C. will this year erect a modern office building.

Henry Black will erect another business block on Hamilton street.

Saskatoon, Sask.

Brown & Vallance, architects, Winnipeg and Saskatoon, are preparing plans for a 5-storey office building (50 x 100 ft.) for Dr. P. D. Stewart, to cost \$70,000.

Toronto, Ont.

Tenders were called until March 13th for excavation, drainage, gas plumbing, etc., required in erection of new plant for Canada Metal Co., Ltd., on Fraser avenue. Plans with F. H. Herbert, architect, 65 Adelaide street east.

Tenders addressed to Darling & Pearson, architects, will be received until March 22nd for the various trades required in erection of Garage on Sussex avenue. Plans, etc., at office of the above.

Darling & Pearson, architects, 2 Leader Lane, are calling for tenders for clearing numbers 1, 3 and 5 southeast corner King and Yonge streets, the site on which the new C. P. R. offices are to be erected.

Windsor, Ont.

The D. M. Ferry Seed Co. will rebuild their plant here, recently destroyed by fire. It will be of reinforced concrete and three storeys high.

Winnipeg, Man.

It is reported that J. F. L. Thomas has opened an office here as representative of Vickers, Sons & Maxim, of Sheffield, Eng., and that a plant will be erected here.

AWARDED

Chatham, Ont.

The Rowsley Spring & Axle Company have let a contract to the Blonde Manufacturing Company to build an extension to their present plant. Cost, \$15,000.

Maisonneuve, Que.

While no official announcement has yet been made we learn from a reliable source that Mr. C. E. Deakin, the well-known building contractor has been awarded the contract for a new electric power house or sub-station here for the Shawinigan Light & Power Company, at an estimated cost of \$100,000. Work will be started as soon as possible. The structure will be of reinforced concrete, 75 x 100 feet, and 3-storeys high.

Montreal, Que.

Mr. C. E. Deakin is the contractor for the reinforced concrete plant to be erected for Messrs. Ramsay & Son, near corner of St. Paul and Inspector streets. The structure will be six storeys high with 50 ft. frontage. Estimated cost, \$30,000.

The Canadian Stewart Co., Limited, general contractors, have been awarded the contract for the power development and construction of pulp mills and paper mills for Messrs. Price Bros. & Co., of Quebec. The plant is to be erected at Jonquiere, Que, ten miles from Chicoutimi. It is understood that the plant will comprise about 20 buildings; estimated cost, over \$2,000,000, exclusive of machinery. G. F. Hardy, architects and

(Continued on page 58)

Tenders and For Sale Department

For Sale — Second Hand

No. 8 Austin Gyratory Crusher.
No. 6 and No. 3 Austin complete plant.
No. 3 Austin and 2 No. 6 Gates and No. 5 "B."
70-ton Vulcan Steam Shovel, 2-yard.
50-ton Bucyrus Steam Shovel, 1 1/4-yard.
Loco. Crane, with 1 1/4-yard Clam Shell.
Little Giant Traction Steam Shovel, 1 1/4 yard.
Hayward Orange Peel Buckets, 1 and 1 1/4 yd.
Concrete Mixers, Steam Rollers, Air and Steam
Drills, Air Compressors, Locomotives, Dump
Cars, etc.

All our goods we fully guarantee.
Send for our February Booklet.

WILLIS SHAW MACHINERY CO.,
171 La Salle St.,
Chicago, Ill.

City of Moose Jaw, Sask.

Tenders for Garbage Wagons, etc.

Sealed tenders, endorsed "Health Department," will be received by the undersigned City Clerk until 8.30 o'clock p.m., on Monday, March 20th, 1911, for the following apparatus:

Wagons made of steel or other material, and tanks suitably designed for conveying ashes, garbage and all materials collected and removed under the supervision of the Health Department.

The lowest or any tender not necessarily accepted.

J. M. WILSON, City Engineer. W. F. HEAL, City Clerk.
Moose Jaw, March 1st, 1911 10-11



Temiskaming & Northern Ontario Railway Commission

Sealed tenders, addressed to the undersigned, will be received up to 12 o'clock noon, on Wednesday, March 22nd, 1911, for all works in connection with the construction of a passenger station at Matheson. Tenders to be marked on envelope—"Passenger Station at Matheson."

Plans and specifications may be seen at the office of the architect, J. M. Lyle, 14 Leader Lane, Toronto, or at the office of the Chief Engineer in North Bay.

Certified cheque on a chartered bank of Canada, payable to the order of the Secretary-Treasurer of the Commission, for ten per cent. of the amount of the tender, must accompany same.

Lowest, or any tender, not necessarily accepted.

A. J. McGEE, Sec.-Treas.,
25 Toronto street, Toronto.

Toronto, March 3rd, 1911.

Note—Papers inserting this advertisement without authority, will not be paid for same. 10-11

City of Moose Jaw, Saskatchewan

Main Drainage Works

Sealed tenders endorsed "Tender A" and "Tender B" will be received by the undersigned City Clerk until 8.30 o'clock p.m., on Monday, April 10th, 1911.

Any tender received after the above-stated time will be declared informal.

Contract "A."

Supplying material for and constructing a Sewage Disposal Plant complete, including Pump House, Sedimentation Tanks and Percolating Filter, also the supply of materials for and the laying of a Trunk Sewer and Water Main.

Contract "B."

Supplying two Electrically Driven Centrifugal Pumps and Auto Starters complete with all piping, connections, etc.

Plans and specifications for Contract "A" may be obtained from the City Engineer, Moose Jaw, upon receipt of a marked cheque for the sum of \$25 to be held until the return of plans and specifications, and for Contract "B" plans and specifications will be sent upon request.

The lowest or any tender not necessarily accepted.

J. M. WILSON, City Engineer. W. F. HEAL, City Clerk.
Moose Jaw, Feb. 18th, 1911. 9-14

City of Moose Jaw, Saskatchewan

SEWER AND WATER EXTENSIONS

Sealed tenders endorsed "Tender 28," "Tender 29," "Tender 30" and "Tender 31," will be received by the undersigned City Clerk until 8.30 o'clock p.m. on Monday, April 10th, 1911.

Any tender received after the above stated time will be declared informal.

Contract 28.—The laying of approximately 30,700 lin. feet of tile-pipe sewer, building man-holes, etc.

The laying of approximately 29,700 lineal feet of cast iron water main, placing valves, valve boxes, hydrants, etc.

Contract 29.—The supplying of approximately: 29,600 lineal feet of 6-in. c.i. water pipe.

112 lineal feet of 4-in. c.i. water pipe.

132 6-in. cast iron reverse curves.

34 6-in. cast iron crosses.

72 6-in. cast iron tees.

29 4-in. off 6-in. cast iron tees.

28 4-in. cast iron tees.

95 6-in. cast iron plugs.

Contract 30.—The supply of approximately: 28,000 lin. feet of 6-in. vitrified tile sewer pipe.

26,600 lin. feet of 8-in. vitrified tile sewer pipe.

5,225 lin. ft. of 10-in. vitrified tile sewer pipe.

1,100 lin. ft. of 12-in. vitrified tile sewer pipe.

25 8-in. tees.

75 6-in. tees.

25 8-in. 1/4 bends.

100 6-in. 1/2 bends.

25 8-in. stops.

25 10-in. stops.

400 4-in. to 6-in. increasers.

Contract 31.—The supply of approximately: 65 6-in. 3-way hydrants.

147 6-in. gate valves.

29 4-in. gate valves.

150 6-in. valve boxes.

29 4-in. valve boxes.

88 manholes, frames and covers.

Plans and specifications for Contract 28 may be seen at the office of the City Engineer, Moose Jaw, and at the offices of the Canadian Engineer at Toronto and Winnipeg.

Plans and specifications for Contracts 29, 30, and 31 will be sent upon request.

The lowest or any tender not necessarily accepted.

J. M. WILSON, City Engineer. W. F. HEAL, City Clerk.
Moose Jaw, Feb. 24, 1911. 9-14

City of Guelph

Pavement Construction

Sealed tenders, addressed to the City Clerk, will be received up till noon on Thursday, March 30th, 1911, for the construction of approximately 26,000 square yards of pavement, with about 5,000 lineal feet of street railway track and approximately 13,000 lineal feet of combined curb and gutter.

Particulars may be obtained from the City Engineer.

A marked cheque for \$1,000 must accompany each tender.

The lowest or any tender not necessarily accepted.

J. HUTCHEON, City Engineer. T. J. MOORE, City Clerk.
Guelph, March 7, 1911. 11-11

City of Toronto

Civic Car Lines

Tenders for Rail & Ties

Tenders will be received by registered post only, addressed to the Chairman of the Board of Control, City Hall, Toronto, Canada, up to noon on Tuesday, April 4th, 1911, for delivery of Thirteen hundred and forty (1340) tons of open hearth steel rail, 80 lb. section, also thirty thousand (30,000) untreated wood ties, white cedar preferred, although other woods will be considered.

Envelopes containing tender must be plainly marked on the outside as to contents.

Specifications and forms of tender may be obtained upon application to the office of the City Engineer, Toronto.

The lowest or any tender not necessarily accepted.

G. R. GEARY (Mayor)

Chairman, Board of Control.

City Hall, Toronto, Feb. 23, 1911, 9-11

City of Brandon, Man.

March 2, 1911.

Sealed tenders, which must be endorsed "Tender for Supplies," will be received by the City Clerk, Brandon, Manitoba, until 12 o'clock at noon on Friday, the 17th day of March, 1911, for the following goods:—

Vitrified sewer pipe, 6-in., 8-in., 10-in., 12-in., 15-in., and junctions at price per foot f.o.b. Brandon, freight and duty paid (all breakages to be allowed for). In carload lots.

Cast iron manhole covers.

Cast iron catch basins and covers.

Water Works Supplies.

Brass Goods—

Corporation and curb cocks and specials.

Lead pipe.

pig lead.

Fire hydrants.

Valves, 4-in., 6-in., 8-in.

Valve casings.

Service boxes.

Specifications and further particulars can be obtained from the City Engineer's office.

All goods must be the best quality of their respective kinds.

The lowest or any tender not necessarily accepted.

R. E. SPEAKMAN,

City Engineer.

Brandon, March 2, 1911.

10-11

Tenders Wanted

For a Steam Road Roller, and crushed stone for County of Middlesex.

Sealed tenders will be received by either of the undersigned until noon on Thursday, March 30th, 1911, for crushed stone delivered F.O.B. at the following stations on the Grand Trunk Railway, viz., Parkhill, Strathroy, Mt. Brydges, and Newbury; also F.O.B. at the following stations on the Canadian Pacific Railway, viz., Appin Junction, Caradoc, and Belmont. The contractor to quote prices for 2-in. and 1½-in. stone, to be delivered in car lots as required, also at the same time tenders will be received for a ten-ton Steam Road Roller.

CHAS. TALBOT,
11-12 County Engineer.

T. E. ROBSON,
County Clerk.

Tenders Wanted

Sealed tenders marked "Tender for Bridges" and addressed to J. A. Smith, Esq., Clerk of Brantford Township, Ont., will be received up till noon on Monday, April 3rd, 1911, for the construction of four concrete bridges for the Municipality of the Township of Brantford.

Two of the bridges are plain concrete arches, and two are reinforced concrete girder bridges.

Plans and specifications may be seen at the office of the undersigned, Court House, Brantford.

The lowest or any tender not necessarily accepted.

JAMES A. SMITH,
Township Clerk.

11-12

Tenders Wanted

Sealed tenders addressed to the undersigned will be received up to noon of 31st March, 1911, for all the various trades interested in the erection and completion of the new building for the Public Library in the Town of Simcoe, Ontario. Drawings and specifications may be seen at the office of the Chairman of the Building Committee in Simcoe, and the Contract Record, 220 King street west, Toronto.

H. B. DONLY,
Chairman Building Committee,
Public Library Board.

11-12

To Architects

Competitive Plans

The Municipal Council of the Town of Goderich is desirous of obtaining plans for a proposed new municipal building (combined Town Hall and Fire Hall) to be erected on the site of the present Town Hall.

Conditions of competition can be had on application to the undersigned.

Plans will be received up to and including April 15th, 1911.

L. L. KNOX, Town Clerk,
Goderich, Ont.

11-13

Tenders Wanted

Bulk and separate tenders for all or any of the different branches required in the erection and completion of a

SCHOOL BUILDING,

to be erected in S. S. No. 13, Brant County, commonly known as Moyle's, will be received up till 12 o'clock noon, on Saturday, the eighteenth day of March, 1911.

All tenders shall be marked "Tender" and addressed to Robert McCormack, Esq., Secretary of Trustee Board, Paris, Ont.

Plans and specifications may be seen at the office of Taylor and Taylor, architects, Hope Chambers, Brantford.

The lowest or any tender not necessarily accepted.

11-11

Bridge Tenders

Sealed tenders addressed to the Chairman, Board of Works, Owen Sound, will be received up till 6 p.m., Friday, April 7th, 1911, for the following:

1. 9th Street Bridge—
 - (a) Steel superstructure, span 53 ft., width 40 ft.
 - (b) Reinforced concrete floor for same.
 - (c) Concrete abutments for same.
 - (d) Reinforced concrete arch, span 50 ft., width 40 ft.
2. 10th Street Bridge—
 - (a) Steel superstructure, span 60 ft., width 66 ft.
 - (b) Reinforced concrete floor for same.
 - (c) Concrete abutments for same.
 - (d) Reinforced concrete arch, span 66 feet, width 66 feet.
3. Removal of old bridge and construction of temporary one.

A certified bank cheque payable to the Treasurer of the Town of Owen Sound for 5 per cent. shall accompany each tender, to be returned in case of non-acceptance, and to be forfeited in case the accepted tenderer declines the contract or fails in the performance thereof.

Plans and specifications may be seen at the office of the Town Engineer.

Tenderers for steel superstructure to submit plans and strain sheets.

The lowest or any tender not necessarily accepted.

J. K. LESLIE, R. McDOWALL, C.E.,
Chairman Board of Works. Town Engineer.
Owen Sound, March 7, 1911.

11-14

To Carpenters and Joiners

Tenders will be received until March 28th for all inside finish, including hardwood floors, doors, stairs, etc., for the Freemasons' Hall, College street, Toronto.

R. J. EDWARDS & SAUNDERS,
Architects.

11-11

18 Toronto street, Toronto.

Town of Sault Ste. Marie, Ontario

Sidewalk Construction

Sealed tenders addressed to W. H. Munro, Mayor, endorsed "Tender for Cement Concrete Sidewalks" will be received by the Town Clerk up till twelve o'clock noon, on Monday, March 20th, 1911, for approximately 175,000 square feet of Cement Concrete Sidewalk.

Specifications, instructions to bidders, forms of tender, to be seen at the office of the Town Engineer, on and after March 6th, 1911.

The lowest or any tender not necessarily accepted.

W. H. MUNRO, Esq., W. F. GRANT, C.E.,
11-11 Mayor. Town Engineer.

City of Prince Albert

Tenders for

Intercepting Sewer

Sealed tenders addressed to the Commissioners of the City of Prince Albert and marked "Tender for Sewer," will be received until noon on Saturday, the 15th day of April, 1911, for the construction of a Main Intercepting Sewer, as follows:

- 5,749 lin. ft. 4-ft. 6-in. x 3 ft. concrete sewer.
- 4,640 lin. ft. 4-ft. 3-in. x 2-ft. 10-in. concrete sewer.
- 2,798 lin. ft. 4-ft. x 2-ft. 8-in. concrete sewer.
- 19 Manholes.

Alternate bids for Reinforced Concrete Pipe will be considered.

Plans and specifications may be obtained at the office of the City Engineer.

A marked cheque for \$2,500, in favor of the Treasurer of the City of Prince Albert must accompany each tender submitted.

ANDREW HOLMES,
C. O. DAVIDSON, Commissioners.

F. A. CREIGHTON,

Prince Albert, Sask.,
March 7, 1911.

11-13

City of Brantford

Tenders for Pavement

Sealed tenders addressed to Alderman C. H. Hartman, Chairman of the Board of Works, in care of the City Clerk, Brantford, Ont., will be received until 12 o'clock noon on Thursday, March 30th, 1911, for the construction of a pavement on South Market Street.

About 5,000 square yards of top surfacing, of which 800 square yards will be on a ten per cent. grade.

Tenders for different kinds of surfacing will be received.

Concrete foundation for this pavement will be laid by the City.

Single track line of Street Railway on street. Plans and specifications may be seen, and instructions to bidders and forms of tender obtained at the City Engineer's Office.

Each tender must be accompanied by a marked cheque for 5 per cent. of the amount of the tender.

The lowest or any tender not necessarily accepted.

T. HARRY JONES,
City Engineer's Office. City Engineer.
Brantford, March 13, 1911.

11-12

Town of Oshawa

Asphalt Block Pavement

Sealed tenders will be received up to and including the 18th day of March, 1911, for the construction of an Asphalt Block Pavement on a concrete base, together with cement concrete curb, gutter and widening of sidewalk where necessary upon the following streets:

King street, 1,750 lineal feet of width, varying from 30 to 40 feet.

Simcoe street, 1,650 lineal feet of width varying from 30 to 40 feet.

The part to be paved will include that portion of the road occupied by the track of the Oshawa Street Railway Company.

Plans may be seen and specifications obtained from the Town Engineer's Office, Town Hall, Oshawa.

The lowest or any tender not necessarily accepted.

W. E. N. SINCLAIR, B.A., L.L.B.
Mayor.

FRANK CHAPPELL,
Town Engineer.

Oshawa, February 20, 1911.

11-11

TENDERS WANTED

Tenders will be received by the undersigned until noon, Thursday, March 23rd, for all trades required in the erection of St. Helens Presbytery, Dundas street, Toronto.

Lowest or any tender not necessarily accepted.

E. W. HOLMES, Architect.
11-11 10 Bloor street east, Toronto.

Sand Dredge for Sale

Hydraulic Sand Dredge in excellent condition, "A" frame, spud cutter, etc.

Accessories include 500 feet of steel discharge pipe, of which 250 feet is fitted with flexible joints; also seven pontoons to carry same.

For further information and details apply to the City Engineer of Hamilton, Canada.
Hamilton, Canada, March 1st, 1911. 10-11

Tenders Wanted

Tenders will be received by the undersigned until 5 p.m. on Friday, March 24th, 1911, for the various trades required in building chapel, principal's residence, and additions to Wycliffe College, Queen's Park, Toronto.

The lowest or any tender will not necessarily be accepted.

GORDON & HELLIWELL,
Architects.

11-11 Confederation Life Building,
Richmond street east, Toronto.

Sealed Tenders

will be received until Monday noon, April 3rd, for the construction, delivery and erection in place in Welland, Ont., of one unit of water power driven waterworks pumps, three million imperial gallons daily capacity, including turbine, pipes, valves, etc.

Specifications, prepared by Mr. Wm. Kennedy, Jr., Engineer, Montreal, may be obtained from the undersigned.

Envelopes to be marked "Tenders for Pumps."

R. COOPER,
Chairman Water Commissioners.
Welland, Ont.

11-13



Notice to Contractors

Tenders will be received by registered post only, addressed to the Chairman of the Board of Control, City Hall, up to noon on Thursday, March 28th, 1911, for the supply of Steel Extensions for Manholes on 6-ft. Steel Pipe-line.

Envelopes containing tenders must be plainly marked on the outside as to contents.

Specifications and forms of tender may be obtained at the office of the City Engineer, Toronto.

The tenderers shall submit with their tender the names of two personal sureties (approved of by the City Treasurer), not members of the City Council or officers of the Corporation of the City of Toronto, or in lieu of said sureties the bond of a Guarantee Company, approved as aforesaid.

The usual conditions relating to tendering, as prescribed by City By-law, must be strictly complied with, or the tenders will not be entertained.

The lowest or any tender not necessarily accepted.

G. R. GEARY (Mayor),
Chairman Board of Control.

City Hall, Toronto.
March 7, 1911. 11-11

For Sale

The Board of Power and Light Commissioners of Ingersoll, Ont., have for sale for immediate shipment, two 25 h.p. Induction motors, C. G. E. 3-phase, 220 volts, 4 Canadian General transformers, each 15 k.w. capacity, 2,200-220 volts, 60 cycles, S. P. direct current Arc Lamps, direct current motors, 220 and 110 volts from 1 to 40 h.p., and for delivery within a few weeks, steam engines, boilers and general steam plant accessories. Particulars on application.

11-13 W. R. REYNOLDS,
Superintendent.

Miscellaneous

Advertisements under this heading two cents word per insertion

REPRESENTATIVES WANTED—Large American firm manufacturing waterproof coating for concrete, wants to secure reliable firm to handle their product in Canada. Good inducements. Box 243, Contract Record, Toronto, Ont. 11-12

Business Buildings and Industrial Plants

(Continued from page 55)

engineers, New York, are preparing plans, etc.,

Ottawa, Ont.

Holbrook & Sutherland have been awarded the contract for erection of business building on Queen street for Hiram Robinson. Plans prepared by James Mather call for a 3-storey building 99 feet square, built strong enough for further additions.

Port Arthur, Ont.

The Imperial Construction Company has the contract for the enamel works here. It is stated that they also have contract for erection of Port Arthur Wagon Works plant. R. Gregg, president of former.

St. John, N.B.

The contract for the concrete foundation of five large buildings for the Atlantic Sugar Refinery here has been awarded to the Foundation Co., Ltd., of Montreal. Estimated total cost of plant, \$2,000,000.

Sydney, N.S.

The Nova Scotia Construction Co. has been awarded several large contracts by the Dominion Iron and Steel Company, consisting of the erection of several brick buildings, construction on which will be started.

Vancouver, B.C.

The Norton-Griffiths Steel Construction Company have been awarded the contract for construction of 12-storey steel and concrete office building on Granville street.

Winnipeg, Man.

F. W. Downs, well-known local contractor and builder, has been awarded by the C. P. R. a contract for the erection of a number of railway stations and houses for section men.

The contract for superstructure, power sub-station No. 1, King street, has been awarded to J. McRiarmid Co., Winnipeg, at unit prices. Estimated cost, \$37,607. M. Peterson, secretary, board of control.

Power Plants, Electricity and Telephones

Fort William, Ont.

The Mt. McKay and Kakabeka Falls Railway Co. has secured the required right-of-way and extension will be made at once. D. J. Piper, reeve of Paipoonage Township.

Kincardine, Ont.

The time for receiving tenders for construction of telephone lines for the Bruce municipal telephone system will be extended until March 25th. Noted in issue of March 8th.

Leith, Ont.

Tenders addressed to Geo. Buzza, Annan, and C. P. Day, Leith, of Annan-Leith Telephone Company, will be received until March 20th for the supply of 200 telephone poles, 20 feet long and 6 in. top, to be delivered not later than April 15th.

Moncton, N.B.

The plans submitted showing route of street railway, plans of construction and a complete system in connection with natural gas installation were approved by council. Engineer Mitchell is in charge. The work will mean thirty miles of pipe-laying.

Saskatoon, Sask.

This city has advertised that it will receive propositions from a company willing to build a street railway. Population of 18,000. Jas. Clinkskill, mayor.

Toronto, Ont.

The Board of Control have decided to advertise for tenders for a railway construction plant — comprising traction steam shovels, dinky locomotives and two-way dump cars—either new or second-hand. The estimated cost of the former is \$55,108, and the latter \$42,705, or a difference of \$11,400. This plant is needed in connection with the construction of the new civic car lines. The engineers estimate they will have to deal with 100,000 cubic yards of excavations and 140,000 cubic yards of filling. City Engineer Rust estimates the cost, including the purchase price of plows, scrapers, etc., at \$104,871.30, less the value of the plant at the close of operations, which he estimates at \$13,923, or a net cost of \$90,948.30.

Miscellaneous

Colchester, Ont.

Tenders for making cement tile for Colchester South will be received until April 1st by J. H. Madill, tp. clerk.

Ottawa, Ont.

Tenders addressed to the Chairman of the Board of Control will be received until March 23rd for supply of twin tank automobile combination chemical fire engine and hose wagon. Information obtained from chief of the fire department. John Henderson, city clerk.

Carmel Freres, hardware merchants, Montreal, have obtained extension.

Roof Leak Paint Co., Ste Anne de la Perade, Que., are stated to have dissolved.

Jos. Belisle & Frere, plumbers, Montreal; J. L. A. Belisle and J. N. Belisle, have registered. 10-11

Contract Record

ESTABLISHED 1886

A Weekly Journal of
Building, Contracting, Engineering, Public Works
Municipal Progress, Advance Information

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No. 12

Contractors' Bonds

Contractors and builders are becoming more and more appreciative of the advantage of corporate bonds to guarantee the completion of their contracts. The amount of capital withdrawn from operating channels and tied up by the cash deposits required with bids and under contracts is simply appalling. On the sums thus deposited the government pays only four per cent. If the government needs the money, why does it not borrow from the banks direct? This would relieve the strain on the credit of the contractors, who can obtain as sufficient substitute the credit of the corporate bonding companies.

In supplying the personal bonds and marked cheques necessary in average work, the ties of friendship and reciprocal obligation are often strained to the breaking point. The contractor is frequently obliged to obligate himself to some particular supply house for note endorsement favors, and in such a case he loses the advantage of competition in the supply market. The resulting chain of credit complications covers the country like a mesh. It is in spite of this heavy burden that the present wonderful development of construction work in Canada has been brought about.

A change of policy by the Dominion government would at once relieve the situation. The authorities have empowered reliable corporations with large capital to transact this business and the acceptance of their bonds is recommended in lieu of cash deposits. The unquestioned credit of these institutions would take the place of the cash deposits and release large sums for use in actual development. In general contract work, where corporate bonds are accepted, the business in Canada has been confined heretofore to two American companies—one an ultra-conservative concern, the other more enterprising, doing the bulk of the business and thus setting the pace. But at best these concerns have only scratched the surface of the field. Four other companies have entered this year, however—two British and two American firms, while other Canadian and British companies are look-

ing over the ground. The present rate of premium charged for contract bonds is one-quarter of one per cent. of the face of the contract. In British Columbia it is forty cents per one hundred up to thirty thousand dollars, and thirty cents above that amount. The rate charged in the United States is somewhat higher, and rumors have been heard of an advance here, but as the pioneer company in the field is opposed to any advance, no immediate change is probable. A number of large contractors, who are able to finance their operations themselves, would welcome the enforcement of corporate bonds by the government, because it would keep out the irresponsible outsiders who put up the deposits, make low bids, ship with the proceeds and leave the supply people to hold the bag. Ability to secure a corporate bond enables a contractor to sign his name with indelible ink.

Conditions in Railroad Camps

In another column will be found an interesting article by Mr. J. M. Shanly, of Montreal, relating to conditions in railroad construction camps. These conditions were discussed editorially in our issue of January 11, our article in that number having been inspired by a letter written by a Mr. Gubrandsen to the Montreal Star. In the main Mr. Shanly's letter bears out the contentions of the former writer, and for this reason we are of the opinion that the matter should be carefully investigated. Mr. Shanly is well known to the engineering profession, is a prominent member of the Canadian Society of Civil Engineers and is qualified to give absolutely reliable testimony. We cannot but think that conditions such as those to which Mr. Shanly refers are inimical not only to the best interests of the country in general, but in particular to contractors themselves, and it is from the latter source that we would welcome some information at this time. Of course, the contractor cannot be expected to establish model villages along the line of his construction, neither can he be held responsible for all the mishaps which befall the various cosmopolitan units of his working gang. He has to take whatever samples of mankind are offered, whether from Chile or Peru, from Italy or Iceland, Germany or the Russian steppes. One can neither understand such people, nor be understood by them, and it is a sufficient task to set them to work without prying into their family matters and ascertaining whether their savings are secured in the event of a premature explosion of dynamite or something of that kind. At the same time we believe contractors should be interested in working towards some improvement. Canada has mapped out a great programme of construction and with the labor which this will entail it will not be wise to offer any discouragement to the working classes in foreign lands. And discouragement has been given them, for, as mentioned in our former article, Mr. Jacobsen, the Norwegian consul at Montreal, sent a warning to his countrymen last fall against coming to Canada to engage in railroad construction, stating that the conditions are both inhuman and unfair.

Mr. Shanly concludes by making a few suggestions for improvement which appeal to us as being worthy of attention. He is not very sanguine as to the benefits to be derived from government supervision. In this we do not altogether see eye to eye with him, but at any rate we are interested in his views and would appreciate some discussion thereof on the part of our contracting friends.

Unsavory Conditions in Railroad Camps

Not the Kind to Attract Labor to this Important Field—Suggestions Looking to Improvement—Supervision by the Government

Montreal, March 16, 1911.

Editor Contract Record:

Referring to your article, "Conditions in Trans-continental Railroad Camps," published recently in the Contract Record, I have had no experience in the conditions on the particular work you mention, and can therefore say nothing definite about them, but unless they are better than is usual on similar undertakings, there is a great deal of room for improvement.

Camp buildings on railroad work are of a very temporary nature, and are usually built in sections of the country where supplies of material from the outside world are hard to get and very expensive. The contractor is therefore forced to use what he finds on the spot. The walls are generally round logs chinked with moss and clay; the roofs split cedar slabs, bark or even brush and earth. The floors are sometimes earth and sometimes poles or flatted logs. Windows, being hard to get, are reduced to a minimum, and ventilation is sometimes insufficient and sometimes too ample. In order to economize space men are packed together, usually two in a bunk. The bedding of boughs, hay or straw, once put in is never changed or aired, neither are the blankets. The men sleep with the greater part of their clothes on—the same clothes in which they have worked all day. Faces and hands are usually washed before meals, but baths are practically unknown. Underclothing may be changed occasionally, and in the warm weather there is usually some laundry work done on Sundays, but this depends a good deal on the fancy of the wearer.

Food in the boarding camps is coarse, but usually wholesome and well cooked.

To secure a water supply camps are located, where possible, on a lake or running stream, but where this is impossible shallow wells are dug which catch the surface water. No regular latrines or dumping places are established, but all refuse is thrown out near the camp and usually without considering whether or not it may contaminate the drinking water. Birds and small animals, however, act as scavengers and reduce the nuisance considerably.

When a man gets too sick to go out to work he lies in his bunk until he gets better, dies or is sent out to civilization. If his disease is contagious there is no means of isolating him and his blankets and bedding may become a source of disease for others.

Where doctors are employed they are usually young men fresh from college and without much experience; often they have long distances to cover, but I believe that on the whole they do their duty to the best of their ability.

The laborer is usually strong and hardy. While in the woods he leads a temperate, healthy life, and his ailments are mostly of a trifling character and such as the cook can cure with simple remedies. He, however, is a nomad and often throws up one job and travels off to look for another without any apparent reason. When in civilization—if he has any money—he is apt to go on a spree and in that condition may come in contact with infectious diseases, the germs of

which he brings back to camp, where they have every chance to thrive and multiply. Disease germs do not originate in the camps but must be imported. Vast numbers of foreign laborers, who do not understand our language and know nothing of sanitation, are coming in every year. If one of their number is sick, his companions look after him and are apt to say nothing about it to the doctor until the disease, if contagious, has got to such a state that the whole camp may be infected. Neither the foreman nor the contractor, be they ever so willing, can do much with such cases as this, and any attempt on the part of the authorities to institute a regular system of personal sanitary inspection would be resented by the men themselves and cause strikes and endless troubles.

Accidents, of course, are known at once, and the doctor is usually hurried to the spot to give such assistance as he can. Under the conditions prevailing the injured man has a pretty hard time of it. His wounds are dressed and he is taken to his bunk in camp. If he has to be sent out to a hospital he may have to walk a long distance or be driven over a rough road in a springless cart. If he stays in camp, he lies alone all day in his bunk. His fellow workman is too busy to do anything for him except at night and at meal times, and it is therefore not to be wondered at if he dies.

Workmen Generally Careless.

Accidents are usually due to carelessness on the part of the victim himself or some of his fellow workmen. Once a man begins to handle explosives he seems to lose all fear of them and nothing can convince him that a dynamite cartridge is a thing to be handled with care and treated with respect. A contractor can hardly be expected to provide hospital facilities for men who habitually disregard plain instructions given them for their own welfare.

In the case of men who die on the works, the notification of their friends at home often depends on their companions. This is particularly so in the case of foreigners. A man who speaks neither English nor French is officially known by his number only. The foreman may know him as Tony or Ole, or John, but that is all. If the man is killed, the interpreter, whose English is usually weak, may tell some one his name and address. The man he tells it to, usually one without much education, reports it, as he understands it, to the foreman or timekeeper, who in turn sends his version to headquarters—and by this time the man's own mother would not recognize it. Some of the foreign consuls do endeavor, I believe, to keep track of these men, but it is impossible to follow them all in their wanderings from camp to camp.

As to the claim that exorbitant prices are charged for supplies, I can say nothing except that the desire to take advantage of the needs of others for personal advantage is no more strongly developed among contractors than among any other class of people. Such things go on everywhere. Laboring men do not usually realize that the value of any commodity depends not only on its market value at the point of production, but on the cost of bringing it to the consumer;

and what would be an outrageous price in Montreal or Toronto may barely cover the cost out in the woods. I, myself, have seen a barrel of cement double in value in taking it from the nearest point on the railway to the site of the works. And the haul was not very long at that.

In conclusion, I might add that the only solution of these difficulties appears to me to be in the teaching of foremen, camp cooks, laborers and others who frequent camps, the principles of sanitation; by issuing pamphlets containing instructions, and posting conspicuous notices, in different languages, where they can be seen and read by all, and by requiring

the doctor, or some responsible official on the spot, to inspect each camp from time to time and report to the government health officials. Accidents will continue as long as explosives are used, for you cannot teach the workman to handle them carefully. And ignorant men will continue to be robbed by sharpers both in the wilderness and in civilization. Supervision by the government, if properly carried out, would no doubt improve conditions, but it would be necessary to cut out politics entirely.

Yours truly,

J. M. SHANLY.

The G.T.P. Elevator at Fort William, Ont.

Complete Plant, with Storage Capacity of Forty Million Bushels, will be Largest in the World—Constructional Details of First Section

The largest grain handling and grain storage plant in the world is that which is now being built for the Grand Trunk Pacific Railway at Fort William, Ont., to serve the enormous and increasing traffic due to the development of the wheat-growing districts of western and northwestern Canada. When the Fort William plant is completed it will have a storage capacity of 40,000,000 bushels, but it will be built in four separate units for 10,000,000 bushels each. The first section, which was completed in December, 1910, has a storage capacity of 3,500,000 bushels, with equipment for handling and cleaning. The cost of this section was about \$1,250,000.

Preliminary plans for the plant were prepared by the engineers of the railway during 1906-1907. In 1908 a contract was awarded to the Canadian Stewart Company, of Montreal, for the construction of the first section (3,500,000 bushels capacity), according to plans and specifications submitted by that company.

The work was commenced in November, 1908. The designing was under the direction of Mr. R. H. Folwell, chief engineer; the construction was done under Mr. W. R. Sinks, general manager, both of the contracting company. Mr. John S. Metcalf was resident engineer for the owners. The plant will be operated by a subsidiary company, known as the Grand Trunk Pacific Elevator Company, of Winnipeg. Fig. 1 is a view of the shipping side or water front of the elevator. Figs. 3, 4 and 5 show the general construction and arrangement.

The elevator was built on reclaimed land on the delta formed near Lake Superior by the Kaministiquia and Mission rivers. It is founded on 55-ft. timber piles driven to rock. A heavy concrete mattress and walls distribute the load evenly over this footing. A concrete wharf 337 feet long and 12 feet wide forms the water front, and there is sufficient depth of water here for the largest lake carriers. The fact that grain

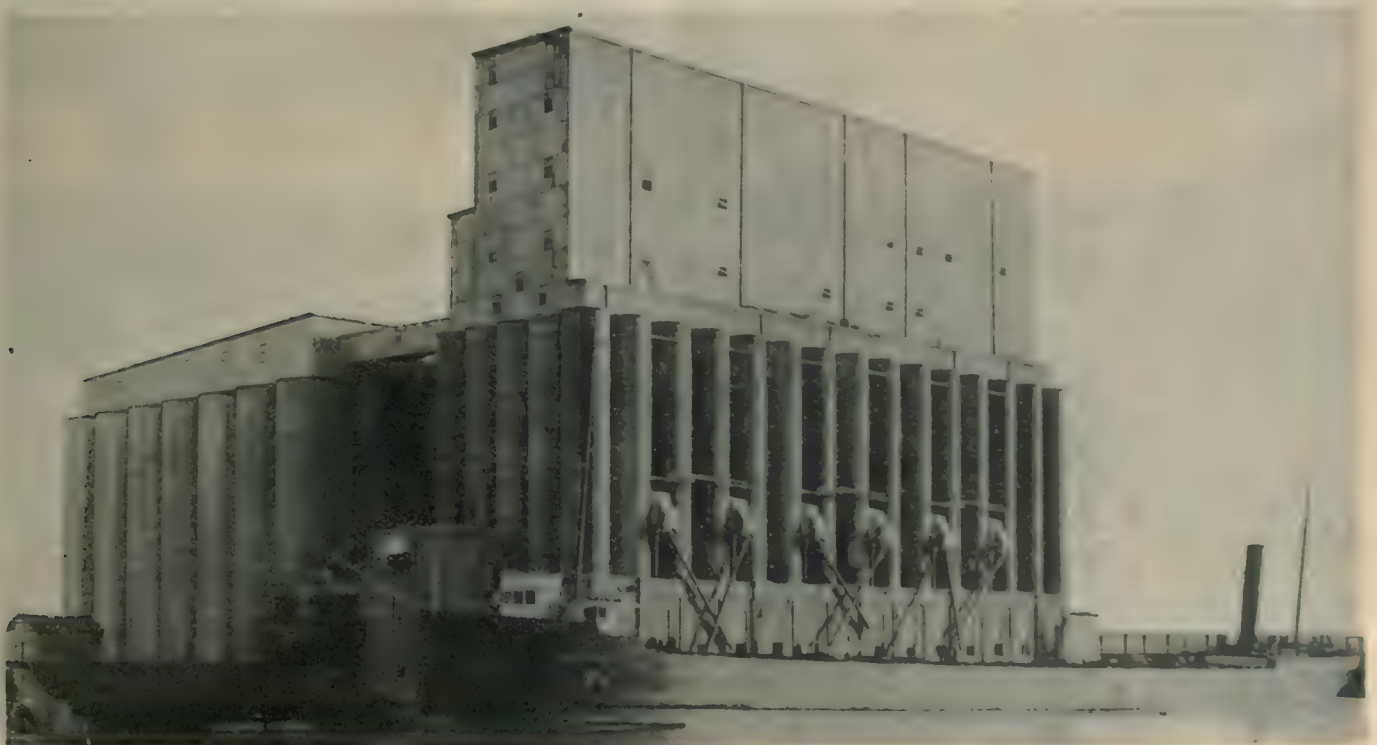


Fig. 1. —Shipping side of the G.T.P. elevator at Fort William. Capacity 3,500,000 bushels.



Fig. 1a.—Completed bins and steel frames of track shed and cupolas, G.T.P. elevator, Fort William.

can be delivered directly into vessels is a factor of great importance in relation to the efficiency of this type of elevator. In the case of terminal elevators at the seaboard (for ocean-going steamers) long conveyor galleries are usually necessary for the distribution of grain from the elevators, as the vessels carry a miscellaneous cargo and must lie at warehouse wharves in order to receive all classes of freight simultaneously. With the grain elevators on the upper lakes this condition is obviated, since grain generally forms the entire cargo of a steamer, and thus dock

spouts (delivering directly to the vessels through dock hatches) may be utilized. This results in a great saving of expensive equipment and in time of loading.

The present completed section of the plant consists of the following: (1) a four-track receiving shed; (2) a working and cleaning house with 75 cylindrical bins 12 feet inside diameter and 79 feet high; (3) a storage annex of 2,750,000 bushels capacity, having 70 bins 23 ft. 3 ins. inside diameter and 95 ft. high; (4) a house for the electrical transformers and switchboard; (5) a drying plant. In both the working house and the



Fig. 1b.—Receiving pits and bins of G.T.P. elevator in course of construction.

storage annex the spaces between the main bins are used also for storage. The smaller buildings and the main structures from the bottom of foundation to the top of the bins are built of reinforced concrete. The cupolas of the working house and storage annex are of steel frame construction, with concrete roofs and floors, the roofs having a five-ply felt and composition covering. The doors are steel-covered, and sheet metal window frames glazed with $\frac{1}{4}$ -in. ribbed wire glass are used throughout.

The forms for the cylindrical bins are of particular interest. They consist essentially of inner and outer staves 4 ft. high, held in place by built-up wooden rings. To maintain the proper space between these walls rigid yokes built of steel plates and channels are bolted to the forms. The latter are raised continuously as the work progresses and give a smooth surface without unsightly rings, breaks, or offsets. Another advantage in the use of these forms is that when the work is completed they may be taken down and

will also assist in obtaining the precise location of the horizontal reinforcing rods and in keeping the forms truly level. The forms of the separate tanks, though constructed in sections, are tied together to prevent spreading from the pressure of wet cement by a system of horizontal rods attached from yoke to yoke. They serve to support the working floor.

The concrete was composed of Portland cement, sand and gravel, in the proportions of 1:2:4, mixed very wet. The aggregate varied in size from $2\frac{1}{2}$ ins down to coarse sand. The various materials were handled by steel dump cars hauled by locomotives. The sand and gravel was dredged from Lake Superior by means of derrick scows with clam-shell buckets, and unloaded upon a temporary dock 2,000 feet long constructed for the purpose. From the stock piles the materials were loaded into the cars by a locomotive revolving crane. There were two concrete mixing plants, one at either end of the elevator, and each had two concrete mixers. Here the aggregate was elevat-



Fig. 2.—Construction of concrete bins for grain elevator.

used a second time. The construction of the yokes and jacks for the forms is shown in Fig. 6.

These circular forms were handled and raised by means of an ingenious device invented by Mr. R. H. Folwell and Mr. W. R. Sinks, of the contracting company (mentioned above). This is patented in both the United States and Canada. The essential element in the invention is a hollow jack screw (Fig. 6) through which is passed one of the vertical rods for reinforcing the concrete; the jack is made to climb this rod, and thereby raise the forms. In operation, a bar is inserted in one of the sockets in the cast head of the jack, and with this leverage the screw is turned. By turning to the right, the forms are lifted, and by turning to the left the jack itself climbs the rod, while the form remains stationary, supported by the adjacent jacks. By reason of the rod passing through the jack, the load is applied concentrically, and thus any tendency of the forms to bind is eliminated. No delay is caused by the placing of additional vertical rods as these are merely inserted in the tops of the jacks. In this way, daily progress may be observed accurately by reference to marks on the rods, which

ed to charging hoppers, where cement and water were added. The proper amount for a batch of concrete was then introduced into the mixer, and from there the concrete was poured directly into a large hoisting bucket in an elevator tower. The loaded bucket was then raised and emptied into a hopper above the level of the work. As the work progresses upward the hoist towers were extended and the hoppers raised. The concrete was distributed to the various sections of the work by means of concrete carts. With this equipment as much as 800 cubic yards of concrete were placed in one 20-hour working day, and a total of 60,000 cubic yards were handled.

The reinforcement of the bins consisted of vertical rods and horizontal hoops of flat steel of varying widths and thicknesses. For the reinforcing of the concrete columns supporting the bins of the working house, a spiral of $\frac{1}{2}$ -in. steel wire forming a helix 41 inches diameter was used, supplemented by vertical rods. Round steel rods were used for reinforcing girders and floor slabs. Fig. 2 shows the concrete construction work in progress.

When a train of loaded grain cars is pushed onto

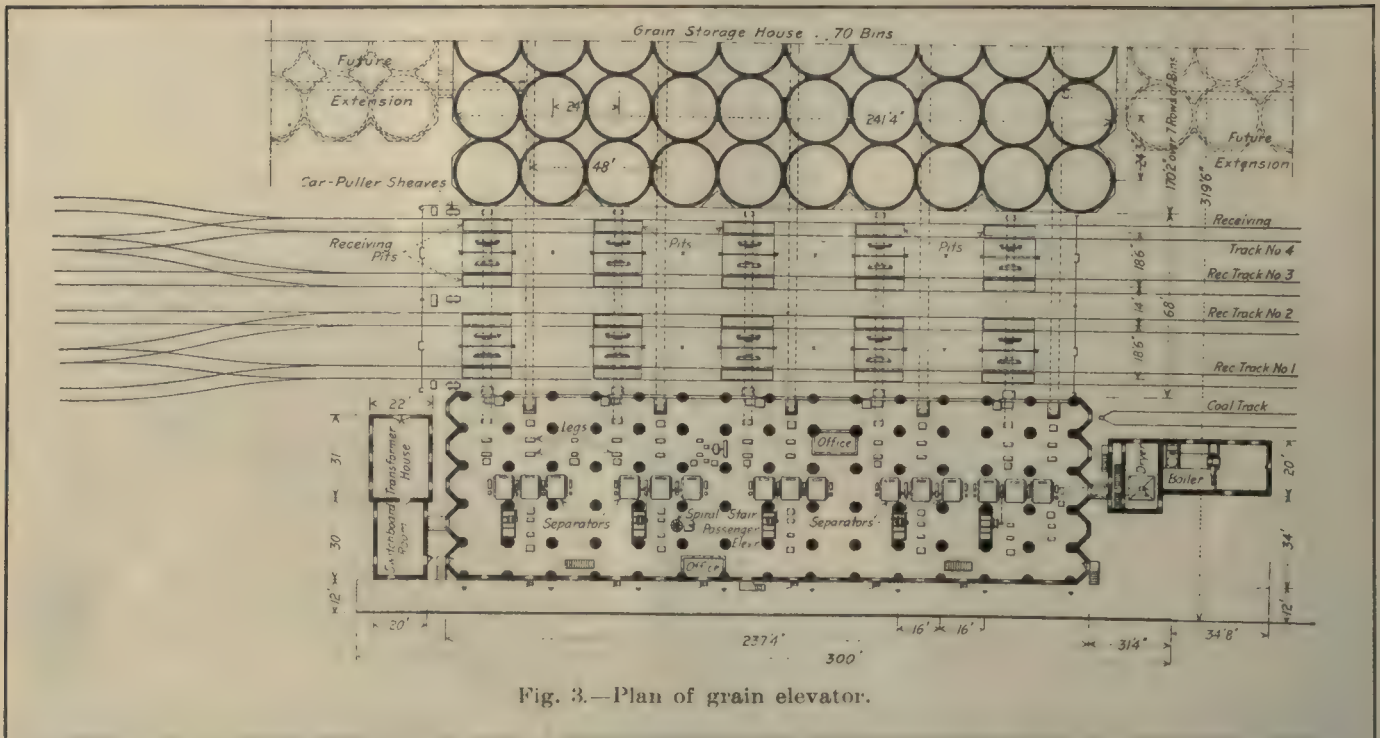


Fig. 3.—Plan of grain elevator.

any one of the four receiving tracks it is stopped with the first five cars over the five receiving pits. Much of the grain pours out when the car doors are opened; the remainder is plowed out by large plows or shovels guided by men and hauled by cables on electrically operated drums. With the four tracks, 20 cars can be unloaded simultaneously, giving a receiving capacity of 500 cars per 24 hours. As soon as the five cars are empty, the train is pulled ahead five car lengths by a cable on an electric hoist or car-puller which is powerful enough to handle a 30-car train. This hoist is controlled from a position in which the operator has full view of the train.

Each track pit has a capacity of 2,000 bushels, and

has a gate for delivering its contents upon a 36-in. lateral belt conveyor leading to the five receiving legs. The grain thus received may be sent to the storage bins by belt conveyors over-head or to the bins in the working house and then cleaned by machines in the first story below. Then it may be elevated again and sent to the storage bins, or it may be delivered directly to the steamers. If grain needs drying it may be delivered by spouts to the dryer plant from the working house. Grain from all storage bins is fed by gravity through hoppers upon belt conveyors which deliver it to the elevators in the working house. For reloading into the cars, there are five car spouts with forked delivery heads. For loading grain directly into vessels,

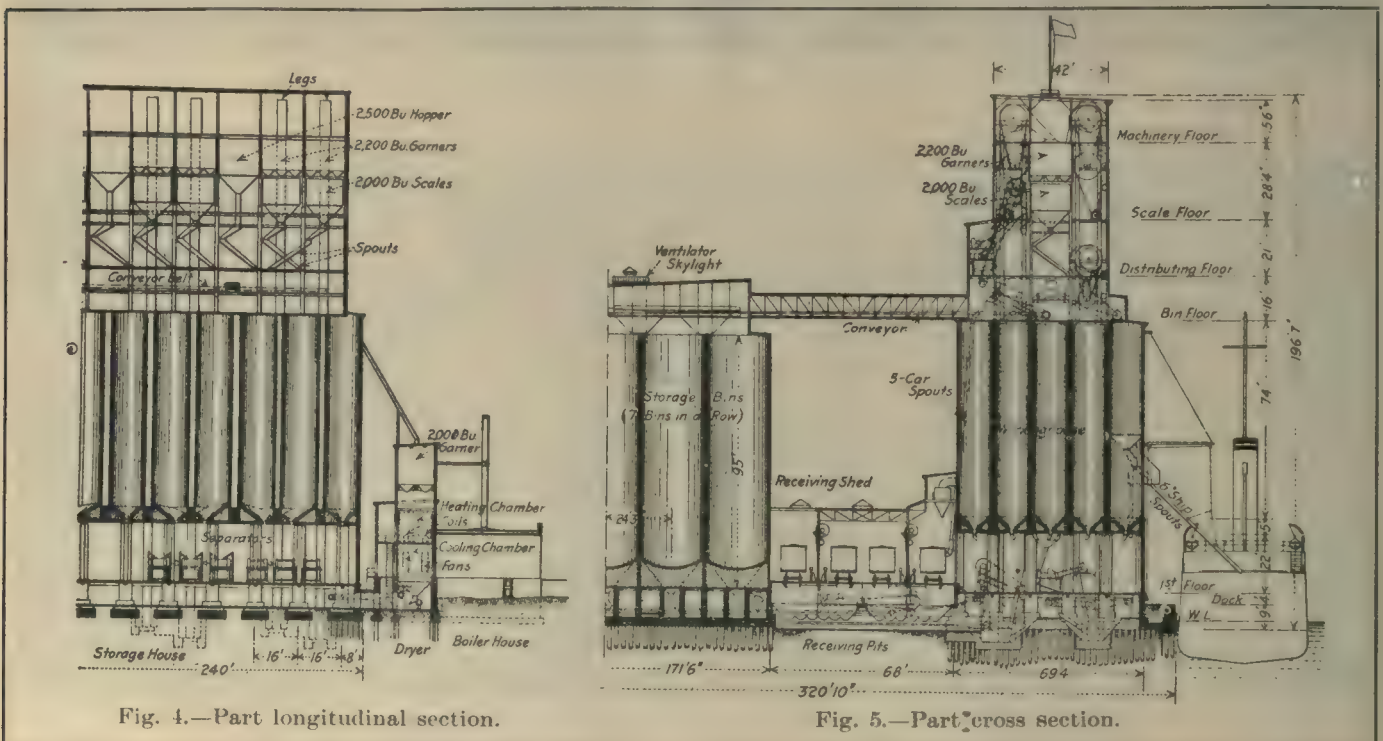


Fig. 4.—Part longitudinal section.

Fig. 5.—Part cross section.

there are six dock spouts, each capable of delivering 20,000 bushels per hour.

In the cupola, there are 10 hopper scales of 2,000 bushels capacity, fitted with recording devices; each is served by an overhead garner of 2,200 bushels capacity. Fans and cyclone separators are used for the removal of dust from the various departments, and this is discharged into dust bins. An efficient and well balanced system of conveyors, elevators and spouts provides for the distribution and handling of grain from one part of the plant to another.

Electric power is used throughout, and current of 22,000 volts is delivered by the 22-mile high-tension transmission line from the Kakabeka Falls hydro-electric plant of the Kaministiquia Power Company. This is transformed and reduced to 550-volt alternating current. Individual motors are used throughout, and there are in all about 37 motors aggregating 2,500 h.p. Rope drives are used in preference to gearing in all cases, with the exception of the car-puller, which is equipped with heavy cast-steel gars. The lighting

a 500-gallon pump directly connected to a 50-h.p. motor.

We are indebted to the Engineering News and to the contractors, the Canadian Stewart Company, for data and illustrations.

Canada's Zig-Zag Trade with the U.S.

There are a considerable number of loyal Canadians who find just cause for satisfaction in the continuous development of inter-provincial trade on east and west lines. These gratified sentimentalists, however, must often speak loudly to be heard above the rumble of heavy freight trains on north and south lines crossing the border between the two countries. It is noticeable in the building trade that many novelties in patented or secret processes, and products used in modern construction, come from the busy factories of the United States, while the raw material of which they are fashioned is to be found plentifully in this country. An actual illustration of Canadian trade on zig-zag lines was noted at the recent Cement Show in Toronto. Certain fireproofing blocks there shown, and used extensively in this country for partitions in new buildings, proved to be made in the United States of gypsum plaster from Canadian quarries. This gypsum, of the pure white quality, is shipped in the rock from Windsor, N.S., to New York, paying a duty of fifty cents a ton to the American government. It is there calcined and ground, sold to the partition-block manufacturers, and re-crosses the line as finished product, contributing another customs fee, this time to Canada. The east and west sentiment is reasonably strong among Canadian contractors and builders, but this zig-zag game is fascinating.

The Canada Car Company, Limited, of Montreal, is working on a contract to construct one hundred automobile cars for the C. P. R. This is quite a new style of freight car in this country. It is 36 feet long, 9 feet high, and the usual width. The special feature of the car is a large door at the end of the car, through which a full sized automobile can be driven conveniently. There is also the usual side door that may be used for loading and unloading ordinary freight.

The C. P. R. will open fifty new towns this year on branch lines completed last fall in western Canada. Last year forty were placed on the map and nearly all of these are developing into centres of commercial activity. To the company's progressive plan of expansion is attributable largely the increased immigration of Americans into Saskatchewan and Alberta.

High salaried positions are not reserved exclusively for Canadian city engineers. Mr. Howard Elliott, president of the Northern Pacific, was recently offered \$100,000 a year to accept the presidency of the Missouri Pacific—and declined.

Judgment for \$3,250 was given John A. Macdonald, a railway construction foreman, in his suit against D. R. McDonald, railroad contractor. This was reduced from \$6,000 awarded at a preliminary hearing. Macdonald was injured in an explosion of dynamite at La Tuque.

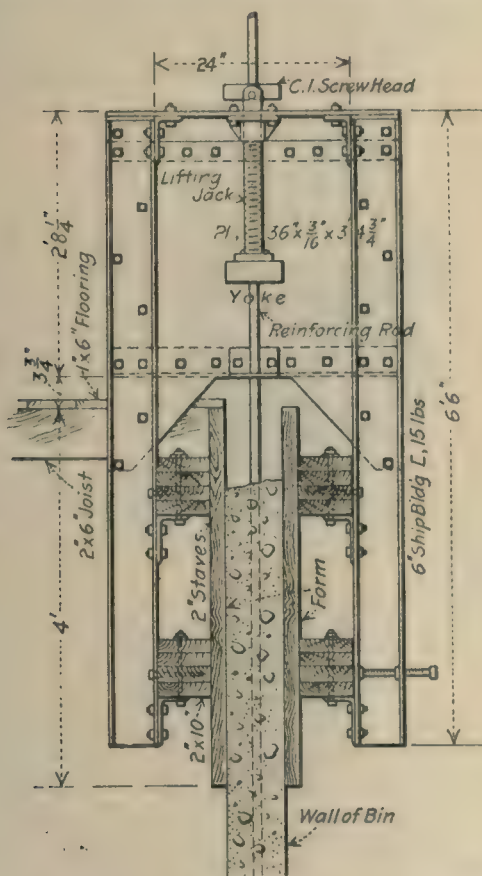


Fig. 6. Jack and yoke for supporting and raising the forms for the circular concrete bins.
(R. H. Folwell and W. R. Sinks, Inventors)

plant includes outdoor arc lamps for the wharf and tracks, and 800 incandescent lamps in the buildings. All wiring is laid in conduits, and all hanging lamps have flexible armored conduits and wire guards. There is a complete telephone system, in addition to speaking tubes, electric bells, and a system of red and green lamps at the receiving and shipping legs for signaling the operators. A passenger elevator is provided, and also a traveling belt elevator for the workmen. Steam for heating the dryer and the offices is supplied by a horizontal tubular boiler. For fire protection there is a complete equipment of hose and piping served by

The Sherardizing Process of Galvanizing

A Method of Metal Lath Protection, recently invented, calculated to revolutionize this class of work — Various Uses and Advantages

By C. W. Noble, Toronto

Any discussion of galvanizing, in order to be complete, must be prefaced by a discussion of corrosion of steel. Whenever two metals of different electric potential are in contact in the presence of an acid or salt solution, an electric current is set up and that metal which is electro positive as compared with its fellow, is attacked. The chemical reaction, and the electric current are apparently mutually dependent on each other for existence. An electric battery, for example, will remain indefinitely strong if the current is not allowed to flow. Yet as soon as the wires are brought in contact the chemical attack takes place and the zinc in the battery goes onward to destruction. In spite of this

variation in impurities that made them electro positive as compared with the adjacent portions. Even a very slight variation in the metal is sufficient to localize the attack, and, as the action results whenever there is moisture in the air, or, in other words, is practically continuous, it soon shows appreciable results.

Now zinc, as compared with iron, is always electro positive. If zinc and iron, therefore, are in contact in the presence of a corroding agent, the flow of the electric current is from the zinc to the iron, instead of between the different portions of the iron, and the zinc is attacked while its fellow remains unscathed. The action is identical in the case of the fence wire where certain spots rusted and by so doing saved the adjacent portions. The only difference is that zinc is electro positive as compared with any commercial iron and the point of attack can therefore be definitely located, while if the rust is to be allowed to develop on the steel, only time can tell where it will first occur.

Superior to Painting.

Galvanizing consists of coating iron or steel articles with a coating of zinc which will shield them from rust by taking the attack itself. The zinc is always added after the article is complete, and its destruction does not therefore weaken the article itself, while a corresponding rusting might have serious consequences. The reason that galvanizing is a better protection than paint is the fact that the salts which cause the electric currents can pass through the scratches in the paint and thus start corrosion at all exposed points. Zinc, on the contrary, protects the steel, in its immediate neighborhood, even if it does not form a complete covering. It also offers a greater resistance to abrasion, and is not subject to decay as is vegetable oil used in making paint.

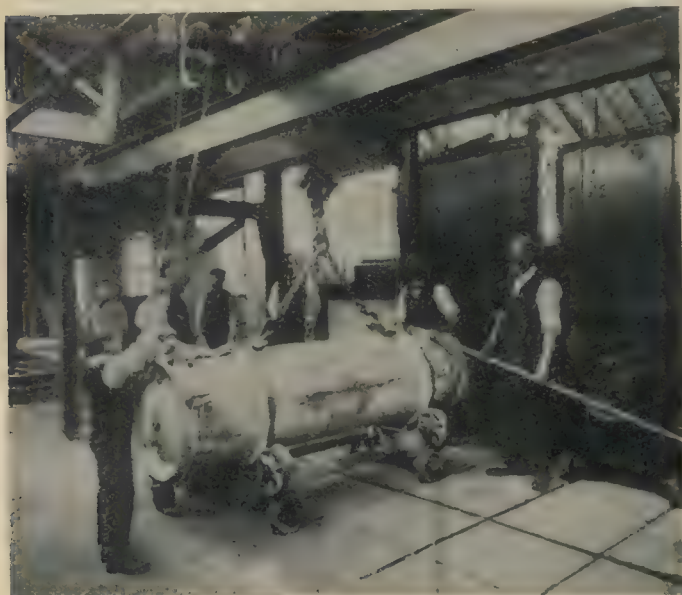
The first galvanizing was done by Cranford, in England, in 1846. The method used was the hot process. After the removal of all mill scale, grease and rust, the article to be galvanized is dipped in a bath of molten zinc. As it emerges, if the nature of the article permits, it is passed through rollers, or brushes, to remove the excess metal. By rapid cooling the zinc coating is given that bright spangled appearance which characterises this type of galvanizing.

Electro galvanizing has been practised for about eighty years. It is merely zinc electro-plating. The articles to be coated are suspended in a solution of zinc salts, in which also are suspended plates of metallic zinc. The plates and articles are then so connected with an electric current that the current will flow from the zinc plates to the articles through the solution. The plates then disintegrate and the zinc is deposited in the articles. When finished, the coating has much the color of aluminum and is very easily distinguished from the hot galvanized.

An English Invention.

Sherardizing, or dry galvanizing, was first invented by Mr. Sherard Cowper-Coles, of London, England, about six years ago. A large number of plants are now operating in England, the United States, and Canada, and it has already replaced the old process for certain lines of work. As the method is entirely new it will be described at considerable length.

It is very similar to the old process of case hardening,



Sherardizing Plant in Operation

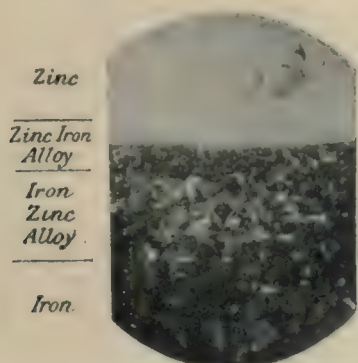
everybody knows that the chemical reaction causes the current instead of being the result of it.

The air contains small quantities of sulphurous and carbonic acid gases, the product of decay and combustion. The play of lightning throughout the atmosphere also produces small quantities of nitric acid. These gases, together with the moisture normally present in the air, form one of the elements of a battery. Commercial steel forms the other two elements. At first glance this seems impossible. The explanation is that the impurities in steel are never absolutely uniform in their distribution, and a very small variation in certain impurities, particularly manganese, makes considerable variation in electric potential. Whenever moisture having these gases in solution is brought into contact with steel, small electric currents are set up and a chemical attack, or in other words, a rusting of the steel, takes place.

This matter has been very carefully investigated by Dr. A. S. Cushman, of the United States Department of Agriculture, who investigated the corrosion of fence wire. He noted that frequently one wire in a fence would be badly corroded while parallel wires in the same situation would be clean. Often an individual wire would be corroded for a few yards and would be bright throughout the remainder of its length. He concluded that these rusted spots were caused by slight

by which the outer portions of steel castings are impregnated with carbon by baking in charcoal dust and thus hardened. The articles to be sherardized are first cleaned from mill scale and packed in zinc dust. They are then baked for four or five hours at a temperature of about seven hundred and fifty degrees. During the process the retorts in which the articles are packed are rotated from time to time to insure perfect contact with the dust. On removal and cleaning the articles are found to be covered with a frost-like coating of metallic zinc. If this is removed it will be found that there is no distinct surface between the zinc and the iron. Instead, the metal passes through gradations of pure zinc, zinc-iron alloy, iron-zinc alloy, and pure iron. The result, therefore, except for the addition of the pure zinc on the outside, is very much like the case hardening, for in this process the outer surface of the steel is converted to an alloy of the material in which it is baked.

The explanation of all this is very interesting. Zinc dust is not powdered zinc; for zinc, as everybody knows, cannot be pulverized. It is the sweepings from flues through which zinc vapors are passed at the smelters. The particles are very minute. It requires about fifty thousand of them in contact to make a row an inch long. Chemically, the dust is a mixture of metallic zinc and zinc oxide. When placed in a test tube, and heated, the dust will begin to give



Magnified Cross Section through Sherardized Surface

off zinc vapor at a temperature of about two hundred and fifty degrees and the vapor condenses as metallic zinc about the mouth of the test tube. This is a very curious matter as the melting point of zinc is as high as seven hundred and eighty degrees and the vaporizing point is of course much above that.

The explanation removes the difficulty. Each zinc particle consists of a minute globule of metallic zinc covered with a coating of zinc oxide. It was to all intents condensed from a gas to a solid without the intervention of a liquid state. The atoms in the zinc globule have a tendency to crystallize but were condensed without having time to do so and are held in their uncomfortable position by the coating of zinc oxide. A similar condition exists in the small portions of unannealed glass called Ruperts drops, which are used in a laboratory experiment. When pricked or pinched they fly into a thousand pieces on account of the sudden release of the internal stresses. Similarly these particles of zinc dust under the influence of only a moderate heat explode into zinc vapor.

When packed in masses in the retort the strength of the oxide envelopes is reinforced by contact with the neighboring particles and explosions at low temperature do not occur. When it is in immediate contact with the steel, however, the chemical affinity between the two elements overcomes the constraining effect of the packing. The vapor is then formed and condenses on and within the steel. It is a curious fact that the zinc is never condensed on the inside of the retort itself. This is because the retort is hot-

ter than the enclosed zinc dust and the vapor which always will condense on the cooler surface is therefore re-absorbed back into the zinc.

In the old style of galvanizing there is an actual surface of contact between the zinc and the steel. The difference in electric potential in crossing the surface is about one-half volt. The electric current and consequently the chemical attack on the steel is in proportion to this difference. In the sherardized coating the total differences in the electric potential is accomplished by a gradual variation while passing through the alloy. The current resulting from the chemical attack occurs, therefore, only between the pure zinc and the outer zinc-iron alloy, between which there is only a slight difference in potential. The rate of attack on the zinc is correspondingly slow. When the pure zinc is entirely removed the alloy itself acts as a protection. In fact, the alloy resists the attack much better than pure zinc, probably because the difference in potential between the different portions of the alloy is less between the alloy and the zinc.

Sulphate of Copper Test.

The usual test for galvanizing is what is known as Preeci's or the sulphate of copper test. The article to be tested is immersed in a concentrated solution of sulphate of copper, at the usual room temperature of seventy degrees. A deposit of metallic copper is slowly formed on the zinc. After leaving the articles one minute in the solution it is removed and the copper wiped off. The process is continued until all the zinc is destroyed. This is indicated by the fact that the copper cannot be removed from the underlying iron by wiping.

Another comparison can be made by placing the bits of galvanized steel in a copper sulphate solution to which a little sulphuric acid had been added. This solution is what is used in the gravity cell. The hot and electro galvanized lath samples will boil off hydrogen very rapidly. The zinc will totally disappear and the formation of hydrogen consequently ceases in a very short time. The sherardized sample will appear almost inert. At first the bubbles which rise are so fine as to appear almost like a wisp of mist, but as the alloy is reached they become too small to be seen and the only way one can detect the action is by the movement of the liquid over the sample. This is shown by the slow rise impurities. The time of ending of the action is always uncertain, but it is very much longer than is the case with the other types.

An Interesting Test.

M. J. H. Burn Murdoch reports a severe test on sherardizing. He cut a steel jack chain in two and had one part sherardized and the other part hot galvanized. The hot galvanized coating was unnecessarily heavy as there was no way by which the excess zinc could be wiped off. Both chains were hung side by side off the end of a wharf in sea water and were observed from time to time. When finally removed the hot galvanized coating was entirely gone and the links beneath it were so badly corroded that many of them could be broken in the fingers. The zinc on the sherardized coating was entirely gone and the link had the blue black color that characterizes the alloy. Only a few spots had begun to show rust. There were no pits and no scale, and the strength of the chain was as great as ever.

The sherardizing process costs less than any other type of galvanizing. In hot galvanizing a large portion of the zinc is lost in dross, and in electro galvanizing the anodes crumble so that only about one-half the zinc actually goes into solution. In sherardizing, on the other hand, the zinc is all used. The cost per pound, too, of the zinc in the form of dust is less than when bought in the form of spelter or anode plates.

The sherardizing process costs less for heat than hot

galvanizing and can be started at any time without the delay incident to melting up a pot of spelter. The cost of the heat for sherardizing is also less than the cost of the power for electro galvanizing. The process must be well done or it must not be done at all. This is because the zinc dust is such a poor conductor of heat that the process has been going on for some time at the outside of the drum before it starts at the centre, and, conversely, after removing the drum the process continues at the centre after the outside of the drum is comparatively cool. This is in marked contrast to electro galvanizing which gives color with a very short immersion and long before sufficient zinc has been deposited to insure adequate protection. All the processes depend for their success on the perfect removal of mill scale, but the presence of oil which is fatal in the case of the older processes is no hindrance to sherardizing.

Various Uses.

The process is being very generally adopted for situations which are badly exposed to electrolysis where paint and the older types of galvanizing have not proven satisfactory. Cross-arm braces and insulation pins for telephone

are now largely sherardized. So also are the castings by which trolley wires are suspended. An American firm manufacturing sherardized conduit pipe now supplies the greater portion of that trade south of the line. High voltage transmission towers are also treated. The British Admiralty are now using sherardized malleable castings for many situations, such as boat fittings, where bronze was formerly used. A sherardized coating, when buffed, takes a polish very much like nickel. Stove trimmings made thus are coming very much into use.

Another use for the process which will soon become general is the protection of metal lath. Hard wall plaster while setting up generates electric currents and thus attacks any exposed metal in a manner very similar to electrolysis. The action of the plaster of Paris while crystallizing, is similar in kind, although less in degree, to the action of the salts in a dry battery. The older types of galvanizing, if done efficiently, have proven too expensive for any but the very best work. Sherardizing, which is more efficient than the older types, is low enough in cost to have an extended use.

Exhibits at the Toronto Cement Show

Features of Interest to the Engineer, Architect and Contractor— Convincing Proofs of the Wonderful Development of the Industry

As will be seen by the illustration published herewith, the Ideal Concrete Machinery Company, of London, Ont., had a most attractive exhibit. The company's products were favorably commented upon alike by the general public and the man actually engaged in contract work. Considerable interest centred in a machine for tamping the mixture in moulds, this being a wonderful improvement over the old style of hand tamping. Labor is always erratic even at its best, and as the quality and strength of the concrete block depend greatly upon the amount of tamping it receives, the value of this machine can be readily appreciated. The Ideal people also make an excellent line of concrete block machinery. The illustration shows the firm's exhibit

at the Cement Show, adjoining the booth of the "Contract Record."

There was always a great attraction in the exhibit of the Canada Cement Company. That corner of the building never failed to draw its numbers. The exhibit was one of the largest and showed much careful planning. At one end of the booth, forming a striking contrast to the pieces of concrete for building purposes, was a section of a model home, showing some of the artistic effects that can be produced with concrete. A novel feature was a fireplace of simple design yet attractive, and blending perfectly with the color scheme and general tone of the room. The booth



Exhibit of the Ideal Concrete Machinery Company, Limited, London, Ont., adjoining the "Contract Record" Booth

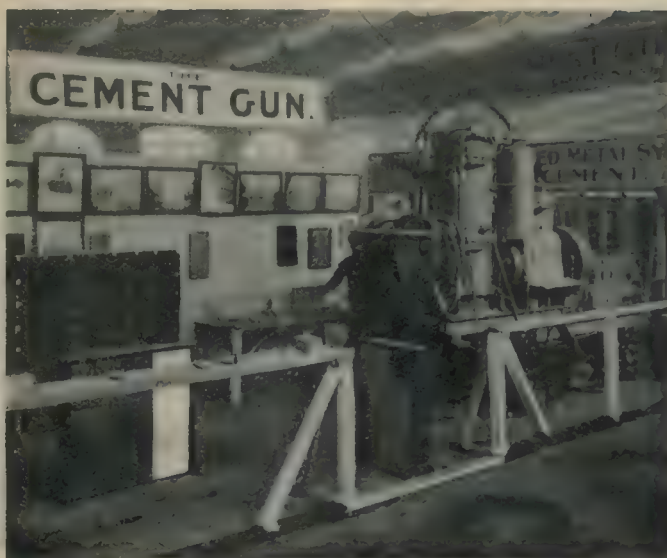
Centres of Interest at the St. Lawrence Arena, Toronto

Exhibition of the Canadian Cement and Concrete Association

March 6-11, 1911



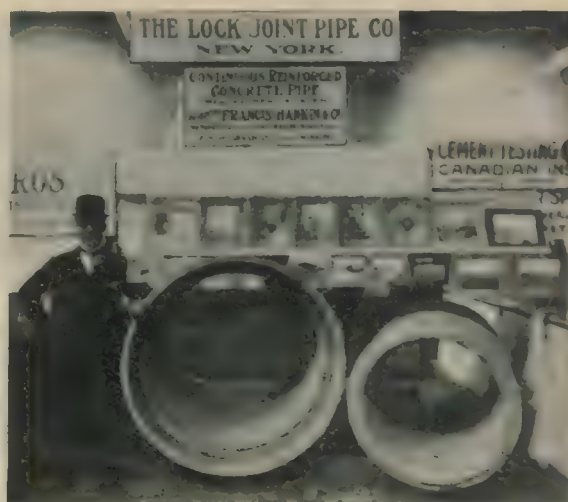
Wettlaufer Bros., Toronto



Canadian Cement Gun Company (Steel & Radiation), Toronto



Canadian Inspection Company, Limited, Toronto



Lock Joint Pipe Company, New York

Centres of Interest at the St. Lawrence Arena, Toronto

Exhibition of the Canadian Cement and Concrete Association

March 6-11, 1911



London Concrete Machinery Company, Limited, London, Ont.



Steel & Radiation, Limited, Toronto and Montreal



National Roofing Company, Tonawanda, N. Y.
(Toronto Agents: Allen General Supplies Company)

also had a great drawing card in the shape of a miniature cement mill, complete, and in operation. Each visitor was shown the details of cement manufacturing, and on leaving, was given a tiny bag of "Canada" cement as a souvenir.

Wettlaufer Bros., Toronto, had an up-to-date line of concrete mixers and machinery in operation. The firm were excellently located and their was one of the largest exhibits. They are well known in the eastern market, a statement which is proven by the fact that in the city of Toronto alone during the last three season they have sold 75 concrete mixers and 30 hand mixers. Their half-yard heart-shape mixer with automatic lift hopper, replete with new improvements for discharging the drum, elicited much favorable comment from the trade.

A complete cement testing laboratory was the exhibit of the Canadian Inspection Company, Limited, which was in charge of the vice-president of the concern, Mr. L. J. Street, and Dr. Herlitschka, director of the company's laboratory. The Canadian Inspection Company are establishing a testing laboratory in Winnipeg and the apparatus shown was that which is about to be shipped to the western capital. In the investigations of structural material made by this company three different machines are used for each test, thus insuring absolutely reliable analyses

The Lock Joint Pipe Company, 165 Broadway, N.Y., had an effective exhibit containing a number of samples of their continuous reinforced concrete pipe. This firm is one of the best known in the Canadian field. It will be remembered that they obtained the contract for the pipe used at the Toronto filtration plant. Their representatives gave us a copy of an attractive booklet, illustrating the various uses to which this material has been put on important construction throughout the continent. This booklet, which may be obtained upon application to the Lock Joint Pipe Company, also contains constructional information pertaining to the Meriweather system that should be of interest to the trade. They are represented in Canada by Francis Hankin & Company, of Montreal and Toronto; F. H. McGavin & Company, Winnipeg, and in British Columbia by Pacific Coast Lock Joint Pipe Company, Seattle, Wash.

The exhibit of the London Concrete Machinery Company, Limited, London, Ont., furnished conclusive evidence of the enterprise and progress of this firm. It was not only one of the largest exhibits of the kind we have yet seen, but also one of the best. It comprised in part a complete line of concrete machinery in operation. Among the most popular of the company's products may be mentioned the London automatic batch mixer, a machine which is claimed to have the largest sale of any mixer manufactured or sold in Canada. The No. 1 style has a capacity of 50 yards a day and the No. 2 a capacity of 75 yards a day. As an all round money saver in the cost of producing the concrete and the expense of the machine itself, it is an excellent proposition. The London standard batch mixers, made in four sizes and furnished with any equipment, are also a popular line with contractors. In addition to a full line of cement working tools the company also manufacture face down block machines, cement brick machines, drain tile machines, ornamental moulds, sewer pipe moulds, etc. Their headquarters are 19 Marmora street, London, Ont. Branches are located in Vancouver, Winnipeg, Calgary, Montreal, Halifax and London, Eng.

Eadie Douglas, Limited, of Montreal, Toronto, Ottawa and Winnipeg, had an exhibit of considerable interest. Of

the samples shown may be mentioned those demonstrating the possibilities of Terrazo floors. This flooring is strongly recommended for public buildings, hotels and large residences where a fireproof, sanitary and durable floor of good appearance is required. Ceresit, an efficient, economical waterproofing, another of the Eadie Douglas specialties, came in for a good deal of investigation, while "Preservo" applied to a canvas sheet in the company's exhibit had rendered the material absolutely waterproof and able to hold water indefinitely. Keystone gypsum blocks were another noteworthy line. The company are also agents for Burman-troft's terra cotta. In this connection it is interesting to note that they have secured contracts for several buildings for the Toronto General Hospital.

The Ottawa Silica Company, of Ottawa, Ill., showed samples of their silica sand, which they claim to be the best for facing cement blocks, artificial stone, cement and stucco work. This sand is derived from the formation of St. Peter's quartzite. It is white in color, and a chemical analysis shows 99.90 per cent. pure silica.

The space allotted to the Canadian Cement Gun Company, subsidiary to Steel and Radiation, Limited, Fraser avenue, Toronto, was well patronized throughout the whole meeting. The novelty of the exhibit appealed to the non-technical man as well as to the engineer and contractor, the imagination of the former being tickled at the idea of a machine which literally shoots cement on to surfaces and creates a solid wall "while you wait." A detailed description of the cement gun was published in our last issue. To this we can only add that the machine is equally applicable to larger construction work and that it handles equally effectively lime, gypsum, cement and other plastic materials. It is held that there is almost no limit to the field for the cement gun process. A few of the many practical uses to which it may be applied are foundation work and waterproofing below grade, coating steel to prevent corrosion and rust, covering wooden buildings, sidewalk construction, coating water pipes, also railroad tunnels and highway bridges, and the giving of fire retardent treatment to the interior and exterior of combustible buildings.

The cement gun will be placed with subsidiary companies throughout the country under the direction of the Canadian Cement Gun Company, Limited. For information or estimates address the Canadian Cement Gun Company, care Steel & Radiation, Limited, Fraser avenue, Toronto.

Steel & Radiation, Limited, of Toronto and Montreal (head office Fraser avenue, Toronto), had an excellent exhibit which deservedly came in for a good deal of attention. One of their specialties which appealed particularly to engineers and contractors was a testing frame in operation. Reinforced concrete slabs and beams were tested from day to day throughout the Show. The company showed a large range of expanded metal and concrete reinforcement, also expanded metal lath and steel studding partitions, both solid and hollow. Their expanded metal lath is specified by leading architects for many uses, chief among which may be mentioned fireproof ceilings and walls, also beam and column covering; fireproofing stairway, elevator and dumb waiter enclosures; fireproofing eaves, cornices, etc. Other features of interest were suspended ceiling work; fireproof columns and beams; expanded metal lockers; solid steel sash, recommended particularly for factories and industrial buildings of all kinds; also solid steel casements for high-class residence work, office buildings, etc. The "Fenestra" steel window sash shown by this firm has been used in many of the most important commercial buildings

throughout the country and also on the various hydro-electric power stations throughout Ontario. The exhibit was in charge of Mr. W. F. Adams, chief engineer, and Mr. A. D. Dame, general sales manager. The firm is much gratified at the numerous enquiries received throughout the exhibition. They regard this as infallible evidence of a good season ahead.

The "Contractor's" portable saw bench and wood worker was shown by the American Sawmill Machinery Company, of Hackettstown, N.J. This is a self-driven, portable and yet rigid machine, designed to stand hard continuous service, and as such it should be a useful adjunct to any contractor's equipment. It is adapted particularly to the use of engineers, contractors and builders, and is intended to be used right on the job for a variety of light and medium mill work. Catalogues and detailed information will be furnished on request.

The National Roofing Company, of Tonawanda, N.Y., were represented by their Toronto agents, the Allen General Supplies Company, 140 Wellington street west. Samples of Security asphalt roofing furnished conclusive proof of the excellent qualities of this material. "Security" roofing is made in three styles of surfacing: white sea-gravel, coarse feldspar rock and fine feldspar rock.

It can also be furnished with burlap insertion for siding or roofs over half pitch. One of the principal advantages of Security roofing is its 6-inch asphalt cement welded joint. Of other lines belonging to the National Roofing Company may be mentioned Retaw roofing, Asphaltus roof covering and Natroco paint.

The Blystone batch mixer, shown by the Blystone Manufacturing Company, Cambridge Springs, Pa., appealed to us as one of the most effective machines of this kind we have yet seen. The Blystone mixer can be filled and discharged while in motion. Its rapid operation and the thoroughness of its mixing are the chief points in its favor. It is of simple construction, is easily cleaned, and requires only a 2 h.p. engine or motor to operate it.

The Koehring mixer shown by the Canada Foundry Company, Limited, Toronto, is well known to concrete workers and a detailed description of the machine is unnecessary. Another of the company's lines is the Koehring



Exhibit of the Canada Foundry Co., Ltd., Toronto

excavating loader, the advantages claimed for which are that it is self-contained, easily transported, adaptable to excavating cellars and trenches, and grading and loading materials into wagons or cars. Special catalogues will be furnished by the company on request.

W. D. Beath & Son, Toronto, agents for the American Steel & Wire Company, had plenty of enquiries in regard to their triangle mesh concrete reinforcement. The continuous action of this reinforcement over the beams, and the methods of laying, were well illustrated in an effective picture screen showing a 15-storey commercial building in course of erection. The scene was from an actual photograph taken in New York City. An interesting booklet containing reports of various tests of concrete reinforced with triangle mesh may be obtained on application to Messrs. Beath. The principal claims advanced on behalf of this material, we might say, are that it provides an even distribution of the steel, reinforcing in every direction; that it gives a perfect mechanical bond; that its application can be made at the minimum cost, and that it is easily handled.

Concrete hollow tile, made by the Pauly patented system, was the chief item of interest at the booth of Mr. Kennedy Stinson, of Montreal, who is the sole proprietor of the Concrete Structural Tile Company, of Montreal. Among



Concrete Hollow Tile in Residence Work

the plants operating under the above system may be mentioned the Montreal Concrete Tile Company, Limited, Montreal; Perfection Concrete Company, Limited, Winnipeg; Edmonton Concrete Company, Limited, Edmonton; Ritchie Contractors' Supply Company, Vancouver. These structural tiles are now being used very extensively. Their popularity is due to their inherent and exclusive qualities. They have been successfully employed in every class of building from farm buildings and residences to factories, commercial and public buildings. They are made in all sizes and shapes and are at once effective and economical. Samples of Medusa products handled by the Stinson-Reeb Builders' Supply Company, Limited, Montreal, were also shown at this booth.

Clarence W. Noble, 117 Home Life Building, Toronto, showed samples of Herringbone metal lath, trussed beam fabric reinforcing and also twisted bars for reinforcement. Mr. Noble was kept busy explaining the superiority of sherardized Herringbone lath. A complete description of the sherardizing process will be found elsewhere in this issue.

The Concrete Form & Engine Company were represented by F. S. Freer, who showed models of the company's collapsible steel culvert forms and explained the manner in which they are used in the construction of culverts, conduits, small bridges and sewers. Mr. Freer informed us that there was an excellent demand for the forms and that a number of enquiries had been received from readers of the "Contract Record." A detailed description was published in our issue of March 8th.

Chillas-Black, Limited, Mail Building, Toronto, showed samples of paints, enamels, varnishes and damp-proofing compounds. The "R.I.W." damp resisting paints manufactured by Toch Bros., New York, and handled by Chillas-Black, Limited, will need little introduction to the trade. Other lines of interest were Toxloxpore and Toxement. The former is a colorless liquid, which, when applied to the exterior surfaces of walls, renders them waterproof and prevents their disintegration. Toxement is a waterproof material in the form of powder, which, when mixed to the extent of two per cent. of the neat Portland cement used, will absolutely waterproof concrete for floors, foundations, etc. It is claimed to produce a distinct chemical reaction between cement and itself which physically fills up all voids.

The Standard Paint Company, of Canada, Limited, Montreal, showed samples of Ruberoid, P. & B. building and sheathing papers, preservative coatings and other of their products. The qualities of Ruberoid were effectively demonstrated in samples of that material laid on the roofs of the A. A. Griffing Iron Company (now the American Radiator Company), Jersey City, 17 years ago. The qualifications for foundry roofing are far more exacting than for a warehouse or for a building of similar character, and the excellent conditions and life of the sample of Ruberoid furnished convincing evidence of its capabilities. J. L. Vokes & Sons are Toronto agents for the Standard Paint Company.

The Lehigh friction clutch, and a pulverize fuel economizer were the lines shown by the Lehigh Clutch Company, Catasauqua, Pa. The Lehigh clutch is very powerful and readily adjustable, and the fuel economizer for burning pulverized coal is a most efficient apparatus. The Lehigh clutch is especially adapted to high speed and is designed for electrical drives and any machines where a quick acting, powerful and safe friction clutch is required. The company's representative, Mr. C. H. Wolf, Jr., gave us a copy of a letter from Dr. Otto Schott, chemist, of Heidelberg, Germany, in which he states that it should be advantageous to every cement company to use the company's fuel economizer and that he regards the apparatus as being a distinct improvement on that used in Germany.

The Kent Mill Company, 170 Broadway, New York, showed the Maxecon mill, which is claimed to be unequalled for grinding any hard or soft friable materials, such as cement, limestone, ores, and so on. The Maxecon pulverizer is claimed to combine the highest efficiency with the greatest durability. Its special advantages are that it is simple in construction and economical in operation, that no special foundation is required, that it is automatic throughout and that it entails the minimum amount of repairs.

C. S. Wert, Kendallville, Ind., showed the Perfect brick machine, described and illustrated in our issue of March 8. The Canadian market for this machine is continually improving and doubtless there will be a still further demand when a branch factory is established here. The "Perfect" has a capacity of over 1,000 brick an hour. It retails at \$125.

Mr. L. V. Thayer, president of the Peerless Brick Machine Company, Minneapolis, Minn., who has become quite popular among Canadian cement men, was on hand to demonstrate the merits of the Peerless cement brick machine. The "Peerless" is operated by one man and has a capacity of 12,000 a day. It is a marvel of simplicity and durability,

and no better point can be made in its favor than the ready sale it finds in all parts of the country.

The exhibition booth of the Trussed Concrete Steel Company of Canada, Limited, Walkerville, Ont., was made of Hy-Rib and cement mortar—a most effective demonstration. Hy-Rib and self-centering for floors, roofs, partitions, etc. It consists of a perfect steel lath surface stiffened by rigid high ribs. The ribs and the lath are manufactured from a single sheet of steel, making it a complete unit of lath and studs. The material effects a great saving in the cost of building work as it does away with extensive field labor and centering. Samples of this and various other lines carried by the company were shown. Among the latter may be mentioned rib metal which is made of the best open hearth steel and is used for reinforcing cement floors, roofs, cisterns and similar work; also rib bars for columns, floors, slabs, and so on, and the United Steel Sash embodying all modern ideas in fireproof window sash. The merits of Trus-Con exterior wall finishes for waterproofing and finishing concrete were also demonstrated.

Alfred Rogers, Limited, Toronto, selling agents for the independent cement companies, had a most attractive booth which afforded many of the exhibitors and their friends a haven of retreat from the clamour of their own exhibits. Indeed the booth, bedecked with evergreens and palms, would have been a credit to the Horticultural Building of the Canadian National Exhibition. The representatives of the firm had numerous enquiries in regard to shipments for the coming season. Mr. Alfred Rogers, who spent a great deal of time at the Show, had his usual genial smile for the cement men, and that in itself brings business. An ingenious device, known as the Curry bag tyer, demonstrated at the Rogers booth, elicited much favorable comment. The wires are crossed on the neck of the bag. The slide handle is pulled back and the bag is then tied up securely with the loops supported ready for untwisting. This tyer has already been adopted by a number of the leading cement and plaster companies. Its use effects a considerable saving inasmuch as unhemmed bags may be used. A further advantage is that each package of cement is practically sealed.

"Hercules" waterproofing cement, and cement strengthening and waterproofing compounds were featured at the booth of the Ontario Lime Association, Toronto. Here also were shown samples of Crown gypsum plasters manufactured by the Crown Gypsum Company, Limited, York Mines, Ont. (Sale office, 24 Yonge Street Arcade).

The Meaford Wheelbarrow Company, Limited, Meaford, Ont., had an up-to-date line of steel tray wheelbarrows, both with wooden handles and tubular iron handles, adapted to the requirements of cement workers, contractors and others.

The "Little Giant" brick machine was shown by the LaGrange Specialty Company, LaGrange, Ind. The features of this machine are its simplicity and compactness. It makes plain or fancy brick and is claimed to effect a saving of one-fifth of the material used.

The Gearless cement brick machine was exhibited by the Gearless Company, Gloversville, N.Y. The advantages claimed for the Gearless are durability, simplicity of operation and low cost. Either a wet or dry mix may be used, and it is said that the machine, with the same labor and cement, produces 1,000 more brick per day than other makes.

Winnipeg's Building Programme

An Outline of the More Important Work for the Season—Railway Companies Active—Labor Steady

Office of the Contract Record,
March 15, 1911.

Spring-like weather for the past week has had the effect of awakening architects and builders to the realization that the season is close upon them. In consequence there are a number of important plans in the air. In fact within the next few weeks actual work will be started on several big projects which will run into huge sums. Unless there is trouble in the financial world and with the labor organizations, this year in Winnipeg cannot help but exceed all past records.

A brief sketch of what is now in hand may be of interest to readers of the Contract Record. The provincial government has let the first contract, that of the administration building, for the group of buildings which will be rushed to completion to accommodate the new agricultural college in St. Vital, a few miles south of the city. The expenditure on this work alone will amount to over a million dollars, and the first gang will be put to work this week.

Along with this work comes the question of providing street car accommodation, and several companies are in the field for charters for lines through the municipality, which will connect the college either with the city direct or with the existing city lines. Lines have been planned for both sides of the river, and a contract which has been signed calls for the completion of the first of these within a year. Then, too, there are many plans on foot for placing subdivisions in this section on the market, and this means that a number of residences will be constructed.

The city has a large amount of work on hand which will call for rush contracts. The Brant street overhead bridge is to be erected this summer and a large amount of the preliminary work has already been done. The hydro-electric plant will be ready for operation early in July and plans are now being completed for the distribution system. The terminal station and sub-stations are almost ready, but the laying of the conduits on Main street and Portage avenue has not been started. This and the pole lines must be carried through under high pressure.

Work on an addition to the present police station will be started at once, where accommodation is to be provided for the new patrol system and additional quarters for patrolmen and general police detail work. Though the contract has not yet been called for, the city will install, during the summer, a complete patrol system connecting with the central and branch stations. It will mean a good contract for some electrical house as the entire installation will be new and it is proposed to make it absolutely up-to-date. Plans are now being perfected.

There is a lot of work in hand in connection with the bridges of the city. The superstructure of the Louise bridge is making but slow progress and the city is taking steps to see that the contractors live up to their agreement. The government is at work on the lift span of their bridge at the foot of Lombard street for the Transcontinental Railway, and at the Assiniboine river the first two shore spans on the north end of the new double track railway bridge have been placed within the past week. There is a tremendous amount of steel work in connection with the viaduct at the Union terminals still to be done. One-half of the steel for the trainshed has been erected, but there are a half dozen subway viaducts still to be placed. A request has been made to the government for aid in building another bridge across the Assiniboine river at the city park, the government, city and municipality to share the expense.

The indications are that this request will be granted. At Osborne street and at Main street the city proposes to construct new steel bridges, and though the plans have not been completed, the necessary money has been provided for.

There is no end to the proposals in regard to street railways and suburban lines. A cross-town line, parallel to Main street and four blocks to the westward has been insisted on by the city in order to relieve the existing congestion of traffic. It will be a little over a mile in length. Another east and west line parallel to Portage avenue, also to relieve congestion, and about the same length, has also been requested, and there are many extensions proposed to existing lines. This will keep the Winnipeg Electric Railway Company's construction department more than occupied.

The final plans for the entry of the Great Northern into the city are hanging fire, but it is expected that an agreement will be arrived at within a week or two. The demand is for elevated tracks, though there are but three streets to cross, and it is probable that a compromise will be effected, the company raising their tracks about eight feet and the city permitting a subway to be constructed. The Grand Trunk Pacific have considerable work to do at their new shops, east of the city, and already plans are being made for a number of residences, boarding houses and hotels to accommodate the workmen and staff.

Most notable among the rumors, and it is not contradicted at headquarters, is that the G. T. P. will proceed this summer with the construction of a 400-room hotel on a property which they have acquired half a block west of the Union Depot. The plans, as already prepared, call for a structure which will cost over a million dollars, and there have been several events during the past week which add weight to the rumor.

The city has accepted the plans of George G. Teeter for a new tubercular hospital which will be built this summer. Tenders will be called for within a short time, and a site has been selected. The building, which will cost about \$75,000, will be erected in Riverview, on the bank of the Red river.

So far there has been no suggestion of trouble in regard to the labor market, and it is hoped that none will arise. Existing agreements have seemed to give satisfaction and it is expected that those which expire this spring will be renewed.

L. H. S.

From the Federal Capital

Ottawa, March 16, 1911.

Due to the epidemic of typhoid fever, almost the entire interest in the city is on the question of how the water supply can be improved. There has been a great deal of discussion regarding the suggestion of Mr. N. Cauchon and Dr. Bryce to build a sedimentation basin in the Ottawa river west of the city. The need is for something that will help at once. There is so little water over the city intake pipe at present that it has not sufficient head to carry enough water to the pumps when they are running at high speed in case of fire. It has been customary under such conditions to open valves in the intake nearer the shore and let enough water in there to provide against a vacuum being formed in the intake by the fast pumping and the water from the mouth of the pipe not coming in volume enough to supply the pumps. Such a vacuum would cause injury to the pipe. However, it is by letting in water near the shore that has, to a great extent, been responsible for the typhoid. So at present in case of fire if the valves are opened, typhoid water is let in and if they are not the pipe is liable to be torn up. R. L. Haycock comes forward with a proposal for immediate relief. He suggests placing centrifugal pumps at the mouth of the intake pipe which would pump water

into the intake and keep a constant pressure to supply the big pumps at whatever rate they might run. This suggestion is being considered by the city engineer. He suggests two pumps of 100 h.p. each.

Prices in the building supplies remain very much the same, according to the city contracts. Stone is slightly lower. Brick dropped from \$8.30 per M. to \$8.20. In other cases there is not much difference except in the price of sand, which has advanced 7 cents a cubic yard, from 87 to 94 cents. The supply of sand immediate to the city is not as plentiful as could be wished. Then there is a move on foot on the part of the sand interests to amalgamate, and one large company is being formed which claims that it has now control of every sand pit of importance close to the city as well as the equipment used for securing river sand. The promoters of this company state that prices will therefore advance this summer anywhere from 10 to 20 cents a cubic yard.

Probably this will be the biggest advance that will take place in building materials this year. Lumber prices are very nearly the same. The brick manufacturers state that in spite of the fact that the city contract for this material was low, prices will be a little stiffer this year than last. There is already a big demand for brick and the companies are receiving a great many orders for early spring, with little or no supply to meet the earliest buildin. The Silicate Brick Works are beginning operations.

The demand for brick will doubtless be very great all the summer. A large number of apartment houses are being planned as well as many smaller commercial buildings. It is thus very probable that the scarcity which prevailed last year will be duplicated this season.

Some idea of the huge sum annually called for in the improvement appropriations of a large transcontinental railway like the Canadian Pacific can be had from the statement that improvements now under construction at the two cities of Calgary and Toronto alone will involve an expenditure of something like \$17,000,000. Of course this sum does not apply only to the cities themselves, but to general improvements in their vicinity. At Calgary a million dollars will be devoted to the building of a huge hotel; the railway station, new only two years ago, is to be greatly enlarged, and additional office space provided. At Toronto new stations, new freight sheds and a huge sixteen storey building are to be erected. These improvements will make a big hole in the \$17,000,000, and there are numerous smaller items which will take care of the balance of the appropriations for these districts.

Mr. F. P. Jones, general manager of the Canada Cement Company, Limited, recently gave a banquet to the firm's sales staff at the St. Regis Hotel, Montreal. The men came in to headquarters from all parts of the country to meet the heads of the firm and benefit by personal intercourse with them. The general manager presided at the banquet and a very enjoyable evening was spent. Business was reported to be flourishing in all parts of the field.

Mr. J. W. Seens, formerly of the Canadian Bridge Company, Limited, Walkerville, Ont., has been appointed manager of the Structural Steel Company, Limited, of Montreal, to succeed Mr. J. L. Brower, who resigned to become general manager of the National Bridge Company of Canada, Limited.

The appointment of D. O. Lewis as superintendent of construction of the Vancouver Island section of the Canadian Northern Railway is announced. He was recently engaged by Mackenzie & Mann as engineer of the Portland Canal short line.

Vancouver's New City Engineer

Mr. F. L. Fellowes, who has just accepted the appointment as chief, or supervising, engineer for the city of Vancouver, B.C., was born in Ottawa, Ont., about forty-eight years ago. He started to learn his profession before the days of technical colleges and was articled to a firm of civil engineers and land surveyors. Among the first important works of which he was given charge was bridge foundation work under Mr. C. H. Keefer, of Ottawa. Next he was assistant engineer at West Toronto Junction, where he had charge of sewer and subway construction, macadam road building and over-head bridge work. Later he was employed on the short line (now C. P. R.) railway connecting New Brunswick and Quebec. He was for some time assistant engineer of the Central Ontario Railway and was employed on hydraulic power construction work on the Trent Canal, near Trenton. He went to the Northwest on land surveying work before the Riel rebellion. Returning he took up the practice of his profession in a private way at Toronto and supervised the construction of the Keele street subway, which involved an outlay of some \$200,000.

Thirteen years ago Mr. Fellowes went to Montreal, and after three years' private practice was appointed engineer



Mr. F. L. Fellowes, City Engineer of Westmount, who is shortly going to Vancouver

for the (then) town of Westmount, which position he has filled with eminent satisfaction ever since. During this period he has been connected with many important local projects. He worked for a year in conjunction with Mr. F. H. Pitcher, engineer of the Montreal Water & Power Company, and Mr. J. C. Macklin, hydraulic engineer, securing data and preparing a report on the best location for the intake of the M. W. & P. Company. Also, he conducted surveys on the river St. Lawrence to determine the velocity and direction of currents and points of shore sewage contamination, with a view to the establishment of a waterworks system for the city of Westmount. Later, he was associated with Mr. Geo. Janin, chief engineer of Montreal, and Mr. Willis Chipman, of Toronto, representing the Federal Government, as a commission to report on the best system of drainage for the west end of the city of Montreal and adjoining municipalities, including the question of the relation of the Little River St. Pierre to the entire new drainage system. He investigated the various systems of lighting, filtration and incineration in vogue in leading cities in Canada and the United States, and on his report the plants now in

operation in Westmount were established. His latest important work was the preparation of a report for the town of St. Lambert as a basis for waterworks drainage and street improvement operations to the value of \$225,000, on which a favorable vote was given at the municipal elections held recently. In addition to his duties as engineer for Westmount Mr. Fellowes was responsible for purchasing all supplies for the municipal plant, including horses and fodder. He also directed the scavenging department. He has prepared plans and estimates for \$45,000 worth of new paving to be commenced with the opening of the spring.

It is not to be wondered at that a man of such wide and varied experience—and such a capacity for work—should have been offered \$8,000 a year and given a free hand to manage the public works department of the city of Vancouver.

Mr. Fellowes' Successor at Westmount

Mr. Archibald Currie has been appointed city surveyor or chief engineer for the city of Westmount in place of Mr. F. L. Fellowes, who resigned recently to accept the superintendency of public works at Vancouver. Mr. Currie has had wide experience in large municipal engineering



Mr. Archibald Currie, who has been appointed City Engineer of Westmount, Que., to succeed Mr. Fellowes

works, including waterworks and street railway construction in Great Britain and elsewhere.

Born in Glasgow, 42 years ago, and educated in that city and at the West of Scotland Technical College, Mr. Currie graduated as an engineer in 1890. For three years he was assistant engineer with the celebrated firm of Sir John Aird & Sons, contractors, in London. He then accepted an engagement with the Chinese government as resident engineer in charge of important engineering works in the north of China.

When Admiral Sir Edward Seymour made his famous attempt to relieve the European legations in Peking in 1900, at the time of the Boxer uprising, Mr. Currie was his chief engineer. For his services in this connection Mr. Currie received a medal and clasps. A very interesting and touching incident in Mr. Currie's experience at that time was the fact that his wife and family were in Tien Tsin and he, of course, was unable to assist them in their peril or learn how they fared.

South Africa was the next continent visited by Mr.

Currie. The city of Johannesburg benefited by his services for six out of the nine years that he spent in Africa, during which time he was in charge of electric railway, drainage and road construction work.

On returning to Great Britain Mr. Currie became engaged as consulting engineer on water supply works and similar enterprises in Ireland, Scotland and Wales. His coming to Canada having been coincident with Mr. Fellowes' resignation, Mr. Currie's services were at once available and his engagement by the municipality begins at once.

New Montreal Schools

Mr. A. W. Dunlop, architect, Montreal, reports three new schools completed and another to be ready by April 1st. These buildings are for the Protestant School Commissioners. The plans were selected after keen competition. In the case of the Dawson school, which is being built on Christopher Columbus street, at a cost of \$200,000, there were seventeen competitors. The Alexandra school on Saint Guinet street, has been completed at a cost of \$150,000, and the Royal Arthur school, on Canning street, at a cost of \$100,000. Two large wings have been added to the Earl Grey school. The walls of the three first named buildings are built of Montreal limestone to the full height of the basement and in some cases to the top of the first storey; the remaining storeys are of brick with Roman stone trimmings. The contractors were as follows: for the Wm. Dawson school, Gray & Wighton; Alexandra school, Byers & Anglin; Royal Arthur school, C. E. Deakin; Earl Grey school, E. G. M. Cape.

Mr. Dunlop was also the architect for a five-roomed school at Rosemount, for which Mr. L. Beaudry is the contractor.

Contractors Successful in Action against G.T.P.

Judgment in favor of plaintiffs has been given in the action Wickam vs. the G. T. P., the case having recently been concluded at Edmonton after dragging along for nearly two years. It was based on an understanding the plaintiffs, formerly a contracting firm in Edmonton, had with Frank Morse, former general manager of the G. T. P. that they were to secure a contract for 100 miles of the railway west of Edmonton. Mr. Morse sent a telegram to Messrs. Alfred and Wickam giving them to understand that they were to put in supplies, which would be taken over at cost by the railway company, in case the contracts were not awarded to them. The plaintiffs installed \$163,000 worth of supplies at Wolf Creek. When Mr. Chamberlain succeeded Mr. Morse, the supplies were taken over and only \$100,000 paid. Mr. Chamberlain claiming that the contractors, by not having their plant on the ground ready to commence work, had refused to accept the contract.

Messrs. Ross & Holgate, hydraulic and electrical engineers, Montreal, have tested the new plant of the Sherbrooke Railway and Power Company and found it ready for operating. This is a 3,000 h.p. plant, costing about \$150,000. It is on the Magog river and the company will have power to sell as well as to operate their street car service. Messrs. Ross & Holgate were the supervising engineers. The concrete and other building work was done by the Bishop Construction Company, Limited, of Montreal. The Canadian General Electric Company, of Toronto, furnished the electric apparatus, and the Jenckes Machine Company the hydraulic machinery. Work on the plant was commenced last July.

The union carpenters of Victoria, B.C., are asking for \$4.50 a day from the 1st of May.

Contracts Department

News of Special Interest to Contractors, Engineers, Manufacturers and Dealers in Building Supplies.

Information for insertion in these columns is invited from Architects, Contractors, Engineers, etc.

Waterworks, Sewerage and Roadways

Calgary, Alta.

Tenders are to be in the hands of the city in about a week's time for a 5-ton roller, a portable asphalt paving plant (capacity of 800 to 1,000 square yards per day), and a stone breaker. These items are included in the \$25,000 by-law carried. The by-laws for paving and sewers were carried.

Edmonton, Alta.

Tenders addressed to city commissioners, will be received until April 8th for supply of water meters required by the city during the year 1911. Specifications obtained at the waterworks department.

Fort William, Ont.

Tenders addressed to the chairman of the utilities committee will be received until April 5th for labor and material in connection with the laying of 18-in., 14-in., 12-in. and 8-in. water mains, and making necessary connections, valves, etc., will be supplied by the corporation. John Wilson, city engineer.

Hull, Que.

Tenders addressed to J. F. Boulton, city clerk, will be received until April 10th for construction of artificial stone sidewalks, sewer pipe, etc., as the case may be. Specifications, etc., at office of city engineer Chene, C.E.

Ingersoll, Ont.

Tenders for construction of sage drain, Tp. of West Oxford, etc., will be received until April 1st by B. Jenvey, Tp. Clerk, West Oxford.

Lachine, Que.

Tenders addressed to L. K. Jones, secretary, department of railways and canals, will be received until March 28th for concrete walls and building of roads, etc., at office of the superintending engineer of the Quebec canals, No. 2 Place d'Armes, Montreal.

Leamington, Ont.

Tenders addressed to Alex Baird, C.E., commissioner in charge, Leamington, will be received until April 8th for construction of the Seventh Concession Outlet Drain, etc., in Tp. of Malden. Plans, etc., at office of James Honor, Tp. Clerk.

Moncton, N.B.

The waterworks system to be established here is estimated to cost about \$250,000. J. Edington, city engineer; E. A. Reilly, mayor.

North Vancouver, B.C.

Tenders for laying storm sewers on Mahon, Chesterfield, St. George's, St. Andrew's and St. Patrick's avenues, from the waterfront to Third street, were received from: M. P. Cotton & Co., \$36,973; Palmer Bros., \$40,080.83; Mathew and James McDougall, \$37,146.25; Ro-

mino Pinto, \$35,958.25; L. P. Laplacea, \$43,451.62; McAlpine-Robertson Construction Company, \$41,250. R. McLean & Co., \$28,620; and W. Allan Kennedy, \$10,419. Referred to the engineer.

New Westminster, B.C.

Burnaby ratepayers will shortly vote on money by-laws to authorize the raising of half a million dollars for opening new roads.

North Toronto, Ont.

The ratepayers voted in favor of the issuing of \$265,000 debentures for construction of sewerage system.

Port Arthur, Ont.

Work on the lengthening of the 1,000 feet of additional intake pipe here will start shortly. Material is on hand.

Tenders addressed to J. McTeigue, city clerk, will be received until March 25th for supply and delivery, f.o.b. city warehouse, of sewer pipe.

Sarnia, Ont.

Tenders are called until March 25th for constructing cement walks, concrete curb; also for sewer supplies, etc. Specifications at office of town engineer, H. A. McLean.

Saskatoon, Sask.

Tenders addressed to the City Commissioners will be received until April 7th for cement sidewalks. Plans at office of the city engineer, Saskatoon. Jas. Clinkskill, mayor.

Tenders addressed to Jas. Clinkskill and W. B. Neil, city commissioners, will be received until March 24th for the following: tile pipe and specials, galvanized iron pipe, lead pipe, brass fittings, service boxes, water meters, tapping machines.

Simcoe, Ont.

Tenders addressed to E. Boughner, county clerk, will be received until April 4th for construction of septic tank at the Norfolk Industrial Farm and Home. Plans, etc., at office of the above.

Toronto, Ont.

Tenders addressed to the Chairman, Board of Control, will be received until March 28th for construction of sewers on seven streets.

Tenders addressed to the chairman of the board of control will be received for water pipes, valves, hydrants and of water pipes, valves, hydrants and special castings. Advertisement in "Tenders and For Sale Department," of this issue.

Victoria, B.C.

The following firms tendered on the asphalt paving required for View and Fort streets, the government having decided favorably in respect to these two streets: National Paving & Contracting Company, on standard pavement, \$1.90 per square yard; with excavation and curb and gutter extra; Pacific Westrumite Asphalt Company, standard not quoted, alternative bids from \$2.21 to

\$7.50 per square yard, excavation and curb and gutters extra, city engineer standard, \$2.15 per square yard, excavation and curb and gutters extra; Worswick Paving Company, no bid on standard pavement, alternative bids from \$1.00 to \$1.75 per square yard, excavation and curb and gutters extra; Elson Paving Company, alternative bids of \$1.85 to \$2.10 per yard; Moore & Pithick, standard pavement, \$2.60 to \$3.10 per square yard, excavation and curb and gutters extra. The city engineer favored returning the tenders to the various bidders and then calling for bids for a very large amount of work.

Welland, Ont.

Tenders are called until April 4th for construction, etc., of one unit water-driven waterworks pumps, etc. Advertisement in "Tenders and For Sale Department," of this issue.

Westmount, Que.

Tenders addressed to A. D. Shibley, city clerk, will be received until March 30th for supply of cement, sand, crushed stone, lumber, paving blocks, sewer pipe, bricks, and farm tile, required by the road department for 1911. Information obtained from city surveyor.

Winnipeg, Man.

Tenders addressed to the chairman, board of control, will be received until April 19th for supply of labor and materials required in construction of wooden stave conduit for extension of water pipe line, etc. Plans, etc., with city engineer; M. Peterson, secretary.

AWARDED

Hamilton, Ont.

The council gave to Sackville Hill the contract for the year's supply of sewer pipe, also to Chadwick Bros., of Hamilton, for furnishing compression stop and corporation cocks, and 50 hydrant drop valves.

Kerrisdale, B.C.

The contracts for the laying of the pipes for the waterworks system in Point Grey are as follows. Contracts No. 6 and 7 have been awarded to Mr. McAdam and contract No. 8 to Kilber & Moore. It is the intention to construct a reservoir at D. L. 540, to supply that portion of the municipality, in addition to the main reservoir on Whitehead road, and contract No. 6 is for laying a 25-inch main from the reservoir on Whitehead road to the proposed reservoir in 540. Contract No. 7 is for laying distribution mains through Kerrisdale, Magee and the surrounding section of the municipality. Contract No. 8 is for the laying of the distributing mains in Eburne and district. Total amount, about \$145,000.

St. Boniface, Man.

The city council awarded the contract for 1,000,000 gal. reservoir to J. Benoit, of St. Boniface, \$32,330.

Vancouver, B.C.

The paving of Vancouver street between Pandora avenue and Humboldt street, will be done by the Westrumite Paving Company, the British Columbia representative of which is Mr. J. Nixon.

Railroads, Bridges and Wharves**Brockville, Ont.**

Tenders are called by the county road commissioners until April 17th for construction of concrete floor on the South Lake bridge across the Gananoque river, Tp. of Leeds. Plans, etc., at office of E. R. Blackwell, county engineer.

Calgary, Alta.

The Grand Trunk Pacific is after more property along the Bow river front, east of the Langevin bridge. W. A. Lowry is interested.

Centerville, N.S.

Tenders are asked until March 27th by the Hon. Chief Commissioner of Public Works for rebuilding the Centerville bridge in Studholme, Kings Co.

Edmonton, Alta.

The C. N. R., it is said, will build 40 miles on their line running northwest from Onoway toward Dunvegan on the Peace river. Contract will probably be let this spring.

Fredericton, N.B.

It is reported that a second railway may be built between Levis and Moncton. Mr. Thos. Malcolm has, it is understood, acquired the charter for the Quebec and New Brunswick Railway, and contemplates building from Levis to St. Leonard's, a distance of 174 miles. From St. Leonard's the road will run to Grand Falls, a distance of twelve miles, and thence to Woodstock, 74 miles. From Woodstock it is 62 miles to Fredericton, and another twenty miles will take the road into St. John. It is rumored that the road would be constructed in the interests of the Canadian Northern. D. B. Hanna, vice-president C. N. R.

Golden, B.C.

See "Business Buildings."

Kingston, Ont.

On April 4 a by-law will be submitted to the ratepayers to raise \$30,000 for the purchase of the Cataract bridge and the construction of a span in the centre. Noted in issue of February 22nd.

Kenora, Ont.

Tenders are called until March 27th for construction of sub-structures for bridges and culverts on the Manitoba division and for subway at Main street here. Frank Lee, division engineer, Winnipeg.

London, Ont.

Charles Talbot, county engineer, has prepared plans for a number of bridges to be erected in the county of Middlesex this year. Tenders for ten will be called for on April 1st. These range in size from ten-foot culverts to 45 ft. spans, and will cost about \$8,000. All the small structures will be of reinforced concrete; the larger spans will be of steel and concrete.

Montreal, Que.

Tenders addressed to David Seath, secretary, harbor commissioners, will be received until March 29th for construction of ferry wharf and approaches.

Plans, etc., upon application to F. W. Cowie, chief engineer.

Ottawa, Ont.

The city engineer has been instructed to prepare plans for an iron bridge across the G. T. R. tracks at Bronson avenue instead of a wooden bridge, as authorized by the Railway Commission.

The C. P. R. has completed plans and will shortly award the contract for a \$70,000 roundhouse in the Union Station yards here. The structure will be concrete. Big alterations in the yard track-age are also being planned.

Hon. C. R. Devlin will recommend that a bridge be built across the Lievre at Notre Dame du Laus and to continue to Gracefield by means of a new road. A splendid road will also be opened up between Maniwaki and Rapide de L'Orignal. In addition, several buildings will be built.

Tenders addressed to R. C. Desrochers, secretary, Department of Public Works, will be received until April 3rd for construction of Plaza between Dufferin and Sapper's bridges, alterations to Dufferin bridge and demolition and reconstruction of Sapper's bridge. Plans, etc., at office of the above department.

Port Burwell, Ont.

The C. P. R. propose spending about \$30,000 on improvements here, providing the town agrees to certain transfers of property.

Richibucto, N.B.

Tenders are called until March 28th for construction of approach to public wharf here by Public Works Department, R. C. Desrochers, secretary.

Vancouver, B.C.

The Howe Sound & Northern Railway Company will shortly call for tenders for the construction of an additional ten mile extension to the main line. Work will be rushed this spring and summer.

The city engineer has been instructed to prepare a general plan for overhead bridges over the Great Northern Industrial tracks east of Campbell avenue, on Hastings, Pender, Keefer and Harris streets.

Weyburn, Sask.

The contracts for the line from Estevan to Forward, 36 miles; one from Weyburn west 20 miles, and one from Carmangay to Aldeyside, 27 miles, on the C. P. R. are still to be awarded in the west.

Winnipeg, Man.

The plans for the proposed entrance of the Midland Railway into Winnipeg were presented at the board of control meeting by Mr. Gilman, the chief executive. The plans will be discussed before the railways committee. James Fisher, Winnipeg, representative of J. J. Hill.

Surveys have been made for the railway line from Winnipeg to Fort Alexander by the C. N. R. corps. Original charter for line is under the name of the Winnipeg Northern Railway. It is not known whether the road will be electric or steam. The charter gives power for both. Mr. McLeod, manager, C. N. R.

AWARDED**Estevan, Sask.**

A contract for the grading of 55 miles of railway west of Estevan has been let by the C. P. R. to J. D. McArthur.

Fernie, B.C.

The C. P. R. has awarded a contract to Digby & Grenier, contractors, this place, for the construction of a large bridge were as follows: O'Neill & Loney, south fork, near Fernie. The bridge will be 860 feet in length and 137 feet high, and will require 1,500,000 feet of timber, 1,000 yards of concrete, 500 piles and 2,000 yards of excavation. It is stated that its construction will occupy the greater part of six months.

Ottawa, Ont.

The road and bridge committee of the county of Carleton awarded the tenders for the construction of three concrete bridges in the county as follows: Jennings and Ross, Traders Bank, Toronto, for the three bridges. Theirs was the lowest tender and was \$2,795 for the bridge on the second concession of of Osgoode. The 4th line bridge, near Carp, will be repaired. Chas. McNab, county clerk; R. W. Farley, 158 Nelson street, Ottawa, engineer.

St. George's East.

The tenders for concrete and iron bridge were as follows: O'Neill & Loney, Quebec, \$16,172; Joseph Gosselin, Levis, \$14,300.

Whitefish, Ont.

We are advised that the Superior Construction Co. (T. J. Kennedy, president), Sault Ste. Marie, have been awarded the contract for construction of roadbed and structures for the M. & N. S. Ry. from Crean Hill to Whitefish. Contract price, \$1,500,000, let on percentage basis. R. S. McCormick, engineer in charge, Sault Ste. Marie.

Public Buildings, Churches Schools, etc.**Amherst, Ont.**

Competitive plans are called until March 31st for 12-room school of brick with stone or cement trimmings.

Aylmer, Ont.

The ratepayers passed a by-law authorizing the expenditure of \$4,000 on remodeling the town hall. Work will be commenced at once.

Bannatyne, Man.

Tenders addressed to J. N. Semmens, architect, 903 McArthur Building, Winnipeg, will be received until March 30th for erection of Public school here. Plans, at office of Secretary, D. Macdonald, care Lewis Furniture Co., or with above. Also for sinking of well for school at St. James.

Belleville, Ont.

Tenders addressed to city clerk, will be received until March 30th for erection of new reinforced concrete floor at No. 2 Fire Hall; also for painting and glazing of the new police station. Jas. G. Lindsay, city engineer.

Berlin, Ont.

The sketch of Mr. W. H. Breithaupt for the building for athletic grounds was approved. He was authorized to prepare plans, etc., and call for tenders.

Brandon, Man.

It is probable that a Carnegie library will be established here. John McDonald is interested.

Brockville, Ont.

Tenders addressed to A. Stuart Al-laster, architect, will be received until

March 25th for alterations and addition to First church. Plans, etc., at office of the above.

Calgary, Alta.

The by-law to establish incinerator was carried; also that for fire hall.

Tenders addressed to J. Diamond, president, 232 Eighth avenue east, will be received until March 28th for erection of Hebrew Synagogue on First avenue east. Plans, etc., with above.

Tenders were called until March 21st for erection of Wesley Methodist church. Plans, etc., at office of J. E. Bull, Norman Block. T. Vandelinder, Room 9, Alexander Corner, recording steward.

Charlottetown, P.E.I.

The congregation of Zion Church will erect a new church this season. A committee composed of M. McLeod, W. T. Huggan, Rev. R. G. Strathie, pastor, and others, were appointed to decide on plans, to call for tenders, etc.

Chatham, Ont.

Messrs. Zakoor plan extensive improvements to the present Princess theatre.

Collingwood, Ont.

Tenders addressed to John Wilson, architect, will be received until April 4th for erection of 8-room school for the Board of Education. Plans, etc., at office of the above.

Chapleau, Ont.

A new municipal building containing free library, town council chamber, clerk's offices, complete theatre, large assembly and banquet hall will be erected. Tenders are being called for construction by H. W. Angus, architect, North Bay.

Eburne, B.C.

Tenders addressed to J. W. Fairhall, secretary, Point Grey, S. B., will be received until March 29th for erection of 2-storey addition to the Kerrisdale school house. H. Bowman, architect, 112 Crown Building, Pender street, Vancouver.

Additions will be made to three schools in Kerrisdale. Tenders close 29th inst. Architect, Mr. Bowman. The trustees are negotiating for the purchase of four school sites.

Edmonton, Alta.

Tenders addressed to John Stocks, Deputy Minister of Public Works, will be received until March 25th for plastering material and brick required in connection with the new parliament buildings here. Specifications at office of engineer, department of public works.

Fairville, N.B.

Tenders are called by Public Works Department, Ottawa, until April 10th for erection of public building here. Plans, etc., on application to D. H. Waterbury, superintendent of public buildings, St. John, at above department and at local post office.

Florence, Ont.

Messrs. Wilson & Son, architects, Chatham, are preparing plans for a new Methodist church here. Tenders will be called in a few days.

Fort William, Ont.

The council are in favor of submitting a by-law to raise the \$100,000 for school purposes.

Galt, Ont.

The Business Men's Club have decided to erect a club house, 2-storey and basement, 50 x 60 ft., on Dickson street. President Geo. A. Dobbie; secretary-treasurer, M. A. Secord, K.C.

Gravelburg, Sask.

Tenders are called until March 25th for construction of Dominion Government Immigration Hall here. Plans, etc., at office of Geo. Ruffell, Immigration Agent, Moose Jaw; S. J. Bruce Walker, Commissioner of Immigration, Winnipeg.

Grand Forks, B.C.

The provincial public works department is again inviting tenders for the erection of a new court house, tenders to be received until April 3 next. The plans have been completed by Mr. Lawrence, supervising architect, for the provincial government. They indicate complete abandonment of the plans previously prepared, and show a handsome structure in the Italian Renaissance, to be built of British Columbia white marble and buff brick, occupying a ground floor space of 72 by 74 feet.

Hull, Que.

The Sisters of Providence have offered to erect a hospital on modern plans at a cost of \$34,000 in return for site, etc. Work will commence next spring. Mayor Archambault.

Ingersoll, Ont.

Tenders are called until March 30th for erection of public school in S. S. No. 2, Tp. of West Oxford. Messrs. Taylor & Taylor, architects, Hope Chambers, Brantford.

Ilderton, Ont.

Tenders addressed to A. L. Hodgins, secretary, will be received until March 25th for erection of Methodist church here.

Lethbridge, Alta.

Lethbridge will shortly submit two by-laws, \$100,000 for building and improvements on the Agricultural Society grounds, and \$58,600 for improvements to Henderson Park.

Levis, Que.

Tenders addressed to R. C. Desrochers, secretary, will be received until April 5th for erection of Armoury here. Plans, etc., on application to A. R. Decary, district engineer, Quebec.

London, Ont.

The Masons, it is stated, will commence the erection of their new Masonic Temple next month. G. W. McGuire, president.

Montreal, Que.

Mr. Dalbe Viau, architect, is about to call for tenders for two new schools for the Catholic School Commissioners, and for the construction of a row of seventeen tenements on Mentana street, and eight tenements on Stadacona street.

Mr. H. L. Pacaud has taken out a permit for the rebuilding of King's Hall, recently destroyed by fire. The cost of the repairs will be about \$60,000.

At a meeting of the Montreal Amateur Athletic Association the following were appointed on the committee to look after the erection of the proposed new club house: E. Herbert Brown, Gordon C. Bowie, Percival Molson, J. H. Boyd, and others. Estimated expenditure,

\$80,000. architects, Messrs. Ross & McFarlane.

The Winter Club, Limited, have under consideration the erection of a club house. Messrs. E. & J. Maxwell are the architects; Capt. D. C. Newton, hon. secretary. Sir H. Montague Allan, H. S. Holt, H. Joseph, and Hugh Paton are on the building committee.

The Protestant Board of School Commissioners have decided to make an extensive addition to the Fairmount school in Laurier Ward. A new wing on the south side will be four storeys high, the same as the main building. The alterations will be made during the holidays. The construction will be of pressed and rustic brick corresponding with the present building. The windows will be enlarged and made uniform in style. The old heating plant will be replaced by new apparatus, and the ventilation also, the designing of the latter being in the hands of the Domestic Engineering Company. The furnaces and boilers will be in a fireproof apartment. The architects are Messrs. Nobbs & Hyde, and the general contractor is Mr. E. G. M. Cape. The estimated cost is \$150,000.

Nanaimo, B.C.

The Nanaimo Agricultural and Horticultural Society will call at once for tenders for construction of exhibition buildings to cost about \$10,000.

Ottawa, Ont.

The Salvation Army have commenced a campaign to raise \$20,000 for the erection of a new citadel. Staff Captain Burrows, Toronto, is in charge.

Outremont, Que.

The council is again considering the advisability of erecting a new town hall on a more central site than the present one.

Portage la Prairie, Man.

It is rumored here that the government intend to spend about \$100,000 in the erection of buildings. The largest expenditure in view is that at the Industrial school, where the intention is to erect a separate building for the girls confined there.

Port Arthur, Ont.

Tenders addressed to J. McTeigue, city clerk, will be received until March 22nd for construction of proposed extension to municipal building on Arthur street. Plans, etc., at office of M. B. Aylesworth, Court street.

Preston, Ont.

Tenders are called until April 10th for erection of Roman Catholic church here. Plans, etc., at residence of Father Gehl.

Regina, Sask.

The plans of the Regina College were approved by the Board of Governors. Dr. W. W. Andrews, president. Tenders will be called shortly.

Tenders are called until March 24th for erection of new church for First Baptist congregation. H. A. Couse, secretary building committee.

St. Theresa, Que.

Tenders addressed to I. R. A. McDonald, P.P., will be received until March 25th for erection of new Roman Catholic church here. Plans, etc., at Parochial house.

Saskatoon, Sask.

The prospects are that a by-law authorizing the expenditure of \$150,000 for city hall will go to the people.

The council authorized the clerk to advertise for competitive plans for a city hall to cost \$150,000.

St. John, N.B.

The question of the establishment of an incinerator is under consideration.

Sunderland, Ont.

Tenders were called until March 20th for erection of new brick school here. Plans, etc., on application to N. McPhaden or to J. H. Robertson, architect, Orillia, Ont.

Toronto, Ont.

Tenders addressed to Darling & Pearson, architects, 2 Leader Lane, will be received until April 1st for the various trades required in erection of club house for the Toronto Hunt, Limited. Plans, etc., at office of above.

The city will be permitted to build new registry office without submitting the matter to the ratepayers.

The school board has approved of the plans prepared by Superintendent Bishop for the 17-room school on Caledonia road, and tenders were ordered to be called.

Vancouver, B.C.

Tenders are called for erection of a stock judging pavilion, Hastings Park, for Vancouver Exhibition Association. Plans, etc., at office of the architect, C. P. Jones, A.R.A.I.C., 429 Pender street west.

Tenders for the purchase of the court house property, corner of Hastings and Cambie streets, are being asked by the provincial government until April 22nd.

Tenders were called until March 22nd for construction of grand stand in Stanley Park. O. W. Moberg, 314 Cotton Building.

A Western Canada Ice Hockey League, embracing Vancouver, Victoria, etc., has been formed, which has a proposition to construct artificial rinks in these two cities for which sites have already been secured. Contracts will be let within sixty days, it is stated. Directors of Vancouver Co., Messrs. F. L. Buckley, Blake, Wilson and Joseph Patrick, Nelson.

Victoria, B.C.

The inadequacy of the post office for present needs and the necessity for a new court house and a more spacious registry office was discussed at a recent meeting of the Board of Trade. C. H. Lugin and Mr. Leiser spoke to the question. Deputy-postmaster-general, Dr. R. M. Coulter.

Walsh, Ont.

Tenders were called until March 20th for erection of brick veneered 1-storey school for S. S. No. 14, Charlotteville. A. Neilson, trustee.

Welland, Ont.

The Presbyterian Church Sunday school will be enlarged.

Whitby, Ont.

The Board of Education have decided to proceed with the erection of a new collegiate institute at once.

Winnipeg, Man.

The city of Winnipeg will shortly call for the erection of a new tubercular hos-

pital at a cost of \$75,000. M. Peterson, secretary, Board of Control.

Plans for a combined automobile and motor club house at Winnipeg beach are now under consideration and will likely be settled at an early date. When the final decision is reached the building will be commenced at once, and it is expected that it will be ready for occupation during the present year. Accommodation of the highest possible class will be provided for both the motor boat owners and the motorists, including garages for the automobiles and a harbor and land-

AWARDED**Brandon, Man.**

The Brandon Construction Company was awarded the contract for the East Ward school at a price of \$42,256. The building will be eight-roomed, of reinforced concrete, pressed brick and cut stone, with all floors and stair cases fireproof. The contract calls for completion by September 1 next.

Edmonton, Alta.

Mr. M. L. Bertheaume, proprietor Senate Hotel, will erect an addition to cost about \$40,000.

Galt, Ont.

The following contracts for Trinity Church Sunday school have been awarded: Excavation, masonry and concrete work, Thomas and Hancock; carpenter work, Wm. Holman; painting, J. W. Swain; plumbing and electric wiring, Lockhart and Co.; slating and galvanized iron, the Brown-Jarvis Roofing Co., Brantford; plastering, Wm. Mogg, Hamilton.

Hamilton, Ont.

Contracts for erecting the county house of refuge are reported awarded as follows (total cost about \$40,000): Masonry, Hancock Bros.; carpenter work, Bowman & Gray; galvanized iron and slating work, John E. Riddell; painting and glazing, Matthews & Williams; electrical work, Lowe & Farrell; plumbing and heating, Rodgers, Gibson Co.; mantel and tile, Kent, Garvin Co.; all of

Kinston, Ont.

The contract for masonry and carpentry in the Nicol Metallurgy building has been given to Michael Sullivan, of this city, \$45,000. Total cost of building, \$55,000; Powers & Son, architects.

St. Isidore d'Auckland, Que.

The contract for school here was awarded to M. Joseph Perron, St. Isidore, \$1,650.

Stratford, Ont.

The contract for the erection of the new children's shelter on Clark street has been let to Messrs. Cowan and Walker. They will sub-let the work to the various contractors.

Sherbrooke, Que.

The contract for the construction of annex to the St. Charles Borromeo Seminary has been awarded to Messrs. LeFebvre & Bonin, contractors, Sherbrooke. Architect, J. W. Gregoire. Reported cost, \$71,000.

Toronto, Ont.

A. B. Ormsby, Limited, have been awarded the contract for roofing, skylight and copper flashing work on the Museum building, Queen's Park; contract for the galvanized iron work, windows and steel rolling doors on Telegram building.

Vancouver, B.C.

The contract for the new Labor Temple has been awarded to Norton Griffiths Steel Construction Company, Ltd., \$136,000; Thos. Hooper, architect.

Victoria, B.C.

The South Saanich municipal council has awarded the contract for the construction of the new municipal building to be erected on a site near Royal Oak to C. H. Merkely. J. C. M. Keith, architect.

Winnipeg, Man.

S. B. Ritchie has secured the contract for the new pavilion to be erected in Assiniboine Park by the city of Winnipeg.

Residences**Brantford, Ont.**

Tenders addressed to Dr. B. W. Kinscott, will be received until March 25th for erection of residence. Geo. W. Hall, architect.

Calgary, Alta.

William Laing, architect, 229a Eighth avenue east, called for tenders for excavation and concrete works of F. M. Blackhouse, Mount Royal.

Harwich, Ont.

The parsonage of St. Paul's Church, near Chatham, was destroyed by fire on the 17th inst. Estimated loss, \$5,000.

Galt, Ont.

Tenders are called until March 24th for erection of brick veneer house for H. Willard. Plans, etc., with J. Evans, architect, Ball avenue.

Montreal, Que.

Mr. Henry Gaffney, of Montreal and Toronto, is building a block of forty houses on Oxford avenue, Notre Dame de Grace Ward. They will be semi-detached, self-contained, solid brick residences. The entire block is valued at \$170,000.

Moose Jaw, Sask.

Plans are being prepared for a large apartment block on Fairfield street east, property purchased last week. The deal was put through by Davis & McIntyre.

Tenders are called until April 1st for erection of residence, etc., for J. McCauley. Plans, etc., at office of R. G. Bunyard, architect, Moose Jaw.

Prince Albert, Sask.

Andrew Lunn, of Asquith, Sask., has purchased six lots. He will erect a residence.

Toronto, Ont.

H. C. Schofield has been given a permit for a \$26,000 residence, Highland avenue.

Vancouver, B.C.

The Provincial Land & Financial Corporation have filed an application for permits for eight residences, cost \$22,700.

Victoria, B.C.

Dinsdale & Malcolm, contractors, will erect their 3-storey brick and stone apartment house on Field street. Plans have been approved. Estimated cost, \$25,000.

Welland, Ont.

W. G. Rennie, J. R. Jackson and J. Wing, of Toronto, are arranging to build forty houses for rental in the new sub-division purchased here and placed in lots a short time ago. The houses will

cost about two thousand dollars each. Two brick blocks with two stories each are to be built on Division street in the near future.

AWARDED

Brandon, Man.

A. McDonald, Brandon, has been awarded the general contract for erection of St. Paul's Presbyterian Church manse, \$10,500; Brandon Heating and Plumbing Co. that for heating, etc. Shillinglaw & Marshall, architects.

Montreal, Que.

Messrs. Geo. W. Reed Co., Limited, have been awarded the contract for the copper roofing of Lieut.-Col. C. A. Smart's \$100,000 residence on Belvedere avenue, Westmount.

Ottawa, Ont.

Shuttleworth and Black, of this city, have been awarded the contract for erecting W. M. Southam's residence at Rockliffe, to cost about \$25,000. A. Leb. Weeks, architect.

Shuttleworth and Black have been awarded the contract for alterations to Harry Rosenthal's residence, Metcalfe street, \$5,000. A. Leb. Weeks, architect.

Business Buildings and Industrial Plants

Barrows, Sask.

The Red Deer Lumber Company's mills here were destroyed by fire recently. Estimated loss, \$90,000.

Cobden, Ont.

Maclaren's roller mill here was destroyed by fire on the 14th inst. Estimated loss, about \$30,000.

Calgary, Alta.

Plans have been filed by the McNair Fruit Company with Building Inspector Harrison for a two and a half storey brick building on Ninth avenue, between Fourth and Fifth streets west. Noted in issue of February 15th.

The new Hudson's Bay Stores will be located at the corner of Seventh avenue and First street west, with a frontage of 250 feet on the former and 130 on the latter. Estimated cost, \$1,500,000. Architects, Horwood, Burke & White, Toronto. H. E. Burbridge, commissioner; J. M. Baker, Calgary, manager.

Port William, Ont.

The Industrial Bureau have been in communication with the president of a large stone-cutting firm in the east who are likely to locate here. G. W. Gorman, secretary of the former; Dr. W. H. Hamilton, acting chairman.

Galt, Ont.

The C. Turnbull Knitting Company will erect a 4-storey yarn factory of brick, 72 x 110.

Golden, B.C.

Tenders are invited until April 1st for erection of six chalets at Edelweiss Village near here by C. P. R. Advertisement in "Tenders and For Sale Department" of this issue.

Hillsboro, N.B.

The plaster mill here was destroyed by fire recently. Albert Manufacturing Co., owners. Hon. C. J. Osman, president.

Lethbridge, Alta.

The Western Supply & Equipment Company have called for tenders for re-

moval of the houses on the property on which their new warehouse will be erected.

London, Ont.

The management of the Western Wire & Nail Company are seeking a site for their new works which they estimate will cost fully \$250,000.

Medicine Hat, Alta.

Tenders are called until March 22nd for extension of 116 feet and changes to brick and stone station here. J. G. Sullivan, assistant chief engineer; resident engineer at Medicine Hat; division engineer at Calgary.

Montreal, Que.

It is announced that in connection with their dry dock the firm of Vickers, Sons & Maxim will establish an industry for the manufacture of large tiers for locomotives. It is also assumed that a ship-building plant is involved in the company's plans.

Moose Jaw, Sask.

See "Power Plans."

North Vancouver, B.C.

Messrs. Baynes and Horie, of Vancouver, have started the excavation for the three-storey brick block to be erected for Lett & Sons, on First street. The new building will have a 50-foot frontage on First street and will extend back 120 feet to the lane.

Ottawa, Ont.

The Quebec Bank, it is stated, will remove from Wellington street to Sparks street.

D. H. MacLean will erect a block on Wellington street, containing 3 stores and apartments overhead.

Frank Jarman and A. A. Baylis have purchased a property on Bank street on which a large commercial building will probably be erected for Toronto interests.

The Bell Telephone Company will erect another exchange on Bessemer st. of brick with stone trimmings, of two-storeys, with 116 ft. on Bessemer street and a depth of 40 feet. General manager, McPherson.

Peterboro, Ont.

The ratepayers will be asked to vote on a by-law covering an agreement with an automobile tire, rubber goods factory seeking location here. Commissioner Duggan.

Port Arthur, Ont.

The C. N. R. will build a large modern "bunk house" to accommodate over 200 men. Plans are almost complete. Cost, about \$30,000. Gen. Supt., J. A. Cameron.

Prince Albert, Sask.

Andrew Lunn, formerly of Asquith, Sask., has bought the property behind the Merchants' Hotel, on which it is said that he will erect a hotel costing about \$100,000. Excavation will start in the spring.

Port Mann, B.C.

The plans and estimates of the United Engineering & Foundry Co., Pittsburg, Pa., have been adopted for the proposed plant for the B. C. Steel Corporation. Noted in issue of February 22nd.

Regina, Sask.

The proposed new station of the C. P. R. will be constructed with approach leading from Rose street and a

circular drive leading to Hamilton and Broad streets. F. W. Peters, assistant and vice president, C. P. R.

St. John, N.B.

A new company to be known as White, Limited, is seeking incorporation. They will erect a new factory here.

The Safety Board have been asked to consider a proposition from a new company in regard to the erection of a cement plant at a cost of about \$100,000. Capitalization, \$2,000,000. President Beach, of the Pennsylvania Cement Co. is interested.

Sussex, N.B.

The Depot House, conducted by Mr. A. D. Fugley, was destroyed by fire on the 14th inst. Loss, about \$50,000.

Fort William, Ont.

The Barnett-McQueen Company will install a plant for the manufacture of bolts of all kinds at a total cost of about \$10,000.

Sherbrooke, Que.

The Sherbrooke Scale Co. has made arrangements to erect a new factory in the spring. It is understood that the Sherbrooke Machinery Co. will also make large extensions to their plant. Plans are under consideration.

Toronto, Ont.

The work of tearing down the buildings on 35-37 King street east for the Quebec Bank, has been commenced.

Vancouver, B.C.

W. S. Ramsay has under consideration the erection of a 6-storey hotel on Melville and Burrard streets. Plans are being prepared.

The Imperial Car, Shipbuilding & Drydock Corporation, of B.C., 282 Hastings street east, Vancouver, and Washington, U.S.A., are calling for competitive plans for their car works to be located at Roche Point, otherwise known as Imperial, B.C. Estimated expenditure on buildings, equipment, etc., \$50,000, buildings to be of structural iron covered with corrugated iron, etc. Machinery will cost about \$150,000. The competition for plans closes May 1 at 5 p.m.

Winnipeg, Man.

Plans are being prepared for construction of a modern 12-storey hotel. E. J. Rochlon, proprietor, Leland Hotel, is interested.

Tenders were called until March 18th for excavation required for Central Y. M. C. A. J. H. G. Russell, McArthur Building, architect.

Tenders are called for erection of 6-storey warehouse for the J. H. Ashdown Hardware Company. Total cost, about \$80,000. Architect, J. H. S. Russell.

The Notre Dame Block, owned by Manitoba, Ontario and Western Land Co. will be enlarged and remodelled. W. Wallace Blair, architect.

It is rumored that the Hudson's Bay Company have secured a block of land on Portage avenue between Vaughn and Colony streets. Oldfield, Kirby and Girdner, Portage avenue, negotiated.

The De Cew, Limited, has applied for incorporation in Winnipeg. They will go into the business of movable lighting installations and ornamental plaster work and decorating, with branches in the west.

The Grand Trunk Pacific officials do not deny the report that they are going

(Continued on page 58)

Tenders and For Sale Department

City of Moose Jaw, Saskatchewan

Main Drainage Works

Sealed tenders endorsed "Tender A" and "Tender B" will be received by the undersigned City Clerk until 8.30 o'clock p.m., on Monday, April 10th, 1911.

Any tender received after the above-stated time will be declared informal.

Contract "A."

Supplying material for and constructing a Sewage Disposal Plant complete, including Pump House, Sedimentation Tanks and Percolating Filter, also the supply of materials for and the laying of a Trunk Sewer and Water Main.

Contract "B."

Supplying two Electrically Driven Centrifugal Pumps and Auto Starters complete with all piping, connections, etc.

Plans and specifications for Contract "A" may be obtained from the City Engineer, Moose Jaw, upon receipt of a marked cheque for the sum of \$25 to be held until the return of plans and specifications, and for Contract "B" plans and specifications will be sent upon request.

The lowest or any tender not necessarily accepted.

J. M. WILSON, City Engineer. W. F. HEAL, City Clerk.
Moose Jaw, Feb. 18th, 1911. 9-14

City of Moose Jaw, Saskatchewan

SEWER AND WATER EXTENSIONS

Sealed tenders endorsed "Tender 28," "Tender 29," "Tender 30" and "Tender 31," will be received by the undersigned City Clerk until 8.30 o'clock p.m. on Monday, April 10th, 1911.

Any tender received after the above stated time will be declared informal.

Contract 28.—The laying of approximately 30,700 lin. feet of tile pipe sewer, building man-holes, etc.

The laying of approximately 20,700 lineal feet of cast iron water main, placing valves, valve boxes, hydrants, etc.

Contract 29.—The supplying of approximately:

- 29,600 lineal feet of 6-in. c.i. water pipe.
- 112 lineal feet of 4-in. c.i. water pipe.
- 132 6-in. cast iron reverse curves.
- 34 6-in. cast iron crosses.
- 72 6-in. cast iron tees.
- 29 4-in. off 6-in. cast iron tees.
- 28 4-in. cast iron tees.
- 95 6-in. cast iron plugs.

Contract 30.—The supply of approximately:

- 28,000 lin. feet of 6-in. vitrified tile sewer pipe.
- 26,600 lin. feet of 8-in. vitrified tile sewer pipe.
- 5,225 lin. ft. of 10-in. vitrified tile sewer pipe.
- 1,100 lin. ft. of 12-in. vitrified tile sewer pipe.
- 25 8-in. tees.
- 75 6-in. tees.
- 25 8-in. ¼ bends.
- 100 6-in. ½ bends.
- 25 8-in. stops.
- 25 10-in. stops.
- 400 4-in. to 6-in. increasers.

Contract 31.—The supply of approximately:

- 65 6-in. 3-way hydrants.
- 147 6-in. gate valves.
- 29 4-in. gate valves.
- 150 6-in. valve boxes.
- 29 4-in. valve boxes.
- 88 manholes, frames and covers.

Plans and specifications for Contract 28 may be seen at the office of the City Engineer, Moose Jaw, and at the offices of the Canadian Engineer at Toronto and Winnipeg.

Plans and specifications for Contracts 29, 30, and 31 will be sent upon request.

The lowest or any tender not necessarily accepted.

J. M. WILSON, City Engineer. W. F. HEAL, City Clerk.
Moose Jaw, Feb. 24, 1911. 9-14

Tenders Wanted

For a Steam Road Roller, and crushed stone for County of Middlesex.

Sealed tenders will be received by either of the undersigned until noon on Thursday, March 30th, 1911, for crushed stone delivered F.O.B. at the following stations on the Grand Trunk Railway, viz., Parkhill, Strathroy, Mt. Brydges, and Newbury; also F.O.B. at the following stations on the Canadian Pacific Railway, viz., Appin Junction, Caradoc, and Belmont. The contractor to quote prices for 2-in. and ½-in. stone, to be delivered in car lots as required, also at the same time tenders will be received for a ten-ton Steam Road Roller.

CHAS. TALBOT, T. E. ROBSON,
11-12 County Engineer. County Clerk.

Tenders Wanted

Sealed tenders marked "Tender for Bridges" and addressed to J. A. Smith, Esq., Clerk of Brantford Township, Ont., will be received up till noon on Monday, April 3rd, 1911, for the construction of four concrete bridges for the Municipality of the Township of Brantford.

Two of the bridges are plain concrete arches, and two are reinforced concrete girder bridges.

Plans and specifications may be seen at the office of the undersigned, Court House, Brantford.

The lowest or any tender not necessarily accepted.

JAMES A. SMITH,
11-12 Township Clerk.

Tenders Wanted

Sealed tenders addressed to the undersigned will be received up to noon of 31st March, 1911, for all the various trades interested in the erection and completion of the new building for the Public Library in the Town of Simcoe, Ontario.

Drawings and specifications may be seen at the office of the Chairman of the Building Committee in Simcoe, and the Contract Record, 220 King Street west, Toronto.

H. B. DONLY,
Chairman Building Committee,
11-12 Public Library Board.

City of Brantford

Tenders for Pavement

Sealed tenders addressed to Alderman C. H. Hartman, Chairman of the Board of Works, in care of the City Clerk, Brantford, Ont., will be received until 12 o'clock noon on Thursday, March 30th, 1911, for the construction of a pavement on South Market Street.

About 5,000 square yards of top surfacing, of which 800 square yards will be on a ten per cent. grade.

Tenders for different kinds of surfacing will be received.

Concrete foundation for this pavement will be laid by the City.

Single track line of Street Railway on street. Plans and specifications may be seen, and instructions to bidders and forms of tender obtained at the City Engineer's Office.

Each tender must be accompanied by a marked cheque for 5 per cent. of the amount of the tender.

The lowest or any tender not necessarily accepted.

T. HARRY JONES,
City Engineer's Office, City Engineer.
Brantford, March 13, 1911. 11-12

To Architects

Competitive Plans

The Municipal Council of the Town of Goderich is desirous of obtaining plans for a proposed new municipal building (combined Town Hall and Fire Hall) to be erected on the site of the present Town Hall.

Conditions of competition can be had on application to the undersigned.

Plans will be received up to and including April 15th, 1911.

L. L. KNOX, Town Clerk,
11-13 Goderich, Ont.

Bridge Tenders

Sealed tenders addressed to the Chairman, Board of Works, Owen Sound, will be received up till 6 p.m., Friday, April 7th, 1911, for the following:

1. 9th Street Bridge—
 - (a) Steel superstructure, span 53 ft., width 40 ft.
 - (b) Reinforced concrete floor for same.
 - (c) Concrete abutments for same.
 - (d) Reinforced concrete arch, span 50 ft., width 40 ft.
2. 10th Street Bridge—
 - (a) Steel superstructure, span 60 ft., width 66 ft.
 - (b) Reinforced concrete floor for same.
 - (c) Concrete abutments for same.
 - (d) Reinforced concrete arch, span 66 feet, width 66 feet.
3. Removal of old bridge and construction of temporary one.

A certified bank cheque payable to the Treasurer of the Town of Owen Sound for 5 per cent. shall accompany each tender, to be returned in case of non-acceptance, and to be forfeited in case the accepted tenderer declines the contract or fails in the performance thereof.

Plans and specifications may be seen at the office of the Town Engineer.

Tenderers for steel superstructure to submit plans and strain sheets.

The lowest or any tender not necessarily accepted.

J. K. LESLIE, R. McDOWALL, C.E.,
Chairman Board of Works, Town Engineer.
Owen Sound, March 7, 1911. 11-14

City of Prince Albert

Tenders for

Intercepting Sewer

Sealed tenders addressed to the Commissioners of the City of Prince Albert and marked "Tender for Sewer" will be received until noon on Saturday, the 15th day of April, 1911, for the construction of a Main Intercepting Sewer, as follows:

5,749 lin. ft. 4-ft. 6-in. x 3 ft. concrete sewer.

4,640 lin. ft. 4-ft. 3-in. x 2-ft. 10-in. concrete sewer.

2,798 lin. ft. 4-ft. x 2-ft. 8-in. concrete sewer.

19 Manholes.

Alternate bids for Reinforced Concrete Pipe will be considered.

Plans and specifications may be obtained at the office of the City Engineer.

A marked cheque for \$2,500, in favor of the Treasurer of the City of Prince Albert must accompany each tender submitted.

ANDREW HOLMES,
C. O. DAVIDSON, Commissioners.
F. A. CREIGHTON,
Prince Albert, Sask.,
March 7, 1911. 11-13

Sealed Tenders

will be received until Monday noon, April 3rd, for the construction, delivery and erection in place in Welland, Ont., of one unit of water power driven waterworks pumps, three million imperial gallons daily capacity, including turbine, pipes, valves, etc.

Specifications, prepared by Mr. Wm. Kennedy, Jr., Engineer, Montreal, may be obtained from the undersigned.

Envelopes to be marked "Tenders for Pumps."

R. COOPER,
Chairman Water Commissioners,
Welland, Ont.

11-13

For Sale

The Board of Power and Light Commissioners of Ingersoll, Ont., have for sale for immediate shipment, two 25 h.p. Induction motors, C. G. E. 3-phase, 220 volts, 4 Canadian General transformers, each 15 k.w. capacity, 2,200 220 volts, 60 cycles, S. P. direct current Arc Lamps, direct current motors, 220 and 110 volts from 1 to 40 h.p., and for delivery within a few weeks, steam engines, boilers and general steam plant accessories. Particulars on application.

W. R. REYNOLDS,
Superintendent.

11-13

Concrete Mixer for Sale

Ransome Concrete Mixer No. 2, complete with Engine, Hoisting Crab, bucket, charging barrows and concrete carts, all in first-class order. Cheap.

CLARKE & CLARKE, LTD.,
Christie street, Toronto.

12-14

Tenders for Road Rollers

Tenders will be received by the undersigned up to the first day of April, 1911, for a Steam Road Roller, prices to be given on both ten and twelve-ton rollers delivered f.o.c. Simcoe; full description of machine to accompany tender; delivery to be made on or before the first of May next.

The lowest or any tender not necessarily accepted.

W. C. McCALL, Clerk,
Town of Simcoe.

12-12



Notice to Contractors

Tenders will be received by registered post only, addressed to the Chairman of the Board of Control, City Hall, up to noon on Tuesday, March 28th, 1911, for the Laying and Jointing of Water Pipes, Valves, Hydrants, and Special Castings.

Envelopes containing tenders must be plainly marked on the outside as to contents.

Specifications and forms of tender may be obtained at the office of the City Engineer, Toronto.

The tenderers shall submit with their tender the names of two personal sureties (approved by the City Treasurer), not members of the City Council or officers of the Corporation of the City of Toronto, or in lieu of said sureties the bond of a Guarantee Company, approved as aforesaid.

The usual conditions relating to tendering, as prescribed by City By-law, must be strictly complied with, or the tenders will not be entertained.

The lowest or any tender not necessarily accepted.

G. R. GEARY (Mayor),
Chairman Board of Control.

City Hall, Toronto.
March 14th, 1911.

12-12

Tenders for Cement

Sealed tenders endorsed "Tender for Cement" will be received at the office of the undersigned up to 4 o'clock p.m. on March 31st, 1911, for supplying 4,000 barrels, more or less, of Portland cement. Tenders will state whether cement is packed in sacks or barrels, net weight per sack or barrel, and price f.o.b. Peterborough. Sample tests will be made from consignments before acceptance. Delivery to commence not later than May 1st, 1911. A marked cheque for an amount equal to 5 per cent. of total contract must accompany each tender. Specifications furnished on application. The lowest or any tender not necessarily accepted.

12-12

S. R. ARMSTRONG,
City Clerk.

Steam Shovels

We own and have for sale near Buffalo, N.Y., two Vulcan 75-ton 2½-yard steam shovels; late model, with new extra large boilers and in excellent condition; also one 70-ton. These will stand most rigid inspection and we are offering them at unusually low prices. Confer with us.

WILLIS SHAW MACHINERY CO.,
171 La Salle Street,

T.F.

Chicago, Ill.

Tenders Wanted

Bulk and separate tenders for all or any of the several branches required in the erection and completion of a

PUBLIC SCHOOL BUILDING

to be erected in School Section No. 2, Township of West Oxford, Ont., will be received up till noon Thursday, March 30th, 1911.

All tenders shall be sealed, marked "Tender" and addressed to M. C. Bell, Esq., Ingersoll, Ont., Secretary School Board in above S. S.

The plans and specifications may be seen upon application to the secretary or at the office of Taylor & Taylor, architects, Hope Chambers, Brantford, Ont.

Lowest or any tender not necessarily accepted.

Brantford, Ont., March 14, 1911. 12-12

Tenders for Swiss Chalets at Golden, B.C.

for the

Canadian Pacific Railway Co.

Sealed tenders are invited for the erection of six chalets of Swiss design at the C. P. R. Swiss Village "Edelweiss," near Golden, B.C.

Plans and specifications may be obtained on application to the undersigned. All applications must be accompanied by a certified cheque for \$10, which will be returned on the receipt of bona fide tender and the return of the plans and specifications.

Tenders are to be delivered not later than 9 a.m. on Saturday, April 1st, 1911, addressed to J. S. DENNIS.

Manager Irrigation, Alberta and B.C. Lands,
Canadian Pacific Railway Company,
Calgary, Alberta.

The lowest or any tender not necessarily accepted. 12-13

Positions Vacant

Advertisements under this heading one cent a word per insertion. Box No. ten cents extra.

ARCHITECTURAL DRAUGHTSMAN WANTED. Apply stating experience, where last employed and salary expected to McBride and Farncombe, architects, Bank of Toronto Building, London, Ont. 12-12

Positions Wanted

Advertisements under this heading one cent a word per insertion. Box No. ten cents extra.

ARCHITECTURAL AND ENGINEERING ASSISTANT. An Englishman at present time engaged at a large municipal corporation in England, as clerk of works, is anxious to obtain an appointment either as architect or engineer's assistant, or clerk of works. Used to control of men of all branches, 16 years in architectural, civil and electrical engineering profession. Special work, electrical power house design and erection. Reliable, 21 Smith's Avenue, Hamilton, Ont. 12-12

Miscellaneous

Advertisements under this heading two cents per word per insertion.

REPRESENTATIVES WANTED. Large American firm manufacturing waterproof coating for concrete, wants to secure reliable firm to handle their product in Canada. Good inducements. Box 243, Contract Record, Toronto, Ont. 11-12

Civil Supplies

Separate tenders will be received up to 4 p.m., Tuesday, April 10th, 1911, addressed to John E. Boulton, City Clerk, Hull, P.Q., and endorsed:

Tenders for Construction of Artificial Stone Sidewalks, Sewer, Cast Iron Pipe, etc., as the case may be.

Specifications, forms of tender and information may be obtained at the City Engineer's Office, City Hall, Hull, P.Q.

D. CHENE, C.E. and C.,
City Engineer.

12-12

To Contractors

Tenders will be received at the Office of the Secretary, School of Mining, Kingston, up to 6 p.m., of Saturday, April 1st, for the Cabinet Work, comprising Tables, Benches, Fume Cupboards, and other Furniture, and also Plumbing and Fitters' Works required in the completion of the Chemistry Building for the Governors of the School of Mining.

Plans and specifications may be seen at the office of the undersigned.

The lowest or any tender not necessarily accepted.

POWER & SON,
Architects.

Merchants' Bank Chambers,
Kingston, Ont.

12-13

Town of Brampton

Pavement Construction

Sealed tenders addressed to the Town Clerk will be received up till 6 p.m., Monday, April 17, 1911, for the construction of approximately 8,000 square yards of pavement and 3,500 lineal feet of concrete curb and gutter. Different classes of pavement to be constructed are: 1. Asphalt Block; 2. Vitrified Brick; 3. Bitulithine; 4. Bituminous Macadam.

Plans and specifications may be seen at the Town Engineer's or the Town Clerk's Office. Marked cheque for \$500 or 5 per cent. of tender submitted must accompany each tender.

Lowest or any tender not necessarily accepted.

W. M. TRENDGOLD, W. C. YOUNG,
Town Engineer, Town Clerk
Brampton, March 21, 1911. 12-12

Bellefeuille & Frere, foundry, etc.,
Three Rivers, Que.; C. Bellefeuille &
D. D. Blais, have registered.

Business Buildings and Industrial Plants

(Continued from page 55)

to go ahead with the construction of a new 400 roomed hotel in Winnipeg this summer. The plans have been completed and many of the minor details decided upon.

The C. P. R. will proceed this summer with the construction of numerous additional buildings for their stock yards in Winnipeg. Gordon, Ironsides and Fares are extending their abattoirs at this point and will shortly let additional contracts.

Woodstock, Ont.

The Libby, McNeill & Libby Co., of Chicago, will erect a factory to cost about \$5,000.

It is stated that tenders for erection of Ken-Knit factory will be called in about two weeks, plans for which are being prepared. Site has been chosen on the east side of Wilson street.

Weyburn, Sask.

Tenders are called until March 25th for erection of wholesale warehouse for the Weyburn Grocery Company. Plans, etc., at office of the Moose Grocery Co., Moose Jaw, Sask., and at office of the General Brokerage Co., Grand Forks, North Dakota, and at office of B. D. Keek, architect, Crookston, Mich.

Wingham, Ont.

The Chisholm Block was damaged by fire on the 13th inst. to the extent of \$15,000. Dr. Chisholm, M.P., owner.

AWARDED

Guelph, Ont.

The contract for the new building for the Canadian Gate Co. was awarded to Cowan & Walker, \$5,000.

Montreal, Que.

E. F. Dartnell has been awarded the contract for supplying about 160,000 white porcelain faced brick for the exterior of the Dominion Express Co.'s building. E. & W. Maxwell, architects; P. Lyall & Sons, Limited, general contractors.

Mr. Pierre Brault has taken out a permit for the erection of a carriage factory at 178 St. Antoine street, to replace the one which was destroyed by fire recently. The main structure will have a frontage of 94 feet by 65 feet, and will be four stories high. Rear addition will be 52 feet by 30 feet, and five stories high. It will be a brick structure; the estimated cost is \$35,000. Architect, Mr. L. R. Monthriand; contractor, Henri Demers.

Ottawa, Ont.

Holbrook and Sutherland have been awarded the contract for erecting a commercial block on Queen street for Hiram Robinson that will cost about \$30,000. It will be 100 feet long. Jas. Mather, architect.

Vancouver, B.C.

Work on the proposed wholesale house which H. T. Duncan will build in Vancouver will be started at once, the contract having recently been awarded to H. L. Stevens & Co., of Vancouver and Kansas City, Mo.

Winnipeg, Man.

Contract was let to Davidson Bros. for the addition of two storeys to the building owned by the Grose and Walker Company, commission merchants, 259-261 Stanley street.

Power Plants, Electricity and Telephones

Berlin, Ont.

There will be no extension of the Toronto Suburban Railway to Hamilton. Guelph, Berlin, Preston, Hespeler and Galt at present.

Fort William, Ont.

The Kaministiquia Power Co., Ltd., will require about 60 miles of standard copper wire shortly, for which contracts will be let. R. S. Kelsch, Power Building, Montreal, designing engineer.

Guelph, Ont.

Manager Hackney, Guelph Radial Railway, was authorized to secure specifications and call for tenders for construction of the St. Patrick's Ward extension.

Lethbridge, Alta.

The report of Superintendent Reid on line extensions, new street lamps and power house equipment (\$1,600) was adopted by council. The estimated cost is as follows: Poles and wire extensions, \$8,625; transformers, \$3,000; meters, \$5,090; 60 new street lamps and mast arms, \$7,240; two wattmeters, water meters, frequency meters, \$1,025; boiler gauge glasses, \$110; total, \$25,000.

Magog, Que.

The ratepayers voted in favor of the erection of a larger power dam on the Magog river. Tenders will be called shortly for construction which involves an expenditure of about \$125,000. Messrs. Ross & Holgate estimate that the dam and power plant, when completed, will give an average of 1,100 h.p. Noted in issue of March 8th.

Moose Jaw, Sask.

Tenders are called until April 1st for erection of car barns and power house for the Moose Jaw Electric Street Railway Co., Ltd. Plans, etc., at office of R. G. Bunyard, architect, Bank of Commerce.

Ottawa, Ont.

Tenders addressed to the chairman of the municipal electrical department, will be received until April 6th for supply of meters, transformers, incandescent lamps, arc lamp globes, carbons, hardware and sundry supplies. J. E. Brown, electrical superintendent.

Peterboro, Ont.

Tenders are called until March 31st for supply of cement. S. R. Armstrong, city clerk. Advertisement in "Tenders and For Sale Department" of this issue.

Renfrew, Ont.

The council have decided to proceed with the construction of the municipal power plant from plans prepared by J. B. McRae, C.E., Ottawa. Estimated cost, \$100,000.

Sault Ste. Marie, Ont.

In connection with the developments of the Lake Superior Paper Company, it is stated the power company is planning the construction of another power canal and a plant capable of developing 40,000 h.p.

Simcoe, Ont.

Tenders are called for steam road roller until April 1st. Advertisement in "Tenders and For Sale Department" of this issue.

Toronto, Ont.

Tenders addressed to the chairman of the board of control will be received until March 28th for insulated copper wire. Specifications with Hydro-Electric System, City Hall.

Tenders addressed to chairman, board of control, will be received until March 28th for integrating wattmeters. Specifications at office of the Hydro-Electric System, City Hall, G. R. Geary, mayor.

The Hydro-Electric Power Commission will call for tenders for material for some ten miles of transmission lines from a point on the Severn river to the towns of Midland and Penetanguishene. Tenders will also include material for transformer stations.

Vancouver, B.C.

The plans of the Vancouver Gas Company, subsidiary to the B. C. Electric Railway Company, in the development of a gas producing plant, call for a large expenditure on plant, wharves, buildings, supply mains, etc., to the amount of about \$1,500,000. Of this about \$600,000 will be spent this year. Acting general manager Glover.

Winnipeg, Man.

Tenders addressed to chairman, board of control, will be received until May 1st for supply and delivery, f.o.b. Winnipeg, of ornamental lighting standards of approved designs. Plans, etc., at office of city electrician; M. Peterson, secretary.

AWARDED

Calgary, Alta.

Tenders for switchboard and apparatus for the new power station were received as follows: Canadian Fairbanks Co. (1) \$4,804; (2) \$6,053; Allis-Chalmers-Bullock, \$5,200; Canadian General Electric, \$5,700; Canadian Westinghouse Co. (1) \$3,845; (2) \$3,650 (accepted).

Miscellaneous

Ottawa, Ont.

Six tenders for the supplying of the city with motor-propelled fire engine were referred to Chief Graham for report. The tenders were for various types of apparatus, ranging in capacity from 750 to 1,000 gallons, and were: Ottawa Machine Company, Limited, \$11,400; Webb Motor Fire Apparatus Company, \$10,450; Pink, McVeity and Blackburn, \$10,350; L. W. Cameron Company, \$10,600 or \$7,850; McDonald and Company, \$9,000; Merryweather and Sons, \$11,300.

St. John, N.B.

Tenders addressed to R. C. Desrochers, secretary, public works department, Ottawa, will be received until March 24th for supply and installation of appliances for fire protection to wharf and warehouses at Sand Point, St. John Harbor. Plans, etc., on application to J. K. Scammell, district engineer, St. John.

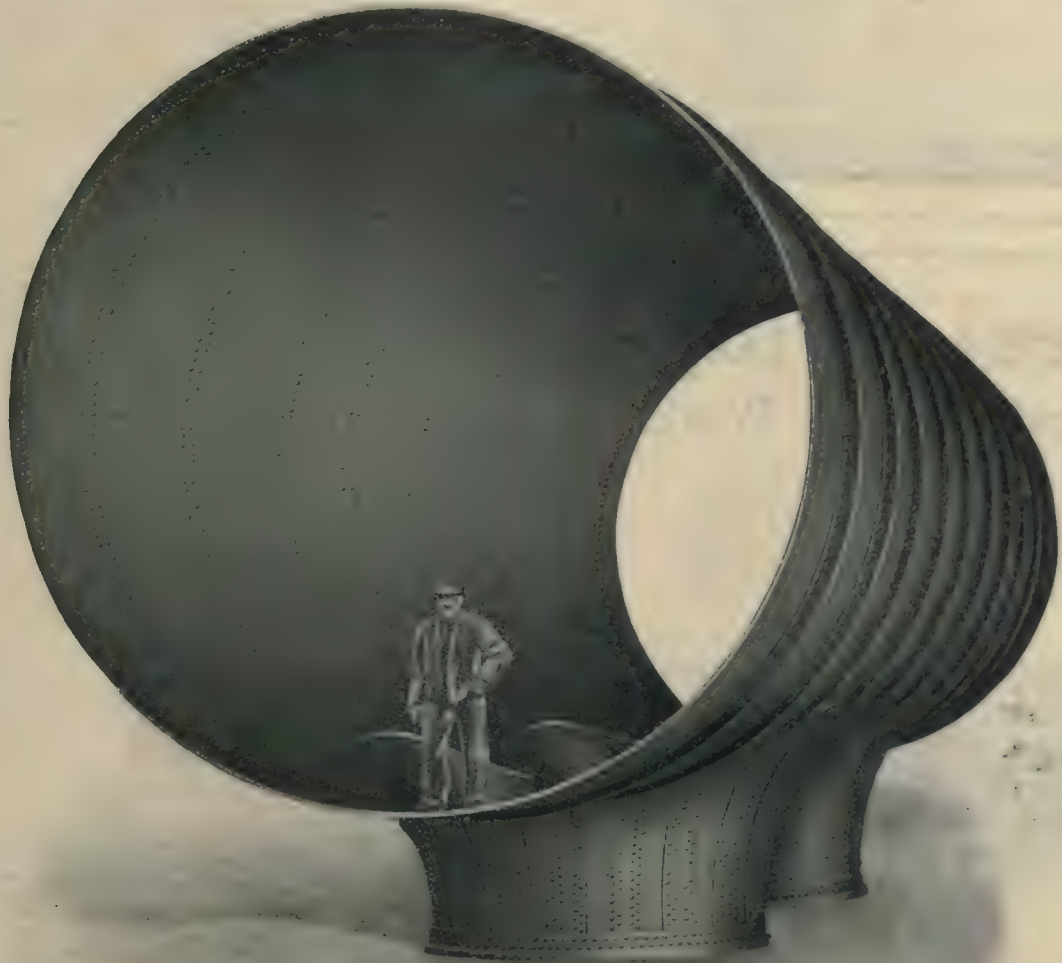
North Toronto, Ont.

The item in the issue of March 8th should have read thus: The Rogers Supply Co. were awarded the contract for supply of crushed stone at \$1.30 per ton.

Vancouver, B.C.

Tenders are called until April 20th for one 85-ft. ladder truck and one chemical engine for the Vancouver fire department. Wm. McQueen, city clerk.

PENSTOCKS



Side view of Penstock Distributor built for the Ontario Power Co.

We would be glad to hear from those who have Heavy Plate work of any kind to build and especially American Companies who are contemplating the erection of Penstocks or Heavy Plate work of any description in Canada. We are specially equipped for this work.

Write us for particulars

The John Inglis Company

Engineers and Boilermakers

Limited

14 Strachan Avenue, TORONTO, CANADA



TO PROVE TO YOU the high, standardized construction and composition of Carey's Roofing, we want to send you BOOKLET AND SAMPLE FREE, and give you practical information regarding Carey's Roofing based on 25 years' actual time-proved tests. Carey's Roofing is equally adapted to flat or steep surfaces, wood sheathing, tile or concrete. Whether your contract is large or small, we want to show you the advantage of using a standardized roofing material. THE PHILIP CAREY MFG. CO., 60 Wayne Ave. Cincinnati, O. 50 Branches.

"FAMOUS FOR DURABILITY"

Steel Bridges and Concrete Work

For over a quarter of a century we have been building Steel Highway Bridges throughout Canada.

Our experience is at your disposal.



We also manufacture Standpipes and Elevated Tanks, Steel Piling, Boilers, etc.

Get our figures before closing your contracts.

The Hunter Bridge & Boiler Co., Ltd.
Kincardine, - Ontario.

Tenders

A few dollars spent in advertising your proposals in

The Contract Record

would result in additional competition, which might save your city or town or your client many hundreds of dollars.

Personal News and Notes

Mr. D. T. Black, of Campbellton, N.B., has been engaged as town engineer of Welland, Ont., at a salary of \$90 a month.

Sir Thomas Shaughnessy left New York recently for a six weeks' tour of Great Britain and the Mediterranean. He will return to Montreal about the end of April.

Mr. Jno. Haddin, of the John Galt Engineering Company, Winnipeg and Toronto, was recently in Cranbrook, where his firm is reporting on the installation of a sewerage system.

Mr. F. L. Fellowes, the newly appointed supervising engineer, of Vancouver, B.C., is due to arrive at the coast early in April. He severs his connection with the city of Westmount at the end of this month.

Mr. J. D. McArthur, the well-known Winnipeg railway contractor, returned recently with his wife to the western capital after an enjoyable trip to southern California. Mr. McArthur is one of the best known contractors in the Dominion. Among his recent noteworthy works may be mentioned the Winnipeg-Lake Superior Junction line of the National Transcontinental Railway. He owns several thousand square miles of timber limits in British Columbia.

Mr. E. A. Wickam, brother of D. P. Wickham, the railway contractor, of Edmonton, Alta., when recently in that city, stated that United States railway contractors are looking to Western Canada for work during 1911. This is owing to the action of the United States Inter-State Commerce Commission in forbidding an advance in rates by the railroads, as a result whereof the companies are curtailing their construction programmes considerably. Mr. E. A. Wickam has been associated with his brother in several important contracts in western Canada and is well known in the province of Alberta. He is general manager of the Cincinnati, Hamilton & Dayton road, controlling some 1,200 miles of railway. He is devoting close attention to developments in the Canadian field.

Quebec Builders' Exchange

The second annual banquet of the Quebec Builders' Exchange was held at the Kent House at Montmorency Falls on the 25th ult. Those present included the premier of the province, Sir Lomer Gouin, Hon. L. A. Taschereau, Minister of Public Works for Quebec, and his Worship, Mayor Druoin. Mr. E. T. Nesbitt, president of the exchange, was in the chair. Sir Lomer Gouin and Hon. Mr. Taschereau replied to the toast of the Province of Quebec. The premier laid particular stress upon the value of technical education and assured those present that his best efforts would be put forth in its behalf. The Provincial Government had created schools for architecture, surveying and forestry engineering and it was to be hoped that these technical schools would multiply in large centres and so stimulate interest in skilled labor.

Hon. Mr. Taschereau congratulated Mr. Nesbitt upon his re-election as president of such an important organization as the Canadian National Association of Builders. The speaker concluded with an explanation of his workmen's compensation bill and incidentally referred to the prospect of lower insurance rates in the near future. Mayor Druoin, responding to the toast, "The City of Quebec," gave a number of substantial reasons for his belief that an era of progress and activity was ahead of the ancient capital. Plans had been accepted for a group of work shops for the Transcontinental. These comprised some 28 buildings, which would likely employ thousands of workmen.

Mr. D. Ouellet responded to "The Architects," and Mr. Jas. Ballantyne, president, Montreal Exchange, to "The Builders' Exchange of Montreal."

Contract Record

ESTABLISHED 1886

A Weekly Journal of
Building, Contracting, Engineering, Public Works
Municipal Progress, Advance Information

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VANCOUVER - Tel. - 26 Crowe & Wilson Chambers
CHICAGO - - - - - 4059 Perry Street
LONDON, ENG. - - - - - 3 Regent St., S.W.

SUBSCRIPTION RATES

Canada and Great Britain, \$2.00 U.S. and Foreign, \$2.50

Vol. 25

March 29, 1911

No. 13

The "Sole Arbitrator" Clause

It has always been an exceedingly difficult matter to prove to municipal engineers the falsity of the position in which they are placed should there by any chance be a vital difference of opinion as to the interpretation of any specification. We do not for a moment say there have not previously been differences, but to fight out such direct differences at law is a costly process. It is our desire to disassociate ourselves completely from any argument of a particular character in relation to one side or the other, that is, we do not wish to take sides, but we do wish to impress upon readers the illogical position which a municipal engineer takes who holds by the "sole arbitrator" clause.

Surely an arbitrator is one having expert knowledge, who shall judge, and judge unbiassedly, between two conflicting opinions. From his very vocation the municipal engineer has a difficulty in putting himself into this position. He is, and must be, a party man. However great his experience, however great his wish to be fair and unbiassed, he is saddled with the responsibility of being in the position that he must do the best he can for his employers—that is, he must err, if he errs at all, on the side of stringency of interpretation in all that counts for authority. And what is his position if the difference of opinion leads to litigation? The procedure can only be on one count—dishonesty. No matter his frame of mind, his effort to do his work in the interest of his employers, whenever that "sole arbitrator" clause is used, legal action must take the course of questioning his honesty. That is not a nice position. His decision is to be "final." It is held to be final unless proved to be dishonest, and, of course, the legal fraternity must so interpret actions and words to support this contention. Now, it may be painful to think it, but nothing is more certain than the fact that no man can go through a trial of this kind unscathed. No matter how really innocent every action and word may have been, there is always a considerable section of the community to take sides and to retain the idea, "there must be

something in it." We have long held the opinion that the members of the profession should not put themselves in the position of being so proceeded against.

There may be arguments of some weight for the retention of the clause making the engineer sole arbitrator, but they cannot prevail against the far more weighty considerations that can be put forward for its rejection. It is a most anomalous position to know that the ordinary verbal interpretation of a specification is never intended to hold good. Phrases are inserted because of custom, because of reference in case of dispute. No valid reason can be given for use of such words, "best of its kind." It is well known that there is no intention of insisting upon the strict interpretation of these words—they are to be read "reasonably." Far better to use words that define more clearly what really is required. Surely language is flexible enough to define anything required within small limits, so that there ought to be little chance of dispute as to what the engineer really wants to buy. We are anxious, at the present moment, to restrict our statements, and rather to indicate the necessity for immediate consideration of the question. The two parties—engineer and contractor—labor under disadvantages which can easily be remedied, if so desired.

Victoria, B.C. is mixed up in a nice little complication over the Sooke Lake survey work. The ex-city engineer, Mr. C. H. Topp, was engaged to make the preliminary investigations. Some time after he had received the notification of his appointment and when he actually had a dozen men at work, the mayor vetoed the selection of Mr. Topp. Whereat the ex-city engineer marvelled somewhat, but said nothing and quietly proceeded with the Sooke Lake scheme. It is understood that Mr. Topp has received legal intimation that the first notification of his appointment, received from the city clerk, holds good. The situation is interesting and there is every promise of a legal squabble as to who shall pay the bill for Mr. Topp's services in the event of the mayor refusing to sign the papers authorizing his appointment.

"Like crows in Stanley Park" is the way a Vancouver man described the flocking of paving company representatives to Victoria recently to bid upon the 400,000 square yards of asphalt which the city contemplated putting under contract. No fewer than thirty-eight agents for almost as many companies put in an appearance, and there was grievous disappointment when it was learned that the legislature had refused to permit the present board of works to consider the tenders owing to an informality in the election of the city council. The allotment of tenders will probably be delayed for two or three months.

As Vancouver is now rapidly taking on all the characteristics of a big city, it is only natural that the civic building by-laws are being found sadly inadequate in many cases. The fact has been recognized by the city council in the appointment of a commission of three experts to revise the existing regulations and draft new ones to fit the needs of Greater Vancouver. The commissioners are Mr. Purdy, of Purdy & Henderson, Mr. U. A. Leech and Mr. G. S. Andrews. They begin their labors with one point irrevocably fixed—hereafter all buildings must be subject to the "ten storeys with 120 feet" limit established by by-law.

The Reader's Views on Current Topics

Can Engineering and Contracting be Successfully Combined?—The Lowest Tender Discussed—The Cement Show and the C.N.E.

Halifax, N.S., March 15, 1911.

Editor, Contract Record:

I presume that the Mr. W. R. Harris, who contributed an article to your issue of November 2nd., 1910, on "The Training of the Engineer-Contractor," is himself an engineer-contractor, but I should judge, from a perusal of his paper, that he was more of a contractor than an engineer, or rather that he was a contractor mainly, and possibly more or less of an engineer incidentally.

I can imagine, indeed I have known, engineers to have become contractors, but I have never known a contractor who has afterwards become an engineer. If I know the meaning of the word "engineer," a contractor cannot become an engineer. In middle life,



Mr. C. E. W. Dodwell, Resident Engineer Public Works Department, Halifax, N. S.

or even early manhood—and at an earlier stage of life he would not be a contractor—he cannot enter a scientific or engineering college and go through the three or four years' course by which alone he can acquire the theoretical and scientific knowledge which constitutes the indispensable mental equipment of an engineer.

Engineer-Contractor "Rarely an Unqualified Success."

The education of an engineer, moreover, would, in a manner, seem to unfit a man for the business of contracting and make it distasteful to him. *Ingenuas didicisse fideliter artes emollit mores, et nec sinit esse feros.* In short, an engineer-contractor is a hybrid and, like most hybrids, rarely an unqualified success. I do not mean to imply that an engineer is not the better for having some practical knowledge of methods and cost of executing the works of his design, or that the contractor is not the better for some scientific knowledge of the constructive principles, or the properties of the materials, and the stresses to

which they are subject, in the work which he undertakes to carry out, but while some practical knowledge of methods and costs is absolutely essential to the engineer in the successful practice of his profession, a knowledge of engineering is by no means a *sine qua non* with the contractor.

In nearly forty years' experience I have had to do with a great many contractors. Of the successful men in this line of business that I have known, nine out of ten began life with the pick and shovel of the laborer, the trowel and hammer of the mason, or the plane of the carpenter. At the present day, the large-scale, successful contractor employs an engineer, or perhaps a staff of engineers, but the point that I wish to make is that between the mental equipment and essential traits of character of the contractor, on the one hand, and of the engineer on the other, there is a very real gulf, or incompatibility, and that no amount or kind of training will blend or reconcile them.

I can therefore give but a very qualified approval to Mr. Harris' advocacy of the teaching of costs and contractors' methods in our engineering schools and colleges. In the first place, few college professors are capable of such teaching, and their efforts in this direction would, in my opinion, be productive of more harm than good. If a professor were capable of teaching the mathematical and physical sciences and principles of design that constitute the foundation of engineering, and if he also had the requisite knowledge and experience of costs, practical methods, constructive details and the rest, he would himself be a successful engineer or contractor; for the successful engineer or contractor makes three or four times, aye, and fifty times, the salary of a professor. In the second place, the basic scientific principles, mathematical and physical, on which all engineering rests, remain fixed, definite, immovable, while costs and methods, and tools and appliances fluctuate, from time to time, and from place to place, and the engineering student laying up a store of scientific facts and principles in one pigeon-hole of his mind, and a set of prices and methods in another, would in after years find it a matter of extreme difficulty and confusion to discriminate between the fixity of one class of knowledge and the variability of the other, and he would be very apt to throw them both overboard together. Thirdly, the engineering student goes to the engineering college to acquire knowledge that he cannot acquire elsewhere, namely, as I said above, the main scientific principles, mathematical and physical, upon which the whole fabric of engineering rests.

The Function of the College.

But what the engineering professor can do, and should do, is to incidentally call the student's attention to the great importance of costs and methods, or what may be called the "economics of engineering," and urge him to make a profitable use of his holidays, by obtaining employment in even a very humble or unpaid capacity, on some engineering work, with a view to the acquisition of some practical knowledge which, on the resumption of his studies, he can blend

and co-ordinate with his theoretical knowledge, to his great and lasting advantage. I have done a bit of lecturing to engineering students in the past twenty years, and I have always made it a point to advise my classes to get all the theoretical and scientific knowledge during their collegiate course that they can absorb and assimilate, because they will never get any after they leave college. It is true that in the past many famous engineers had little or no theoretic training, but they were shining lights in the profession, in spite of, and not because of, their scientific ignorance. And times have changed; the standard of the profession is vastly higher and more exacting than it was forty, twenty, or even ten years ago. The problems that the engineer of to-day is called upon to solve, and the difficulties that he is required to conquer, are far greater and more formidable than they were in the early days of the profession, and to-day, be a man ever so bright, and ever so ambitious or energetic, it is no less difficult for him to reach the highest rungs in the ladder of the noblest of all professions, without a thorough training in science and theory, than it is for a rich man to enter the Kingdom.

Yours truly,

C. E. W. Dodwell.

M. Inst. C.E., M. Can. Soc. C.E.

Canadian Contractors Entitled to Some Preference

Editor, Contract Record:

Referring to the article which appeared in your issue of March 1st, under the heading "The Lowest or Any Other Tender Not Necessarily Accepted," I may say that while I agree with your line of argument in part, I have met cases where I do not think it should apply. I refer particularly to alien contractors who come into the country for the purpose of tendering on some particular piece of work, who have little or no interest in the country, and no intention of locating here permanently. I believe that where competent contractors can be found at home, tenders from foreign contractors should receive about the same consideration as the tenders of Canadian contractors would receive if the positions were reversed.

There are also cases where the lowest tenderer may lack the necessary ability or experience to carry out a difficult piece of work, while at the same time he may be sufficiently strong financially to comply with all the requirements of the tender as to bond, etc., and to lose several thousand dollars, if necessary, in carrying out the contract. But every engineer of experience knows perfectly well what this means in the end; it results in loss of time in completing the work, which may mean thousands of dollars to the proprietor or owner; friction between the engineer in charge and the contractor; legal tangles, and general dissatisfaction.

True, the time of completion can be covered by the bond, but no matter how large a bond you may have it cannot make up for lack of brains or experience on the part of the delinquent contractor. The only recourse is to attempt to recover from the sureties—and this, at best, gives poor satisfaction and usually results in nothing more than an "elongated" solicitor's bill.

No, there are times, I believe, when an engineer or anybody else appointed to consider a set of tenders, should use his judgment, based on his experience, and award the contract to the tenderer who, he believes,

is best able to carry out the work—regardless of the difference of a few paltry dollars which may exist between the bids.

However, when tenders are to be considered which are submitted by bona fide contractors doing business in our own country, and all things are equal as to their fitness and ability to carry out the work, then, I say, by all means award the contract to the lowest.

Yours very truly,

Public Works Contractor.

The Lowest Tender

Editor, Contract Record:

We are pleased to see that the above matter, discussed editorially in recent issues of your journal, is receiving the attention which it deserves. Any business concern that has been in the habit of submitting competitive bids will agree, we think, that the phrase "The Lowest Tender Not Necessarily Accepted," has been very much misconstrued. In our particular experience we find that in a good many instances tenders are let to the lowest bidder without sufficient regard for such important considerations as quality, time of delivery, etc. This is very often the case in the letting of contracts for buildings. The lowest tender is almost invariably accepted for such work, and, as a result, the proprietor suffers. One great objection to the lowest tender is that an irresponsible contractor, not having the financial means to carry the work through, often secures a contract, and although he may provide the necessary bonds it is a matter of continual vigilance on the part of the proprietor, and also the bondsman, to see if he is going to come out successfully on his contract, without loss either to himself or his backers.

To sum up, we cannot see that this question has been receiving the consideration which it deserves. We think that government officials are the greatest offenders in the abuse of this clause. Partly, it may be, they are placed at a disadvantage for political reasons and do not have the discretion or authority to accept any but the lowest tender. We believe that they award many contracts on the sole merit of the lowest bid—and this for the reason that the general public (also, for political reasons) would not give them the credit should they place a contract based on other than the lowest tender received.

There can only be one correct way, and that is to let contracts the same as a merchant would purchase goods, i.e., with the object of securing the best value for the least money. Particular attention should be paid to the value at all times, for value remains long after price is forgotten.

Yours truly,

A Western Firm.

The Cement Show and the Canadian National Exhibition

Editor, Contract Record:

In connection with the suggestion in your last number, that the Cement Show be held at the same time and form a part of the Toronto Exhibition, it may be worth while to point out some of the difficulties which would be encountered.

In the first place it is doubtful whether the Exhibition authorities would welcome the suggestion that any building industry so highly specialized, and therefore limited in its scope, should have a building of its

own. It is quite conceivable that they would be inundated with similar requests from other industries even better prepared to shoulder the financial burdens involved.

The time of the year at which the Toronto Exhibition is held is at the close of the summer season when practically every contractor is doing his utmost to complete the contracts which he has under way. The Cement Shows have always been held, both here and in the United States, at the opening of the contract season, when the buyer wants to purchase his supplies and the seller wants the opportunity of meeting the buyer. The Canadian Cement & Concrete Association hold the show purely for its educational value, and therefore, to hold it in conjunction with the Toronto Exhibition would be as satisfactory as at the present time, but it is questionable whether it would be possible to secure the co-operation of the firms who could more conveniently exhibit at a season when they were less taken up with the actual filling of orders.

If the Cement Show were held in a special building on the Exhibition grounds, it would be only fitting that this building should be constructed of reinforced concrete and that it should be of such capacity as would hold as many exhibits as the St. Lawrence Arena. Such a building would involve the solution of some interesting engineering and architectural problems. While this could be met from within the membership of the association, the main problem, that of financing the undertaking, could not be met by the members.

Neither the association nor the executive have expressed any opinion as regards this suggestion, although it has been discussed, and the above remarks can only be taken at their face value as an expression of personal opinion.

Yours truly,

W. Snaith,

Sec.-Treas. Can. Cement and Concrete. Assn.

Contract Work at Montreal

Interviewed recently upon the Quebec legislature's new law empowering the city engineer of Montreal to tender on all municipal works, a number of prominent contractors expressed opinions which reflect pretty well the attitude of the trade upon this matter.

Among those who discussed the subject with the "Contract Record" was J. P. Heffernan, of Messrs. Henault & Heffernan, municipal contractors in Quebec and other provinces, a firm which has done as much work in Montreal in recent years as any other concern we know. Mr. Heffernan expressed himself as being in favor of the new law and said that as a citizen as well as a contractor he considered that the city should get its work done as cheaply as possible, and if it could be done more economically by day labor than by contract there could be no valid objection. Concerning the responsibility of the engineer, however, Mr. Heffernan had this to say: "When the city engineer puts in a successful bid he should be held responsible if the work costs more than his estimate put up against contractors. This would put the engineer and contractor on an equal basis. Under exceptional circumstances, where the conditions of the work varied subsequently, as sometimes happens, allowances might be made, but as a general rule the engineer should be held accountable for the excess of the actual cost over his tender. Whether or no he should pay

the difference out of his own pocket I am not prepared to say, but certainly the citizens should be protected. In several cases, to my knowledge, work done by day labor has cost from 10 to 40 per cent. more than contractors' prices offered. The citizens' money paid for the work and nothing was heard of it.

"As to supervision," continued Mr. Heffernan, "the city will probably have more difficulty than contractors in securing competent foremen. Moreover, the contractor employs his men regularly and obtains the maximum efficiency. There is another point, and that is, that the city engineer's work is often scattered all over the city and if he has to supervise it all personally, the results cannot be entirely satisfactory. In any case, however, contractors have nothing to fear from the new law, if Winnipeg and Toronto may be taken as a precedent."

Mr. F. D. Lawrence, who contracts exclusively for municipal work, believes that the new law will minimize the opportunities for the collusion that has been effected in the past. "It is a safeguard for the city's interests," said Mr. Lawrence, "to which no straight contractor can object. At the same time I cannot see how the city will benefit. The corporation is no better equipped than the private contractor. The civic officials must take what workmen they can get, whether competent or incompetent, and pay them union wages. Contractors can pick their men by paying them what they are worth. The city is liable to get the leavings. However, there is not likely to be any opposition to the new law on the part of local contractors."

An interview was also accorded this journal by Mr. J. W. Harris, who has done a considerable amount of work for the city during the past six or eight years. Mr. Harris said: "I am pretty confident that the city will find out before long that day labor is not as economical as contract work. The city has no trained staff to carry out large contracts and this circumstance must militate against expeditious construction. I do not believe the city could undertake such work as the projected filtration plant or the enlargement of the viaduct. And as for street paving and drainage work there is not much in either for contractors. Cement, wages, and machinery have advanced lately and this will make public works more expensive this season. No, I have not heard of any serious objection to the new regulation."

Another prominent contractor said that inasmuch as the city had always estimated on public works and required contractors' bids to come within a reasonable distance of the figure, the new system would not produce any change. As far as his experience with day labor was concerned, however, he had generally found that it had exceeded the estimates.

City Engineer Hay, of Peterborough, Ont., reports to council there that the oiling of the city streets can be accomplished for 25 per cent. less than watering.

Workingmen's houses have been built of reinforced concrete at the new plant of the British Aluminum Company, at Kinlochleven, Scotland. The walls have reinforced concrete columns and beams, and the panels are filled with a wall of two 1½-in. concrete slabs with a 2-in. air space between. The surface is finished by rough-casting. The architect, Mr. A. A. H. Scott, states that the construction has proved entirely satisfactory.

Municipal Work at Nanaimo, B. C.

The annual report of Mr. Allan Waters, city engineer of Nanaimo, B.C., contains a number of items of interest. A separate system of sewerage estimated to cost \$300,000, is now under construction. For the first section the city was authorized to borrow \$100,000. This section, the contract for which was let to Macdougall & Company, Vancouver, at \$48,600, is now nearing completion. It embraces the business portion of the city, four main trunk sewers to residential sections of the city, together with the two main outfalls into the harbor. In this connection the British Columbia Pottery Company, Victoria, B.C., were awarded the contract for the supply of vitrified pipe.

The state of this work at the date of the report is as follows: The main business streets have been sewered, three out of the four main trunk sewers on this contract have practically been completed, an important section of the linking up of the outfall sewer has yet to be constructed, the Comox Road section is well in hand, and the contractor has commenced the construction of a 12-inch iron outfall at that point.

The main outfall of 18 inches diameter iron pipe is being laid on piled bents from shore to main channel of harbor by the city workmen. The arrangements have been made with the Western Fuel Company to fill in with mine refuse the section of pipe from the shore out to near the ferry slip-way. From near slip-way out to main channel the pipe will be laid below low water.

The total length of vitrified pipe of various sizes from 6-inch to 18-inch laid is 16,400 feet, or nearly three miles. The grades average 3.0 per cent., excessive grades being avoided as far as possible by ramped manholes. The approximate average depths of trenches outside of business section of city is 6½ feet. Amount of rock, hardpan and cemented gravel excavated, 3,823 cubic yards. Amount of shale, 978 cubic yards. The estimated total cost of the work, including preliminary surveys up to the end of the year, inclusive of pipes, is \$566,000.

There are 16 miles of streets within the city limits. During 1910 six miles of concrete sidewalks were laid and placed under contract.

The proposals for 1911 embrace further important extensions to the sewerage system as well as a considerable amount of paving work.

Considerable interest is being shown in the tinting of concrete when it is used for residential purposes. Undoubtedly, the work can be done successfully with certain colors. Concrete can be tinted green, for instance, by the use of chromium oxide, in proportions of approximately five to eight per cent. of the weight of the cement used. A yellow or buff tint can be obtained by the use of French ochre in the percentage of four to ten, according to the shade desired. Red is obtained by the use of red oxide of iron, that manufactured in Germany or France preferred. A pure white concrete can be made by the use of one part white Portland cement and two parts marble screening, tough, hard marble preferred, the screenings to pass through a No. 8 screen and be collected on a No. 40 screen. It should be mixed fairly wet so that it will run into the molds. The molds should be slightly rocked and jarred so as to expel the air bubbles. For some characters of work, the concrete can be made not quite so wet, but of about the consistency used by brick masons in laying brick, and pressed in the molds.

As soon as the concrete is hard, say in three or four days, it should be rubbed well with a fine terrazzo polishing stone. This will give the appearance of a white polished surface. Although the cement itself will not have been polished, each particle of marble will present a polished surface.

Polychrome Concrete

A large concrete vase, made of what is termed "polychrome concrete," was shown at the recent exhibit of the Architectural League in New York, in order to show the effects that can be produced for garden ornaments, decorative panels, balustrades for bridges and similar purposes. The materials were crushed black and yellow marble screenings all passing a No. 8 screen, ⅛-in. mesh; black and yellow marble chips all passing ½-in and retained on a ¼-in. screen, and Vulcanite Portland cement. Mr. Albert Moyer states that the aggregates were mixed wet and moulded in a plaster mould. As soon as the concrete was hard enough to hold its shape, which took about 48 hours, the inside core was removed. Inspection of the interior indicated that the outer mould could be removed, and as soon as it was taken off, the surface was scoured with a stiff scrubbing brush and water. Where this failed to remove the surface coating a wire brush was used. The concrete was brushed until the larger aggregates all appeared, and in order to obtain texture the brushing was continued until they were thrown slightly in relief. The vase was then cleaned with water and kept damp for a couple of weeks, after which it was washed with a solution of 1 part of dilute muriatic acid to 5 parts of water. The acid was left on for a couple of minutes and then scrubbed off with clear water and a scrubbing brush. The effect as to color, texture and form of such concrete, Mr. Moyer states, is permanent.

High-head high-efficiency impulse wheels were built by Escher Wyss & Co., of Zurich, Switzerland, for a peak-load electric generating station for Milan at Isola, Italy. Each wheel (of four) is rated at 6,500 h.p., and has a single deflecting needle-nozzle. The diameter of the wheel is 108¼ ins. on the pitch circle; the head is 2,800 to 3,000 feet, and the speed of the wheel is 420 r.p.m. The maximum efficiency on test was 88 per cent. At 2,200-h.p. load an efficiency of 80 per cent. is reached, and the curve thence upward is very flat, with a value of about 86 per cent. at 7,200-h.p., i.e., 11 per cent. overload. The plant is described in "Schweizerische Bauzeitung."

Mr. H. D. Anderson, of the Associated Portland Cement Company, is at present at Vancouver in company with Mr. H. K. Damber, managing director of the English concern, looking over the Canadian cement situation with a view, it is reported, to establishing plants in this country. A similar statement was made a year ago and there would appear to be good grounds for believing that plans have been formulated.

King Hiram of Tyre was another wise man who emulated the sagacity of his contemporary, King Solomon, by using cement to line the reservoir that supplied his capital with water. Hiram's brand, however, was not quite so good as Solomon's. It has cracked and broken off a little more in the course of thirty centuries, but is still "doing business at the same old stand."—Cement World.

Construction Work in Western Canada

Noteworthy Foundation for Winnipeg Building—Features of Interest on the G. T. P. Shops — The Glyn Office Building, Vancouver

Foundation for the Great West Life Building.

The accompanying illustration shows a section of the foundation of the Great West Life Assurance Building, situated at the corner of Lombard and Rorie streets, opposite the Grain Exchange, Winnipeg. The building has been recently completed and is now ready for occupancy. A remarkable feature in connection with this structure is the immense strength of its foundations, which have been built to carry ten more storeys than have been constructed, or fourteen storeys in all. It is considered the strongest foundation in Winnipeg in connection with a building of this nature.

The foundation is built on the cantilever plan. It reaches twenty feet below the grade level. There are more than two hundred tons of steel used in the underground construction work. The foundation is built on concrete, reinforced with iron rods. The piers are of brick. The outside wall has an average thickness of six feet. It is built of bricks and cement mortared. The columns are of steel and are thirty-four in number. The whole foundation is ponderous and massive in the extreme. Its great strength and carrying power are apparent after even a casual inspection. It is probably a precedent and will mark a new principle

to be followed by the builder when planning a structure that will be increased in size in the future.

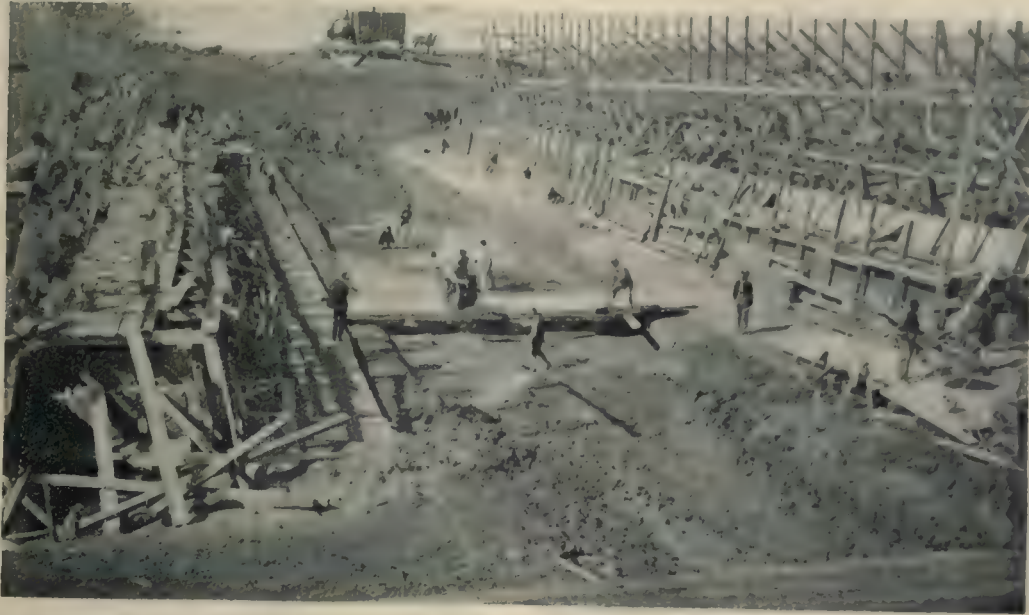
The building is 100 feet square. It is stated that it is of absolute fireproof construction. The most modern ideas have been used in its construction. The general inside finish is of marble and ornamental iron-work. Messrs. C. W. Sharpe & Son are the contractors, and Mr. John Atchison is the architect.

The Largest Stack in the World.

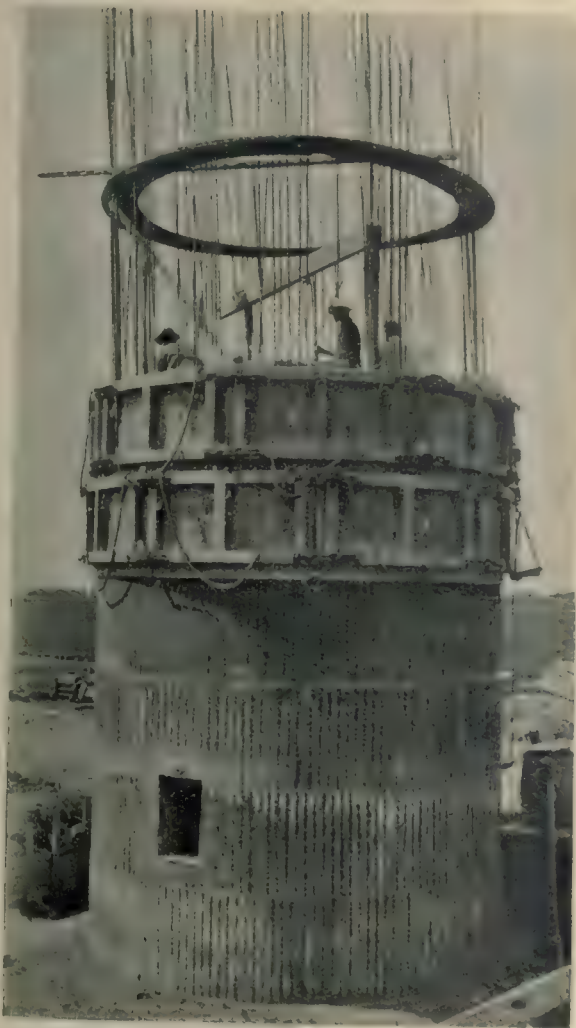
One of the features of the construction of the Grand Trunk Pacific Railway shops at Transcona is the huge smokestack in connection with the power house. This stack, views of which are given on the opposite page, is the largest structure of its kind in Western Canada. It is 200 feet high. The first 66 feet is of double steel construction, and the remaining 134 feet of single shell. The inside diameter is 11 feet from top to bottom. It is built of reinforced concrete, and stands on a foundation thirty feet square, the excavation for which was carried down to blue clay, where it rests upon 84 piles, each 25 feet in length. This smokestack has sufficient capacity for use in connection with the boilers of the power house, which develop 4,000 h.p. This chimney is a part of



Foundation of the Great West Life Assurance Building, Winnipeg, designed to carry ten extra storeys



Concrete Reservoir in course of construction at the G. T. P. Shops at Transcona. Twenty thousand yards of excavating were involved in the contract. Capacity of Reservoir, 2,000,000 gals.



Constructional Views of Reinforced Concrete Smokestack at the Power House of the G. T. P. Shops at Transcona. The Structure is the largest of its kind in Western Canada. It is 200 ft. high and has an inside diameter of 11 ft.

the contract being carried out by Haney, Quinlan & Robertson. Mr. F. W. Walker, superintendent of construction, made the design.

A Huge Concrete Reservoir.

Another feature of more than ordinary interest, is the concrete reservoir recently constructed in connection with the new shops. This tank is built inside an excavation and has a capacity of 2,000,000 imperial gallons. It is 60 feet wide, 270 feet long, and 25 feet deep. It is divided into two basins, each 30 feet wide. 7,000 yards of concrete were used in its construction. The walls of the reservoir project above the ground for a distance of five feet. The excavation is of 20,000 yards extent. The reservoir is roofed and heated to prevent the forming of ice. It will be filled by means of a six mile pipe line, consisting of a 12-inch wood-stave pipe, and the water will be pumped from the reservoir, as needed, to a high-level tank of 1,000,000 gallons capacity to be used for pressure purposes.

Palatial Office Building for Vancouver.

The illustration herewith is a reproduction of the magnificent new office building to be erected on the corner of Granville and Pender streets, Vancouver, for Jonathan Rogers, one of the city's prominent men. It will be known as the Glyn Building, and will adjoin the handsome Bank of Commerce Building on the corner of Hastings and Granville streets. The block will



The Glyn Office Building, to be erected at Vancouver, B. C.

be ten storeys high and will occupy ground space of 104 x 120 feet. It will contain 350 offices and will have a special ventilating system and the most modern equipment. One wing of the building will be fitted up for doctors and dentists, for whose convenience special electrical and compressed air appliances will be introduced.

The building will be of reinforced concrete construction, with semi-glaze cream terra cotta above the

first storey, which will be of polished marble. The ground floor of the building will contain eight stores and suitable business quarters to be rented to a well-known Trust Company. The basement will contain a large cafe and kitchen, barber shop, etc., as well as heating and power plants, electric generators, and refrigeration machines for the cafe. The building will be fitted throughout with hardwood and marble. The exposed sides of the building not fronting on the streets will have wire gears and metal frames.

The architect, A. Warren Gould, of the firm of Gould & Champney, and the owner, Jonathan Rogers, are at present visiting Chicago, New York and Toronto, their object being to interview the various manufacturing plans and dealers in high-class finish. The trip will probably include a visit to England, as it is possible they may purchase the terra cotta and special plumbing fixtures abroad.

Construction work on the new block will commence in the early spring, as soon as the necessary drawings can be completed. Mr. Rogers is determined that his new building shall rank as the best office structure on the Pacific Coast.

Tension members in bridges which from bad adjustment or other cause have become bent or slack have been straightened and shortened so as to take their proper share of the stress by means of the thermit process. As described in the "Zentralblatt der Bauverwaltung" the work is done without interrupting traffic. Two clamps are attached to the tie, one above and one below the bend or point where the shortening is to be done, and the clamps connected by two bolts. A two-part mold is placed around the tie, the mold charged and ignited. The tie soon becomes white hot and the bolts are then drawn up to the extent desired. Tests made at the Royal Testing Laboratory at Gross Lichterfelde, it is stated, indicate that the metal is little impaired in strength by the application of the thermit. Some old bridges were first treated, and when the work proved satisfactory the same process was applied to larger structures.

A new form of concrete chimney was originated in 1909 by a Danish concrete construction company in attempting to substitute tapered for cylindrical stacks. The new type is described as the "clover-leaf form." Instead of a circular, or rather annular cross-section, a shape consisting of four arcs, all of the same size, and of a radius less than that of the half dimension of the interior of the stack, is used at the base. This shape may be described as resembling the horizontal periphery of a tomato with four convolutions. The radius of the arcs is the same as that of the top of the stack, so that by gradually taking lagging from the sides of these arcs the diameter of the chimney decreases and the convolutions less marked, merging at the very top to a circular cross-section. This shape was adopted, it is stated in "Beton und Eisen," principally because the form work was believed to be more easily handled than that for a taper chimney of circular cross-section.

The Canadian Northern is planning to have work started in the spring on the construction of the Canadian Northern Ontario Railway east from Port Arthur to overcome the gap in the system in New Ontario of 500 miles between Sudbury and Port Arthur. Location of the line has been completed, and it is intended to conduct the work from both terminals. It will take about three years to complete construction and have the line ready for traffic.

Municipalities and Highway Bridges

Considerations from the Investment Point of View—Availability of Funds—Relative First Cost—Traffic Requirements—Durability—Maintainance*

By C. R. Young, of Barber & Young, Bridge and Structural Engineers, Toronto

The duty of the municipality with respect to its bridges is in effect that of a business corporation which is called upon to provide for the public safe and perpetual facilities for the passage of our streams at a reasonable annual cost to its shareholders, in this case, the public themselves. There should be the same effective management as characterizes a high-class private enterprise, and not only should there be the greatest possible amount of return realized on the money invested in the form of service to the people, but provision should be made for adequately meeting the needs of those who will make use of the highways in the future as well as at the present.

The undertaking on the part of a municipality is one of great importance. Many conditions surround the problem and affect the final decision as to the type of structure and the manner of carrying on the work, and since a bridge costs many times more than an equal length of roadway, and its construction requires a higher degree of skill, and is always attended with more difficulty and a greater element of risk, the necessity of going carefully is evident. With the aim of affording some assistance to municipal councillors and bridge commissioners who have the general direction of the bridge work in their municipalities, the writer proposes to discuss briefly the various conditions affecting the character of the investment of public money in highway bridges. Some typical cases with which the municipal bridge commissioner has frequently to deal will be given special consideration.

Bridge projects generally involve a consideration of the following questions:

1. The availability of funds for the project in hand.
2. The relative first costs of various types of bridges for the situation in mind.
3. Probable future changes in the traffic requirements of the bridge.
4. The relative length of life of various classes of bridges.
5. Relative maintenance charges on various types of bridges.
6. The provision of a structure of pleasing appearance as well as one possessing strength and permanence.

1. Availability of Funds.

The solution of any bridging problem must always be largely determined by the amount of money available for the constructing of the particular bridge in question. In a sparsely settled and undeveloped region where the municipal revenues are small, but where certain bridges are sorely needed, or even in an urban municipality where extensive work must be undertaken and but little money is available, it would be unwise to inconvenience the people and retard the development of the community by deferring the construction of bridges until such time as permanent structures could be built. Sound judgment would demand the erection of a comparatively cheap bridge to last for a limited term of years and then be replaced by more durable structures. An illustration of this is to be found in the case of a certain Canadian city where a long and high viaduct is required for the proper utilization of its railway facilities, but where the great difficulty of financing the scheme can only

be overcome by constructing a comparatively light steel bridge with a wooden floor and then rebuilding and strengthening it when the people have come to appreciate the great value of the service rendered and can no longer do without it. The folly of saddling a community with an expense which it is not at present in a position to bear is apparent to all, but it may be said that the opposite mistake of constructing light, cheap bridges where permanent ones could be afforded and would prove a much more profitable investment, is only too common.

2. Relative First Cost.

Naturally the question which looms up largest to the roads and bridges committee in its consideration of a given project is the amount of immediate outlay of funds required—that is, the first cost. Unfortunately this element of the investment is often the only one given any consideration, although in the case of well-to-do municipalities such a short-sighted policy is obviously very poor business. A broad view of the problem would disclose some features of quite as great importance as the initial expenditure.

So many factors enter into the determination of the relative costs of different types of bridges, that it is impossible to state figures which can be used for any other set of conditions than those assumed in preparing such statements. The only safe procedure for a municipality to follow if it wishes to secure reliable information as to the relative costs of different types of bridges for a given crossing is to employ an engineer who is able to thoroughly investigate the particular situation and prepare accurate comparative estimates of cost, taking into account all the local conditions, prices of material, labor, etc. The following observations concerning the relative costs of different types of highway bridges for Central Ontario may prove of interest for comparative purposes and possibly of some value to those who have to do with bridge work in other portions of the province where similar conditions obtain.

So seldom is timber now used for highway bridges constructed that no consideration will be given to its use for entire bridges, but since the question of building bridges with timber floors instead of those with concrete floors is sometimes brought up, a few words with respect to the latter may not be amiss.

Bridges with timber joists and flooring are, of course, only practicable for comparatively light floor loads, such as a heavily-laden wagon or a threshing engine of 7 or 8 tons weight. For 10 and 15-ton road rollers which weigh, when carrying their full supply of fuel and water, about 11½ and 16½ tons respectively, a wooden floor is expensive to construct and maintain since the wooden joists must be placed close enough together to make practically a solid wooden floor from 12 to 15 inches thick. Assuming traffic light enough to warrant the consideration of a bridge with wooden joists and floor plank, the cost of the superstructure (i.e., everything above the abutments and piers) of steel bridges with wooden floors would be from 50 to 60 per cent. of the cost of the superstructures of steel bridges with concrete floors. It should be pointed out, however, that this comparison of cost is not wholly just to the latter type of bridge for the reason that the advantage of its employment does not arise for such light traffic. A small additional ex-

penditure would enable it to accommodate a 10-ton or a 15-ton roller whereas the bridge with a wooden floor could be made to carry heavy concentrated loads only at considerable expense. If the substructure, or abutments, were included in this comparison, the total cost of complete steel bridges with wooden floors and concrete abutments would be 70 or 80 per cent. of the cost of similar structures with concrete floors. The great advantage which the lighter structure possesses in first cost therefore largely disappears when the entire bridge is taken into consideration.

A comparison of the first cost of steel bridges carrying concrete floors and all concrete bridges is of interest, but it should be clearly understood again that these observations do not apply to situations where the local conditions and unit costs are materially different from those in mind in making the comparison. Since concrete is a material possessing a high compressive resistance and of comparatively low cost in most parts of Ontario, it is to be expected that in certain forms of structures where it could be extensively employed to take compressive stresses it might reduce the cost of construction below that holding for steel bridge work.

The structures in which it may, in general, be economically employed are viaduct posts or bents, beam or girder spans and arches. Thus, in the design for the bents of a steel viaduct with the roadway on an average 48 feet above the level of the ground, it was found by the writer's firm that the steel trusses could be supported on concrete bents for 70 per cent. of the cost of steel bents. Short girder spans can frequently be constructed of concrete for 10 or 15 per cent. less than of steel with concrete floors, especially of the deck type, that is where the girders lie wholly underneath the floor. In this case the floor slab performs the double service of transferring the superimposed load to the main girders and of acting as the compression flange for these girders. On account, however, of the fact that the volume of concrete capable of carrying a given load weighs over seven times as much as the volume of steel required to perform the same service, the weight of girder spans becomes very great when they exceed about 50 feet in length and they can no longer be successfully built in competition with steel. The relative costs of steel bridges with concrete floors and concrete arches is to a large extent determined by the character of the foundation materials encountered. If the foundation bed is of soft clay or sand, the special treatment necessary before an arch can safely be built will generally effect any advantage in first cost which the arch might have over a steel span. Assuming that no piling is necessary in either case, however, and also assuming that sufficient rise is available for an arch, the latter form of structure can often be constructed at no greater cost than a steel bridge of the same capacity. Where the length of the span much exceeds 100 feet, the advantage in first cost is generally with the steel structure, though it is but small and the bidding may often result in a lower price for the concrete bridge.

3. Altered Traffic Requirements.

The growth of a community and the reaching out of our towns and cities into the country will, because of the increased traffic demands, often seriously overtax our highway bridges unless they have been built for the future as well as for the present. While heavier road rollers than are now in common use may become quite common, the loading to be most feared in the future is the heavily-laden motor truck. These vehicles are particularly trying on the floor system of a bridge because of the large portion of the load which is concentrated on the rear axle, and since motor vehicles weighing when loaded anywhere from 15 to 40 tons will probably be in common use within a few years, it is seen that the investment of the public money in high-

way bridges should be to a large extent governed by the future probable traffic of the road. A form of structure which is well suited to resist these increased concentrated loadings is the earth-filled concrete or masonry arch. The kind of loading which taxes this form of arch most severely is a uniformly distributed load covering either a portion of the structure or the entire bridge, depending upon the part of the ring under consideration, and the effect of a 10 or 15-ton roller is ordinarily trifling in comparison with that of the uniform load of 100 pounds per square foot generally assumed in the design of arch bridges for country highway traffic. For this reason, most well-constructed spandrel-filled arches, except those under about 40 feet in span can support heavier rollers or trucks than are in common use at the present time.

In addition to the growth in weight of the traffic, there is also the matter of the increased width of roadway and the provision of sidewalks which may be required in the case of bridges in urban localities or those which from the growth of population may become town or city bridges.

4. Length of Life.

The length of life of a bridge may be determined by its destruction by accident or by the gradual deterioration or corrosion of the material and the loss of rigidity due to the wear and the breaking down of the joints. In the case of structures composed wholly or partially of wood the liability always exists of either total or partial destruction by fire. Structures of all types may also be subjected to the pressure and scour of flood waters and the undoubted ability of a bridge to resist such action contributes a valuable element of certainty to the investment. In soft soils the use of piles, although they increase the cost of the structure considerably, constitutes a justifiable insurance against accident, for the majority of cases of bridge failures due to floods have been due to the short-sighted policy of attempting to do without piling where it was unquestionably necessary. An all-concrete bridge, because of its great weight, possesses greater immunity from destruction by floods than a steel structure, and if it be built on proper foundations no harm is at all likely to result from flood waters, since it is able to resist water pressure quite as effectively as a dam of the same height with an opening through it.

The length of life of timber in bridge floors varies greatly with the traffic, being as short as a year or two in the case of city bridges carrying a dense traffic, and as much as seven or eight years for some country highway bridges which are but little travelled and where the floors are in a dry condition most of the time. Probably the average term of life reached by floor planking and wooden joists in highway bridges in this province would be about 5 years.

Since steel bridges have been in general use only 15 or 20 years, the length of life of steel when exposed to the elements is conjectural and must be based on the durability of the older and similar material—wrought iron. A number of fairly old iron bridges are in existence in the province and give evidence of doing duty for some time yet. One of these is the Hunter street bridge, Peterborough, built in 1875, and two others built in 1877 across the Grand river at Paris, Ont. It must be admitted, however, that steel is not as satisfactory a material as wrought iron in resisting corrosion and therefore a shorter life under service is to be expected of it. However, since wrought iron bridges in this country have defied the elements for from 30 to 40 years with no very serious loss of section, it seems probable that steel structures, if given a fair degree of care in maintenance, will be serviceable for a period of 50 years.

Concrete, like steel, is a material which has had only a few years of extensive use in this country in bridge construction, and its length of life is also a matter of con-

ture. In other lands, plain concrete has been employed as a material of construction in important works for upwards of 2,000 years. In ancient Rome, concrete bridges and domes built at the beginning of the christian era are still standing, but little impaired by time. Reinforced concrete is a comparatively new form of construction, having found its first employment in France about the middle of the last century. The first bridge constructed in America of reinforced concrete was an arch span erected in Golden Gate Park, San Francisco, in 1889. It has proved eminently satisfactory and many thousands of the same class of structures have followed it. It may be urged that since this structure is located in a less trying climate than ours, its length of life is no guide to the durability of a similar structure in Canada, but on the other hand, we have ample evidence that structures of stone masonry, a material offering greater opportunity of attack for the elements than monolithic concrete, have been in existence for well over a century in this country. It would seem reasonable, therefore, to predict for well-constructed concrete bridges a life of at least a hundred years.

5. Maintenance.

While the annual outlay for maintenance may not in any case be very large, this element is a very important one, for the total expenditure entailed during the lifetime of the bridge may amount to as much as several times the original cost of the bridge.

In steel bridges carrying wooden floors, a large part of the expense of maintenance arises from the necessity of frequent renewal of the floors. On the basis of a life of 5 years and assuming that the cost of providing and laying timber in floors is \$35 per M., the annual outlay on this account would be from $2\frac{1}{2}$ to 6 per cent. of the first cost of the superstructure, that is, of the steel work and the original wooden floor. The higher charge is, of course, for short spans and the lower for long spans. If the lifetime of the bridge were 50 years, the expense of renewal of the timber floors for that period would in the average case be nearly 200 per cent. of the original cost of the superstructure, assuming the price of timber were to continue throughout the 50 years the same as at present.

The painting of steel structures constitutes a large item of expense to the municipality, unless the latter is willing to economize in this direction and meet the correspondingly heavy expense of frequent renewals. Climatic conditions and the proximity to towns and cities where corrosive gases may come in contact with the steel, largely determine the durability of preservative coatings. In most cases a steel bridge requires careful painting every three or four years, and if the longer interval is adopted, two coats should be applied, preceded by a thorough brushing and scraping to remove all rust and old paint. On the assumption that steel bridges are painted in this way every four years, the annual cost of painting would be from 2 to $2\frac{1}{2}$ per cent. of the cost of the superstructure for bridges with wooden floors and from $1\frac{1}{2}$ to 2 per cent. of the cost of the superstructure for bridges with concrete floors.

For properly-constructed all-concrete bridges there should be no maintenance charges whatever beyond the gravelling of the roadway over such bridges as carry fills and perhaps the re-caulking of expansion joints at long intervals. These two items combined would constitute but a very small amount of expense per annum, probably not more than half of one per cent. of the first cost.

6. Appearance.

But little attention is ordinarily paid to the matter of appearances in highway bridge construction. This is to be regretted, for nowhere is there a better opportunity for the expression of good taste and the exhibition of neatness and

tidiness in engineering work. A bridge is generally constructed for a long time to come and because of the prominent feature which it forms on the highway, an effort should be made to make each bridge at least a good example of strong, well-proportioned and well-finished construction. It must be remembered also that the traffic over many bridges will have increased many fold before their natural life has expired, and in building some attention should be given to the appearance which the bridge should have when the district may have become much more populous than at present.

Some Typical Cases Considered.

Certain type problems from the investment point of view frequently arise in dealing with bridge projects, and a consideration of a few of these may be of interest in illustrating the general principles already discussed.

A simple problem in bridge economics which requires consideration in fixing the lengths of viaduct is the determination of the points where the earth fill should end and the bridging proper should begin. Under ordinary cost conditions existing in Central Ontario, the first costs per lineal foot of earth fill and of steel highway viaduct coincide for a height of about 20 to 25 feet. This does not mean that the economy of employing earth fill ceases when this depth has been reached, however, for the maintenance charges on an earth fill are limited to re-surfacing, while on a steel viaduct they would be considerable as has already been pointed out. Further, the life of an earth fill is perpetual, but that of any form of built viaduct must be of finite duration and of a steel viaduct probably not over 50 years. The limit of economic depth for an earth fill is therefore not 20 or 25 feet but something greater.

The relative advantages of steel superstructures with wooden floors and with concrete floors are often the subject of much serious study by municipal bridge commissioners. Properly, no fair comparison can be made between them, since the structure with a concrete floor does not find its economical application in the field to which the bridge with the wooden floor must be confined—light country highway traffic. If a steel superstructure with a concrete floor were therefore designed to provide for only the 6 or 8-ton concentrated load which is the maximum loading which a steel bridge with a wooden floor will ordinarily accommodate it would be found that at the end of the natural life of the heavier structure it might have cost as much as the lighter structure with the wooden floor. Such a development would happen, in general, for spans of about 100 feet in length. For shorter spans the lighter bridge would have entailed the greater expenditure in first cost and maintenance at the expiration of 50 years, but for spans over 100 feet the monetary outlay would be greater for the heavy structure. The reason for this somewhat startling fact is that while the cost of renewal of wooden floors in the lighter bridges is very great, the cost of painting the heavier structure is much greater than for the light structure because of the much greater tonnage of steel in the bridge with the concrete floor.

This advantage which the lighter bridge possesses for spans over 100 feet in length is of course only of importance where the bridge will never be required to accommodate rolling loads of greater weight than a heavily-laden wagon or a light traction engine. Should it be necessary to provide for much heavier loads at the outset, the bridge with the wooden floor would lose any advantage which it might possess when employed in its own particular field.

Within the last few years, the economic problem in highway bridge work which has most frequently presented itself for solution is the question whether a steel bridge with a concrete floor or an all-concrete bridge would be the better investment in a given situation. From what has been said already, it is self-evident that where the physical con-

ditions existing at the bridge site will permit of a concrete bridge and where the first cost is at all comparable with that of a steel structure with a concrete floor, the former is the much better investment. Because of the almost negligible maintenance charges and the much greater life of the concrete structure, the annual cost of perpetually providing and maintaining concrete bridges at any typical crossing, assuming a life of 100 years for these structures, is from one-half to one-third as much as it would be if steel

bridges were perpetually employed at the same site.

In conclusion it should be repeated that the determination of the relative advantages of different types of bridges from the investment point of view can only be correctly arrived at by the application of sound technical knowledge and clear business perception to a close study of local conditions, and the only one whose qualifications along both these lines entitle him to deal with such a matter is the trained engineer.

Methods of Road and Sidewalk Building

An Interesting Talk on this Subject with City Engineer Fellowes of Westmount — Practical Phases Discussed — Notes on Cost

Mr. F. L. Fellowes, who for the past decade has been the municipal engineer for the city of Westmount, and who has just been appointed executive head of the public works department of Vancouver, recently accorded an interview on road and sidewalk building to a representative of the "Contract Record." While other branches of engineering have been given practical attention by Mr. Fellowes, municipal work has been his specialty and good roads his hobby.

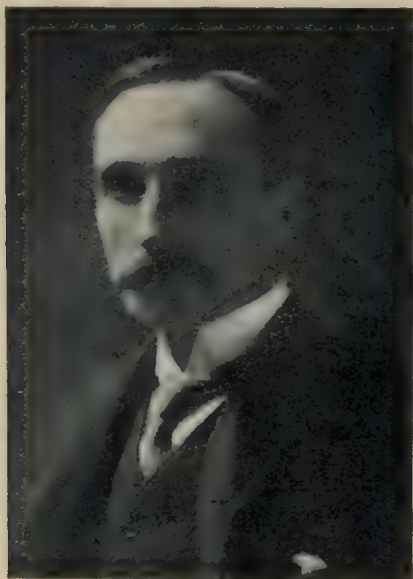
"Whenever I have been able to get a few days' holiday," said Mr. Fellowes, "I have taken a trip to some place across the line that has a reputation for good roads and that is employing the latest methods in their construction. In this way I have examined the roads in the making and seen

mesh. I prefer crusher run to screened of the same grade. Clean stone requires more sand and labor for mixing and it is no better than crushed stone so long as the latter has not too much fine dust in it. The old method surface was two parts stone to one part cement and the finished top is one and a quarter to one and a half inches. I find the granolithic top too slippery for this climate. For steeper grades such as we have on the hillsides in Westmount I use a composition consisting of one part coarse sand, one part fine stone and one part cement. This results in a pumice stone surface rough enough to prevent slipping even when the frost is coming out of the stone in the spring. We know this is a good material for we started using it ten years ago and it has been thoroughly tested. We have thirty miles of these sidewalks. Experience has shown me that here we must provide for an 'expansion joint' or 'hair-crack' about every fifteen or twenty feet. I found this out by experimenting. In other climates this feature might vary.

"Our sidewalks on boulevard streets are built next to the gutter and our surface gutters are made of concrete. This is somewhat unusual but I am convinced that the results justify the method. The advantages are many. The trees, grass and wooden poles or posts are all between the sidewalk and the residences. They are thus protected from damage by horses and other natural enemies that injure them when they are between the sidewalk and the roadway. Then, the water runs from the sidewalk right into the gutter and is carried off to the gullies without damaging the boulevard space as is often done by the reverse method.

Another point in favor of the sidewalk being outside of the boulevard in cities where there is much snow is that it allows a great saving and convenience in the removal of snow. The advantage of the concrete gutter in its relation to the road is that it provides a solid, permanent trough for all refuse from the road after rain or washing. When a macadam, stone black or asphalt road runs all the way across from curb to curb these materials are liable soon to have holes in them. In the case of asphalt and macadam, especially, standing water, uric acid, and other chemical agencies have a tendency to rot the asphalt or soften certain constituents of the macadam on the slope or in the gutter. Besides this climatic changes seriously disturb the surface of roads constructed of these soft materials, whereas the cement gutter maintains its proper alignment and is absolutely permanent. I adopt 24-in. gutters for a 26-foot roadway."

On passing from sidewalks to roadway construction Mr. Fellowes remarked that he made his intersections on street car track allowance of stone block. He favored granite or close grained sandstone of the Medina or Nepian type. These never become greasy, like scoria, and do not



Mr. F. L. Fellowes

them after completion and testing. Westmount has reaped the benefit and I am leaving behind work that will stand every kind of test and prove that the citizens have got good value for their money."

Speaking first of sidewalk construction, Mr. Fellowes said: "We first lay a good heavy stone base suitable for drainage purposes as well as for carrying a substantial concrete top. We provide outlets for the water in the subsoil by running ordinary farm tile to the nearest gully. We cover the joints with brown building or tar paper and these under drains are laid almost level so that there shall not be too great velocity in the flow. Our concrete is made from crushed stone not too large to pass through a two-inch

"turtle-back." Close joints with a filler of asphalt are waterproof and sanitary. He prefers joints being not over one-quarter or half inch in width.

A good road must have a good foundation, good filling and good top dressing. In fact a good road cannot be made from faulty material badly put together. Taking an example from the Appian way leading to Rome the best English and French roads were constructed with foundations of stone, laid by hand in such a way as to carry the heaviest loads and carry off superfluous moisture. In this country resistance to severe frost had to be provided for also. Stone, asphalt or macadam might be used for the top and all had their values. "I am in favor of asphalt for all level road traffic," said Mr. Fellowes. Supposing the life of a stone paved road is fifteen years and that of an asphalt pavement only ten, I would still be in favor of the asphalt. The first cost of the stone blocks and laying will be about \$4.50 to \$5.00 per square yard, while the first cost of asphalt will be about \$2.00 to \$2.50. But when the asphalt is worn out it can be re-surfaced, if the foundation has been properly constructed, for 90c. to \$1.00 per square yard, and last another ten years. When you consider the saving to horses' feet and vehicles, the comparative absence of noise, the advantage in cleaning, the sanitary superiority, and other features in favor of asphalt, I think you would say, with me, that granite is not in the race with asphalt, at any rate for residential localities such as Westmount.

"The kind of a foundation to be put into a road will depend largely on the subsoil. Of course, the superstructure also must be considered. Hand-laid stone has been used here with great success and I can recommend it very highly. I put in a heavy base of a total of eighteen inches in depth; composed of a layer of eight-inch stone, hand-laid and well packed; then a layer four inches deep of 'chink' stone, and over that two inches of fine graded stone, 1½-in. grade. Then comes the top dressing. For a twenty-four or twenty-six foot roadway I provide for an eight or ten inch crown, according to grade. The result is that the water runs to the gutter at once without any cutting or wearing or rotting of the asphalt or macadam. Such roads I have found to be in great favor in New York city and state and in Massachusetts, Rhode Island, including their leading cities. They are preferable to the old-fashioned stone macadam as they are waterproof, practically dustless, almost noiseless and the most sanitary, not to say the most economical from the standpoint of easy traction for the haulage of heavy loads. The bituminous surface is, of course, less noisy again than the asphalt.

"The question of easy haulage," said Mr. Fellowes, "was forcibly illustrated in the course of a conversation I had recently with a farmer at Malone, N.Y. We were talking about the proposed interstate and international highway which is supposed to run from New York to Quebec, through Montreal. I had been driven over road fearfully and wonderfully made in an automobile going at the rate of fifty miles an hour for several miles, and when we stopped for rest and breath and to see if any parts of our anatomy were missing I asked him when he expected the road would be improved. 'Right away,' was his answer. 'The government is going to tax us for the work, add fifty per cent. to what we pay and then go ahead with the work under competent engineers. The roads will be graded and constructed of semi-permanent material so that instead of drawing a ton load to town with damage to the wagon and injury to the teams, we shall be able to haul two tons with the same team in charge of the same man and with next to no wear on the wagon. Anyone can calculate what a tremendous saving that will mean to us.'"

Speaking of the difference between contract work and day labor, Mr. Fellowes gave it as his opinion that the com-

parison was in favor of the day labor system. This was, of course, provided that the corporation owned an efficient plant and employed a competent staff and that the engineer in charge was not interfered with in his work or plans by influential aldermen or other persons. Apart from the work being done a little cheaper, Mr. Fellowes pointed out that it would be better done under the supervision of a competent engineer than under inspectors employed by contractors. Inspectors were apt to be inexperienced or lacking in technical knowledge and if underpaid besides temptation might be put in their way that would not ensure the best work being done. Once a permanent job was done the defect could not be seen, perhaps for years, when it would be too late to recover damages from the contractor. A corporation employee who knew that his job depended on his seeing good work done as well as the cost being kept close to the estimate would give better satisfaction to a town or city.

The Niagara River Boulevard*

By J. H. Jackson, C.E.

The name Queen Victoria Park for the most part, I suppose, calls to mind when mentioned the Falls at Niagara and the public domain skirting the gorge and upper rapids some two hundred acres in extent set part for a breathing spot to be enjoyed by the thousands of visitors who annually come from far and near to view the mighty cataract. It is with considerable surprise that the vast majority of tourists both from our own land and across the border learn that the name stands for a system of parks and interconnecting lengths stretching along the Niagara frontier from Lake Erie on the south to Lake Ontario on the north, comprising within its borders over eight hundred acres of land whose extremities are some thirty-five miles apart.

The general arrangement comprises lawns, trees, shrubbery and a first-class macadam roadway. From the top of the bank fifteen feet is taken up with planting that will not obstruct the continuous view of the river, and, adjoining this, thirty feet is set apart for roadway purposes, while the remaining fifty-five feet will be utilized in lawns, shrubbery and a pathway.

The extent of the work under consideration gives a continuous road from Niagara Falls to the entrance into the Villages of Bridgeburg and Fort Erie, some nineteen miles, and the remaining length in the two villages will likely be provided for by joint action on the part of the Commissioners and the two councils. When the whole of this work is completed a trip may be taken up the Niagara River along the Canadian shore and the return may be made on the New York side on the new State Boulevard now under construction.

The road occupying the thirty feet of width on the river side consists of eighteen feet of macadam construction with six feet on either side for the shoulder and gutter, and it is laid out with tangents and circular curves in a similar manner to railway lines, with curves of large radii to avoid as far as may be abrupt changes of alignment. Complete profiles and sections are obtained and the grades are carefully struck to provide for proper drainage and to balance up cuts and fills. With over five miles in one section almost a level area, it is at once evident that the drainage problem requires much consideration. The typical section adopted shows a road with nine inches of crown in the eighteen feet of stoned surface, and the shoulder of clay in its width of three feet, ten inches to the bottom of the gutter, which has a bottom width of two feet. The remaining two feet on either side forms the outer slope of the two gutters. From the centre of the road to the gutter, therefore, there is a curved slope of nineteen inches. Rather

*Read before the Ontario Good Roads Association, March, 1911

more than would be given were the natural grades not so flat. The depth of stone on the centre line is ten inches, gradually reducing to seven inches at the edges, nine feet away on each side. The subgrade, therefore, has a crown of six inches and the lowest point of the subgrade next to the shoulder will drain to the gutter with three inches of fall. Every effort is made in building to make the macadam not only to shed water but to make it impervious to water. It is believed that the section described will materially assist in this direction. In some stretches of very uncertain material though, side drains of field tile leading the catch basins may be laid.

Constructional Procedure.

The first work by the contractor after the right of way has been cleared of fences, trees and buildings, is to commence the drainage system for carrying the waters from the gutters to the river. This consists of outlet drains from the water's edge across the road itself and extending to the landward limit of the Esplanade lands. These cross drains or outlets are spaced from five hundred to eight hundred feet apart, as the natural slope of the adjoining land and the gutter requirements call for, and the water enters the outlet by three catch basins, one in either gutter, and one at the end opposite the river side. The size of pipe used varies with the location, but ordinarily is twelve inches in diameter and of concrete laid to a minimum grade of 0.5 per cent. The discharge end is protected by a hand-laid dry masonry head-wall and apron. This structure is bedded under the last two pipes twelve inches deep for three feet and the apron extends to and below the normal water level in the river. It is carried two feet above the top of the pipe and two feet on either side. This heavy block of dry wall is designed to prevent under cutting and washing of its river slope in time of heavy freshet. The catch basin itself is not built until the gutters are excavated and the shoulder shaped when it is placed with its top at the grade of the gutter at the point of its location. It consists of a fifteen-inch concrete tile and the junction with the twelve-inch discharge is made with a block of concrete two feet two inches long and bedded four inches below the bottom. No sump is left in the catch basin for the length of pipe is short and it is preferred that any sediment should be discharged into the river. The opening of the catch basin is protected by a circular cast iron top designed to fit the pipe with a collar one and three-eighth inches in depth.

When the drainage outlets are well in advance, excavation for the subgrade is proceeded with according to the levels staked upon the ground by the field men in charge, along with the inspector of a working section of the road. This work varies greatly, requiring much labor in the heavy clay, and progressing rapidly in the sandy loam. The trimming to the required section is done by an ordinary road grader and from one to two inches is left to be consolidated by the heavy road roller (twelve to fifteen tons) which is now placed to work. With the eighteen feet to the proper elevation and section and the side gutters roughly excavated to the top of the macadam surface and foundation stone is started. This is a layer of heavy unquarried irregular stone five inches in depth at the centre and four inches at the shoulder. It is hand-laid with projection points and edges knocked off with the hammer to fill the crevices. With the harder class of stone in the vicinity this course must be filled with screenings before rolling commences, but when the base course is of medium soft stone the roller is placed to work without filling and enough of the projections are worn off to fill the interstices. This layer is thoroughly compacted and rolled to its required camber and then follows a layer of three to two-inch stone, three inches deep at the centre and two inches deep at the shoulder. This middle course is filled but lightly with screenings and

watered and rolled when the top course of one-inch stone is added and rolled into the honeycombed top of three to two-inch stone. This top layer is two inches deep at the centre of the road and one inch at the shoulders. Rolling now continues till the whole is completely compacted, and the roadway shows an acceptable surface for traffic. The work now remaining is the shaping of the shoulder and gutter with the placing of the catch basins. The clay shoulder must be rolled to its required section to show a continuous crown between side ditches.

The stone of the Niagara district, for the most part limestone, varies considerably, and a close inspection has to be maintained to ensure a hard, tough quality of metal, particularly for the top courses. Some of the material offered crushes under the roller until there is practically nothing but screenings for wearing surface. But by careful selection and strict enforcement of the requirements a very fair quality of stone is being procured. In addition to the road drainage all of the water courses and larger ditches are taken care of by either single or double box culverts of reinforced concrete and bridges of artistic design. The streams of any considerable size emptying into the Niagara River between Chippawa and Bridgeburg, and requiring to be spanned by bridges, and are six in number. These structures will all be of the arch type, built of concrete, reinforced with steel and veneered with limestone or sandstone except on one span where concrete is used in massive form. The bridges vary from thirty feet to seventy-five feet in span and each one is individual in its architectural features.

System of Maintenance.

From the beginning of construction work, the problem of maintenance has been kept prominently in the foreground and the section of roadway already completed has been under constant inspection to learn the effect of the traffic and note the efficiency of the drainage. In addition to the studying of conditions a series of experiments are being conducted by the engineering department with dust-laying preparations and surface binders to determine the cost and effect of the products that are being offered to keep the top course from ravelling. It too often happens that the main construction is given much intense consideration and its details are worked out with so much thought that the matter of operating the system receives but scant attention and yet the success of the road, like any other work, depends upon whether it will perform its function as it is designed to do and resist the obstacles in its pathway. Only recently it was publicly stated that on one of the large road systems the construction laid at the first of the season was failing before the contractors laid off for the winter. Several binders have given evidence of their value in the roadways in the park and the cost has not been excessive, but the same product gives different results under different conditions, and a proper selection must be made for the roadway to be treated.

We are in receipt of an informative booklet on Friction Clutch Mechanism from the Dodge Manufacturing Company, Limited, Toronto. Friction clutches during the last few years have materially reduced the percentage of factory accidents attributable to revolving shafting and its equipment, while the friction clutch has unassailable claims from an economical standpoint. By the use of friction clutch pulleys and cut-off couplings it is possible to divide the shafting equipment in a mill or factory into units and to run only that machinery which is actually required. The Dodge Manufacturing Company have had an excellent line of clutches on the market for over eighteen years. They have patterns for a complete range in all sizes from the smallest to the largest and in capacities as small as 1 horse power and as large as 1,000 horse power.

Possibilities of the St. Lawrence River

Equal and Perhaps Superior to the Georgian Bay Route Report should be Submitted before Adoption of any Competitive Scheme

Before the General Section of the Canadian Society of Civil Engineers on Thursday, March 16th, Mr. Henry Holgate, of Montreal, presented a valuable paper, entitled, "The Upper St. Lawrence River; Its International History, Development of Navigation and Future Possibilities."

After giving a resume of the international legislation into which the river has entered since the Treaty of Paris in 1763, Mr. Holgate discussed the physical features and its history as regards navigation. The first lock canals in Canada were built on the St. Lawrence by the Royal Engineers in 1783. Preparations for the Lachine canal were made in 1815 and the work was completed in 1825. The Cornwall canal was commenced in 1834. Owing to the rebellion its completion was delayed until 1843. The Beauharnois was enlarged about this time and opened in 1848.

Mr. Holgate gave further interesting particulars, and concluded this section of his address by stating that the total amount expended in connection with the St. Lawrence canals up to the end of the last fiscal year was \$52,676,298. Concerning the relative advantages of the St. Lawrence river and the Georgian Bay canal, Mr. Holgate said:

Various large schemes of inland transportation by water are now being considered, as for instance the Georgian Bay Canal, and the enlargement of the Welland Canal. In the case of the former, the terminus will be the Port of Montreal, and with the enlargement of the Welland Canal, the larger lake vessels will be able to reach Prescott where the cargoes will be trans-shipped, and moved eastward by rail, or by smaller vessels through the canals to Montreal.

Trade must follow the line of least resistance, and it is a question which has not yet been answered in a satisfactory way, will not the enlargement of the canal system on the St. Lawrence to the Port of Montreal, or a scheme of dams and locks with an improved river channel, be justifiable in the economic working out of our transportation problems, so that upper lake vessels may bring their cargoes to Montreal.

The route via the proposed Georgian Bay Canal will be 282 miles shorter than the existing water route, but the element of time must be considered, and the following is an extract from the report on the Georgian Bay Canal scheme, as submitted by the government:

"Time of transit is affected by the length of restricted channels on the route, where speed has to be reduced, and by the number of lockages, and consequent delays. A close computation of the speed allowable in the different stretches, with about three-quarters of an hour delay for passage of each lock, gives about 70 hours, as time of transit from Georgian Bay to Montreal.

"With the advantage of shorter distances between terminal harbors, it is computed that the route will be from 1 to 1½ days faster than any other existing water route, under present conditions, from the head of the Great Lakes to an open ocean port, apart from also having an enormous superiority as to carrying capacity. But as compared with a possible improved system of St. Lawrence canals to a depth of 22 feet, assuming that the number of locks would be greatly reduced, and some of the channels widened, probably no practical benefit in time of transit could be claimed, the saving in distance being nearly offset by the longer stretches of lake and wide river navigation which exist through the Lake Erie and Lake Ontario route, where higher speeds would be permissible."

So that in so far as time is concerned, an improved St. Lawrence route would be equal and, perhaps, superior to the Georgian Bay or Ottawa River route. For many years the improvement of the St. Lawrence canal system has been discussed, but not in such a way as to produce definite conclusions. No comprehensive surveys and estimates have been made so as to determine the practicability of increasing

the capacity of this route to Montreal on such a scale as contemplated for the Georgian Bay Canal, with locks 650 feet long, 75 feet wide, and a minimum of 22 feet of water on the sill, or of greater dimensions.

The dimensions of the canal and locks is a question demanding careful enquiry and foresight. There are boats on the lakes now 605 feet long, and the proposed new United States lock at Sault Ste. Marie will have 24 ft. 6 in. of water on the sill.

I think the time has come when such a study of the St. Lawrence should be made, and this, before we should commit ourselves to heavy expenditures on competitive routes.

The idea of canalizing the river by maintaining the navigation channel in the river and erecting dams below the various rapids, locking at each dam, has been the dream of engineers for many years, and this has of late been prominently brought forward by the proposal of a power company to treat the Long Sault Rapids in this way.

By treating the river in this way speed will be greatly increased, the number of locks might be reduced from 21 to 6, and the long stretches of river will be made use of to great advantage.

Primarily any such work, as erecting dams across the river, must be for the improvement of navigation, and Canada is more interested in the improvement of navigation, of the St. Lawrence than is the United States, and Canadian interests in this matter focus in Montreal.

The development of power can only be held to be incidental, the real motive must be the improvement of navigation.

Mr. John Kennedy, our best authority on such matters, and whose judgment I would not question, has concluded that works such as are proposed at the Long Sault can be wisely and safely built and maintained, and I think that the same may be said of similar works if constructed at the other rapids.

In the report of the United States Deep Waterways Commission of 1900, it is shown that a deep channel may be obtained from Lake Ontario as far as the head of the Long Sault Rapids, which was as far as that investigation dealt with the St. Lawrence River.

I am not now stating that this is the best way of improving navigation so as to create the greatest benefit. The question is a very great one, and of vast importance, and we have not the evidence before us to form a correct opinion. The question is a national one, and I think that it should be carefully studied, so that the future policy of inland navigation may be carried out on more definite lines than the present knowledge warrants.

If Canada is to incur a very large expenditure on the improvement of inland transportation by water it would be business-like to make the expenditure in the direction from which the greatest benefit would result—so as to obtain the greatest efficiency, and first of all to ascertain all facts which would lead to a correct decision.

The work of improving canal transportation must be a national work, and all canals must be owned and operated by the Federal Government; no private ownership or exploitation of national waterways would be practicable in this country, and may be looked upon as impossible.

The development of power, though an important thing in itself, must under the terms of the treaty of 1909, in the case of the St. Lawrence River, be considered as secondary to the improvement of navigation. No development of power is desired unless by so doing we improve the conditions of navigation, and obtain from such development commercial equivalent for the power produced.

The question before us now is not the maintenance of present conditions of navigation, but how can these conditions be improved, and they must be improved if we are to secure to the Port of Montreal what nature has given us.

The minimum amount of power that may be developed on the St. Lawrence River between Lake Ontario and Montreal, is the vast amount of 3,500,000 horse power. The absorption of this amount of power will be very gradual. It is not now commercially possible to utilize this amount of

power, but we do not know what the future demands will be.

Is it not common-sense to think about this, and to provide for the future as broadly as we can? What I would urge is that a careful study of this whole subject be made now, so that a definite policy may be adopted in order to get the greatest efficiency out of what nature has given us. This study devolves primarily upon the government of Canada, and I would urge that such a study of the river's possibilities should be made, and a comprehensive report be submitted before any commitments be made by Canada for the damming of the St. Lawrence River at any points on it, or the carrying out of any other great scheme of canal transportation.

Let us first decide by logical deduction from definite data what scheme is better than the other, and then carry out that scheme in the most efficient way possible.

In the ensuing discussion Mr. John Kennedy expressed strong disapproval of what he considered was a deliberate attempt by private interests to coerce the government into the construction of the Georgian Bay Canal.

About one hundred members were present. It was generally conceded that the St. Lawrence route should be studied and that full information concerning its advantages should be obtained before the government committed itself to the construction of the Georgian Bay Canal. Subsequently the following resolution, presented by Professor Herdt, of McGill University, and seconded by Mr. Kennedy, was passed:

"That the Council of the Canadian Society of Civil Engineers be requested to take up and study the suggestions made that the Dominion Government be urged to make a study of the River St. Lawrence and its possibilities, and that a comprehensive report be submitted before any commitment be made by the government for the damming of the St. Lawrence at any point, or the carrying out of any other great scheme of canal transportation, and that the council be requested to take this matter up, and if advisable to make a report to the Dominion government."

Modern Filtration Plant for the Montreal Water & Power Company

The Montreal Water and Power Company is a private corporation that supplies water for domestic purposes and fire protection to the municipalities surrounding the city of Montreal and several wards that were formerly separate and independent municipalities, but which have within a few years past been annexed as wards of the city. The territory served by the company includes the greater portion of Westmount, Mount Royal ward and Outremont; all of Laurier ward, St. Denis; Delorimer, Villaray, Cote des Neiges Wards and much of Maisonneuve.

The company has under construction a large and up-to-date filtration plant for which considerable excavation work has already been done. This is a rapid-gravity, sand filtration system with an initial capacity of 25,000,000 gallons per day, provision being made for extending it to 50,000,000 gallons. The clear water basin and filter bed will be of reinforced concrete construction. The operating floors, laboratories, machinery room, air and wash-water plant will be housed in brick buildings with slate roofs, thoroughly fireproof and modern in every detail. Similar plants may be seen at Columbus, O., Little Falls, N.Y., Newport, R.I., Harrisburg, Pa., and elsewhere.

The plant will be situated just north of the company's pumping station on the north shore of the St. Lawrence, opposite the Nun's Island, and near the boundary line between Montreal and Verdun.

The water is first led through the new five-foot steel intake pipe to the new steel-concrete well from which it will be raised by the 25,000,000 gallon low lift pumping plant to the top of the filter so as to flood the sand filtering area. The water flows by gravity through the sand beds into collecting drains and thence to the clear water basin. From here it passes, under pressure, to the high pressure pumps and is forced by them through the maws.

The plant was designed by Mr. F. H. Pitcher, chief engineer and general manager of the company, and is being installed by the Continental Jewel Filtration Company, of New York. The buildings including concrete and excavation, are being constructed by Messrs. Laurin & Leitch, of Montreal.

The guaranteed bacteriological efficiency of the plant will be 98 per cent. This, in conjunction with the sterilizing plant now in operation and which this company was one of the first on the continent to install, will furnish a clear, colorless water of unusual excellence. For some time past the Provincial Board of Health has been making bacteriological tests of the water furnished by this company. These tests show that there has been no pollution in the water since the installation of the sterilization plant during a long period covered by reports now in the company's office. Tests are made five or six times each month in the interest of the public and quite independent of the company.

Mr. Pitcher says that if the company had not been committed to the filtration system for Westmount before the discovery of the treatment of water by hypochlorite of lime he would not have recommended the filtration plant as a means of purifying the water bacteriologically. The lime treatment costs but a small fraction of the filtration system, while the results are not only as certain, but, in many instances more efficient. The amount of commercial chloride of lime used is about twelve pounds to a million gallons of water or one part of hypochlorite to a million of water. In many cases one part to two million would be sufficient.

The plant is to be in operation in the spring of 1912. The estimated cost is \$425,000.

Lake-water for St. Andrew's by the Sea

St. Andrew's-by-the-Sea is a famous summer resort, but there has always been one thing to detract from its popularity, and that was the poor water supply which was derived from wells. The Canadian Pacific Railway, being interested in the place as a resort, decided to bring about an improvement in this direction and employed Mr. H. D. Lumsden, C.E., to lay out a waterworks system that would be satisfactory. Mr. Lumsden found that water in unlimited quantity could be had at Shamcook lake, about five miles from St. Andrew's, and that it could be conveyed to the town by a gravity system. Work was accordingly commenced last fall and has been in progress throughout the winter with the result that the plant is expected to be in running order by the first of May. The reservoir, which has been constructed on the highest level near the town, is built of concrete on solid rock. It will have a capacity of half a million gallons and the head is sufficient to furnish a pressure of 125 pounds in the hotels and stores and houses in the town. The water is pumped into the reservoir by a 9 by 12 Gould triple pump, the power being furnished by a Foss 50 h.p. gasoline engine. The pump has a capacity of 400 gallons per minute. The mechanical installation is in the hands of Mr. William Perry, consulting and hydraulic engineer, of Montreal.

The Marine Department of the Dominion government has arranged for the erection of a number of new light-houses along the dangerous west coast of Vancouver Island. They will be of reinforced concrete, absolutely fireproof, and will be surmounted by the most powerful lanterns on the Pacific coast. The first of the number will be erected at Cape Cook.

Messrs. McGregor and Black, contractors, of Regina, have dissolved partnership. Each is continuing business on his own account.

Marine Depot at Prince Rupert

The Pacific Coast Construction Company, of Victoria, has been awarded the contract for the new depot to be established by the Marine and Fisheries Department at Casey Cove, about three miles from Prince Rupert. It will consist of a reinforced concrete wharf 405 feet long and 50 feet wide, with a long approach. Eight frame buildings, including a buoy warehouse, power house, offices and residences, and a coal bunker to be erected on the end of the wharf. The contract price is about \$200,000, and the work is to be completed by the end of the year.

The wharf piles will be made entirely of concrete and steel, designed to give the greatest strength with the smallest diameter, and the ravages of the teredo which makes the life of wooden piles short, cannot harm this pile.

They are composed of steel longitudinal rods, a lattice work of heavy gauge wires, a steel shoe and a driving head, the whole arranged so as to form a steel pile enclosed with concrete. The rods run longitudinally from one end of the pile to the other, close to the four corners, and are wired together every few inches from end to end with heavy gauge wire. The wiring is so arranged that the four sides of the pile resemble a continuous steel plate from end to end and from side to side. The shoe is made with straps welded in to the extreme point when the casting is in the liquid. The piles are manufactured on the site in wooden moulds, the steel frame work being lifted bodily into the box and filled with close concrete. When set the moulds are removed and the pile is then handled by the ordinary pile driver. A wooden cap is used in driving and the driving head is so arranged as to take all the concussion. No amount of hammering can injure the pile in the slightest degree. They are made square in any length up to 100 feet, measuring 15 in. x 15 in. to 17 in. x 17 in. in diameter, according to length. Each pile is designed to carry a load of 250 tons. The old method of making a concrete column was to sink a steel core through the mud, pump out the silt and fill with concrete. By this method a certain amount of silt always gets into the concrete, and between the concrete and the rock bottom. This method is costly and often unsatisfactory. With the Stedman concrete pile the whole construction can be supervised and tested before the pile is driven.

Soap Concrete Successfully Used

Soap-water instead of ordinary water, has successfully been used for the purpose of making reinforced concrete water-tight. The case is reported in Beton und Eisen, and concerns a grain-elevator built on the Danube, exposed to inundation. The concrete was provided with two coatings, also of concrete. The outer coating, $3\frac{1}{2}$ inches in thickness, consists of fine-grained concrete containing 400kg. of cement and 120 litres of water per cubic metre of mass, and the inner layer, $\frac{1}{2}$ inch in thickness, consists of cement mortar prepared with fine river sand. The water is replaced by a solution of common soft soap (potash soap), about 4 kg. of soap being added to 1 cubic inch of concrete. The building has stood one inundation well, while another building of the same material, without the soap, did not quite keep the water out. Subsequent tests were also favorable. The soap concrete is very cheap compared with other means used to render the concrete impermeable to water. The action of the soap seems to be that the lime of the cement is bound by the fatty acids of the soap.

The city of Sherbrooke is having a plant put in further up the Magog river for the purpose of lighting the town and supplying both light and power for the citizens on a commercial basis. The plant will be 2,000 h.p. and the approxi-

mate cost will be \$100,000. Messrs. Morro & Beatty of Peterborough, are the contractors for the building operations. Tenders for the machinery are all in, but at the time of writing the contracts have not been awarded. The plant is to be finished by October.

Gypsum Beds on the Thompson River, B.C.

Just now it looks as if in a short time British Columbia is to have a very important industry or perhaps it were more correct to say a collection of industries, incident upon the discovery of gypsum on the Thompson river. Already the sum of \$50,000 has been expended on the development of the work. The works will be located at Spatsum, on the main line of the C. P. R. 12 miles east of Spence's Bridge. The deposits are situated on the north side of the Thompson and are reported to surpass any others in western America.

A refining plant will, it is expected, be built on Burrard Inlet in the vicinity of Port Moody, with a capacity of 300 tons daily. There are, of course, many by-products obtained from the refining of gypsum, so that if the undertaking results in any where near fulfilling the expectation of its promoters, British Columbia will have on the banks of the Thompson, one of its best assets.

Trade Enquiries

The Dominion Government Trade and Commerce reports contain the following trade enquiries. Readers of the Contract Record may obtain the names of enquirers by writing us, enclosing stamped envelope and stating number of enquiry:

142. **Steam road rollers, portable engines, centrifugal pumps, etc.**—An East Anglian firm manufacturing steam road rollers, portable engines, centrifugal pumps, etc., would like to get in touch with road contractors in Canada.

282. **Hardware of all kinds, radiators, plumbers' brass work.**—A firm of builders' hardware merchants in Dublin, Ireland, wishes quotations from Canadian exporters of various lines of hardware, etc. Further particulars on application.

323. **Agents.**—A Midlands firm manufacturing glazed tiles for interior decoration, and also encaustic floor tiles, seek suitable resident agents in Canada, with the exception of British Columbia, where they are already represented.

An increased demand is reported for the system of monolithic jointless pipe molds invented by Mr. Joseph Hickson, of the Hickson Sewer Mold Company, of Mount Gilhead, Ohio. The system saves much excavating in the bottom of the trench, as the bottom is shaped to fit the molding of shell, either flat or round base, thus avoiding any possibility of the settlement of the structure. The noteworthy feature of the Hickson invention are the forming plates held off from the collapsible centering by adjustable legs to any thickness of shell desired. We have at hand a number testimonials sent to the Hickson firm by prominent United States engineers. Mr. Geo. Irwin, city engineer, Delaware, O., says that the system is practical and economical and that it may be recommended for large sewers and culverts in city work. Mr. Chas. Perkins, ex-chief engineer, Ohio State Board of Public Works, states that the Hickson devices are suitable for building canal feeders and hollow concrete dams. Professor Eno, Ohio State University, certifies that with the Hickson system a true, monolithic concrete, jointless tube can be built, suitable for all kinds of waterways. Details of methods employed and costs involved in actual construction will be furnished on application to the inventor, Mr. Jos. Hickson, Mount Gilead, O. Mention the "Contract Record."

Bright Outlook at the Federal Capital

Ottawa's Plans call for Large Expenditures on Municipal and Public Works this Season—Trade and Market Developments

Ottawa, March 24, 1911.

The indications are that the wages for cheaper labor will be somewhat higher than last summer in Ottawa. The wages paid by the city will be increased all around for the men working on the streets. This increase will range from 8 to 10 per cent. While this does not entirely govern the prices paid by contractors it affects them to a certain extent. The city paid for ordinary laborers last summer 20 cents an hour for nine-hour day, and for man with horse and cart \$2.50 a day.

Since there will be more effective work done during the summer by the city, the raise will be more effective than it would be otherwise. The city will not build quite as many sidewalks as usual this year, that is, not as much as last year. It built about 12 miles then and the indications are that this year it will be about 8 miles and will cost about \$45,000. Sparks street will be repaved and this with the other permanent pavements will total about 3 miles and will cost somewhere about \$200,000.

The great public work will be in connection with the extension of the sewer systems. The city has been empowered to spend almost \$400,000 in sewer extensions, about half of this amount will be used this summer. Altogether ten miles of system have been authorized. This includes the west end or Hintonburg system which will cost about \$296,000, the Dowe's lake system which will cost about \$112,800, and subsidiary systems which will cost about \$20,000. The drains will be from 6 feet down to 12 inches in diameter. There will also be considerable expenditures for repairs, etc., for which the estimate, including the scavenger system and snow cleaning, is fixed at \$231,000.

About \$25,000 will be spent in sewer systems and lighting systems at the Exhibition grounds.

The Ottawa Street Railway Company will do considerable extension work this summer, a large proportion of which has been already decided on. There will be double tracks laid from Somerset street down to Preston to Dowe's lake with a loop at the end. There will be also extensions along Broad street and to Bridge street. A temporary track will be laid along a portion of Wellington street, while the re-paving of Sparks street is under way. These extensions will total over two miles.

The Canadian Pacific Railway is making extensive plans for this season's changes in the Ottawa yards. The most important will be the erection of a large roundhouse containing 16 stalls. This will be erected just west of the present one in Hintonburg and will cost between \$60,000 and \$70,000. It will be entirely fireproof and will be of reinforced concrete. Tenders will be called for this work very soon and construction will be begun as soon as spring opens up. There are also plans for changes in the trackage, much of which is necessitated by the change in the location of the roundhouse. Some smaller buildings will also be erected by the company in the yards.

The C. P. R. will also call for tenders for a reinforced concrete bridge at Graham station. This bridge will be about 500 feet long.

The extensive changes which are to be made in the Grand Trunk Yards have already been referred to and in some cases have been begun.

The big work of all will be the construction of the departmental building by the Dominion government on Mac-

kenzie avenue, the revised plans of which are completed and tenders for which will soon be called.

The outlook for commercial building is the brightest in the history of the city. The biggest building on which architects are designing in Ottawa just now is the eight-storey building which will be erected on the corner of Elgin and Albert streets by Gordon Stewart and E. R. McNeill. But there are a number of smaller structures. Among these is one for Hiram Robinson on Queen street, the addition to a factory building for the Commercial Bank on Sparks street, and a number of buildings for stores, with apartments overhead, along Bank street.

McFarlane and Douglas are planning to extend their plant for sheet metal working and Mr. McFarlane will erect stores on Bank streets. Considerable additions will be made to the Watson Carriage Works where automobiles are to be manufactured as soon as machinery can be installed.

The Ottawa Vacuum Cleaner Company has taken over Frank Low's foundry on George street and will remodel it somewhat and begin at once the manufacture of vacuum cleaners. J. R. Booth is erecting a large building at the Chaudiere where the logs will be cut into the required lengths for pulp wood immediately on being taken out of the water.

Then of course there are a number of large buildings in course of construction. Chief among these is the Blackburn, of which the steel work for one section (about one-third of the total building) is completed. The work on this building will last for months. The Rosenthal building, the Hope building and the Rideau club are nearing completion, and work is being hurried on the Grand Trunk hotel and station.

There will be two large churches built this summer. One, the Bethany Presbyterian, will be of brick, the other, the First Congregational, will probably be a stone structure.

In most cases the prices of building materials will be about the same, perhaps a trifle higher. Lumber has gone up slightly. Cement work promises to cost more. While stone for this will remain about the same, gravel may be a trifle higher. It is selling now at 65 cents a cubic yard at the pit, while free gravel for roofing sells at \$1.75 cents a cubic yard. Sand will be somewhat more expensive and cement itself its dearer. It is higher than prevailing prices last summer. The contractors are already receiving large numbers of orders for foundations for residences. They are signing up for these at about \$6.50 a cubic yard.

A plan of the factory sites in and around the city which would give good railway facilities with the C. P. R., the G. T. R., the New York and Ottawa and the Canadian Northern Railways, has been prepared. The sites chosen have been selected with a view to providing good street car connections for the workmen. The plan was prepared by Cauchon and Haycock and shows seven large tracts which would be suitable in all requisites.

With everybody wishing good luck to the enterprise of the Canadian Northern Railway Company in its plans for the development of British Columbia, it is perhaps significant that the first steamer to dock at the new Port Mann wharf with steel rails for the Pacific division sported the Irish name Fitzpatrick, and that a second cargo arrived on March 17th.

Busy Season Opening up at Montreal

Office of the Contract Record,
March 24, 1911.

The spring rush in the building line has not yet set in but there are indications that the approaching season will be the busiest in the history of Montreal, providing strikes do not give operations a setback as they did last year. When there is an abundance of work employers usually fear trouble with labor. An official of the building trades states that he does not anticipate any strikes; but he also says that the journeymen carpenters have been asking the employers for a wage increase without much encouragement that they will have their request granted. He said that the men were unusually busy for this time of the year and there was no reason to complain on this score. Building operations have been under way in Montreal all the winter, particularly in connection with steelwork and the interior of big structures. Meetings between employers and representatives of the labor unions are being held every day for the revision of the wage schedules of the different sections of the building trade. Slight advantages are being asked all along the line and quite important concessions are demanded in certain instances but pending friendly negotiations the details of the proposed agreement are being kept close secrets by both sides. There appears to be a disposition on the part of both bosses and men to reach an amicable agreement and formulate principles of a general character for their guidance rather than fight over specific details of a petty character, and if the main regulations can be satisfactorily adjusted before work opens up it is believed and hoped that strikes will be obviated this year. The scale of wages, hours of work, systems of measurement and agreements for apprenticeship being disposed of in a rational manner there is less likelihood of trouble than if these matters had to be dealt with in the middle of the busy season.

Stinson-Reeb Company, of Montreal, Purchase Gypsum Deposits in New Brunswick

Mr. H. P. Timmerman, industrial commissioner of the Canadian Pacific Railway, has just completed an arrangement between the New Brunswick Government and the Stinson-Reeb Builders' Supply Company, Limited, of Montreal, whereby that company has acquired an area of a square mile of gypsum deposits at Plaster Rock, in the Tobique Valley, Victoria County, N.B. Mr. Timmerman has just returned from Plaster Rock, where he was accompanied by Mr. Kennedy Stinson and Mr. C. E. Barrie, chief chemist of the Canada Cement Company, upon an inspection of the property and also of the plaster mill belonging to the C.P.R. Company, which in this connection is under lease to Mr. Stinson. It was found that an exhaustible supply of the gypsum rock was available of a grade suitable to the manufacture of cement, and an order for twelve thousand tons of the crushed material already has been placed for delivery to the Canada Cement Company at Montreal and Hull, Que. It is intended also to extend the operation to the manufacture of gypsum products such as calcine plaster, plaster board, and blocks for building purposes, for which the demand is always increasing owing to their fireproof qualities.

Alberta Forms Provincial Builders' Exchange

At a meeting of the building exchanges of Edmonton, Lethbridge, Medicine Hat and Calgary, held in the last named city, a Provincial Builders' Exchange was formed. Mr. H. J. Goode, of Lethbridge, was elected the first president of the association, and Mr. C. C. Batson, of Edmonton, vice-president. The following directors were chosen: C.

Frost, Edmonton; H. T. Mooers, Calgary; C. D. Leader, Lethbridge, and A. Hook, Medicine Hat. One of the first matters which the association discussed was the validity of agreements between builders' exchanges and trade unions. Mr. H. G. Goode outlined briefly the objects of the provincial exchange. These were to handle such matters as are of a purely provincial character, concerning which it is not necessary to consult the parent body. Such subjects as legislation, agreements with architects, a uniform scale of wages and similar matters could be dealt with better by a provincial exchange, he said. Special committees were selected as follows:

Committee on by-laws and to draft a constitution—C. C. Batson, Edmonton; J. H. Garden, Calgary; J. A. Trimble, Medicine Hat; H. J. Goode, Lethbridge.

Committee to meet the architects and decide on uniform agreement in building matters—A. McSporran, Edmonton; W. J. Richards, Calgary; J. H. Preston, Medicine Hat; A. Smith, Lethbridge.

Liability insurance—A. E. Simpson, Edmonton; R. A. Brocklebank, Calgary; J. H. Preston, Medicine Hat; J. H. Thomas, Lethbridge.

Committee on resolutions—C. Frost, Edmonton; G. C. Christy, Edmonton; A. P. Burns, Medicine Hat; C. D. Leader, Lethbridge.

Committee on maximum scale—J. Dunlop, Edmonton; J. Marr, Calgary; J. D. Everard, Medicine Hat; W. R. Virtue, Lethbridge.

Those present were: J. J. Doyle, J. D. Thomas, E. Power, A. Smith, W. R. Virtue, A. C. Partridge, Jas. Glenister, W. Roy, T. R. Davidson, C. D. Leader and H. J. Goode, all of Lethbridge; A. McSporran, J. Dunlop, A. C. Simpson, P. Charlebois, C. R. Frost and C. C. Batson, all of Edmonton; Ald. R. A. Brocklebank, J. W. Albright, Ald. J. H. Garden, H. T. Mooers, W. J. Richards, Geo. Christie, D. R. Foulds, J. Marr, W. J. Aldridge, of Calgary; and A. P. Burns, J. H. Preston, Jno. A. Grimble and E. D. Everard, of Medicine Hat.

It is now expected that 200 miles of the Grand Trunk Pacific Railway, east of Prince Rupert, B.C., will be ready for operation by the end of the year. At Prairie Creek, on the main line, 200 miles east of Edmonton, a large gang of men is now at work building the steel bridge which is to cross over the Prairie Creek gulch. Prairie Creek is the dividing line between the prairie and the mountain. It has taken nearly five years to build this section of the road, stretching from Winnipeg to the end of the foothill country at Prairie Creek, the total distance being 900 miles. It will take another three years at least to complete the line over the mountains to the coast. One hundred miles of this line has already been completed east from Prince Rupert. This year another 100 miles will be finished from that end, while through the mountains, Foley, Welch & Stewart will build 100 miles from Prairie Creek to Tete Juan Cache, 40 miles west of the summit of the Rockies.

An extension thirty-five feet by sixty feet is being added to the offices of Messrs. Ross & Macfarlane, architects, corner of Belmont street and Beaver Hall Hill, Montreal. The addition will consist of two stories and a basement and will enable the firm to have all their draughting done on one floor as well as providing more room which their increasing business demands. The front will be of stone or stucco to match the cut stone in the building now occupied. The interior will be artistic and modern. The contractors are Messrs. Peel & Peel, masonry; Geo. Roberts, carpentry; A. J. Wilson, painting and glazing; and Mr. Bowen, plastering.

Personal News and Notes

The Duckworth Boyer Engineering and Inspection Company is opening a branch in Winnipeg.

F. W. Davies, electrical engineer, of Calgary, has severed his connection with the Canada Cement Company.

Edmonton has decided to apply to the Dominion government for power rights on the Athabasca river.

Berrington, Son & Watney, civil engineers, of Wolverhampton, England, intend opening a branch office in Calgary.

C. L. Trimingham, western representative of the Canada Ford Company, has taken offices in the Canada Life Building, Winnipeg.

Vice-president Fitzhugh, of the Grand Trunk and Grand Trunk Pacific, returned recently from a six weeks' tour of the Mediterranean.

Considerable building activity is reported from Nelson, B.C. Contractors there are rushing present work to completion in order to get an early start on larger jobs.

At the annual meeting of the B. Greening Wire Company, Limited, Hamilton, Ont., Mr. Norman S. Braden, of the Canadian Westinghouse Company, was elected a director.

Mr. W. H. Ford, of the Canada Cement Company, Limited, Montreal, is in British Columbia in the interests of his firm and is not expected to be back in Montreal until the middle of April.

Mr. H. B. Muckleston has been appointed assistant chief of the irrigation department of the C. P. R. Mr. B. S. Smith has been made assistant engineer in charge of right-of-way, townsites and architecture.

The city council of London, Ont., have asked Mr. A. H. VanCleve, city engineer, to reconsider his resignation and have made him an offer of \$3,250 per annum. Mr. VanCleve resigned on the first of the month.

Geo. Anderson & Co., engineers and ironfounders, of Carnoustie, Scotland, and Montreal, have opened a branch at 504 Builders' Exchange, Winnipeg, for the purpose of looking after their western trade.

C. H. F. Carter and C. C. McKenzie, formerly in the employ of the Hinton Electric Company, have started in business at Victoria under the firm name of Carter and McKenzie, as general electricians and contractors.

Western Clays Company, Limited, an Edmonton concern, have just completed the installation of \$20,000 worth of modern brick machinery and within a month they will be turning out pressed brick at the rate of 40,000 a day.

At the recent election of officers of the Canadian Bridge Company, Limited, of Walkerville, Ont., Mr. Chas. T. Miller was appointed secretary, Mr. B. S. Colburn, treasurer. Hitherto Mr. Colburn, as secretary-treasurer, had filled both offices.

Hon. G. P. Graham, Minister of Railways and Canals, estimates the cost of the new Quebec bridge at \$11,000,000, and the time that will be involved in its construction at five years. The opinion is expressed in some quarters that the cost will be nearer \$25,000,000.

The remodelled design for the new departmental block on Mackenzie avenue and Sussex street, Ottawa, is now awaiting the final approval, upon which it is expected that tenders will be called immediately. The cost of the proposed building is placed at \$3,000,000, at the lowest estimate.

The city of Winnipeg recently called for competitive plans for a new hospital at Riverview to cost \$200,000. Considerable apprehension is now felt on account of there having been thirteen plans submitted. It would seem that ar-

chitectural competitions are bound to meet with bad luck.

Application is to be made at the next session of the Ontario Parliament for an act incorporating a company under the name of the Niagara Frontier Railway, with power to construct an electric railway from Fort Erie, through Niagara Falls, to the town of Niagara.

At a recent meeting of the council of the Alberta Association of Architects, Held in Calgary, it was decided to promote competitive design, and printed copies of proposal regulations will be sent to each member of the association. It was also decided to start a library for the use of architects and students in Calgary and vicinity.

The Cabinet has approved plans for the proposed Plaza Laurier at Ottawa, and it is stated that the work will be undertaken at once. The Plaza will be 280 feet wide at the western end and 290 feet at the eastern end. A group of statuary will occupy the centre. The masonry abutments of the bridges will be replaced by steel structures.

The civic employees of Ottawa, Ont., have had a general boost in their wages. The minimum and maximum salary of the assistant city engineer, Mr. Parsons, has been increased from \$1,500 and \$2,000 to \$1,800 and \$2,400 respectively. Mr. Parsons is now receiving \$2,000. Building Inspector Fotheringham will receive \$1,250, rising to \$1,500.

The town of Farnham, Que., is having an electric plant installed that is to be ready for operation in April. It will provide 1,000 h.p. and furnish light and power for the corporation and for commercial purposes. The building operations are in the hands of the Bishop Construction Company, Limited, while some of the machinery is to come from England and some from Sweden.

The Montreal Board of Control has instructed Mr. T. W. Lesage, superintendent of the waterworks department, to go to New York to consult with Messrs. Hering & Fuller regarding the final plans to be adopted in connection with the civic filtration plant. It is estimated that the work will take three years to complete. Arrangements are now being made for the flotation of a loan to cover the expenses of the project.

The death occurred recently at New York of Mr. John B. Macdonald, a well known contractor, among whose most noteworthy undertakings were the construction of the first underground railway in New York and the tunnelling under the city of Baltimore for the Baltimore and Ohio Railway. Of his Canadian enterprises may be mentioned the Georgian Bay section of the Canadian Pacific Railway. He was born in Ireland in 1844.

News of the death of Mr. W. H. Laurie, of Montreal, came as a great shock to the engineering profession throughout the country. The late Major Laurie died suddenly in his sleep while on the train journeying from Truro to Sydney. He was born in Montreal some 60 years ago and was of Scottish parentage. As an engineer he was held in high esteem. He was one of the older members of the Canadian Society of Civil Engineers.

The Dennis Wire & Iron Works Company, Limited, London, Ont., have secured well appointed and commodious offices at 12 Queen street east, Toronto. These quarters are centrally located and will be easy of access to the company's customers and friends. Mr. C. R. Eberhard, C.E., the Toronto manager, and Mr. T. H. Wood, his assistant, will be pleased to show their excellent display of metal lockers and specimens of the company's work in metal grills, wickets and other iron and bronze work.

At the monthly meeting of the Winnipeg Builders' Exchange there was considerable discussion regarding the advisability of adopting a standard rule of measurement for use in the various trades. A vote of thanks was accorded

the London, Ont., Builders' Exchange for their services in connection with the recent annual convention of the C.N.A.B. in Winnipeg. The bonspiel smoker was fixed for March 28th. The presentation of cups and prizes was arranged for, also an elaborate musical programme.

According to an advice from Cobourg, Ont., J. Lyle Crossen, son of the president of the Crossen Car Company, and Percy Clarke, son of Samuel Clarke, M.P., have organized and received a charter for a company to be known as the Winnipeg Steel Granary and Culvert Company, Limited, capitalized at \$100,000. It will have headquarters and a plant in Winnipeg and a branch at Regina, and will manufacture corrugated steel products of all kinds, chiefly for the use of railroads and municipalities.

With the object of exploiting and developing limestone, brick-clay, silica and mineral properties on Nelson Island, Vancouver, capitalists have organized what is to be known as the British Columbia Mining, Industrial & Development Company, Limited. The immediate development plans include the building of a lime kiln, a brick plant and later on a cement plant on a large scale. According to the present plans of the company, Nelson Island lime and brick will be on the market this summer.

The Winnipeg plant of the Dominion Bridge Company, Limited, is now in operation. Extensive alterations and improvements have been made. It is fitted with the most modern machinery and has a capacity of 15,000 tons per annum. The company has in Winnipeg a large and complete stock of structural steel of all kinds, and a full staff of engineers and draftsmen. They have in the past supplied steel-work for many of the prominent buildings in the west, including the C. P. R. depot and train shed, the Royal Alexandra Hotel, Fort Garry station and train sheds, the McArthur building, Union Bank building and many others.

A proposition to turn over to the city of Edmonton at the end of three years an equipment complete, capable of delivering at the corporation line 20,000 horse power of electrical energy from Rocky Rapids, on the Saskatchewan river 60 miles from Edmonton, for the sum of three million dollars was made by the Edmonton Heat and Power Company at a recent meeting of the city council and the public works committee. At the present time the company owns only the right to develop power at the rapids for 84 years.

The Kelowna Irrigation Company, Limited, of Kelowna, B.C., who are opening up a large tract of orchard land, will put in ten or twelve miles of wood pipe system this spring. The Dominion Wood Pipe Company, of New Westminster, has been awarded the contract. This company are also supplying pipe for a system to be put in by the Richland Fruit Company, who own a large area of fruit land about 40 miles from Vernon. The first installment of pipe, comprising 25,000 or 30,000 feet of 14-inch and 16-inch diameter, is now being hauled over snow roads from Vernon to Richland.

Canadian Railroad Development

Macdonnell, Gzowski & Company, Vancouver, B.C., will begin work about July 1 on their contract for constructing the second 30-mile section of the Kettle Valley Railway.

From the Canadian Rand Company, Limited, Commercial Union Building, Montreal, Que., we have received a leaflet containing concise descriptions of several of the many classes of Rand air compressors. These machines are standards of economy and reliability. They are built at the largest plant in Canada devoted exclusively to the manufacture of compressed air machinery. Full descriptive catalogue containing valuable information to engineers and contractors may be obtained upon application to the company.

The Grand Trunk Railway, during the present season,

is to lay 100-lb. steel rails on its double-track line between Niagara Falls and London, Ont., in place of the 80-lb. rails now in the track. The heavier rails were put down last year on the entire Montreal-Toronto line. The other line will probably be equipped with automatic block signals. Extensions are planned of the telephone system for train dispatching, 250 or 300 miles to be added between Toronto and Sarnia, and so completing the service in the northern division. The line between Montreal and Toronto will also be rock-ballasted.

The Canadian Northern Railway has so far this year placed orders for 90,000 tons of 80 to 90-lb. steel rails for delivery this year. They will cost above \$3,000,000. A great proportion of the rails came from Sydney, C.B. These will be laid in Ontario and the prairie provinces. Last season 548 miles of steel were laid in Manitoba, Alberta and Saskatchewan. Grading for 520 miles of rails more in those provinces has been completed, and this work will be continued this coming summer.

Mr. A. Price, general superintendent of the Alberta division of the C. P. R. states that the company will shortly start the improvements on the Calgary division. The new wing to be added to the station at Calgary will be commenced as soon as possible this spring, and two new double-track bridges, one across the Bow river and the other across the Elbow river in East Calgary, each to cost \$150,000, will be started right away. Work will also be commenced on the C. P. R.'s new hotel in Calgary, and new stations of a special design will be built at Lacombe, High River and Claresholm.

The Canadian Northern Railway is understood to be running location surveys for a railway line from Winnipeg to Fort Alexander on the east side of Lake Winnipeg, where it is proposed to establish a summer resort. It is not known whether the line will be a continuation of the C. N. R. Bird's Hill branch or of the electric line that runs out of Bird's Hill road to the limits of Kildonan. The survey stakes are said to be set from the end of the latter road direct to a point between the river and East Selkirk. From that point it will run direct to the Fort, but a spur will be built to connect with the beaches.

Phelan & Shirley, Omaha, Neb., are making good progress with their contract for constructing the branch line of the Grand Trunk Pacific south of Edson, and the line will probably be ready by next fall. The branch will require two tunnels and about 24 bridges. The bridge contracting firm of Creelman & Verge, which has the contract for all the bridges on the branch line, as well as the big Prairie creek and Athabasca river bridge on the main line, has gangs at present working on the concrete of the big Prairie creek bridge, 65 miles west of Edson on the main line.

The American Ditching Company, of West Minneapolis, has sent us an informative and well illustrated booklet, descriptive of the "American Ditcher." The makers of this machine believe it to be scientifically and mechanically perfect. It is so rigidly constructed that its durability is assured and break-downs are almost impossible. The "American Ditcher" is readily adaptable to varying conditions, is easy of control and economical in operation. Only one man is required to run the machine and the working expense is figured out at \$12.85 a day, this being given as a probable maximum. It is claimed that the machine will dig a ditch six feet deep and 24 inches wide under any reasonable conditions at a minimum rate of 180 linear feet, i.e., 80 cubic yards, an hour. At this speed it digs 3 feet per minute and over 100 rods a day. Contractors should write to the company for further information and catalogues.

Contracts Department

News of Special Interest to Contractors, Engineers, Manufacturers and Dealers in Building Supplies.

Information for insertion in these columns is invited from Architects, Contractors, Engineers, etc.

Waterworks, Sewerage and Roadways

Brampton, Ont.

Tenders addressed to W. C. Young, town clerk, will be received until April 17th for construction of about 8,000 sq. yds. of pavement and 3,500 lin. ft. of concrete curb and gutter. Plans, etc., at office of W. M. Treadgold, town engineer.

Coquitlam, B.C.

A by-law to raise \$150,000 for road purposes will likely be submitted shortly. J. R. Grant, New Westminster, municipal solicitor.

Guelph, Ont.

Tenders addressed to city clerk, will be received until March 30th for construction of cement sidewalks required by the city for current year; also for supply of sewer pipe and Portland cement required this season. Jas. Hutchison, city engineer.

Kerrisdale, B.C.

A by-law was submitted to provide \$175,000 for sewer and water extensions, including house connections; also a by-law providing for \$50,000 for an incinerator for the health department. W. F. Heal, city clerk.

The question of the purchase of a steam traction plant for the purpose of hauling rock for the roads, is being considered by the Point Grey council. Acting Reeve Churchill and Councillor Adams are interested.

Lethbridge, Alta.

A by-law to expend \$29,100, the largest portion of which (\$18,000) will be spent on concrete walks—the rest on mains, storm sewers, electric light, conduits and cables, etc., was carried.

Moose Jaw, Sask.

The Sewer and Water Committee recommended that City Engineer Wilson secure the services of Walter J. Francis as consulting engineer to gain information for the council as to the best methods of procedure an adequate permanent water supply. Further, that the order for iron work for the paved districts be forwarded at once to the Canada Iron Corporation, Limited.

North Toronto, Ont.

The council will have laid this year three miles of concrete sidewalks.

Tenders for construction of sewage plant here will be called shortly. T. Aird Murray, consulting engineer. E. A. James, engineer.

Oakville, Ont.

Tenders addressed to the Chairman of the Board of W. and L. Commissioners, will be received until April 5th for the following: (a) labor for pipe-laying; (b) furnishing c.i. pipes and specials; (c) furnish fire hydrants, valves. Plans, etc., at office of the engineers, Chipman

& Power, 204 Mail Building, Toronto. C. G. Marlett, chairman.

Ottawa, Ont.

The board of control recommend that in view of the large amount of construction to be carried out by engineer's department under day labor system, the main portion of the west end drainage should be done by contract work, and that tenders should be called.

Mayor Hopewell will ask the city council to authorize the preparation of plans and specifications for a purification plant for Ottawa river water for the city supply and alternative plans and specifications for bringing the water from McGregor Lake. This is to save time after it has been decided which is the best place from which to take the city's supply of water.

Quebec, Que.

Tenders addressed to J. Gallagher, W. W. Engineer, will be received until April 11th for iron castings; brass castings; lead pipe and pig lead; cement; brick and drain pipes.

Regina, Sask.

The by-laws providing \$15,000 for waterworks; \$18,000 for sewerage and \$22,000 for street cleaning, were carried.

Tenders addressed to A. J. McPherson, city commissioner, will be received until April 17th for supply of 46,000 sq. ft. of galvanized iron sheeting. Plans, etc., on application to the Chief Engineer, Trunk Sewer Works.

Ridgetown, Ont.

The ratepayers will shortly vote on a waterworks proposition to install a plant to cost about \$30,000.

St. Thomas, Ont.

Tenders addressed to M. H. Baker, acting city engineer, will be received until March 31st for the necessary artificial stone, sidewalks curbing, and curbing and gutters to be constructed during the current year. Plans, etc., at office of the above.

Walkerville, Ont.

Tenders are called until April 11th for construction of brick sewer here. Owen McKay, C.E., engineer; Cecil H. Robinson, town clerk. Advertisement in "Tenders and For Sale Department" of this issue.

Watrous, Sask.

The council has accepted to furnish the citizens with water and in conjunction with this to establish an electric light plant. It is proposed to carry water into the town by a pipe line from a fresh water lake northeast of here.

Wetaskiwin, Alta.

Tenders will be received at the office of the Resident engineer, C. P. R. Co., Calgary, until April 8th for digging, laying and back filling pipe line for water supply here. Further information ob-

tained from T. J. Brown, Resident Engineer, Calgary.

Winnipeg, Man.

Tenders addressed to the Chairman, Board of Control, will be received until April 4th for supply of from 25,000 to 30,000 bbls. of cement f.o.b. city yards. Specifications, etc., at office of City Engineer. M. Peterson, secretary.

Tenders addressed to the Chairman, Board of Control, will be received until April 5th for manufacture and erection of horizontal turbine pump of 2½ gals. capacity per 24 hours. Specifications, etc., at office of city engineer, 223 James avenue. M. Peterson, secretary.

AWARDED

Brandon, Man.

A contract for waterworks supplies has been awarded to the following: James Robertson & Co., Winnipeg, for headpipe, \$4.86 per 100 lbs.; pig lead \$4.03 per 100 lbs. Johnson & Co., Brandon, for brass goods, "Mueller" manufacture.

Calgary, Alta.

Following are the tenders received for sidewalks: Davidson and Westaway, curb and gutter, 58c.; sidewalks with filling, 13c.; total, 71½c. Calgary Construction Co., curb and gutter, 50c.; sidewalks with filling, 10c.; total, 60c. Dan McGrath, curb and gutter, 59c. Forest City Paving Co., curb and gutter, 56c.; sidewalks with filling, 9 7-10c.; sidewalks without filling, 8½c.; total, 65 7-10c. Crown Paving Co., curb and gutter, 52c.; sidewalks with filling, 10¼c.; sidewalks without filling, 8½c.; total, 62¼c. Calgary Paving Co., curb and gutter, 65c. McKibbin Bros., sidewalks with filling, 10¾c.; sidewalks without filling, 8½c. McKibbin Bros., sidewalks with filling, 11½c.; sidewalks without filling, 9¾c. F. Farenback, curb and gutter, 48c.; sidewalks with filling, 9¾c.; sidewalks without filling, 8c.; total, 58¾c. F. Farenback, whose tender was the lowest of those received by the commissioners, was accepted. The price for curb and gutter will be 46 cents per lineal foot, and for the sidewalk without filling 9¾c.; and without filling 9c. per square foot. The total of Mr. Farenback's tender is 57¾c. and 56c. His price was considerably less than the others received.

Coldstream, B.C.

We are informed that the Dominion Wood Pipe Company, Limited, furnished the special castings in the installation of waterworks system, \$228; also the stop valves, \$330, tenders for the latter ranged from this to \$350. Jas. C. Kennedy, 413 Pacific Building, Vancouver, engineer in charge.

Edmonton, Alta.

The contract for the supply of sewer pipes required this year was given to the Standard Plumbing and Heating Company, of Edmonton, and the contract for

galvanized and lead pipes to the Western Supplies, Limited, Edmonton.

Victoria, B.C.

The bid of the Worswick Company which the committee recommended the acceptance of is for a five-inch concrete base and a one-inch wearing surface, with a five years' guarantee bond of 25 per cent. of the cost of the pavements. This refers to View and Fort street paving.

Railroads, Bridges and Wharves

Calgary, Alta.

Work will be started next month on the two C. P. R. bridges across the Elbow river, each to cost \$150,000. For further information address J. S. Dennis.

Carleton Place, Ont.

The Lanark County Council have under consideration the adoption of a report to the effect that the bridge over the Clyde, for which tenders on wooden structures were asked, should be of concrete, according to plans and specifications furnished by Messrs. Holmer & Winstanley, of Morrisburg, at a cost of \$3,700. Reeve, J. Boyd Caldwell.

Edmonton, Alta.

The C. N. R. will commence construction this summer of the quarter million dollar bridge on the main line west over the Pembina and Macleod rivers.

Fergus, Ont.

Engineer Connor has been instructed to draw plans, etc., for a new cement arch bridge to replace the Tower street bridge. County Roads Committee is composed of Chairman Wilkinson, Warden Fox, Road Superintendent Young, and others.

Hintonburg, Ont.

The C. P. R. will erect a new round-house here that will cost between \$60,000 and \$70,000. The plans have been prepared, and tenders will be called for at once. It will be in the form of a semi-circle, and there will be sixteen engine stalls in the building. The structure will be of reinforced concrete, with a fireproof roof, and will be absolutely fireproof.

Kingston, Ont.

Tenders are called until April 5th for construction of bridge over Cataract river. H. B. Craig, city engineer.

Montreal, Que.

The C. P. R. will this year establish 50 new town sites, mostly in Alberta and South Saskatchewan just north of the boundary line. It is said that the company will run feeders or branch lines from Minneapolis, St. Paul and Sault Ste. Marie lines into the neighboring sections of the United States in furtherance of the development of its commercial and immigration policy.

The Harbor Commissioners have approved the plans which call for the expenditure of two and one-half millions.

Sault Ste. Marie, Ont.

The Ontario Dock Co., it is reported, will add 200 ft. of new dockage and a 600-ft. slip to its property here. Estimated cost, \$100,000.

Swan River, Man.

The C. N. R. will build a new steel bridge over the river here, the estimated cost being over \$20,000. Superintendent Fisher.

Toronto, Ont.

The appeal of the C. P. R. against the order of the Dominion Railway Board for the construction of a four-track viaduct along the Esplanade, was dismissed by the Privy Council on the 25th inst.

The plans for the floating dry dock to be built by the Polson Iron Works have been approved by the Public Works Department, Ottawa. Col. J. B. Miller, president. Cost, about \$700,000. Application has been made for a subsidy.

AWARDED

Edson, Alta.

The contract for building the concrete piers for the bridge to be erected over the Macleod river for the Grand Trunk Pacific Edson-Braceau branch railway, has been awarded to Collins Bros. and Hamilton, of Heatherwood, Alta.

Red Deer, Alta.

The contract for 100 miles of railway grading and ballasting of the Alberta Central Railway, and 36 miles east, was awarded to Tanse McDonald & Co., by President John T. Moore and Chief Engineer J. Grant McGregor. The price is \$25,000 a mile, a total of \$2,500,000. The work was first specified to the completion by the end of August, but an extension of fifteen days is in the contract.

Vancouver, B.C.

The C. N. R. Company has awarded to H. Chase & Company of Seattle, the contract for the temporary fill-up trestle to be constructed at the head of False Creek from Park lane up to the western end of the Grandview cut.

The C. P. R. has awarded contracts for the construction of a new ten-stall addition to the engine house at their False Creek yards. Construction work has been commenced and it is the intention to have the building completed in July.

Winnipeg, Man.

The Cleveland Bridge & Engineering Company, Limited, have just been awarded contracts for two bridges in Winnipeg. One is a highway-crossing being a double-track 80-foot girder span, and the other a double-track viaduct 300 feet long for the National Transcontinental Railway Company, crossing over the Canadian Northern Railway tracks. The work is to be completed in both cases by September 1st. The manufacturing is done in Darlington, England, where the company's works are situated. The Montreal office prepares the drawings and supervises the construction.

The following are the contracts awarded by C. N. R.: Cowan Construction Company, 200 miles on main line from Edmonton toward Yellowhead Pass; 200 miles from Alaska to Calgary, on the Maryfield extension; 90 miles from Redville to Moose Jaw and Maryfield extension; 33 miles on Jackfish extension, from North Battleford toward the Peace River country; 80 miles from Sehlbrooke to Battleford. Northern Construction Company, 100 miles from Red Deer to Calgary; 200 miles grading and construction on main line from Vancouver toward Rockies. Amount of expenditure, \$8,000,000.

Public Buildings, Churches Schools, etc.

Berlin, Ont.

The cost of the new wing to the Berlin-Waterloo hospital is estimated at about \$24,000.

The sketches prepared by F. Grayson Brown, architect, of Hamilton, were presented to the Berlin-Waterloo Hospital Board. According to these \$15,000 would be required from each county. The Matter was referred to town council.

Brandon, Man.

Tenders addressed to R. Rogers, Minister of Public Works, will be received until March 31st for erection of Hospital for Insane here. Plans, etc., at office of the Provincial Architect, S. Hooper, Fort Garry Court, Winnipeg.

Calgary, Alta.

Plans for the new market building are almost ready, and it is expected work will be started in a day or so. The building is to cost \$50,000, and will be erected on Fourth avenue and Third street east.

Cornwall, Ont.

The house of refuge committee of the county council has accepted the plans of A. L. Weeks, of Ottawa, subject to certain modifications arranged for by the committee. The estimated cost is within the \$40,000 fixed by the counties council.

Edmonton, Alta.

It is understood that a new site in Hudson's Bay reserve has been purchased by Cushing Bros., Limited, for their plant. Saskatoon is mentioned as a possible location for another factory.

The Building Inspector has been given instructions to prepare plans for an office building for the accommodation of the city commissioners. Estimated expenditure, \$10,000.

Tenders addressed to John Stocks, Deputy Minister of Public Works, will be received until April 8th for supply and construction of the following in connection with erection of Court House: (a) plumbing, sheet metal, roofing and heating; (b) electric conduit wiring; (c) tile and marble work. Plans, etc., at engineer's office, new Parliament Buildings, or at branch office, Department of Public Works, Calgary.

Fernie, B.C.

It was decided, with the sanction of the ratepayers, to enlarge the Central school to a sixteen roomed building. A by-law will be submitted to raise by debentures \$45,000 for building and equipping the enlarged school.

Fort William, Ont.

Excavation has been started on the new Salvation Army Citadel. Captain Walker is interested.

The plans of architect D. W. F. Nichols, Winnipeg, associated with R. E. Mason, of this city, have been accepted for the new Y. M. C. A. Estimated cost, \$80,000.

A by-law covering cost of addition to Central school will probably be submitted shortly by council. Architect Mason's previous estimates of \$68,000 were found not to cover total cost.

Guelph, Ont.

A by-law will likely be submitted to the ratepayers to provide for issue of

debentures to pay for new fire hall and site.

Plans, etc., for an Infection Hospital will be received by T. J. Moore, city clerk, until April 15th.

Mr. J. W. Lyon has been appointed chairman of the committee in charge of the campaign to raise \$50,000 as a building fund for the Y. M. C. A.

Hamilton, Ont.

The Public Works Department, Ottawa, Ont., are calling for tenders for the purchase of the old Custom Buildings on Stuart street until April 8th. R. C. Desrochers, secretary.

Ingersoll, Ont.

The site selected for the armories was inspected by Col. Caldwell, Toronto, Department of Militia, Major W. A. Edgar and others.

Kaledon, B.C.

Tenders are called until April 7th for erection of 2-room school here; also for school at Hammond until April 10th.

Kerrobart, Sask.

Plans and specifications for the \$8,000 immigration building are to hand, and local contractors are to figure upon the construction. The building will be on C. P. R. land.

Kamloops, B.C.

The following have been appointed as a committee to consider the possible establishment here of a large boarding school for boys: Messrs. J. M. Harper, J. L. Brown, F. J. Fulton, K.C., and Mayor Robinson.

Kingston, Ont.

The ratepayers approved of the raising of debentures of \$40,000 for a new public school.

Tenders addressed to the Secretary, School of Mining, will be received until April 1st for the cabinet work comprising tables, benches, cupboards and other furniture, and also plumbing and fitters' works, required in the completion of the Chemistry Building. Power & Son, architects, Kingston.

Lethbridge, Alta.

Pending the voting on the by-law to provide the sum of \$100,000 for the improvements at the agricultural grounds, the council authorized an advance of \$35,000 for the purpose of construction of the main building only.

Merritt, B.C.

A new 4-room school will be erected. As soon as the site has been selected tenders will be called.

Moose Jaw, Sask.

Tenders for large frame stable, grand stand, judges' stand, are called until April 1st. Address, Secretary, P. O. Box 1812. Building must be moved by May 10th.

Rev. A. A. Graham, pastor of St. David's Presbyterian Church at St. John, N.B., has been appointed principal of the residential college for boys to be erected here.

J. A. Blix has placed before the council a proposition concerning the establishment of a school or college in this city by the United Norwegian Lutheran Church, for which a grant of land is asked. W. F. Heal, city clerk.

Niagara Falls, Ont.

The charter for the new Arena has been granted and a suitable building site is being bought.

North Vancouver, B.C.

At a special meeting of the board of health committee it was decided to ask the engineer to prepare plans and estimates for an isolation hospital.

North Bay, Ont.

The Methodist Church board have offered the vacant lot next the church for the consideration of the council as a suitable site for the public library.

New Westminster, B.C.

It is understood that a wing will be added doubling the present capacity of St. Ann's convent. Construction work will probably not commence until next year; St. Mary's hospital will also be enlarged.

Owen Sound, Ont.

The Library Board has decided to ask the council for a building site in Queen's Park. Mr. J. H. Packham, director.

Otter Point, B.C.

The residents of this district have decided to erect a new and more commodious public hall.

Ottawa, Ont.

A. Leb. Weeks has been selected architect for the new Congregation Church.

The Dominion Government will erect a testing station for explosives on Division street.

The Board of Control will recommend the erection of a contagious disease hospital on Portage Island, which will cost about \$25,000.

Tenders will be called very soon for the re-roofing of Howick Hall in order that it may be completed for the horse show which opens on May 1st.

C. P. Meredith has been selected architect for a theatre to be erected for St. Denis Lemoine, extending from Queen street to Sparks, with entrances on both streets. The theatre will accommodate about 1,200 people and will be modern in every respect. It will be built of brick and steel.

Pembroke, Ont.

Under date of last information the contracts for public library had not been awarded. The estimated cost is \$12,000. Building will be brick with stone foundation, 50 x 60 ft., one storey and basement. A. J. Fortier, town clerk.

Renfrew, Ont.

Tenders addressed to J. A. Stubinsky, secretary-treasurer, R. C. S. School, will be received until April 1st for erection of school here. Plans, etc., at office of F. M. Devine. C. P. Meredith, architect, Ottawa.

Regina, Sask.

Messrs. Brown & Vallance, architects, Montreal, report that tenders are being called for the Regina College building.

The school board have decided on a four or six room addition to the Albert street school at once; also a four or eight room addition to the Victoria school without delay; also the purchase of three sites for schools to be erected when required.

The by-law to donate \$15,000 to the Y. M. C. A. carried.

Stanstead, Que.

Stanstead is likely to have a new armory. Major A. C. Hanson, of Coaticook, is interested.

Saskatoon, Sask.

The council will alter the King Edward school, making it suitable for the civic offices, and instead of going through with the plans for a \$150,000 city hall will build a new school.

Sherbrooke, Que.

Tenders are called until April 10th for construction of school on Drummond Road. Plans, etc., with C. O. Palmer, secretary, Tuck's Block.

The Board of Protestant School Commissioners will call for tenders for the erection of a new school building on Drummond street.

The Redemptorist Fathers will erect a monastery on the property they recently acquired on Beckett road. Instructions have been given to Mr. Louis Audet to prepare the plans. The proposed buildings will cost \$80,000. The contract will be let early in the spring and the work proceeded with as early as possible.

Toronto, Ont.

The Governors of University College will erect a new pavilion to seat 2,000 spectators, in the extended athletic field. Plans for extension of Wycliffe College were approved.

Tenders addressed to the Chairman of the Joint Building Committee of the Y. M. C. A. will be received until April 5th for erection of the West-End Building. Burke, Horwood & White, 28 Toronto street, architects.

Tenders addressed to Symons & Rae, architects, 15 Toronto street, will be received until April 1st for the various works required in the erection of a building for the North Broadview Presbyterian Church.

Tenders addressed to W. C. Wilkinson, secretary-treasurer, will be received until March 31st for erection of new school on Caledonia road. Plans, etc., at office of the board, City Hall. W. W. Hodgson, chairman of committee. Advertisement in "Tenders and For Sale Department" of this issue.

The enlargement of school accommodation upon which it is proposed to spend half a million dollars, is as follows:

Roden school, 8-room addition to the front of building, \$40,000; Earl Grey school, 16-room addition for second and third storeys to complete the building, \$75,000; Frankland school, 6-room addition of third storey to complete the building and to provide for building erected last year, \$85,000; Hillcrest school, 8 rooms, new building, \$40,000; Ogden school, 2 rooms, addition to third storey on rear wing, \$8,000; Manning avenue school, 6-room addition to complete the new building, \$30,000; Essex street school, 9-room addition to the front of building, \$43,000; Earls court school, 6 rooms, addition to the front of building. This neighborhood being further provided for eastward by the new McMurrich school and westward by the new school on Caledonia road, \$30,000 Caledonia road, 9 rooms, to supplement estimate of 1910, \$45,000; Annette street school, 16 rooms addition of second and third stories to complete the new building, \$75,000; Fern avenue school, 6 rooms, addition to east side of building, \$30,000.

Victoria, B.C.

The congregation of Knox Presbyterian Church have authorized the board of

managers to purchase a site for a new church. S. J. Drake, chairman.

Mr. Loring D. Rixford, San Francisco, has been chosen architect for the new Union Club building, which will occupy a floor space of 100 sq. ft. Estimated expenditure, \$150,000.

Vancouver, B.C.

Tenders are called for the building of 12-room addition to the school, corner of Charles and Templeton streets; also for addition to the Tennyson school, consisting of 8 rooms with auditorium. Later tenders will be called for 8-room additions to the following schools: Mount Pleasant, West Kitsilano, and North Kitsilano. N. A. Leech, architect.

Woodstock, Ont.

Authority was given the building committee of Chalmers' Church to make and sign contracts for the erection of the building which will be on the old site.

Westmount, Que.

Messrs. Hutchison, Wood and Moller were appointed architects to prepare the plans for the new fire station on the Boulevard.

Winnipeg, Man.

Tenders addressed to H. B. Rugh, architect, Union Bank Building, will be received until April 7th for erection (except plumbing, heating and lighting) of a sanatorium building for the Manitoba Sanatorium Company, on Lakeview Beach, Little Manitou Lake, Sask.

Tenders are called by the Public School Board until April 11th for erection of a 12-room addition to the Strathcona school on McGregor and Burrows streets. Plans, etc., on application to J. B. Mitchell, commissioner of buildings, school board office. R. H. Smith, secretary-treasurer, W. P. S. B.

Tenders addressed to the Chairman, Board of Control, will be received until April 3rd for supply of labor and materials, required for the erection of two patrol houses and stables, near Tyndall, Man., and Lac du Bonnet, Man. Specifications, etc., at office of Smith, Kerry & Chace, power engineers, Carnegie Library Building. M. Peterson, secretary.

AWARDED

Lethbridge, Alta.

The contract for the erection of the main building for Exhibition has been awarded to Smith Bros. & Wilson. The cost will be about \$35,000.

London, Ont.

The Blonde Lumber and Manufacturing Company being the lowest tenderers, were awarded the contract for erection of new R. C. Church and rectory, at the sum of \$43,262. J. L. Wilson & Son, Clitham, architects.

Montreal, Que.

The church authorities of the parish of St. Stanislas parish (Catholic) of Montreal, will build a church on St. Joseph Boulevard, with Guilford street on one side and Garnier street on the other, at an estimated cost of \$142,000. The architect is Mr. Alph. Veane and the general contractor, Mr. Boileau.

Toronto, Ont.

The contract for the galvanized iron, lating, skylight and metal ceiling work on the Woman's Building, Exhibition grounds, has been awarded to A. B. Ornsby, Limited. Messrs. Wickett Bros., general contractors.

Welland, Ont.

The contract for the new Welland Club house has been let to Mr. McKissock, of Toronto. Work has been begun on the contract and the building is to be done by June 1st. Cost, about \$20,000.

Winnipeg Beach, Man.

The contract for municipal hall here was awarded to S. B. Ritchie, Winnipeg, \$2,797.

Residences

Edmonton, Alta.

The Edmonton Apartment House Co., a newly organized company, will erect a 6-storey apartment block on the Hardisty property. W. A. Griesbach, of Edmonton, is the solicitor. F. W. Sykes, England, and G. J. Kinnaird and R. Hardisty, of Edmonton, are provisional directors.

Lethbridge, Alta.

Matson & Carlson have permits for three large houses to be built on the corner of 4th Avenue and 15th Street south, \$13,300.

Montreal, Que.

Messrs. Brown & Vallance, architects, report that tenders are being called for four residential houses in Pine avenue for Messrs. Robb & Brown; also for house in Westmount, for Mr. J. W. Blair.

Vancouver, B.C.

Plans were presented for two large apartment houses, that for Mr. Young shows a 4-storey block, 66 x 129 feet; the other a building, 5-stories, frontage 198 ft. on Haro street, running back along Thurlow street for 122 feet.

Victoria, B.C.

Mr. G. C. Mesher is the architect for the erection of the Savoy Mansion apartment house on Victoria Crescent.

AWARDED

Ottawa, Ont.

M. M. O'Connell, plumber, has been awarded the contract for plumbing a residence for Sir Henry Bate on Sandy Hill.

Victoria, B.C.

Work has commenced upon the new 3-storey apartment house being erected for Mr. Max Leiser. J. L. Skene, contractor; Thos. Hooper, architect.

Business Buildings and Industrial Plants

Bay of Islands, Newfoundland.

A large United States packing concern purposes establishing five cold storage plants in Newfoundland within the next five years at a cost of about \$500,000 or more. An option has already been secured on the whaling plant at Lark Harbor, Bay of Islands, where the company will erect its first establishment. This plant was constructed several years ago, at an outlay of \$40,000, and, as an immense herring trade is done in the vicinity, the outlook is most promising.

Calgary, Alta.

The Molson's Bank of Canada is having plans prepared for a bank building.

Plans have been prepared for a 6-storey block for Frank Fairey, to cost about \$300,000.

Cobourg, Ont.

Specifications are being prepared for a G. T. R. station here.

Edmonton, Alta.

The Petrie Manufacturing Co., of Hamilton, Ont., have purchased a warehouse site where a fireproof building will be erected.

Fort William, Ont.

The Plans for gigantic grain elevators at West Fort William on Lake Superior by the Grand Trunk Pacific Railway show three big piers devoted to the grain traffic on which will be placed six elevators of 10,000,000 bushels capacity each. The plans provide for the handling of 2,400 cars a day in these elevators.

Galt, Ont.

The Galt Town Council has decided to spend \$12,000 in the purchase of a 120 acre farm, part in to town limits and part outside, to be devoted to industrial purposes.

High River, Alta.

Negotiations are in progress for the location of a beet sugar factory here.

Hanover, Ont.

On April 3rd a by-law to grant and by way of loan of \$5,000 to A. Glaeser and P. Leinberger, to assist them in erecting additions to a factory, etc., will be submitted to the ratepayers. John Taylor, town clerk.

Kerrobert, Sask.

The Canadian Bank of Commerce will erect a bank building here opposite the Windsor Hotel. The C. P. R. will construct a roundhouse here at a cost of \$40,000.

Merritt, B. C.

The Shawinigan Lake Lumber Company will erect here a large lumber mill during the ensuing year. Negotiations are in progress for the purchase of local timber limits.

Midland, Ont.

The Campbell Milling Company will erect their mill here to cost about \$400,000, with capacity of 3,000 bbls. Contracts have not been let yet. Noted previously.

Milverton, Ont.

Tenders were called by Ranney Bros., until March 28th for erection of store and bank building here. Plans, etc., at Bank of Hamilton, Milverton.

Montreal, Que.

The carriage factory of Mr. A. C. Lariviere was destroyed by fire on the 21st inst. Estimated loss, about \$30,000.

Messrs. MacVicar & Heriot, architects, are calling for tenders until March 29th for a three-storey addition to the Berliner-Gramophone factory in St. Henry ward. The three additional stories will be erected on the one-storey structure which constitutes the present factory.

New Westminster, B.C.

The Westminster Trust Company have had plans prepared for a ten-storey building to be erected at the corner of Begbie and Columbia streets. Six stories will be erected at this time and will be so built that the other four stories can be added when business demands it.

Peterborough, Ont.

The Electric Power Company will erect a car barn and extend the street

railway to Byersville. J. H. Larmonth, general manager.

A by-law will be submitted shortly to the ratepayers in regard to the location here of the Independent Tire Company, Limited. The company agrees to erect a 3-storey brick or concrete building and machinery to the amount of \$75,000 to be installed by July 1st, 1912.

Port Arthur, Ont.

Tenders addressed to the directors of the Finnish Publishing Company, Box 312, will be received until March 31st for erection of a building. Tenders may be separate for the material or for the work complete. Plans, etc., at office of J. Mannerstam, 204 Court street south.

Quebec, Que.

Mr. C. Moore, representative of the syndicate composed of American and Canadian capitalists, laid a proposition before the council regarding the erection of a hotel here.

Regina, Sask.

Tenders are called until April 1st for erection of office building for Credit Foncier Franco-Canadian. Storey & Van Egmond, architects.

The Saskatchewan Co-operative Company will erect a distributing warehouse in Regina in a short time. A. R. Partridge, president; A. Samson, secretary-manager; W. J. H. Traynor, general organizer.

Revelstoke, B.C.

F. C. Adams, Portland, Ore., and C. H. Danaher, Tacoma, Wash., are concerned in the project to exploit the pulpwood timber and water power resources of this city and district. Part of this projected work is the erection by the Diamond Sawmills Company of a mill at Big Eddy with a capacity of 200,000 feet a day and the acquisition of more than 500 miles of pulpwood and saw timber in the Columbia Valley. Other work proposed is a power plant by which the rapids of the Columbia will be harnessed and the erection of a pulp and paper mill, capable of turning out 200 tons of product per day.

Saskatoon, Sask.

Tenders are called for the six-storey Taylor department store. Cost, about \$200,000. Storey & Van Egmond, architects. The latter are also advancing the plans for the proposed new business block on 2nd avenue, for which some changes will have to be made before tenders will be called.

Sherbrooke, Que.

The Quebec Central Railway Company will erect a large and modern office building on the site of their present offices. Mr. J. H. Walsh, General Manager.

St. Boniface, Man.

D. C. Cameron, president and managing director of the Rat Portage Lumber Company, laid before the council the project to expend about \$250,000 along industrial lines and extensive building, in return for civic privileges named. Referred to committee.

St. Catharines, Ont.

The National Trust Company, Toronto, have purchased the block of land at

the corner of Queen and St. Paul streets, on which a large modern building, 63 x 122 feet, will be erected.

Truro, N.S.

The Intercolonial freight shed at Truro was totally destroyed on the 23rd inst, entailing a loss of \$47,000.

Toronto, Ont.

Moffatt and Irving, steel and iron firm, are trying to secure a five-acre site for a big steel and iron foundry in the Ashbridge's Bay district.

Messrs. Darling & Pearson are preparing plans for the new office building for the C. P. R. management. They show granite as the material for the lower stories.

Vancouver, B.C.

Permit was granted to D. Spencer & Co. for a 4-storey building at the rear of the Standard Furniture Co. block on Hastings street, \$15,000.

Excavation has been started for the Bridge street branch of the Royal Bank of Canada. Jonathan Rogers has the contract. Estimated expenditure, \$60,000. Previously noted.

H. K. Bamber, managing director, Associated Portland Cement Company, London, Eng., and H. D. Anderson, associate, are negotiating for a building site for the plant to be built here or in Victoria.

Messrs. McDonald & Wilson have the building permit for the tram terminal office block which will be erected for the B. C. E. R. Co., corner of Hastings and Carrall streets. The plans have been prepared by Mr. W. M. Somerville and show a five-storey building. The estimated cost of the work is \$350,000, and the contractors will start demolishing the old building in a few days.

Permit covering the erection of a brick warehouse at 1067 Hamilton street has been issued to A. O. Campbell, \$48,000. McLachlan Bros. were also granted a permit to erect a warehouse at 1073 Hamilton street, \$25,000.

Application was made for a permit for the erection of a \$60,000 brick block on Granville street by Messrs. Boyle and Lewerke. The proposed building will be five stories in height and is to measure 50 by 120 feet.

Victoria, B.C.

T. Hooper, architect, is preparing plans for a 4-storey building for Messrs. Gault Bros., Limited, of Montreal. Estimated cost, \$50,000.

Thos. Hooper, architect, called for tenders on March 23rd, for the erection and completion of a steel and reinforced concrete building for the B. C. Telephone Company, Limited, to be erected on the corner of Blanchard and Johnson streets.

Westmount, Que.

Permission to erect a factory on Hillside avenue was granted to Mr. Robert Neville.

Winnipeg, Man.

The plans for the addition of two new storeys for the union depot will be prepared shortly, it is expected.

Messrs. Brown & Vallance, Montreal, Que., report that tenders are being called

for the Canadian Fairbanks Company's warehouse here.

Work on the building for the Confederation Life Association, will, it is thought, commence this spring. Details are not yet worked out definitely.

Tenders are called by C. P. R. management for construction of boiler shop, Winnipeg; and transfer table, Winnipeg shops. Plans, etc., at office of Frank Lee, division engineer.

The Canadian Pacific Telegraph Company is about to erect a large block for telegraph, ticket, freight, express and steamship offices. Address B. S. Jenkins, general Superintendent, Manitoba.

Tenders addressed to W. Wallace Blair, architect, 300 Nanton Bldg., will be received until March 29th for construction of two additional stories on the Notre Dame Block for the Ontario Manitoba and Western Land Co., Ltd.

AWARDED

Edmonton, Alta.

The contract for the new Tegler building, First and Elizabeth, has been awarded to Contractor Archibald, of Carberry, Manitoba, and construction is to be commenced early in April. H. A. Magoon, architect. The building is to be six stories in height, and will cost in the neighborhood of \$125,000. The work must be finished by September 1st.

Fort William, Ont.

George P. Grahame has been awarded the contract at \$77,000 by Carl Wirth, to erect a block here for the Traders Bank of Canada.

Lethbridge, Alta.

The Lussier Construction Co. have secured the contract from the Henderson Estate for the erection of a brick block on the premises lately occupied by the Balmoral Hotel. The construction of the building without heating appliances and plumbing will cost about \$21,000.

North Vancouver, B.C.

Messrs. Lett & Son are erecting a 3 storey pressed brick block on First street. Bayness & Horell of Vancouver have the contract.

Ottawa, Ont.

Holbrook and Sutherland have been awarded the contract for renovating and remodelling the Royal Bank on the corner of Sparks and Elgin streets. Kenneth G. Rea, architect.

Regina, Sask.

A building permit was granted to J. K. McInnis & Sons for erection of ten stores on Broad street. Henry Black has the contract.

Welland, Ont.

The contract for new Page & Hersey plant at Welland was awarded to David Dick & Sons, Limited, of Welland. The buildings when completed will be over twice as large as present plant, and will be of steel, brick and concrete construction, the price is said to be \$150,000. Mr. D. Dick, Jr., president and managing director.

Winnipeg, Man.

A. Macdonald, wholesale grocer, has decided to rebuild his warehouse in Market street, which was burned last Thanksgiving day. Saul & Irish are the contractors; permit called for an expenditure of \$20,000.

Power Plants, Electricity and Telephones

Brandon, Man.

City Engineer Speakman has been instructed to prepare a plan of street railway which in his judgment would be the best paying route, and to report to the council. The line of railway will likely be about nine miles in all.

Dartmouth, N.S.

A company is seeking incorporation with a view to building an electric railway in Dartmouth out to Cow Bay. A. C. Pyke is interested. Robert Stanford, owner of Cow Bay Beach, is one of the incorporators.

Edmonton, Alta.

It was decided to pass a motion asking the Dominion Government to give the city time to submit a by-law to the people, before losing the period during which the contract may be considered.

Edmonton, Alta.

The council have considered the proposition of the Dominion government submitted to the city after application had been made for water power rights on the Athabasca river, the plan was favorably considered and the matter laid over till the next regular meeting. In connection with the government proposition, Cote & Nevelle sent in a communication involving a plan whereby a syndicate they represented would supply to the city from the same place on the Athabasca river where the city has taken rights. Under the terms of the government proposal the city is to start work next year at Grand Rapids by expending \$100,000, and a like sum each year until 1916, when it would have to be in position to deliver 10,000 horse power in the city. It is also given the option of developing a maximum of 60,000 horse power. The syndicate represented by Cote & Nevelle agreed to deliver 10,000 horse power to the city in five years providing the city surrender its rights secured by application to the Dominion government, and contract to take 10,000 horse power per year from the syndicate. The terms upon which it agrees to do this are: Over its own transmission lines it will agree to deliver 10,000 horse power in the city for \$24.85 per horse power per annum; 20,000 horse power at \$18 per h.p. per annum; 30,000 h.p. at \$15 per h.p. per annum. In case the city builds its own transmission line, the estimated cost of which engineer Neville said was \$800,000, then they would supply power at the following figures: 10,000 h.p. at \$15 per h.p. per annum; 20,000 h.p. at \$12 per h.p., and 30,000 h.p. at \$10 per h.p.

Fort William, Ont.

The commissioners of the joint street railway board seem to be in favor of having the car works established here. Commissioner Fortune submitted a report on the plant which he proposed should be built by the city.

Hamilton, Ont.

The board of control recommended the city council to engage E. J. Sifton, of Vancouver, the electrical expert, to report for Hamilton on the cost of a municipal lighting, power and street lighting system. There were forty applications from experts all over Canada and the United States.

Peterborough, Ont.

See "Business Buildings."

Penze, Sask.

Bids will be received until noon, April 1, by F. R. Groves, secretary, for the construction of a telephone system, complete, for the Rufus Rural Telephone Company.

Revelstoke, B.C.

A company known as the Dominion Securities has been organized and it is reported that a franchise for a street railway has been guaranteed.

Regina, Sask.

Tenders addressed to the City Commissioners will be received until April 5th for the construction of about 7 miles of street railway track laying, consisting of ordinary construction and track laying in pavements. Information obtained from L. A. Thornton, city engineer. Advertisement in "Tenders and For Sale department" of this issue.

St. John, N.B.

A bill before the legislature introduced by J. E. Wilson, M.P.P., seeks the incorporation of a company to harness the Lepreaux river and generate electric power for transmission to St. John, the company to be known as the New Brunswick Hydro-Electric Power Company. Incorporators, C. H. Easson, manager, Bank of Nova Scotia, St. John; W. E. Foster and Percy W. Thomson, St. John, and H. H. Beck, Toronto. Capital, \$1,500,000.

Toronto, Ont.

Tenders are called until March 30th for pole line supplies. W. C. Norman, clerk, Eglinton.

Vancouver, B.C.

The Vancouver Gas Co. is having plans prepared for two producers and storage tanks to cost between \$400,000 and \$500,000.

Victoria, B.C.

See "Business Buildings."

Welland, Ont.

The Niagara Falls, Welland and Lake Erie Railway Company have obtained their charter. The company's charter from the town requires the construction to start before May 15th. C. J. Laughlin is interested. Geo. H. Carpenter, Cleveland, Ohio, is financing.

AWARDED

Calgary, Alta.

Tenders for the city's supply of wire for the coming season has been awarded to the Canada General Electric and General Supplies, Limited. Their tenders were the same: For No. 8 to 4-0, \$17.20 per hundred; and for No. 10, \$18.20.

Fort William, Ont.

W. L. Bird, manager and secretary of the Kaministwika Power Company Limited, writes that contracts in connection with the extension of power plant at Kakabeka Falls have been awarded as follows: John Inglis, Toronto, penstocks; waterwheels, J. M. Voith, Gen. Canada General Electric, electrical equipment; Steel Company of Canada, copper wire. Estimated cost, \$200,000.

Sherbrooke, Que.

The Canadian Westinghouse Company, of Hamilton, has the contract to install the civic lighting plant here. The contract is worth about \$40,000.

Strathcona, Alta.

The city council adopted a report from the power house committee recommending the acceptance of various tenders for the supply of \$45,031 worth of electrical machinery to be installed by October next in the municipal power house. The tenders accepted were 600 kw generator to Chapman Walker, Toronto, \$10,160; Burnham regulator, Gorman Clancey & Grindley, Edmonton, \$750; generator engine, Goldie & McCulloch, Galt, \$12,900; 2,500 h.p. boilers, Goldie & McCulloch, \$12,750; smoke stacks, fans, etc., Canada Foundry Company, Toronto, \$7,304; 2 feed pumps, etc., Canada Foundry Company, \$1,167. The machinery will double the present electrical generating capacity of the city power plant and is urgently needed.

Miscellaneous

Edmonton, Alta.

Tenders are called by the City Commissioners until April 3rd for supply of spruce lumber. Information at the Stores and Works Department, Kinistino avenue.

Lachine, Que.

Tenders addressed to H. Robert, secretary-treasurer, will be received until April 4th for supply of cement, hard crush stone, size 1½-in., 1-in. and ¾-in., delivered f.o.b. Lachine, for the supply of coarse river sand, pit sand and cinders, to be delivered on canal bank, and for supply of unbroken stone, blue or grey to be delivered when required. For information apply to V. H. Dupont, civil engineer, 62 St. James street, Montreal.

London, Ont.

Tenders addressed to H. Ashplant, Chairman No. 3 Committee, will be received until April 3rd for new watering carts and repairs to old carts. Specifications, etc., at office of the acting City Engineer, Geo. W. Wright.

Montreal, Que.

Three important building permits were granted at the city hall. One was to Messrs. A. Ramsay and Sons to erect a new manufacturing establishment on St. Paul street, near their present site at a cost of \$16,000. The building will be of concrete, six storeys high. Y. M. C. A. officials have secured a permit to build a power house near their new Drummond street building, \$15,500.

Tenders addressed to David Seath, secretary, Harbor Commissioners, will be received until April 4th for supply of the following: ballast stone, concrete stone, Portland cement, rails, sand, steel bars, yellow pine timber. Specifications upon application to F. W. Cowie, chief engineer.

Ottawa, Ont.

Further supplementary estimates for the year include Port Arthur and Fort William, harbor and river improvements—additional dredging, \$267,422; Victoria Harbour, Ont., improvements, \$111,000.

Renfrew, Ont.

Tenders are called until April 10th for supply of Portland cement, 2,500 bbls. more or less. Cement to meet the standard specifications of the Canadian Society of Civil Engineers. A. T. Lawson, town clerk, treasurer.

Toronto, Ont.

Tenders in connection with the erection of East Toronto Fire Hall will be

(Continued on page 57)

Tenders and For Sale Department

City of Moose Jaw, Saskatchewan

Main Drainage Works

Sealed tenders endorsed "Tender A" and "Tender B" will be received by the undersigned City Clerk until 8.30 o'clock p.m., on Monday, April 10th, 1911.

Any tender received after the above-stated time will be declared informal.

Contract "A."

Supplying material for and constructing a Sewage Disposal Plant complete, including Pump House, Sedimentation Tanks and Percolating Filter, also the supply of materials for and the laying of a Trunk Sewer and Water Main.

Contract "B."

Supplying two Electrically Driven Centrifugal Pumps and Auto Starters complete with all piping, connections, etc.

Plans and specifications for Contract "A" may be obtained from the City Engineer, Moose Jaw, upon receipt of a marked cheque for the sum of \$25 to be held until the return of plans and specifications, and for Contract "B" plans and specifications will be sent upon request.

The lowest or any tender not necessarily accepted.

J. M. WILSON, City Engineer. W. F. HEAL, City Clerk.
Moose Jaw, Feb. 18th, 1911. 9-14

City of Moose Jaw, Saskatchewan

SEWER AND WATER EXTENSIONS

Sealed tenders endorsed "Tender 28," "Tender 29," "Tender 30" and "Tender 31," will be received by the undersigned City Clerk until 8.30 o'clock p.m., on Monday, April 10th, 1911.

Any tender received after the above stated time will be declared informal.

Contract 28.—The laying of approximately 30,700 lin. feet of tile pipe sewer, building man-holes, etc.

The laying of approximately 20,700 lineal feet of cast iron water main, placing valves, valve boxes, hydrants, etc.

Contract 29.—The supplying of approximately: 29,600 lineal feet of 6-in. c.i. water pipe.

112 lineal feet of 4-in. c.i. water pipe.

132 6-in. cast iron reverse curves.

34 6-in. cast iron crosses.

72 6-in. cast iron tees.

29 4-in. off 6-in. cast iron tees.

28 4-in. cast iron tees.

95 6-in. cast iron plugs.

Contract 30.—The supply of approximately: 28,000 lin. feet of 6-in. vitrified tile sewer pipe.

26,600 lin. feet of 8-in. vitrified tile sewer pipe.

5,225 lin. ft. of 10-in. vitrified tile sewer pipe.

1,100 lin. ft. of 12-in. vitrified tile sewer pipe.

25 8-in. tees.

75 6-in. tees.

25 8-in. ¼ bends.

100 6-in. ½ bends.

25 8-in. stops.

25 10-in. stops.

400 4-in. to 6-in. increasers.

Contract 31.—The supply of approximately:

65 6-in. 3-way hydrants.

147 6-in. gate valves.

29 4-in. gate valves.

150 6-in. valve boxes.

29 4-in. valve boxes.

88 manholes, frames and covers.

Plans and specifications for Contract 28 may be seen at the office of the City Engineer, Moose Jaw, and at the offices of the Canadian Engineer at Toronto and Winnipeg.

Plans and specifications for Contracts 29, 30, and 31 will be sent upon request.

The lowest or any tender not necessarily accepted.

J. M. WILSON, City Engineer. W. F. HEAL, City Clerk.
Moose Jaw, Feb. 24, 1911. 9-14

Steam Shovels

We own and have for sale near Buffalo, N.Y., two Vulcan 75-ton 2½-yard steam shovels; late model, with new extra large boilers and in excellent condition; also one 70-ton. These will stand most rigid inspection and we are offering them at unusually low prices. Confer with us.

WILLIS SHAW MACHINERY CO.,

171 La Salle Street,

T.F.

Chicago, Ill.

Sealed Tenders

will be received until Monday noon, April 8rd, for the construction, delivery and erection in place in Welland, Ont., of one unit of water power driven waterworks pumps, three million imperial gallons daily capacity, including turbine, pipes, valves, etc.

Specifications, prepared by Mr. Wm. Kennedy, Jr., Engineer, Montreal, may be obtained from the undersigned.

Envelopes to be marked "Tenders for Pumps."

R. COOPER,

Chairman Water Commissioners.

Welland, Ont.

11-13

To Contractors

Tenders will be received at the Office of the Secretary, School of Mining, Kingston, up to 6 p.m., of Saturday, April 1st, for the Cabinet Work, comprising Tables, Benches, Fume Cupboards, and other Furniture, and also Plumbing and Fitters' Works required in the completion of the Chemistry Building for the Governors of the School of Mining.

Plans and specifications may be seen at the office of the undersigned.

The lowest or any tender not necessarily accepted.

POWER & SON,

Architects.

Merchants' Bank Chambers,
Kingston, Ont.

12-13

Tenders for Swiss Chalets at Golden, B.C.

for the

Canadian Pacific Railway Co.

Sealed tenders are invited for the erection of six chalets of Swiss design at the C. P. R. Swiss Village "Edelweiss," near Golden, B.C.

Plans and specifications may be obtained on application to the undersigned. All applications must be accompanied by a certified cheque for \$10, which will be returned on the receipt of bona fide tender and the return of the plans and specifications.

Tenders are to be delivered not later than 9 a.m. on Saturday, April 1st, 1911, addressed to

J. S. DENNIS,

Manager Irrigation, Alberta and B.C. Lands,

Canadian Pacific Railway Company,

Calgary, Alberta.

The lowest or any tender not necessarily accepted. 12-13

To Architects

Competitive Plans

The Municipal Council of the Town of Goderich is desirous of obtaining plans for a proposed new municipal building (combined Town Hall and Fire Hall) to be erected on the site of the present Town Hall.

Conditions of competition can be had on application to the undersigned.

Plans will be received up to and including April 15th, 1911.

L. L. KNOX, Town Clerk,

11-13

Goderich, Ont.

Bridge Tenders

Sealed tenders addressed to the Chairman, Board of Works, Owen Sound, will be received up till 6 p.m., Friday, April 7th, 1911, for the following:

1. 9th Street Bridge—

(a) Steel superstructure, span 53 ft., width 40 ft.

(b) Reinforced concrete floor for same.

(c) Concrete abutments for same.

(d) Reinforced concrete arch, span 50 ft., width 40 ft.

2. 10th Street Bridge—

(a) Steel superstructure, span 69 ft., width 68 ft.

(b) Reinforced concrete floor for same.

(c) Concrete abutments for same.

(d) Reinforced concrete arch, span 66 feet, width 66 feet.

3. Removal of old bridge and construction of temporary one.

A certified bank cheque payable to the Treasurer of the Town of Owen Sound for 5 per cent. shall accompany each tender, to be returned in case of non-acceptance, and to be forfeited in case the accepted tenderer declines the contract or fails in the performance thereof.

Plans and specifications may be seen at the office of the Town Engineer.

Tenderers for steel superstructure to submit plans and strain sheets.

The lowest or any tender not necessarily accepted.

J. K. LESLIE,

R. McDOWALL, C.E.,

Chairman Board of Works. Town Engineer.
Owen Sound, March 7. 1911. 11-14

City of Prince Albert

Tenders for

Intercepting Sewer

Sealed tenders addressed to the Commissioners of the City of Prince Albert and marked "Tender for Sewer," will be received until noon on Saturday, the 15th day of April, 1911, for the construction of a Main Intercepting Sewer, as follows: 5,749 lin. ft. 4-ft. 6-in. x 3 ft. concrete sewer. 4,640 lin. ft. 4-ft. 3-in. x 2-ft. 10-in. concrete sewer.

2,798 lin. ft. 4-ft. x 2-ft. 8-in. concrete sewer. 19 Manholes.

Alternate bids for Reinforced Concrete Pipe will be considered.

Plans and specifications may be obtained at the office of the City Engineer.

A marked cheque for \$2,500, in favor of the Treasurer of the City of Prince Albert must accompany each tender submitted.

ANDREW HOLMES,

C. O. DAVIDSON,

F. A. CREIGHTON,

Commissioners.

Prince Albert, Sask.,
March 7, 1911.

11-13

For Sale

The Board of Power and Light Commissioners of Ingersoll, Ont., have for sale for immediate shipment, two 25 h.p. induction motors, C. G. E. 3-phase, 220 volts, 4 Canadian General transformers, each 15 k.w. capacity, 2,200-220 volts, 60 cycles, S. P. direct current Arc Lamps, direct current motors, 220 and 110 volts from 1 to 40 h.p., and for delivery within a few weeks, steam engines, boilers and general steam plant accessories. Particulars on application.

11-13 W. R. REYNOLDS,
Superintendent.

Harriston Water Works

Tenders will be received until April 13th next for
**CAST IRON PIPE, HYDRANTS, VALVES,
LEAD, WATER TOWER.**

For all information apply to
BOWMAN & CONNOR,
Consulting Engineers,
Berlin, Ont.
13-13

Tender for Sewer
Town of Walkerville

Sealed tenders will be received, by registered letters, addressed to the undersigned up to noon on **Tuesday, the 11th day of April, 1911**, for the construction of a Brick Sewer on Victoria Road from Huron street south to Ontario street in the Town of Walkerville.

Plans and specifications may be seen on application to Mr. Owen McKay, C.E., Walkerville.

Tenders must be accompanied by a marked cheque, made payable to the Town Treasurer, equal to 5 per cent. of the amount thereof.

Should any party whose tender is accepted, fail to execute the necessary Contract Bond for the due fulfilment of the same, his deposit will be forfeited to the Town.

Deposits of unsuccessful tenderers will be returned.

The lowest tender not necessarily accepted.

The names of two responsible persons must accompany each tender.

CECIL H. ROBINSON,
Walkerville, Ont., Town Clerk.
March 24, 1911. 13-13

Town of Oakville

Waterworks Extensions

Notice to Contractors

Sealed tenders will be received by the Chairman of the Board of Water and Light Commissioners until 8 p.m., **Wednesday, April 5th, 1911**, for the following work:

Contract A. Labor for pipe laying.

Contract D. Furnishing cast iron pipe and specials.

Contract E. Furnishing fire hydrants, valves, etc.

Plans and specifications may be seen at the office of the engineer, 204 Mail Building, Toronto. No tender necessarily accepted.

C. G. MARLATT, Chairman.
GEO. HILLMER, Mayor.
P. A. BATH, Commissioner.
(Board of Water and Light Commissioners)

13-13 CHIPMAN & POWER, Engineers.

Tenders for Scow

Tenders will be received, addressed to the undersigned, for the furnishing of all materials, construction, painting and caulking for a scow at Blue Lake, Ontario, to be built of Georgia pine or British Columbia fir. Scow to contain a hoisting engine and digging machine, estimated weight 40 tons.

Size of scow to be 60 feet x 30 feet x 5 feet 3 inches over all and having 3 spuds 30 feet long.

Parties tendering will give a detail specification of what they purpose to supply as being proper and sufficient, and give all details, tracings, etc., and also state earliest date they would guarantee completion.

The lowest or any tender not necessarily accepted.

The Ontario Portland Cement Co., Ltd.,
13-13 Brantford, Ont.

BOARD OF EDUCATION

Tenders Wanted

Sealed tenders, addressed to the Secretary-Treasurer of the Board, will be received until **Friday Noon, March 31st, 1911**, for the several trades required in the erection of new school on Caledonia Road.

Plans and specifications may be seen and all information obtained at the office of the Board, City Hall. Each tender must be accompanied by the deposit mentioned in the said specifications and forms of tender. The lowest or any tender will not necessarily be accepted.

W. W. HODGSON,
Chairman of Committee.
W. C. WILKINSON,
13-13 Secretary-Treasurer.

City of Toronto

Tenders Wanted for
Construction Equipment

Separate or bulk tenders, on prescribed forms, will be received, by registered post only, addressed to the Chairman of the Board of Control, City Hall, Toronto, Canada, up to noon on **Tuesday, April 11th, 1911**, for the delivery of the following:—

(1) Two (2) full circle swing traction steam shovels, one and a quarter (1¼) yard dipper.
(2) Six (6) saddle tank locomotives, 36-in. gauge.

(3) Forty (40) four yard (4 yd.) dump cars, or fifty-four (54) three yard (3 yd.) dump cars, 36-in. gauge.

(4) Four (4) double truck flat cars, 36-in. gauge.

(5) (a) Two hundred (200) tons 30-lb. steel rail.

(b) Twenty-four (24) No. 5 switch leads.

(c) Seventy-five (75) kegs of spikes.

(d) Eighteen hundred (1800) pair of fish plates.

(e) Twenty (20) kegs bolts and nuts.

Envelopes containing tenders must be plainly marked on the outside as to contents.

Specifications and form of tender may be obtained upon application from Department of Railways, Bridges and Docks, City Engineer's Office, Toronto.

The lowest or any tender not necessarily accepted.

G. R. GEARY (Mayor),
Chairman Board of Control.
City Hall, Toronto,
March 27th, 1911. 13-13

The City of Regina

Street Railway
Construction

Sealed tenders marked "Tenders for Street Railway Construction" will be received by the City Commissioners until 12 noon, **April 6th, 1911**, for the construction of approximately 7 miles of Street Railway Track Laying, consisting of ordinary construction, and track laying in pavements.

Full particulars may be had upon application to the City Engineer.

A marked cheque covering 5 per cent of the amount of the bid must accompany each tender.

The lowest or any tender not necessarily accepted.

(Signed) L. A. THORNTON,
13-13 City Engineer.

Miscellaneous

(Continued from page 55)

received until April 11th for the following: concrete paving, hardware, stable fittings. Plans, etc., with City Architect.

The time for receiving tenders for wiring Exhibition Building is extended until April 11th. G. R. Geary, Chairman Board of Control.

Recent building permits include: W. H. Merritt, 2½ storey brick dwelling, East Roxboro street, \$5,000; W. H. Merritt, 2½-storey brick dwelling, East Roxboro street, \$5,000; A. & A. Grant, 1 pr. semi-det. 2-storey brick dwellings, Logan avenue, \$5,000; F. T. Proctor, 2-storey brick dwelling, west side Spadina road, \$7,000; Rankin & Son, 2½-storey brick dwelling Westminster avenue, \$4,000; J. Castleman, 2 pr. semi-det. 2-storey and attic brick dwellings, on Wiloughby avenue, \$10,000; E. G. McBride, 1 pr. semi-det. 2-storey and attic brick dwellings, 62-64 Wheeler avenue, \$4,600; Philo Lamb, altering printing office to hotel, cor. Yonge and Adelaide streets, \$15,000; Jas. Kyle, 3 det. 2-storey and attic brick dwellings, on east side Triller avenue, \$6,000; John Price, 1 pr. semi-det. 2-storey and attic brick dwellings, on Greenwood avenue, \$4,600; J. H. McBrien, 2-storey and attic brick dwelling, 33 Castle Frank road, \$4,500; Geo. E. Case, 9 pr. semi-det. 2-storey and attic brick dwellings, Western and Humberside, \$50,000; Hugh Munro, 3 att. 2-storey stucco dwellings, brick fronts, on Tiverton, \$4,200; D. H. Farrow, 2-storey attic brick dwelling, Russell Hill Road, \$8,000; Houghton & Breeze, 2-storey brick store and dwelling, and 2-storey brick dwelling attached, cor. Dufferin and Lappin, \$5,000; R. C. Vaughan, 3 att. 2-storey brick dwellings Shirley street, \$4,500; Mrs. A. F. Lambert, 2-storey brick dwelling, north side Glendownne, \$4,300; Chas. Smedley, 2-storey brick dwelling, Summerhill avenue, \$4,000; G. K. Halladay, 2-storey brick apartments, near King on east side Dunn, \$5,500; Clare & Edmonds, 3 pr. semi-det. 2-storey brick dwellings, on southeast cor. Perth and Ernest, \$12,000; E. P. Atkinson, 2½-storey brick dwelling, 11 High Park Boulevard, \$6,000; Crossley & Hunter, 2-storey and attic brick dwelling, 510 Palmerston Boulevard, \$4,700; A. Nelson, 2 pr. semi-det. 2-storey and attic brick dwellings, near Hepbourne on west side Dovercourt, \$16,000; Wil-

kins & Co., 10 pr. semi-det. 2½-storey brick dwellings on southeast cor. Bedford and Dupont, \$50,000; H. F. Squires, 1 pr. semi-det. 2-storey and attic brick dwellings, 288-288½ Major street; C. E. Pickard, 2½-storey brick dwelling, near Yonge on south side Lonsdale, \$4,200; J. F. Gladwell, 1 pr. semi-det. and 1 det. 2-storey roughcast dwellings, brick fronts, near Danforth on Logan avenue, \$5,100; J. C. Wilgar, 2½-storey brick dwelling, near Indian road on High Park Boulevard, \$7,000; A. P. Cranfield, 6 pr. semi-det. 2-storey brick dwellings, near Davenport on east side Symington, \$19,600; Sheahan & Rostron, 1 pr. semi-det. 2-storey brick dwellings, 91-93 Ritchie avenue, \$4,000; Wm. Long, 2-storey and attic brick dwelling, near Indian road on High Park Gardens, \$8,000; R. W. Harrison, 1 pr. semi-det. 2-storey brick dwellings, near Brock on Delaney, \$5,000; Ontario Dock Co., dock, at foot of York street, \$6,000; Quebec Bank, 4-storey brick bank building on south side King near Jordan, \$50,000; H. P. Baird, 3 att. 2-storey brick stores and dwellings, near Fern on east side Roncesvalles, \$6,000; H. C. Schofield, 2-storey and attic brick dwelling, near Roxborough on Highlands, \$26,250; Thompson & Mitchell, 1 pr. semi-det. 2-storey and attic brick dwellings, near Harbord on west side Montrose, \$5,500; D. Weismiller, 2-storey brick dwelling, cor. Dowling & King, \$6,000; Samuel Frame, 1 pr. semi-det. 2½-storey brick dwellings on Roncesvalles, \$5,000; John Bell, 2 det. 2-storey brick dwellings, near Mavety on Hillside, \$4,000; W. Dunseath, 1 pr. semi-det. 2-storey and attic brick dwellings, on Shaw street, \$6,600; E. A. Lock, 2½-storey brick dwelling on Lyndhurst, \$9,000; L. & J. Hulme, 3 att. 2-storey roughcast dwellings, brick fronts, on Ashdale avenue, \$4,800; Toronto General Hospital, chimney, corner Elizabeth and Christopher streets, \$7,900; W. F. Thompson, 2½-storey brick dwelling and a garage, 80 Woodlawn avenue, \$6,000; Thos. Painter, 3 att. 2½-storey brick dwellings, 325-7-9 Huron street, \$8,000; Don Rowing Club, 2-storey frame club house, foot of Morley avenue, \$7,000; Mr. McBain, 1 pr. semi-det. 2-storey brick dwellings, west side Ellerbeck, \$4,000; Wm. & A. Hutchins, 2-storey brick apartments, 93-95 Dowling avenue; Davidson & Co., 3 att. 2½-storey brick dwellings, Crawford street, \$6,000; A. & J. Dyce, 3 pr. semi-det. 2-storey brick dwellings, on Campbell avenue, \$12,000; John Maguire, 4 pr. semi-det. 2-storey brick dwellings, cor. Spadina and Bridman, \$15,000; J. J. Walsh, 2½-storey brick apartments, northwest cor. King and Close ave., \$20,000; L. C. Sheppard, 3 att. 2½-storey brick dwellings, near King on Massey, \$6,000; W. G. Smith, addition to store and dwelling, cor. College and Clinton, \$4,000; R. C. Roundell, 1 pr. semi-det. 2-storey brick dwellings, Symington avenue, \$4,000; F. R. Snow, 2-storey brick dwellings on west side Strachan avenue, \$8,000; John M. Walkey, 2 pr. semi-det. 2-storey brick dwellings on east side Shaw street, \$7,000; A. Duff, 1 pr. semi-det. 2-storey brick dwellings, on Columbus, \$5,000; W. H. Benson, 2 pr. semi-det. 2-storey brick dwellings, on Booth avenue, \$7,200; R. A. Shields, 1 pr. semi-det. 2-storey brick dwellings, on Alvin avenue, \$4,200; D. A. Eagle & G. F. Smith, 3 pr. semi-det. 2-storey brick dwellings, on Bloomfield avenue, \$12,000; Cairo Bros., 3-storey brick store and

dwelling, corner of Queen street west, \$6,000; C. E. Walton, 1 pr. semi-det. 2-storey brick stores and dwellings on south side Gerrard, \$7,000; M. P. Warren, 3-storey brick warehouse on King street, \$12,000; A. J. Savage, 2½-storey brick dwelling, near Glen road, \$6,500; J. G. Shackleton, 1 pr. semi-det. 2-storey brick dwellings, on Heward, \$4,800; J. N. Hoare, 2½-storey brick dwellings on Glen road, \$6,500; Geo. Aikins, 2½-storey brick dwelling, near Broadview, \$4,000; W. A. Forster, 2 det. 2-storey and attic brick dwellings, 22 and 28 Gloucester, \$6,000; J. W. Young, 3 pr. semi-det. 2-storey brick dwellings, Westmoreland, \$10,000; H. Talbot, 4 att. 2-storey and attic brick dwellings, 68 Hayden street, \$11,000; D. Hornell, 1 pr. semi-det. 2½-storey brick dwellings, on Harcourt, \$4,600; J. J. Downey, 1 pr. semi-det. 2-storey brick dwellings, on north side Humber side, \$4,800; C. R. Peterkin, 2-storey and attic brick dwelling, on Oakmount road, \$4,500; Peter Griffin, 2 pr. semi-det. 2-storey brick dwellings, 662-8 Lansdowne, \$7,200; Geo. Nicholson, 2 pr. semi-det. 2-storey brick dwellings, on north side Gerrard, \$10,000; J. T. Turner, 3 pr. semi-det. and 1 det. 2-storey roughcast dwellings, on Sarah, \$8,400; Chas. Soules, 3 pr. semi-det. 2-storey brick dwellings, on Strathcona avenue, \$11,800; A. A. Kennedy, 3 pr. semi-det. 2-storey brick dwellings, southwest cor. Spadina and Davenport roads, \$12,000; Thompson & Mitchell, 1 pr. semi-det. 2-storey and attic brick dwellings, on Montrose, \$5,500; Wm. A. Hart, Jr., 3-storey brick apartments, 1251 King street west, \$14,000; Colman & Pearson, 2 det. 2-storey and attic brick dwellings, 172-4 Sunnyside, \$9,000; H. Bine, 1 pr. semi-det. 2-storey brick dwellings, on Wallace, \$5,000; Government of Canada, alterations to examining warehouse, cor. Yonge and Esplanade, \$16,000; O. Millar, alterations to hotel on St. Patrick square and Queen, \$5,000; L. E. Phillips, 4 det. 1½-storey brick veneer dwellings, on Norton, \$7,200; Jas. Sargeant, 2-storey brick dwelling, on Perth avenue, \$4,000.

Tenders will be shortly called by the new directors of the Northern Navigation Company for a new steamer larger and faster than the Hamonic for service on the upper lakes, to cost about \$600,000. H. H. Gildersleeve, manager; Jas. Playfair, Midland, president of Inland Lines.

Vancouver, B.C.

The City Electrician is preparing plans for the installation of a modern fire and police alarm and signal system; also for red lights to be placed over each fire alarm box.

Welland, Ont.

Tenders addressed to L. K. Jones, secretary, Department of Railways and Canals, Ottawa, will be received until April 6th for supply, etc., of various articles of timber, hardware, castings, oils, etc., for use on the Welland canal and its branches for the year 1911-1912. Specifications obtained from the purchasing agent of the above department.

Winnipeg, Man.

The board of control is advertising for tenders for a gasoline or steam traction engine to haul supply power to the "link belt" mixer, the big machine to make the ingredients which go to make what is known in Winnipeg as asphalt-macadam.

Recent building permits include: Two dwellings on the south side of Beresford avenue, between John and Helen, owner J. L. Scott, value \$4,200; one dwelling on the south side of Arnold avenue, between Mabel and Fisher, owner K. Creelman, value \$2,200; one dwelling on the south side of Oakwood avenue, owner R. C. Mitchell, value \$4,500; one dwelling on Maplewood avenue, owner R. C. Mitchell, value \$3,500; Axebride & Markel, 2 dwellings, Arnold avenue, \$4,000; city of Winnipeg patrol and signal stations, Rupert avenue, \$62,711; R. Robson, 3 dwellings, Home street, \$15,000; R. Bray, dwelling, Alfred avenue, \$5,000; R. Taylor, dwelling, Dorchester avenue, \$6,000; P. Olson, dwelling, Home street, \$2,500; Petrusson & Thornsteinsson, apartment block, west side of Agnes street, between Ellice and Sargent, \$50,000; H. Johnanson, dwelling, Lipton street, \$2,200; W. J. McLaughlin, two dwellings, Beresford avenue, \$4,400; B. C. Andrews, dwelling, Walnut street, \$3,000; E. W. Andrews, dwelling, Grosvenor avenue, \$8,000; H. Birkhill, dwelling, Ingersoll avenue, \$2,200; Winnipeg Electric Railway Company, pavilion, River Park, \$11,750; Wallace & Akins, dwelling, Westminster avenue, \$4,800; C. E. Foster, dwelling, Jubilee avenue, \$2,500; J. A. M. Aikens, dwelling, Langside street, \$15,000; Mrs. Diner, terrace 5 stores; Henry avenue, \$25,000; Ed. Moe, four dwellings, Rosser avenue, \$12,000; a factory for the Perfection Concrete Company, \$8,000; a terrace of five stores on Pembina street, to be built for H. J. Smith, \$15,000; an apartment building on the north side of Spadina avenue, for H. Gesner, \$25,000; a store and warehouse to be built on Salter street, for M. Calof, 531 Selkirk avenue, \$14,000; ten dwellings to be built on the north side of Jubilee avenue for H. H. Cottingham, \$26,000; J. J. Bergman, 226 Agnes street, dwelling on Telfer street, \$4,000; Dunn and Wallace, dwelling on Rosedale, \$3,500; D. H. Mather, garage and improvement to dwelling, Evergreen place, \$7,000.

AWARDED

Calgary, Alta.

Mr. T. H. Goodman has just let contracts to MacKissock and Thomas, of Winnipeg and Calgary, for a residence in Crescentwood to cost about \$15,000, and for other work amounting to \$30,000.

Espanola, Ont.

The directors of the Spanish River Pulp and Paper Company recently awarded the contract for their new million dollar news plant at Espanola. The contract for two 164 inch paper machines went to Pusey & Jones, of Wilmington, Del. They will be of 55 tons per day capacity each. The contract for eight beaters went to the Waterous Engine Works, at Brantford, Ont. The Westinghouse Company, of Hamilton, gets the contract for the generators, and the Robb Engineering Company, of Windsor, N.S., the boilers. Work on the new plant will be started as soon as the frost is out of the ground, and it is expected that the machinery will be installed by December 1 of the present year. The building will be of concrete and brick, so constructed as to permit at any future time the doubling of the mill's capacity without difficulty. The company decided to carry out the work themselves. They also decided not to proceed with the erection of a sulphite mill for the present.

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No. 14

Constructional Forecast

The indications are that 1911 will at least equal if not exceed 1910 in building activity. We regard this as a most conservative statement. We prefer a rational outlook to the exaggerated optimism of the professional booster, but at the same time we can find substantial reasons for encouragement. The advent of spring was heralded by a better defined interest in all constructional projects and each weekly report now received from large commercial centres, especially those of western Canada, shows distinct improvement. Montreal has set the pace in the east and is progressing well enough to sustain the credit of the whole section. When the building returns for the first quarter are available it will surprise us if this city has not increased at least 100 per cent. over the first three months of 1910. Certainly it is most encouraging and suggestive to find such activity and such excellent prospects in the commercial metropolis of the Dominion. Toronto had a particularly good season last year and is now holding up her end, which carries sufficient weight to preserve the balance of activity and progress.

It goes without saying that great things are happening in the west. Vancouver's wonderful record will be found in another column. In Winnipeg the business for the year so far has marked a fair increase on the corresponding period of 1910, and it is expected that the eighteen-million mark will be reached this year, but from all reports it is Calgary that is doing the most hustling in proportion to its size. A prominent Calgary builder told our representative in that city that he expected the building permits for 1911 to total \$8,000,000. For the first two months there was an increase of about 150 per cent—an excellent start.

No changes of importance have taken place in the market for building materials and there is the usual uncertainty in regard to labor. At Edmonton, Calgary and Lethbridge declaration has been made for "open shop" on May 1st. It is quite possible that the unions will have something to say to this. Strike rumors are

prevalent at Montreal, but of course it is early to make predictions.

Public works will be kept up to the usual volume. Plans have been started quite generally for sewer work, water systems and extensions, electric light plants and other lines of public utility and public necessities, and they will all be carried out, with the exception of a few which may be hung up in the council preliminaries. Practically none of them will be deferred because of any hesitation on the cost, except where it develops that the funds provided are not sufficient to cover the bids entered.

Private work will be irregular and uncertain as to volume. Some sections will show a gain over last year and others will have a slump, depending upon local conditions.

Viewed from the standpoint of the man who will furnish materials, the outlook is for a good season. The spring demand for the different building materials will probably be enough to show that there need be no serious accumulation for which there is no outlet. The cement trade bids fair to be well sustained through the constantly expanding demand for it in new applications as well as in the need of older methods. The brick trade seems likely to come in for a somewhat better demand this spring, due to a little more activity on the part of manufacturers to push their wares. Building iron and steel will have a very fair trade, though it will probably be lacking in the rush which has marked previous seasons.

Equipment of School Buildings

While the recent disastrous factory fire in New York has directed public attention in such a shockingly tragic manner to the lack of fire protection in all buildings where any large number of people are assembled, Canadian municipal authorities might well make particular inquiry regarding the better safeguarding of the children in the public schools. One method thus far overlooked is the equipment of school basements and stairways with automatic sprinklers. Since they are required in all theatres, why not in school buildings? Fire drills, enclosed stairways and ample fire escapes are good, and necessary, but they do not extinguish a fire once started, nor create a damp safe passage to the open air and safety. From the standpoint of parents alone any reasonable expenditure in this direction would be justifiable.

Contract Bonds

Two interesting contributions on the subject of corporate bonds for contractors, commented upon editorially two weeks ago, are published in another column.

This is a live topic in the trade. The argument of one of the writers that the bond companies require as much security as they give, and that such bonds are therefore theoretically very good but practically impossible to obtain, seems to be fully answered by the record for last year of the Toronto office of one of the bonding companies, which wrote 608 bonds for a premium consideration of \$47,115.95, covering contract liability of \$3,766,717.26. In only one small case was security taken, and this was where the contractors were strangers in the city and voluntarily offered the security to expedite the issuance of the bond.

The bridge case cited by the other correspondent is a matter of public record, and it much be admitted that the construction company, defaulting as the result of an accident, satisfied the government—which

was the principal in the case—to the amount of the bond, which was consequently released. Its purpose would seem to have been well served. That the construction company was otherwise financially weak is another matter.

To quote the correspondent who thinks such bonds practically impossible to obtain: "We are thoroughly convinced that no job of any importance should be awarded without asking a bond from the contractor."

Value vs. Price in the Award of Contracts

It is somewhat surprising to note that in spite of the fact that the acceptance of the lowest tender is almost a general practice, few contractors are very enthusiastic in its behalf. Since the publication of our editorial on this subject in the issue of March 1, we have received a number of letters and have heard several opinions expressed, but the general tenor of them all is that the first consideration should be value for value and not the lowest price obtainable. "Value," says 'A Western Firm,' writing in our last issue, "remains long after price is forgotten"—an epigram which may be worth committing to memory. Still, the fact remains that while the municipal corporation does not bind itself to accept the lowest tender, it nevertheless is usually accepted, as may be proven by a study of the weekly lists of tenders published in our Contracts Department. Contractors find out from such sources the approximate rates which their competitors are quoting for each class of municipal work, and consequently know within a little what they must ask. Occasionally—very occasionally—a contractor may be somewhat embarrassed financially and the securing of a good contract would re-establish his credit. In such cases he may decide to quote the bare cost of the work to be done, which is good for the municipality. On the other hand from an insufficient knowledge of local conditions and an inadequate idea of the responsibilities, he may quote a price at which a good job is out of the question. Here, then, is one of a number of instances in which the acceptance of the lowest tender would be inimical to the best interests of the municipality. The question rests with the engineer and his attitude on such matters is a measure of his efficiency or otherwise. If a storm is to be faced by recommending a higher tender he should have the courage to do so. Certainly he should refuse to advise the acceptance of any tender, the amount of which does not in his opinion cover the actual cost of the work to be done. The responsibilities of the engineer in this connection were defined very nicely by Mr. Lochridge in a recent discussion of the Boston Society of Civil Engineers. Mr. Lochridge said:

"We, as engineers, have responsibilities in laying out work and giving to the contractor the fullest and most accurate details that we can. I think that contracting at best is a gamble, in the bringing in, as it does, of various conditions of weather and of material and of labor conditions, etc. It is for this reason a duty of the engineer to place all the facts as clearly before all of the bidders as can possibly be done.

"After the engineer makes his estimate and knows something of what that work is to be, he should go over the bid very carefully to see whether the contractor has bid enough to do the work, because I believe it is very poor economy to let the low man have the job simply because he is low.

"I think that, too, is a province of the engineer, where it is possible and where it is right and just, to

see that the conditions under which the job must be done are fully considered and balanced at the end of the work just as fully as they are at the beginning."

Renewal of Building Equipment

At this season of the year many contractors are beginning to make preparations for a vigorous work season, and are maturing plans for new work. During the winter season much outfit and many tools have lain idle. Most of these will be put to work within the next few weeks. When they were stored in the autumn they should have been properly housed or protected from the weather, but now that they are to be put to hard usage everything should be completely overhauled.

Parts that are cracked or broken, especially gears, should be renewed, as one tooth stripped from a gear wheel may mean that as the machine is being used to its greatest capacity so many teeth may be stripped from the gears as to put it out of commission. This not only means expensive repairs, but time is lost on the work and men who receive monthly salaries are being paid, when productive work is not going on. In the same way, boiler fittings should all be made good and new grate bars put in the fire boxes. Burnt-out grate bars not only mean a considerable waste in coal, by half burnt coal dropping through the bars, but the boiler does not steam well as the full value of the fuel is not obtained.

Old wood work on machines should be renewed. This is especially true as to cars. How often one sees contractors' cars with the wood work all knocked to pieces, so that the cars operate with difficulty and part of the load is spilled before it reaches the dump. This also applies to carts. Scrapers should be repaired, especially the pans. Many will be found to need new cutting edges, and wheel scrapers may need new boxes in the wheels.

Special attention should be given to derricks and derrick fittings. After standing out in the weather unused all winter, derricks should be entirely overhauled, as the risk of killing men, working around them, is too great to assume. Piledrivers, too, should be well inspected, and repaired, wherever necessary. This applies to all the heavy machinery as steam shovels and other heavy excavating apparatus. Locomotives likewise need a complete overhauling. Ask any master mechanic of an operating railroad as to the necessity of going over a locomotive at regular intervals, and he will tell you of the importance of such work. One should not expect good work to be done, when one's machinery is out of order. A loaded train must sometimes be divided because the locomotive needs a little shop work done on it.

All machinery should be painted each spring. Paint means protection both from rain and sun. If metal is painted late in the season and exposed to the sun the paint is likely to blister, so all painting should be done early in the spring. Not only does paint make an outfit look a hundred per cent. better, but it pays for itself quickly by preventing the metal parts from rusting and the wood from splitting.

A contractor's name should always be kept plain and bright on all of his outfit. This is just as important as names on railroad cars, as it shows at once the ownership, and acts as an advertisement. In traveling on a train, when one passes a contractor's outfit at work, it is nearly always impossible to tell whose machinery it is, as the names have generally been effaced.—The Contractor.

The Reader's Views on Current Topics

Contractors and Corporate Bonds—The Element of Value in the Award of Contracts—Defects of Trades Unionism

Contractors' Bonds

Editor, Contract Record:

Referring to the article on the above subject published in your issue of March 22, in our opinion, corporate bonds are theoretically very good, but practically impossible to obtain. The bond companies require as much security as they give, and if one has this amount of security to hand out, it might just as well be given to the proprietor, who makes no charge for accepting it, as do the bond companies.

The bond companies are careful and conservative, so much so that they require a firm to have nearly as much capital as it does business in the year. Few contracting firms are in this enviable position, and it is only these few who can buy a bond when they want it. Others have to make out as best they can.

We are thoroughly convinced that no job of any importance should be awarded without asking a bond from the contractor. We believe that if bonds were asked for more frequently contractors would be more careful in making estimates, have more knowledge of the cost of doing work and live longer in the business. More contractors fail through the lack of knowledge of the cost of doing the work than through difficulties of executing intricate building problems. Many contractors will take a chance in figuring on work that they would not take if they knew that they could not obtain work without giving a bond, and that their estimates of the said work would be carefully scrutinized by the bond companies, whose view point would be the completion of the job rather than the signing of the contract.

Yours very truly,
"A P.Q. Contracting Firm."

Famous Bridge Case Cited

Editor, Contract Record:

I have read the article in your issue of March 22nd in which you discuss Contractors' Bonds at a rate of one-quarter of one per cent. on the amount of the contract. This rate seems to me to be very low and it must represent not the total cost but the annual premium. Very few works are fully completed and paid for within twelve months of the acceptance of the tender, and thus it means doubling or perhaps trebling the amount of the "premium."

The attitude of the bonding company is well shown in an example which came to my attention recently. A bridge concern was bonded for \$100,000, but the bridge collapsed before completion. The case was discussed in all the papers but the company did not pay, they having received timely notification. What they did was to keep the premiums which had been paid in good faith and calmly shake their heads when requested to pay up.

This question of bonding contractors recently came up at a committee meeting at the Toronto City Hall, when it was stated that the city had never lost anything by accepting personal sureties, and no change was made.

I am of the opinion that personal sureties, given

by those having an interest in the contract, are the best. Thus if a supply man becomes surety for a contractor, he will see that he gets his supplies on time for it is to his interest to do so. This is no small advantage to the contractor. Then in the unlikely event of the supply man seeking to take advantage of the contractor by putting his prices up, why, I think I can see his finish.

Yours truly,
"Building Contractor."

Value vs. Price

Boston, Mass., March 30, 1911.

Editor, Contract Record:

In your discussion of the award of contracts you have touched upon a subject in which we are all interested. The exercise of the privilege of accepting other than the lowest tender often enables corporations to obtain better value either in the actual contract or in the supply of materials. It frequently happens that it is just permissible under the specifications to tender at a low figure for certain materials and classes of work when the superiority of materials quoted at a higher figure is so great that the corporation would be actually losing by accepting the lowest bid, even though the specifications could be enforced. There would be many things to offset the difference in price between the tenders and to make the lower the more expensive.

In the award of contracts there are many things that should receive equal consideration with cost. The general reputation of the tenderer should be taken into account, his ability, the quality of his previous work, his responsibility, organization and equipment. And in awarding contracts for material, quality, supply and the general reputation of the tender should certainly be considered as much as the figure.

Occasionally circumstances arise which seem to justify the consideration of nothing but price. But these are of only occasional occurrence. The other things should be considered more often than they are. It may be said that the course suggested opens up opportunities for graft, but grafters are few and far between nowadays and the remaining few are rapidly passing.

Yours truly,
A. H. Stowell.

Are Competent Engineers Scarce?

Editor, Contract Record:

When you begin to discuss the "lowest tender" you are opening up a very important—in fact a vital question, and it is difficult to draw the line.

One difficulty is that many municipalities ask for tenders without previously giving the matter careful consideration or getting any kind of estimates or information as to the probable cost of the work. They seem to think that the cheapest and easiest course to pursue is to advertise for tenders, when possibly the work in view will not be gone on with. I am not aware if common law would compel any municipality

or corporation to accept any tender or to reimburse the parties tendering if their advertisement specified "the lowest or any tender not necessarily accepted." The vital point in this seems to me to be that in cities like Toronto, Hamilton, Ottawa and other places, the councils are anxious to get the benefit of the lowest possible figures but at the same time are anxious to leave the work in their own city. This, I think, is reasonable and fair, but it is not reasonable or fair to put outside parties to the expense of tendering if they have no intention of giving the work outside their own towns.

I consider that one of the great difficulties in connection with this matter is the scarcity of competent engineers or architects in charge of municipal work or even general work. It is surprising the lack of knowledge as to prices likely to govern under different conditions. If the general public only knew the difficulty contractors have in trying to make up estimates on the information furnished by so-called engineers and architects, they would be very much surprised. It is common practice for municipalities and corporations to employ men at a cheap figure. These men may be specialists in a small way and familiar with only one line of engineering work, and when it comes to something in a special line, they have to fall back on certain text books from which they prepare certain work and then rely on the contractors to do the rest.

My idea is that any municipality or corporation asking for tenders on work should have the plans prepared complete and made so clear and explicit that every contractor is bound to figure on the same basis; moreover, only reliable and experienced contracting firms should be asked to bid. In many cases the parties in charge of work and the inspection of work are not competent and the contractor who has secured the work at a price so far below the correct figures has no difficulty in skinning the work and dodging certain features of the specifications. The engineer in charge, or the inspector, is no wiser and therefore the general public are cheated out of the proper results.

As previously stated, when you raise this question, you are going into something very serious. Many remedies have been discussed to try and overcome difficulties such as these. One remedy which has worked satisfactorily to a certain extent is to place work in the hands of a reliable contracting firm and agree to pay them a percentage on the cost. Before going on with the work, however, a fair and reasonable estimated cost should be arrived at, and in the agreement with the contractor it should be understood that a reasonable figure is a certain amount. For all he will save under that amount pay him 25 per cent., and for all he may exceed the specified amount dock him 5 per cent. Even with this system there are difficulties, but anyone who has had a few years' contracting experience will tell you there are difficulties all the time and every minute of the day.

Unions at Fault

The tendency in these days is to scant work and to use poor material. This is a very serious question indeed to contractors and firms willing and anxious to use first class material and to give good results in workmanship. Unfortunately with every trade so thoroughly organized by the unions, skilled mechanics and tradesmen are becoming more scarce every day and there is no longer any incentive for a working man to make himself a better tradesman than he may happen to be. In my opinion, it is the greatest pos-

sible farce to say that tradesmen of a certain union shall all be paid the same wage per hour, whether they be good, bad or indifferent. It is an undoubted fact that the abilities of men vary in professions, and the same must be the case in trades. To say that an inexperienced tradesman—no matter how husky he may be—shall be paid the same wage as a first-class experienced man, or that an elderly man, who is past his prime and not able to do as much as a younger man, shall be paid the same is not reasonable. Every man should be paid what he is worth and the good man should not be kept down in his wages by the poor man; neither should the poor man expect to receive the same wage as a good man; nor should an energetic man be held back to the level of a lazy man.

Yours truly,
"Contractor."

Conditions in Railroad Camps

Editor, Contract Record:

Referring to your recent articles anent conditions in railroad camps, I must say that my experience leads me to believe that things are nothing like as bad as have been represented. I have been in a number of railway camps in the different provinces of Canada. In some cases they have not been as clean or sanitary as might be expected, but I am of the opinion this was due very largely to the men themselves. My experience is that no matter what precautions you take, no matter how you try to keep everything in good shape about these camps, it is most difficult to get the men interested. They seem to be full of the idea that they are only temporary quarters and that any kind of conditions are good enough for a short time.

In our own camps we do everything we possibly can to have all the conditions as near right as possible, but it is difficult—in fact almost impossible—to get the men to take any interest other than in making sure that they get plenty to eat. And it would astonish an ordinary individual to see what a hungry railroad man can get away with at one meal.

Yours very truly,
"A Close Observer."

The Lowest or Any Other Tender Not Necessarily Accepted

Ex-City Engineer writes:

"I thoroughly agree with you that the above caluse must be used with the utmost caution. In fact it bears a close resemblance to the proverbial function of fire—"a good servant but a bad master." Only once in my experience have I ever advised the acceptance of any but the lowest tender. In fact I think that with the ordinary municipal contract the only excuse for the acceptance of any other tender is in a contract where failure to complete in time may mean serious loss or danger to the city, or in the case of some highly specialized work in which previous extensive experience is practically an essential to successful completion. The ordinary municipal contract properly handled practically precludes danger of financial loss to the municipality."

Object lesson roads, aggregating 1,007,596 square yards, were constructed by the United States Office of Public Roads during the fiscal year ending June 30, 1910. Of this total area 722,485 square yards, or nearly 72 per cent. consisted of earth and gravel roads.

Causes and Prevention of Masonry Failure

In an investigation to determine whether or not monolithic concrete construction will prevent or delay failure under ordinary conditions, an analysis has been made of the various causes of masonry failure by the committee on masonry of the American Railway Engineering and Maintenance of Way Association. This study was made from the reports of a number of railroads and a report on the subject by Prof. G. F. Swain. The principal causes are summarized as follows: 1. faulty design; 2. poor material or poor workmanship; 3. temperature cracks; 4. disintegration of the masonry; 5. improper filling; 6. scouring away of the material underneath the masonry; 7. material sliding and carrying the masonry with it.

In the discussion of faulty design a number of points of common weakness are noted. The masonry may be placed on grillage above the water line, which rots and allows settlement, or the grillage may rest on piling where too high a unit stress is used for timbers in compression. The U-abutments may have their wings built too light. Too high a unit pressure may be allowed on the earth in front of the abutment or on piling upon which it may rest. Failure may be caused by settlement, which frequently causes a crack to appear where the wing leaves the main portion of the abutment, or in the case of arches, the wings may separate from the body of the arch, or the arch crack from 10 to 20 feet on each side of the centre line of the track, depending on the height of fill. Again, lack of proper drainage may result in failure.

Commenting on the probable behavior of a monolithic structure under these faulty conditions, the committee observes that if the settlement were not uniform in the cases of the rotted or overstressed grillage or of the overstressed foundation soil, cracks would develop unless reinforcement were provided to prevent them. An ordinary single-track abutment up to 20 or 25 ft. in height would probably settle without cracking. Abutments built in sections divided by vertical planes would be provided against such cracks. In arches under high fills and on ordinary soils it is difficult to prevent cracking of the abutments and ring unless reinforcement is used, as the foundation pressure in the centre of the arch support is much greater than at the end of the wing walls, and the plain monolithic is not strong enough to distribute the load uniformly. Such cracks as these are unsightly but seldom dangerous.

The study of failures due to temperature cracks showed a wide variation of practice in providing for expansion and contraction in large monolithic structures. Abutments were reported in lengths of 60 to 100 feet, plain concrete, without such cracks, and with reinforcement, 150 feet. In any case, the temperature movement of the concrete is greater than that of the material adjoining it, and the structure must be strong enough to overcome the friction between the two if there is to be no cracking.

Failures due to disintegration of the masonry are traced to freezing and thawing of exposed surfaces, particularly where water drips through an arch ring or where the masonry near the ground is exposed to alternate freezing and thawing, and frequently also to exposure to salt water, alkalis, acids or heat.

Relative to improper filling and dislocation of masonry by sliding material the committee comments that a well-designed monolithic structure will resist failure better than one built in sections.

Scouring of material underneath the masonry may

result from unusual freshets, from driftwood, wagon bridges, etc., lodging against the masonry, from ice gorges, or from the size of the opening being too small, thereby causing the water to rise during a freshet and to assume increased velocity and scouring power. Under these conditions the abutments are apt to tip forward or settle bodily downward. It is believed that a monolithic abutment will resist the pressure back of it under these conditions better than one built in sections, for when one part is undermined the balance assists it, and if the whole abutment tips forward, the movement is at times slow and complete failure may be prevented by relieving the pressure at the back or putting in props and bracing them across the bridge opening.

New B.C.E.R. Tram Station at Vancouver, B. C.

Messrs. McDonald & Wilson, contractors, have taken out the building permit for the tram terminal office block which will be erected for the British Columbia Electric Railway Company at the corner of Hastings and Carral streets, Vancouver, on the site occupied by the present station. The plans for the building have been prepared by Mr. W. M. Somerville, and show a five-storey structure, the foundations being of sufficient strength to permit of additional stories being added in the future. The plot covered is of irregular shape occupying the space taken by the old terminal offices as well as the Carral street block now being used for general offices. The inten-



New Tram Station at Vancouver

tion is to build the corner section first and then remove the offices to the new building, then the present office building will be razed and rebuilt to conform to the new plan. The estimated cost of the work is \$350,000 and the contractors will probably start demolishing the old building in a few days.

In the new block the entire lower floor will be used for interurban tram business, three tracks entering from Hastings street and the balance of the floor being taken up with a large waiting room, ticket office, etc. The upper four stories are to be entirely devoted to the company's offices.

American cement manufacturers are pushing their foreign trade, having shipped abroad last year 2,475,957 barrels, against 1,417,534 barrels in 1909 and 846,785 barrels in 1908.

Thousands of men are killing themselves by worrying over what might happen to them.

Types of Concrete Bridges and Culverts

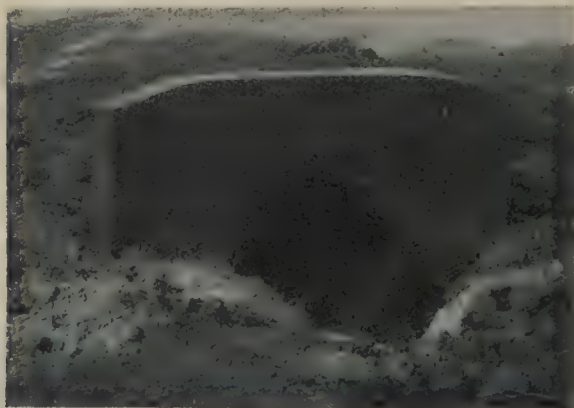
Considerations for the Municipality and Contractor—Safety and Permanency of the Construction Described — Economy in Cost Illustrated

By Thos. H. MacDonald, Ames, Iowa

In general the types in use now are circular culverts built over collapsible moulds, slab top or box culverts, arched culvert, I-beam construction, including I-beams supporting a concrete floor, and I-beam piling with concrete filled between for abutments and side walls, and steel bridges with concrete floors.

The types of bridges and culverts recommended by the Iowa Highway Commission are as follows:

First. Round culverts built over collapsible moulds



Probably the most economical type of small culvert that can be built. These culverts are built over collapsible moulds.

with the small amount of longitudinal reinforcement, including all sizes up to a 36-inch diameter. These moulds are on the market in a wide variety of forms. Most of them answer the purpose very well.

Second. Box culverts or slab bridges from a 2-ft. to a 20-ft. span. Spans longer than 20 feet may be built safely in this type but not economically. In such bridges the slab's thickness much increases with the span and the dead load becomes excessive.

Third. Reinforced concrete arches from an 8-ft. up to a 100-ft. span, built either singly or in series,

where the foundation and head room are favorable. The ancients have a saying that the "arch never sleeps." In this type of construction more surely, perhaps, than in any other, the forces of nature, and more particularly the temperature changes are everlastingly at work tending to destroy. Some of the men most enthusiastic over this type of bridge even go so far away from engineering principles that are hereditary, as to declare the uselessness of taking into account the destroying action of temperature stresses. Personally, I am willing to stand upon the principle that all material things are subject to destroying forces and that construction is the most permanent which to the highest degree provides against these forces. Under these conditions, as a general proposition, we do not believe the arch to be the best type of bridge, especially for the shorter span.

Fourth. Pony truss steel bridges from 30-foot span to 80-foot span with reinforced concrete floors. To provide an economical, as well as a very substantial bridge, we have designed a series of pony truss steel bridges, carrying a reinforced concrete floor without steel joists. The steel is used in heavy sections and if kept well protected by paint, should be even more permanent than many poorly constructed concrete bridges. This type is particularly adapted to



This view shows the plain substantial structural lines to be secured by careful building of the forms.

districts that have little or no sand and gravel or broken stone suitable for concrete purposes.

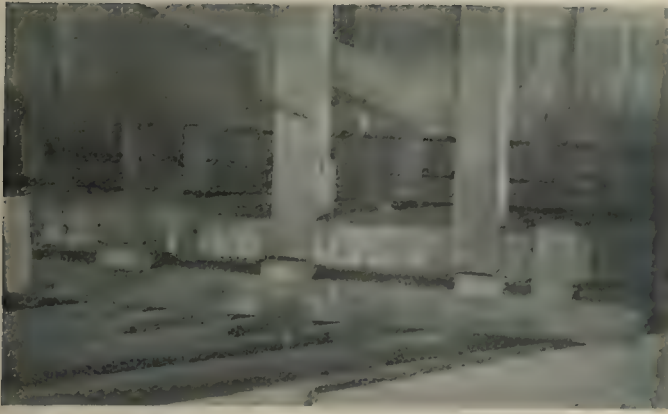
Fifth. Reinforced concrete girders of either the through or deck type, from a 20-foot to a 50-foot span. For spans ranging above 16 or 20 feet for any given area of water way up to a 50-foot span, the girder bridge is one of the most economical types that can be built. It is not, however, a safe type of bridge to be handled by either the inexperienced designer or contractor, and should only be built with the greatest care in the most painstaking manner.

Naturally the big questions confronting the concrete contractor are, what methods to use in creating a local demand for such structures and what are the big arguments that justify this higher cost of construction.

First in importance, perhaps, is the increased duty that can safely be required of such culverts or bridges. The material is so heavy and substantial that properly built with foundations protected against undermining



30 ft. reinforced through girder with part of the form work still in place.



Detail of the forms with the wedges

and with flaring wing walls, much smaller water ways may be used than has been the custom with other materials.

Second, perhaps, in appealing arguments, is the idea of safety and permanency. It has well been said that the difference between concrete bridges and most of the other kinds is the difference between an asset and a liability.

Third, if properly figured, the cost of permanent concrete work is not so much above temporary structures. The exact figures for the two kinds at present contract prices in one Iowa county are as follows:

4 ft. x 16 ft. I-beam span wood floor and pile foundation.

1 16 ft. I-beam span	62.40
1 set caps	16.00
Erection	12.00
1.5 M. fir at \$33	49.50
140 feet piling at 30c.	42.00
Digging out and hauling	10.00
Anchor bolts	1.00

Cost, not including extras and incidentals \$192.90

One 4-ft. x 4-ft. concrete culvert, 16-ft. roadway, 6 ft. wings, contract price, \$169.00.

Cost of temporary I-beam span above that of permanent concrete culvert 14 per cent.

Of course as the length of span is increased, the difference in cost between temporary structures and permanent ones, varies more widely, and when the larger structures are considered, the justification for



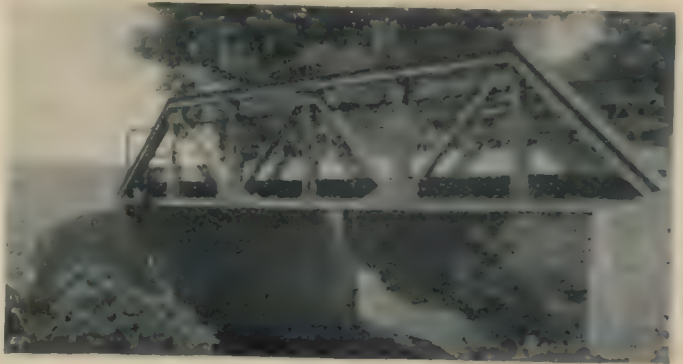
Roadway view of steel bridge with concrete floors. The renewal of floor plank is becoming such an item of expense in maintaining highway bridges, that the best economy demands a more permanent type of floor.

the increased cost must lie in the greater value received.

There have been no notable failures of concrete work in Iowa during the past year. There are, however, we believe, some serious mistakes being made that will eventually result in failures. The mere fact that a bridge or culvert is standing is no reason for assuming that it is a safe kind of structure to build. Shallow foundations easily undermined; loam mixtures, quickly disintegrated; insufficient reinforcing and rough form work are all contributory mistakes that may end in failures.

Among the costly mistakes that have been most frequently made is that of low bidding. Concrete work is not and never will be cheap work, and concrete workers should not attempt to compete in first cost with bridges of other less permanent material except under very particular circumstances. The fact that concrete work well done is permanent, entailing practically no maintenance charge, should be sufficient to off-set in the minds of public road officers, the somewhat higher investment. We have found that bids on plans prepared by the Highway Commission, and on which the competition has been strong, have almost invariably been below the estimated cost. On the other hand, it is apparent that contracts have been taken at a loss by many concrete contractors, because of the rank favoritism that prevails in so many counties, or on account of the conditions that have been imposed upon contractors which has effectually eliminated competition.

In response to the demand for concrete bridges,



Type of steel and concrete construction. The floor joists are omitted and the reinforced concrete floor slab spans between floor beams.

the steel I-beam bridge has been encased in concrete and used extensively in some counties. This is a needless waste of steel, as a few rods of steel would reinforce the abutments far more effectively and the prices that have been paid for this material are far in excess of the market value. When used for floors, the I-beams must carry their own weight plus that of the concrete floors plus the loads that pass over them. This is not reinforced concrete construction, and if the I-beams are sufficiently large to take the superimposed loads, the cost complete with concrete floor would be considerably more than the slab, reinforced with steel rods.

There are many mistakes made in concrete construction, due to the incomplete knowledge of the men handling the material or insufficient supervision. Among these mistakes is the misplacing of reinforcing steel. Careless placing of the steel reinforcing is a really serious matter, for in the use of slabs and thin sections, a minimum thickness is nearly always used.

If then the steel is misplaced even one-half inch from its figured positions, the calculated stresses will be greatly increased and if in a thin section, the steel is misplaced one inch, then the stresses induced may cause serious cracks or even failures.

Concrete Sidewalk Construction at Verdun, Que.

Upon request for information relative to methods adopted at Verdun for the above work, Mr. Henry Hadley, town engineer, has furnished us with the following:

"A good sidewalk must possess permanency, solidity, evenness and elasticity to resist the action of frost. The writer believes that to overcome heaving by frost the walk must be built with a foundation below frost line or else it must be laid so that the frost will act on the material as a whole. After careful study a pavement consisting of concrete slabs was decided upon as being the most economical and possessing, in a large degree, the essential qualities of a good walk. The width used is five feet on main streets and four feet on side streets, with provision for increasing the width an additional two feet. The materials used consist of a standard cement, the best quality of sand obtainable and a good quality of screened gravel. The foundation is built of yellow clay thoroughly tramped and carefully graded. The clay foundation is extended eight inches on each side of the concrete to prevent slipping and to protect the edges of the walk.

"The method of laying the walk is as follows: Two men lay the forms, which consist of 2-in. x 4-in. lumber, set on edge, to grade pegs given by the engineer. The material is mixed by hand on two boards; two men mix it dry and four men mix it wet. The material is then carried by barrows and dumped into place. One man, who has charge of the gang, lays the walk, spreading the material in place and putting a taper board at right angles to the length of the walk dividing the cement into blocks four or five feet wide and four feet long. The thickness of the cement is four inches. The walk is finished by rounding the edges and dotting the surface with cement tools. This walk possesses the advantage of being easily lifted and replaced. This is necessary in case of excavating under the walk or of settlement. The council have been thoroughly satisfied with this work and the town has laid to date about fourteen miles, which will be increased to about twenty this season.

Waterproofing Masonry

The waterproofing of masonry has been studied during the past two years by the committee on masonry of the American Railway Engineering and Maintenance of Way Association, and the data collected so far are tabulated in the report of that committee to the annual convention. The committee is considering the problem from the point of view of an investigation of methods of treating certain masonry structures to prevent leakage through them, rather than as an investigation of the imperviousness of certain substances. The information collected thus far covers 48 structures of various types on different roads. It seems to the committee that no method of waterproofing has proved entirely satisfactory. Some cases have shown leaks in each of the four classifications adopted in the study, namely, exterior envelopes, materials mixed with the concrete, exterior coatings and concrete without other protecting material. The difference in efficiency between the various classes does not

seem to be great, and the credit due to the quality of the masonry does not appear in the data. Failures are evidently due to faulty details, poor materials, poor workmanship and the formation of cracks in the masonry. Dry work seems dependent on careful design of masonry details as well as of the waterproofing. The materials should be placed by skillful workmen, under careful supervision, and reinforcement should be provided against shrinkage and temperature cracks. The committee concludes from the results of its investigation that concrete masonry, properly designed and placed, may be made waterproof without the addition of special waterproofing materials.

Reinforced Concrete Roads

Reinforced concrete roads have been selected for stretches of $1\frac{1}{4}$ miles in Harrison County and $\frac{1}{4}$ mile in Pike County, Ohio. In both cases the work is located on sections that are subject to overflow and it was partly on this account, according to the report of Mr. James C. Wonders, State Highway Commissioner, that concrete was selected. The concrete will be 14 feet wide and 6 inches thick, made in the proportion of 1 part Portland cement, $2\frac{1}{2}$ parts sand and 5 parts gravel; it will be reinforced with No. 11 wire, woven in a 6-in. mesh. The reinforcement will be placed midway between the upper and lower surfaces and the work will be cut in sections 50 feet long. The joints will be at an angle of 45 deg. with the line of the road. The concrete will be a wet mixture and will be rough floated, with a plank template so as to leave a safe footing for horses. An experimental section of this type of road was built in 1909, and Mr. Wonders reports that after a year's use it is in perfect condition and its surface has been very satisfactory.

Sedimentation basin cleaning at the Poughkeepsie, N.Y., water purification works resulted in the removal of 464.4 cubic yards of sludge from 845,769,290 gal. of Hudson river water. The basin holds about 3,000,000 gal., or 24 hours' supply, was put into commission October 2, 1909, and operated up to June 15, 1910, when the water was drawn off and the sediment removed. The specific gravity of the sediment, as given in the 1910 report of Mr. Robert J. Harding, superintendent and engineer of the Board of Public Works, was 1.183, the total weight 467.6 tons, the total weight of dry material 137.9 tons. The raw water from the Hudson river during the period since the basin has been in service has had an average turbidity of 57.9 parts per million and 1.32 gr. per gallon of coagulant were used, on an average of 14.1 days per month. The sludge deposit amounted to 0.5 cubic yards per million gallons of water, or 0.163 tons or dry material per million gallons. Analyses of the composition of the material showed 83.3 per cent. vegetable matter. The per cent. of the total deposit in the first 1-16 of the basin, which is baffled, was 53.3; in the first 1-3, 70.1; and in the first $\frac{1}{2}$, 83.9. The total cost of cleaning was \$149.30.

Two local railway projects have been organized in St. John, N.B. One of these proposes to construct a road from Hartland on the St. John River to Sparkle, a point on the Grand Trunk Pacific and on the Miramichi River, a distance of 40 miles through a fine agricultural country. It is also proposed to build a branch railway from the Canadian Pacific to Southampton in York County, a distance of 13 miles.

Shop Fabrication of Steel Highway Bridges

The Treatment of Steel Through the Various Stages—Its Final Erection in Bridge Work—The Necessity for Careful Supervision*

By L. J. Street, Vice-President Canadian Inspection Company, Limited

"All is not gold that glitters." With equal truthfulness may it be said, "All is not safety though of steel."

Apparently there are a few laymen to whom this latter axiom of truth is unknown, and who are, on the contrary, imbued with the belief that the word "steel" and "life-long strength" are synonymous. Unfortunately an occasional bridge commissioner has such beliefs, and feels himself relieved of much responsibility when the highway bridge ordered is specified steel, provided a low price has been obtained. This low cost feature, which ought to cause him uneasiness, is perverted to a feeling of satisfaction.

Equally unsatisfactory is a bridge commissioner who appreciates the necessity for bridges being carefully designed, and the steel fabrication and erection being properly carried out, but who leaves it to the bridge company to presumably protect his interests in these requirements, while at the same time tying their hands with a contract price much too low to permit the advisable weight and workmanship going into the structure, this price being forced on the bridge company by competition without governing specifications plainly setting out the load requirements, permissible unit stresses, quality of material and class of workmanship. Even with such specifications there is the uncertainty as to whether they are to be strictly enforced or not.

Reputable and well equipped bridge companies are thus often compelled to tender with competitive designs, and low cost as the controlling factor, also frequently in competition with concerns not having the engineering knowledge and mechanical facilities for turning out first class work. Knowing that the contract will likely go to the lowest bidder, they, with great aversion, have very often to tender on a design and class of workmanship which is a standing menace to an otherwise good reputation, and a poor investment to the buyer.

To obviate, or at least lessen, this unsatisfactory state of affairs is a vital necessity, not only from the structural steel companies' point of view, but also in the interest of the public in general, who daily use the bridges along our highways. These bridges are relied on as being safe, but they may possibly prove deficient in strength under the heavy loads supposed to be carried.

As J. A. L. Waddell remarks in "De Pontibus," "County Commissioners might well be made criminally liable for all injuries to persons, and pecuniarily liable for all injuries to property, due to failures of county bridges built during their tenure of office. Of course, if the commissioners could prove that they had taken all possible precautions by having the structure designed by a specialist of established reputation, built by a good manufacturing company, and inspected by first class inspectors during both manufacture and erection, they would be able to relieve themselves from the responsibility; but if they were to do all this no bridge failure could occur, or at least the chances for such an occurrence would be extremely small."

True, under the Good Roads Association system, highway bridge designs are submitted to the Provincial Government Engineer for approval, but failures might still occur owing to faulty workmanship.

The object of this paper is an endeavor to place before

those interested a necessarily abbreviated, but to be hoped clear mental picture of the treatment of steel from the time it leaves the rolling mill, its passage through the various stages of fabrication in the structural shop, and its final erection into a bridge at the site. An insight into these various details of construction may show the purchaser that even though his bridge bears that mystic prefix "steel," yet the necessity still exists for having a first class specification governing the work, and an experienced bridge engineer advise on same and see that the requirements are complied with. It is not to be expected that your engineer will personally locate at the bridge works and watch every operation, but he can avail himself of the services of Inspection Companies, who have expert structural steel inspectors located in the various bridge shops for just such contingencies, who supervise every detail of shop fabrication, their charge being only a nominal one—less than fifty cents per ton. These inspection companies furnish experienced inspectors to supervise the erection work of the bridge. The mechanical interests of the buyer are thus guarded just as a lawyer protects the legal interests.

If time would permit it might be interesting to touch on the chemical and physical requirements of bridge steel, as also the rolling of the plates or sections used, but under the circumstances these details must be omitted, and the thread taken up after the steel has been rolled and shipped to the bridge company.

Rusting of Steel from Exposure to Elements.

On the arrival of the steel from the rolling mills, it is usually piled in the open in the bridge companies' stock yard. Here it is that considerable damage may occur by reason of the steel not being protected from the weather, and allowed to get rusty and pitted. Of course where very little stock is carried and steel is newly ordered for the various contracts, this oxidization has not time to affect the steel to any great extent, but in other cases where, to be certain of having steel to fill orders, or where, owing to the fluctuations of the steel market, bridge companies wish to take advantage of a low price, a very large tonnage is stocked and this in some sections may remain unused for two or three years. Unless the steel has been protected on arrival, by a coating of paint or oil, at the end of such time the section in question has deteriorated and should not be permitted in a structure. Some of our bridge companies appreciate this loss, and go to the expense of painting all stock material as it is received in the yard. It is therefore readily seen that precautions should be taken to see that only proper steel is selected from the stock yard.

After bringing in the required steel from the stock yard, the plates and flats are run through horizontal rollers to straighten same, and occasionally by means of side fillers, to line up a bowed plate. This rolling operation is frequently omitted in many shops—by some on account of their not having rolls, and in others by reason of the extra expense. However, it is a very necessary operation and one that should be insisted upon, as it is impossible to properly lay off a buckled plate or one out of line.

During the time that the steel is being brought in from the stock yard and rolled, or previously, the template department is making the wooden or cardboard templet for marking off rivet holes, etc., on the steel. Care should be

* Read before the Ontario Good Roads Association, March 1910.

taken to see that templets lie flat and without distortion. After the steel has been laid off it is brought to the shears, coping machine, or punches. In the punching out of the rivet holes, close supervision might be given to the condition of the punches and dies to see that the specified clearance is not exceeded, and that both dies and punches are sharp and unbroken, making a cleanly punched hole, with almost parallel sides. As it is naturally easier to punch holes with a large clearance between the die and the punch, occasionally this practice is resorted to with the result that a hole measuring $\frac{3}{4}$ -in. on the top side, tapers to 1-in. or 1 $\frac{1}{16}$ -in. at the bottom. Some authorities consider it good practice to punch the holes smaller than the desired diameter and then ream out to the required size, this reaming being intended to remove the crystallized portion of steel around the hole caused by the punching. In addition to removing this crystallization, the reaming, if deferred until the members are all assembled together, has the advantage of correcting any slight inaccuracies in punching, and making the holes in the various pieces assembled together, coincide, giving a uniform space to be filled by the rivet. This makes it considerably easier to secure uniform size of rivet heads and a well filled shank. When holes are not reamed and are eccentric, the rivetters, to get proper results, have to use different lengths of rivet stock to secure uniform heads, and as this entails considerable delay and consequent expense, it is not often resorted to, except under the strictest inspection.

Close Supervision Essential Throughout.

After the various members are laid off and punched, and again straightened, if necessary, to remove distortion caused by shearing and punching, the intended contact surfaces receive a coat of paint, and at this stage also, close supervision is required, as the men in the shop are prone to omit this painting operation, primarily on account of its making the steel awkward to handle with the wet paint, and also on account of its being necessary before applying this paint to take the time to wire and secure the surface to remove foreign matter and loose mill scale.

After assembling the plates and angles going to make up a member, the reaming, if specified, is then done. The member is afterwards placed on the riveting horses or skids, and rivets are driven in the open holes. This operation can be carefully watched, the condition of the riveting dies being particularly noted, both the size and shape of rivet head being dependent on the die. For $\frac{7}{8}$ -in. rivets, the stock of the riveting die should be at least $2\frac{3}{4}$ -in. in diameter, as dies under this size have a tendency to spread and form shallow-headed, unsightly rivets. If pneumatic rivetters are used, the air pressure should be noted to see that there is sufficient force to properly enlarge the shank of the rivet to the full size of the hole and form the required head. The driven rivets should be carefully gone over with a tapping hammer and tested for tightness. They should also be inspected for shape and line of heads—all loose or otherwise defective rivets being marked to be cut out and replaced. With direct acting hydraulic or pneumatic rivetters, the percentage of defective rivets is very low, but with the "air-gun," or with hand-driven rivets, the rejections will often run up as high as 10 per cent. or 15 per cent.

On the completion of the rivetting, the member is turned over the painters, who should thoroughly clean same with scrapers and wire and hair brushes before painting. In many shops this painting instead of being a preservative operation, appears to be looked upon as merely a coloring device to improve the appearance of the structure. Also, as "a good overcoat covers a multitude of sins" likewise a good coat of paint can often be made to cover numerous defects—open joints and mis-punched holes filled with putty, rolling mill defects filled with paste, etc., all being very

nicely concealed. It is only fair, however, to emphasize the fact that this concealment is not countenanced by the bridge shop management but is an attempt on the part of the workmen to hide defects caused by themselves, and which, if admitted to the management, would bring censure and possibly dismissal.

In the case of truss bridges, and where field connections are specified to be shop assembled and reamed in position, the whole truss is assembled lying on its flat, the proper camber secured by opening or closing splice joints in the bottom chord, and then the field connections reamed out. Special precautions should be taken to see that all the top chord and other compression joints are brought into close and even contact, it being customary to face such joints beforehand in a rotary planer. It is also necessary to watch the setting up of members on the rotary planer, so that the planing may be done at exact right angles to the axis of the chord where straight top chord is used, and to the correct bevel in the case of hip joints and sloping top chords.

After the reaming of field holes in the assembled truss has been completed, the various members are matchmarked for the guidance of the field erector, and to ensure the same location in the field as members had in the shop assembling.

Where the bridge steel is being bought at a pound rate, the weighing of the various members should be carefully watched to guard against errors, and in addition theoretical weights of the members should be calculated as a check against the scale weights, the basis of settlement usually being that the scale weights must be within two per cent. of the theoretical calculated weights.

Larger Bridge Shops Have Many Advantages.

To properly equip a structural shop with the necessary pneumatic air system and varied machinery to handle the steel through the above mentioned operations, involves an expenditure of many thousands of dollars, according to the capacity of the shop, and there is a marked distinction between a small jobbing shop with only a punch, a drill and a hack-saw, and an un-to-date structural shop fully equipped with modern machinery. True, the jobbing shop can turn out a light highway bridge, provided they would take the time with the consequent expense, but when they attempt to compete in point of time with larger shops, the quality of work is decidedly affected. Some of these smaller shops, whose names I could mention, do take the time and turn out a very creditable bridge. However, as the larger bridge shops have a skilled staff and an equipment for turning out the heaviest class of railway bridges, and the sky-scraper building steel work, it follows that as this same labor is expended, and the same machinery used on highway bridge work as for the heavier class of work, the larger bridge shops have an advantage over their smaller competitors.

I certainly would not advocate putting the small companies out of business, as competition is truly the life of trade, but these smaller companies should thoroughly understand that the specification they tender on is to be enforced to the letter, and that therefore if they do not possess the skilled labor and machinery to carry out the requirements of the specification, they should spend sufficient money on the necessary extra equipment; but just so long as they are allowed to understand that rotaried compression joints, air driven rivets, and submission of detail working drawings for approval will not be insisted on, just so long will they continue turning out bridge work not in accordance with specifications, and therefore in unfair competition with other bridge companies who comply with the requirements throughout.

The dangerous feature in connection with this kind of competition is that no matter how poor a structure is, once it is erected it stays, and at the most a municipal council

will make an arrangement with the contractor for a deduction from the contract price in order to affect a settlement. This also is unfair to other contractors because as a matter of fact the bridge that was specified was not built and the contractors who bid in good faith on the work, and also the general public are deceived, and, we might almost say, defrauded by any council who accepts a structure of that kind. In the case of one span of about 120 feet, I believe not more than one-half of the contract price has been paid, the balance being withheld for unsatisfactory workmanship and non-compliance otherwise with the terms of the specifications.

Erection.

Usually in transporting steel to highway bridge sites, it has to be carried by wagon from the nearest railway siding, often over rough roads, and considerable care should therefore be used to see that the loading on the wagon is properly done, and that long members do not project too far and become bent or otherwise damaged. On arrival at the site, the steel should not be dumped roughly off the wagon, or allowed to become covered with mud, as this foreign matter has all to be cleaned off before final painting, which means a needless expense, and is often a bone of contention with the local painter who usually takes the painting contract from the bridge company after erection, and who does not figure on the cleaning of the steel.

In the erection of falsework on which to place the steel while erecting, especially in the case of long spans, particular attention should be given to the camber blocking, and also to guard against the falsework settling and throwing camber line out. Without the necessary camber being provided for, the various members of the truss will not come together without considerable drifting.

The careful alignment of trusses should be strongly insisted upon and care taken to see that all tension members are well drawn up and compression joints in close contact. It can be readily understood that if a tension member is left in a bowed condition, it is not doing its intended work, and other members taking care of this strain are being overloaded. I know of a case where the end sections of the bottom chords of a highway bridge had a distinct bow, showing that they were not taking care of any of the strain for which they were designed. On investigation it was found that this was caused by the rod diagonals under the floor being screwed up to such an extent that the bridge was actually being carried by the floor system.

Where the roadway is a reinforced concrete slab resting on corrugated sheets care should be exercised in seeing that the bridge stringers are all in a true plane, so that they will all take an equal share of the load and thus prevent cracking of the slab. It is a very common occurrence to note at the end panels of highway bridges, where the stringers rest directly on the concrete-stringer seats, that same are very much out of plane even to the extent of $\frac{1}{2}$ in. or $\frac{3}{4}$ -in., in fact I have seen a case where corrugated sheet metal was used over the stringers on which to place concrete floor, where the entire load was bridged over one stringer, which was about $\frac{3}{4}$ -in. higher than the others in the panel. Another point which can well be given attention is that the necessary clearance exists at the expansion end of the bridge behind the shoe plates and the face of ballast wall of abutment. This is not only necessary to provide for the natural temperature expansion of the steel, but it is also useful to provide for the possible slight shoving of the abutment itself where heavy filling is behind it. Of course, when an abutment is designed and built it is not expected that any shoving will occur, but nevertheless the fact remains that in many instances a slight settlement and shove does take place.

When placing truss shoe plates on bridge seats, it should

be seen that an even bearing throughout is secured, even bush hammering where necessary. $\frac{1}{4}$ -in. sheet lead inserted between the bridge seat and the shoe plate is a wise protection.

Preparation of Contact Surfaces.

All contact surfaces of steel before erection should receive a coat of paint, and in the event of winter erection, all ice and snow should be removed from such surface. It can be easily understood that if members are put together with a layer of ice between, no matter how tightly they are bolted together, as soon as a hot rivet is inserted and driven, it melts the snow or ice and causes a loose joint. All joints should be well bolted before any rivets are driven, so that the contact surfaces are brought closely together.

Most of the field rivets in highway bridges are, even at the present day, driven by hand, but unfortunately owing to pneumatic tools being used universally on all large steel erection works, it is forcing hand rivetting gradually into the background, and causing it to become practically a lost art, consequently there are few good hand rivetters among bridge erection gangs, and these are not usually met with on highway erection work. Therefore the rivetting of the highway bridge work has to be supervised by a man thoroughly conversant with the possibilities of hand-driving, and who will not be intimidated or argued into accepting something very inferior, but which is insisted, is the very best than can be given. Hand-driven rivets can be made absolutely as tight, and quite as good appearing as pneumatic-driven rivets.

Much could be said on the placing of concrete deck, but time will not permit the subject to be taken up on this occasion.

One Water Wheel of Greater Capacity than Lachine Rapids

One measure of the strides which Vancouver is making in wealth and population is the rapid growth in the use of electric power in and about that city. The British Columbia Electric Railway Company which has also extensive lighting and power franchises, is now utilizing over 33,000 h.p. from the plant at Lake Buntzen and has in addition a steam auxiliary of 6,000 h.p. in the city itself.

But the demand for electric power is so great that the company has been compelled to make additional provision and has just awarded to the John McDougall Caledonian Iron Works Company, Limited, of Montreal, the contract for another 10,500 h.p. wheel for an extension of the hydro-electric plant. It is known as the Doble-impulse wheel and is specially suitable for high heads. At Lake Buntzen there is a fall of 380 feet, but Doble wheels are in operation under 2,000 ft. head. This is rendered possible by the use of patented needle nozzles, which regulate the flow of water and act as relief valves to prevent undue shock in the inlet pipes.

The McDougall Company built a similar wheel for the Lake Buntzen power house two years ago and it has run without the slightest trouble ever since it was installed. These wheels, though rated at 10,500 h.p., will really deliver over 15,000 h.p. each, which is more than is now derived from the celebrated Lachine Rapids. The comparison will give an idea of their enormous power and capacity and of the magnitude of the B. C. Electric Railway Company's operations. The contract price was in the neighborhood of \$50,000.

The Canadian Pacific Railway has completed plans for a \$70,000 concrete roundhouse to be erected at the Union Depot yards at Ottawa. A number of changes in the yard trackage are also planned.

Canadian Contractors and Their Work

The Brandon Construction Company, Limited—Personnel of the Firm, and a Brief Description of one of their Recent Contracts

Of the progressive contracting firms of Western Canada the Brandon Construction Company, Limited, Brandon, Man., is a noteworthy example. The managing director of this concern, Mr. T. M. Harrington, was one of the pioneers in the field, and the secretary-treasurer, Mr. H. B. Harrington, is doing much to build up for his company a reputation for expeditious and satisfactory construction. Many excellent buildings in the western provinces testify to the ability of the Brandon Construction Company. Among these may be mentioned the Winter, Fair building and the McKenzie warehouse at Brandon. Views of the latter building are shown on the opposite page. The McKenzie seed warehouse was the first concrete structure to be erected in Brandon. It has a frontage on Ninth street of 60 feet, by a depth of 120 feet, and is seven storeys high, including the basement, with a brick storey erected on top of the roof slab.

The total height of the building from sidewalk to coping is 91 feet. There were seven slabs erected, the time occupied in their completion being indicated by the following schedule: ground floor, August 4, 1910; first floor, August 19; second floor, August 31; third floor, September 9; fourth floor, September 17; fifth floor, September 23; sixth floor, September 30. The total time occupied in the erection was thus 57 days; deducting eight Sundays leaves 49 working days—an average of about eight days to a storey. This reflects most creditably upon the contractors.

The construction of the building was not unattended by difficulty. This being the first building of its kind erected in Brandon the company were somewhat handicapped in securing the proper class of men to handle the work.

The slab and columns for each floor averaged about 250

cubic yards of concrete. The best time for pouring a slab was 17 hours continuous run. This was accomplished by a No. 2½ Smith mixer used in conjunction with a Smith concrete hoist. Both machines gave splendid service. The "Mushroom" system of concrete was employed. This system was invented by Mr. C. A. P. Turner, of Minneapolis, Minn., who is well known to the architectural profession and building trade throughout Canada.

The columns are octagonal in form and range from 34 inches to 28 inches in diameter. The slab is 9 inches and is designed to carry a live load of 400 pounds to the foot. Provision has been made in the footings and columns for extending the building to 12 storeys. The whole design calls for about 3,000 yards of concrete and about 214 tons of reinforcing steel.

The front of the building is faced on the first two storeys with Bedford limestone and the remainder with red pressed brick, surmounted by a massive copper cornice. The interior trim and doors are finished in copper. The walls are finished in Parisian white with red plastic flooring and marble stairs. There two elevators, one passenger and one freight. The whole building is fireproof, the only wood used being the maple floors in the warehouse. Possession of part of the building was given the owner on December 15. The structure was finally completed and turned over about February 15, 1911.

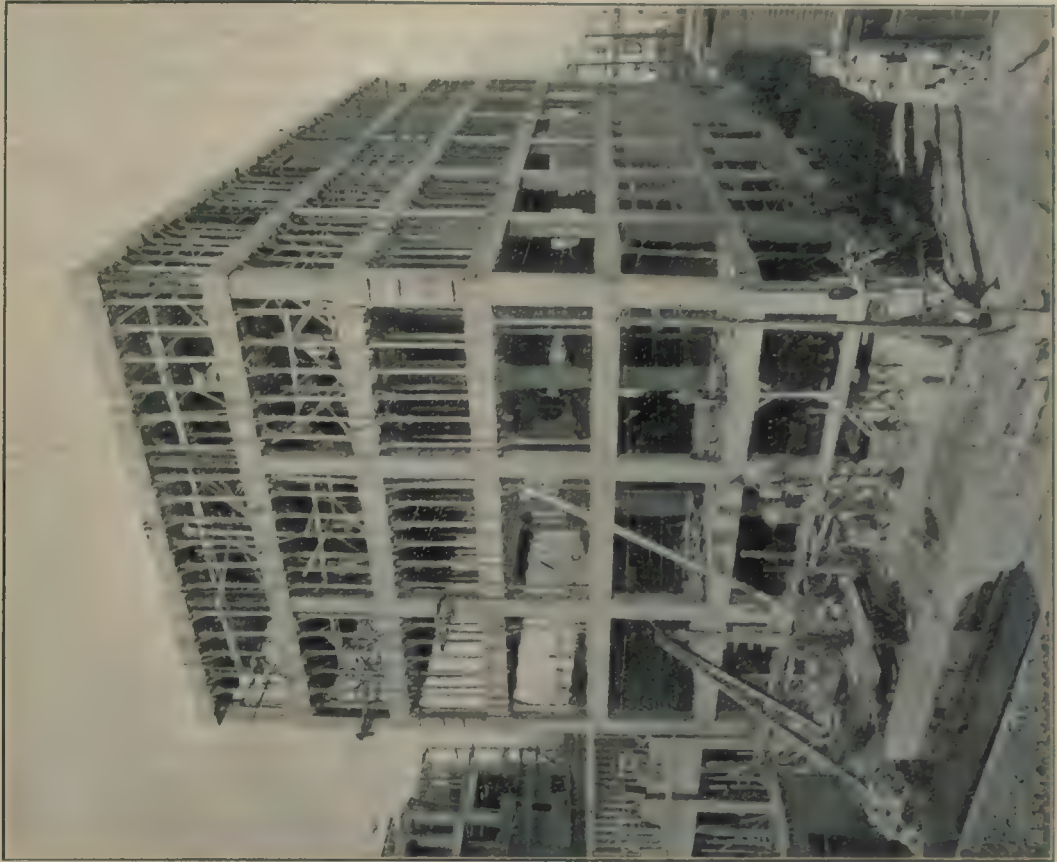
The building was designed by Mr. Thos. Sinclair, architect, and erected under his supervision. Mr. Sinclair has specialized with much success in reinforced concrete building work.



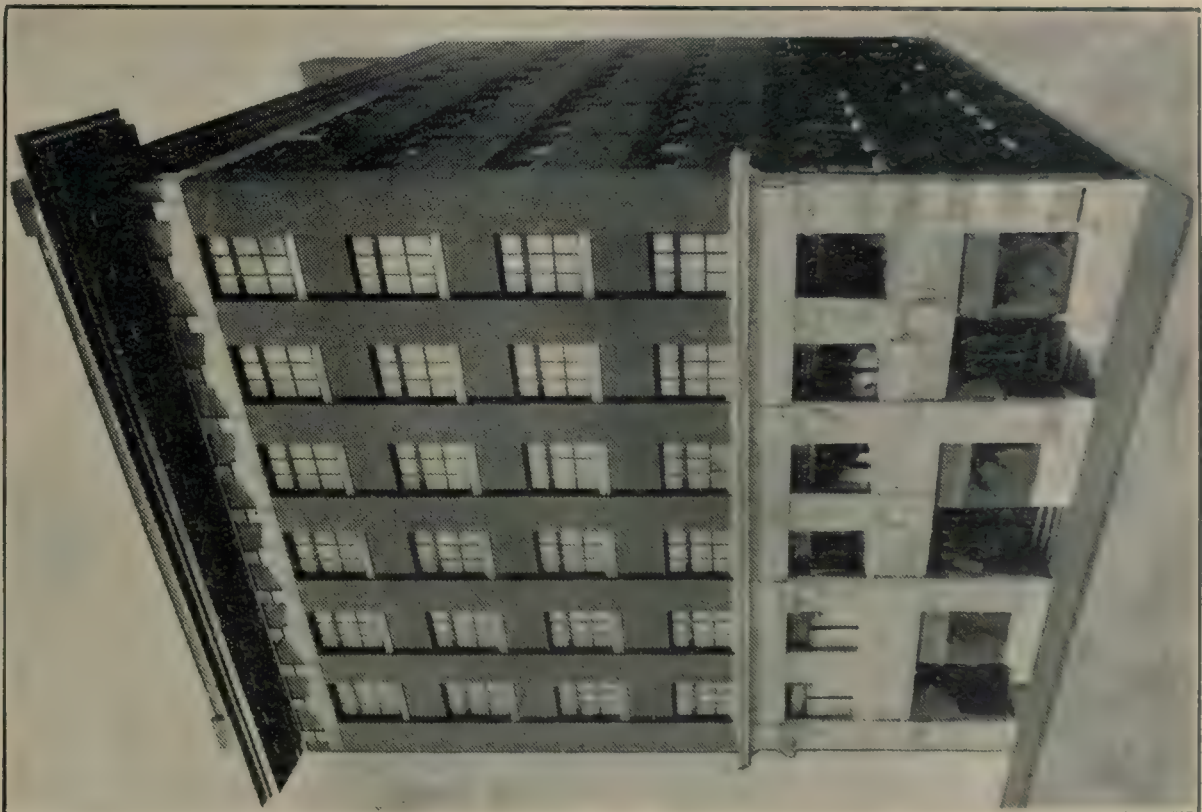
T. M. Harrington.
Managing Director Brandon Construction Co., Ltd.



H. B. Harrington,
Secretary-Treasurer Brandon Construction Co., Ltd



McKenzie Warehouse, Brandon, Man., in Course of Erection.



McKenzie Warehouse, Brandon, Man., upon Completion.

Some Unfair Provisions of Contracts

One-Sided Clauses in Specifications and How They Affect the Contractor—Noteworthy Examples on Various Classes of Work

By Daniel J. Hauer *

Contracts and specifications have been written since man first began to live in cities and work in the arts and sciences. The earliest specifications on record are to be found in Genesis, chapter 6. These were prepared for Noah's guidance in building the ark.

"Make thee an ark of gopher wood; rooms shalt thou make in the ark, and shalt pitch it within and without with pitch. And this is how thou shalt make it: the length of the ark three hundred cubits, the breadth of it fifty cubits, and the height of it thirty cubits.

"A light shalt thou make to the ark, and to a cubit shalt thou finish it upward; and the door of the ark shalt thou set in the side thereof; with lower, second, and third stories shalt thou make it."

Noah finished the contract, and his work was accepted, for it is recorded:

"Thus did Noah; according to all that God commanded him, so did he."

The originals of these papers are not on file, but I think we are safe in concluding that they are the genesis of all modern specifications.

Noah carried out his contract successfully and satisfactorily, in spite of, or, perhaps because of, the heavy liquidating damages that were imposed for failure to do so. The contractor of to-day risks his money on unsuccessful performance, but Noah risked loss of money and life by flood if for any reason he should not carry out the terms of the specifications and the contract under which he worked.

Some modern engineers still harp on flood risks. I quote from a set of specifications under which I have done considerable work as a contractor:

The contractor shall take all risks from floods and casualties of every description, and shall make no charge for detention for such cause.

Unequal Conditions

The contractor must pay for all damage by floods, fires or other acts of God, and yet he has no choice or say in designing or locating the work. A railroad may be located along a body of water, which, in a great storm, may destroy several miles of partly finished roadbed; and the contractor must stand the loss. Again, a partly finished building may be set on fire from an adjoining blast furnace; and the contractor must replace the work at his own expense.

I quote another clause:

No charge shall be made by the contractor for hindrance or delay, from any cause, in the progress of any portion of his work; but it may entitle him to an extension to the time stipulated in his contract for completing the work sufficient to compensate for the detention, to be determined by the engineer; provided, he shall give the engineer immediate notice, in writing, of the cause of the detention.

This seems like an innocent provision. In many cases it is if it is not needed; but let a detention occur, or let the work be suspended, and it may cause the ruin of a contractor. Only recently a member of this society told me of an experience he had had in connection with a clause similar to the one just quoted. He was building a railroad. Besides having on the work a number of sub-contractors, he had some large team outfits of his own. The company suspended the construction work. Settlement was made with the sub-contractors, and the general contractor was asked to keep his outfit on the work. For three months he fed a large number of horses and mules and maintained some of

his men. Then the company controlling the railroad decided not to finish building. The contractor asked for an allowance for his time. It was refused and he entered suit, but was not able to recover because of the presence in the contract of a provision like that referred to. His loss amounted to thousands of dollars.

I again quote from a contract:

Contractors must satisfy themselves of the nature of the soil; of the general forms of the surface of the ground; of the quality of materials required for forming the embankments or other work, and all matters which can in any way influence their contract; and no information upon any such matters derived from the maps, plans, profiles, drawings, or specifications, or from the engineer or his assistants, will, in any way, relieve the contractor from all risks, or from fulfilling all the terms of this contract.

This clause is similar to the following, copied from another set of specifications:

The contractor must examine carefully the plans and drawings and must assume all responsibility for the work to be done under them, and for any omissions or mistakes that may occur in said plans and drawings.

Nothing could be more one-sided and absurdly unjust than such provisions. They surely would not stand in court, yet the responsibility which they shift upon the contractor may work him great injury; as, for instance, in the case of building a concrete house, which collapses during construction owing to faulty design.

I copy this from a set of specifications on railroad work:

Embankments can be made by dumping from grade when carts or cars are used, and in layers when scrapers or wagons are used to make the excavation.

This clause is to be commended, as it provides for work to be done as it is customarily done. What a difference between it and the clauses in a set of specifications under which I worked some year ago, which specified that wheelbarrows must not be used, and embankments must not be built by dumping from grade; but must be built in layers of such thickness as the engineer may direct. These provisions applied to work in mountains, where the embankments were fifty to one hundred feet high, and, in some cases only a few hundred feet long, the hills being difficult to climb. One would think that only an inexperienced man would draw such specifications.

Prohibitive Clauses which Mean Nothing.

Nearly every engineering contract contains a clause reading somewhat like this:

It is agreed that this work, as a whole, or any part of it, shall not be sub-let, without the written permission of the engineer.

Notwithstanding this clause, much work is sub-let, and protest is seldom made by the engineer. It has been my experience that, although much work is sub-let, yet it is the exception when written permission is obtained. Then, why keep such a clause in the contract? It is evidently the idea to allow the engineer to control the situation, that this old clause, entirely prohibiting sub-contracting, is retained.

It would seem to be the better plan to draw up such clauses as govern and control sub-contracting rather than use the one above quoted. Naturally, the engineer and his employer are interested in who is to do their work, and it might be wise to state that a sub-contract is not valid after it is executed, until countersigned by the engineer, or, if such a procedure is not legal, it might be well for the en-

* Before the American Society of Engineering-Contractors.

gineer to approve the sub-contractor before the work is let to the latter. Any other conditions that are to be met should also be set forth.

The following is copied from a set of specifications for canal work:

At the end of sluice gate walls, culverts and other designated places, sheet piling 5 feet deep will be required, to be of sound, durable 2-inch plank. A trench will be dug to the proper depth, and the sheet piling set on end therein, and so that the edges will remain in close contact. The trench will then be filled up with stone from the old work, or with rip-rap stone, and the interstices filled with concrete, as directed. The price bid on sheet piling shall cover the excavation of the trench, and the stone and concrete used in rebuilding, as well as the timber and labor.

I might enter into discussion of this clause, showing that timber placed in this manner is not sheet piling, but shoring; and showing, also, that to dig trenches and then to place the shoring, is poor construction, as cave-ins or to the cost of the work. I wish only to call attention to the slides of the material may occur, which will add considerable last sentence. Under this sentence one price is set on four classes of work. This is never desirable. The quantities that are to enter into the work are uncertain, with the exception of the sheet piling. The excavation can be increased by the sides of the trench breaking. The amount of rock to be handled will depend upon the size of the individual pieces as well as the way in which they are placed, and this, too, will govern the quantity of concrete to be mixed and placed. The result of these uncertain features will necessarily compel bidders to name a high price for the work, all of which must be under the head of sheet piling. If each class of work be definitely set forth and a price asked for each, the engineer would no doubt effect a saving for his employers.

Engineer's Decision re Changes in Work.

I again quote:

The quantities and disposition of excavation, embankment and masonry may be changed during the progress of the work at the pleasure of the engineer, by alterations in grades . . . it being understood that if by such changes the work is made more or less expensive to the contractor than the plans and statement furnished him by the engineer, and on which he made his proposal, would have required he shall have such allowances or deductions therefor as the engineer may in his own judgment consider just.

Changes can be made under these specifications that may materially affect the cost of the work, and yet only the agent for one party of the contract can have anything to say regarding the prices or allowances to be made. Under these circumstances what is to prevent the entire work from being so changed that none of the original prices would cover the cost of the different classes of work, or to prevent the engineer from naming such prices as suit him? The contractor might as well have the engineer fix his prices at the start.

The same contract states:

It is mutually agreed and distinctly understood, that the decision of the engineer shall be final and conclusive in any dispute which may arise between the parties to the agreement relative to or touching the same; and each and every one of said parties do hereby waive any right of action, suit or suits, other remedy in law or otherwise, by virtue of the covenants and provisions herein, so that the decision of said engineer, shall in the nature of an award be final and conclusive on the rights and claims of said parties.

This clause only adds to the injustice of the first clause quoted from this contract, giving the engineer the right to change the work at his pleasure and set a new price upon it. By the second clause the contractor is made to bind himself to accept the decision of the engineer, no matter what it may be, as final, and even to sign away his constitutional rights to sue and be sued. Of course, such a proceeding is illegal, and in case of a suit at law the court would set aside this last clause, and would put upon the first a

reasonable construction, that is, the price made should cover the cost of the changes in the work.

Surely such clauses and conditions should find no place in a set of specifications and contract made to-day. The idea evidently was to prevent a lawsuit, but such clauses rather foster than prevent actions at law.

Improper Classification

Here is another unfair provision:

Grading and excavation for the roadbed shall include the grubbing and clearing of the right of way.

Grading shall have but one classification, and that shall be per cubic yard measured in excavation.

Here we have one price covering two classes of work, namely, clearing and grubbing, and excavation. Then the excavation is paid for without classification, which certainly costs the company extra money. I am familiar with one contract done under these specifications, in which there was not a yard of hard material excavated, yet, inasmuch as there were no borings or test pits made prior to the letting of the work, the contractor added a percentage to his price to cover the risk of finding rock, thus making the cost of the excavation greater to the railroad company than it would have been had there been a contract price named for earth, loose rock and solid rock excavation.

There is never any need of including clearing and grubbing in the price of excavation, as there are several equitable methods of paying for this work, and classifying it either as one or two items. Where the excavation is entirely scraper or grader work it is well to classify it as "clearing and grubbing," but should some of the excavation be rock, then money can be saved by a separate price being paid for each, as all the cuts will not have to be grubbed, and in shooting the rock the stumps will be shot out. The engineer should also object to the price of excavation including the clearing and grubbing, for in many cases side tracks and spurs that frequently have to be located after a contract is let, may be through cleared land, yet, as the price for excavation covers the cost of clearing, the engineer's employers pay for it as though it was there. A contractor objects to it, owing to the fact that clearing must be done first, and, as in many section of the country the work is expensive, he is compelled to pay out a large sum of money, the whole of which does not come back until the job is finished. Consequently he must charge interest on the money so paid out, which means a higher price to the railroad for their clearing and grubbing.

Another clause of these specifications says:

Embankments about concrete shall be built at such times, and in such manner, and of such materials as the engineer may direct.

No one but the engineer knows what he "may direct," and how expensive the work may be made by his directions.

I quote two more clauses:

The contractor shall indemnify the company from and against all suits and claims of every kind of damage done or caused in the course of construction of work provided for in this contract.

Any damage done by the contractors, or any person in their employ, to the owners or occupants of land or other property adjoining or in the vicinity of the work herein agreed to be done, shall be estimated by the engineer, and the estimated amount shall be paid by the contractors, and upon their failure to do so, the company shall pay the same, and the engineer shall deduct the amount from the ensuing monthly estimates.

In the first clause, as is just and fair, it is stipulated that the contractor shall indemnify the company for all suits and claims for damages; yet, in the next paragraph, the right to settle such claims on terms that the contractor may agree on with the third party is taken away from his hands and given to the engineer. This is clearly not legal, in my opinion, and the engineer is usurping the inherent rights of the contractor. Such a clause takes from the contractor

the right to manage his own business, and it would not stand before the courts. Such clauses are as swords hanging over the contractor's head. He cannot afford to combat them when the occasion arises, so he must submit to petty damage claims being settled by the engineer, as the latter deems expedient. It is like the contractor paying for the meal, and some one else ordering it and another eating it.

I copy from another contract governing railroad construction:

The engineer shall have entire charge of all forces employed under this contract and shall direct their work and disposition, and shall order such forces increased or diminished, as he shall deem expedient.

The engineer mentioned in these specifications and contract shall mean the engineer in active charge of the work, and it is mutually agreed between the two parties to this contract that his decisions in all matters shall be binding to both parties and shall be final.

The defense of such articles, that they are not enforced, is a poor one, for they should not be written if they are not to be considered in carrying on the work.

At times, though, they are not only considered, but are carried out to the letter, the result being much hardship to the contractor. By these specifications the engineer becomes superintendent for the contractor, and he is clothed with such power as to put nearly every detail of the work and the contractor's entire outfit under his control. Of course this is wrong. The contractor's money is at stake and he should have the exclusive right of handling his forces and outfit as he deems best.

Not only do these clauses make the engineer superintendent of the contractor's forces and outfit, but they state that his decision shall be final in these, and in all other matters, that may come under the contract. Could any contract or agreement be more one-sided and unjust than this? The contractor has but one remedy. He must ask more for the work. This is always the result of such specifications.

Fair specifications and equitable contracts will go a long ways toward making contractors honest, and will ensure the lowest possible prices. Unfair specifications throttle competition, increase the cost and delay the work. A dissatisfied contractor always means trouble.

Reinforced concrete pipe, 36 in. in diameter, was used for 3,480 lin. ft. of sewer at Mishawaka, Ind. The approximate cost per linear foot, as given by Mr. W. P. Moore, city engineer, in a paper before the Indiana Engineering Society, was \$4.16. The excavation for the trench was sand and gravel, and the average cut 10 feet. The pipe was furnished to the contractor by the Jackson Concrete Pipe Company at a cost of \$1.80 per linear foot, and the charges per foot for labor and material for joints were: labor, \$2.25; cement, sand and gravel for joints, 9 cents; water for flushing trench, 2 cents.

Worms and larvae in sewage filters at Chester, England, have appeared in large numbers during the spring and summer, and by their scavenging action are said to clear away the solid matter which accumulates during the colder months to such an extent that the natural color of the filtering material again becomes visible. Last summer, the "Surveyor" reports, birds flocked over the beds in large numbers and devoured the worms and larvae when the latter were most active in cleaning the filtering material. The result is said to have been that the filters have suffered from not undergoing the yearly purging hitherto carried out by the worms.

Trade Enquiries

The Dominion Government Trade and Commerce reports contain the following trade enquiries. Readers of the "Contract Record" may obtain the names of enquirers by writing us, enclosing stamped envelope and stating number of enquiry.

346. Wire and wire netting.—A London firm makes inquiry for the names of Canadian manufacturers of wire and wire netting.

350. Special friction clutch.—A Danish firm manufacturing a special friction clutch for engineering purposes wishes to arrange for its introduction and sale in Canada.

357. Wire fencing and fencing standards.—A South African firm of stock and mercantile brokers desires to be placed in communication with exporters of barbed and ordinary wire fencing and fencing standards.

Tracklaying on the V., V. & E. Ry., northwest from Princeton, B.C., will be started in about two months. At the present time the line is graded from Princeton, 16 miles to Tulameen and it is understood that when the tracklayers begin on the Princeton end to put the rails on the grade, other gangs will continue the grading. Work is being pushed at the western end of the V., V. & E. J. W. Stewart at present has about 150 men on grading operations between Abbotsford and Sumas river. This contract which originally extended to Chilliwack, but which, it is understood, is being cut off at Sumas river to permit the railway company to use Canadian Northern tracks between the river and Hope, is over 60 per cent. completed. It will probably be done in about two months.

Business is particularly brisk at Port Arthur and an active season is assured. The supply houses are busy filling orders for this locality.

An attractive 2-storey structure of red pressed brick and stone trimmings is now being erected for the Canadian National Exhibition at Toronto. It is located south of the Manufacturers' Building and will cost \$66,000. Mr. Geo. W. Gouinlock is the architect.

A despatch from Winnipeg states that contracts have been awarded by the Canadian Northern Railway Company amounting to \$8,000,000 for the grading to be done on the main line and new branch lines which the company is having constructed in the west this year. The following are the contracts in detail: Cowan Construction Company—200 miles on main line from Edmonton toward Yellow Head Pass; 200 miles from Alsask to Calgary, on the Maryfield extension; 90 miles from Redville to Moose Jaw and Maryfield extension; 35 miles on Jack Fish extension from North Battleford toward Peace River country; 80 miles from Sheldbrooke to Battleford. Northern Construction Company—100 miles from Red Deer to Calgary; 20 miles grading and construction on main line from Vancouver toward Rockies.

Editing a newspaper is not a nice thing. If we publish jokes people say we are rattle brained. If we don't we are fossils. If we publish original matter they say we don't give them enough selections. If we give them selections they say we are too lazy to write. If we don't go to church we are heathens. If we do go we are hypocrites. If we remain at the office we ought to be out looking for news items. If we go out then we are not attending to business. If we wear old clothes they laugh at us. If we wear good clothes they say we have a pull. Now, what are we to do. Just as likely as not some one will say that we stole this from an exchange. So we did.

Noteworthy Developments at Montreal

**Many Important Building and Municipal Projects in hand this Season—
Extensive Improvements to the Harbour—Work of Legislature Reviewed**

Office of the Contract Record,

Montreal, April 1, 1910.

Rumors of strikes are in the air in Montreal. Prospects for building operations here during the coming season are very encouraging so far as the amount of work is concerned, but when there is abundance of work to do, laborers in all departments of the building trade acting on the advice of labor agitators are pretty sure to take advantage of these conditions to demand higher wages and shorter hours. This is the prospect which faces the Montreal contractor at the present time. Millions of dollars' worth of work is in sight. In addition to hundreds of residences and ordinary commercial buildings of every kind there will be office buildings erected within the next twelve months larger than anything hitherto erected in the commercial metropolis.

The greatest danger that threatens the industrial world to-day is the International Trades Union. Most of the troubles that we have in the labor world in Canada are engineered by international trouble makers, so-called organizers, but in reality disorganizers of the most important industries that we are concerned in.

To give some concrete examples: Carpenters are at the present time working for from 22½c. to 30c. an hour with a nine-hour day. 27c. to 28c. represents the pay of the average mechanic and a great many of them are not worth that much. Many so-called carpenters are really only wood butchers and yet the union system encourages incompetency because it secures for a poor workman the same wage as his more skilled brother. This may be considered, when looked at through union spectacles, as an advantage to the journeyman, but in reality the skilled laborer suffers in greater proportion than the unskilled man benefits; whereas the real burden and loss bears heavily on the employer. The carpenters are going to demand 40c. an hour after the first of May. Employers consider that a jump from 30c. to 40c. all at once is too strenuous a demand. The only course for contractors to take is to unite and deal with their employees individually, not permitting agitators to interfere with their affairs. It is simply absurd for carpenters to ask 40c. as a minimum wage for this season's work, and there is every probability that the demand will be refused.

Following the example of the carpenters, the plasterers are asking for a new schedule on the basis of 45c. an hour for an eight-hour day, instead of 40c. an hour for a nine-hour day as at present. The employers suggest a compromise, offering 42½c. for a nine-hour day up to October 1st, and 45c. an hour for an eight-hour day after January 1st. To grant the demands above outlined would mean an additional cost of about 12 per cent. on contracts now entered into. No decision has yet been reached regarding the demands of the plasterers.

There is also some dissatisfaction among the painters who are asking a minimum wage of 30c. an hour. Good men are already getting 30c., but this is too much to give unskilled workmen. The only way to deal with this branch of trade is to stick to the open shop system. In fact "open shop," in which the law of supply and demand regulates the wages, is the only fair method of carrying on building operations.

It is well known in Montreal that some of the unions have not been living up to their agreements and it cannot be denied that bricklayers and others in the east end of the city have been working during the winter at considerably lower rates of remuneration than the union scale. This is looked upon as an unfair discrimination against the English contractors, and moreover shows conclusively that a union agreement is not worth the paper it is written on when the testing time comes. The unions not being incorporated there is no one upon whom the law can lay its hand when an agreement is broken. In the departments of plumbing, painting and carpentering the open shop system has been maintained during the last six or seven years, owing to there being a sufficiency of labor, but in such lines as bricklaying and plastering, owing to the scarcity of skilled labor the unions have been able to exact their own terms. The closed shop is a tyrannical institution and the limitation of apprentices is one of the greatest evils existing in the industrial world.

There is room in Montreal for a great many more good class tenement houses. These should be simple in design, medium in size, up to date in sanitation, and not too elaborate in finish, so as to be available for the working classes at a moderate rental.



Grain Elevator No. 2 in course of construction Montreal Harbour Improvement.

Extensive Improvements to Montreal Harbour

The Montreal Harbour Commissioners have ratified plans for the improvement of the harbour which call for the expenditure of two and a half millions. The plans include the construction of grain elevator No. 2, which will have a capacity of 1,772,000 bushels; also the completion of ten additional miles of high level railway, sidings, etc. Another most important work is the remodelling of Victoria pier, so as to give increased accommodation to ocean liners. The inner side of the remodelled pier will be 4,800 feet long. A concrete ferry wharf, 265 feet long, will be constructed at St. Helen's Island.

The construction of high level railways, which was started last season, will be continued this year as far as Racine pier, opposite the Montreal Locomotive Machine Works at Longue Pointe. In connection with this increased railway accommodation there will be 11 steel concrete subways to permit of entry from the harbour to the city.

In preparation for the new elevator, foundations were laid last season for a building 314 feet in length by 100 feet wide, and 230 feet high. Plans were prepared by Mr. John S. Metcalf, the grain elevator expert. The new elevator will have a receiving capacity of 40,000 bushels per hour from boats, and 24 cars per hour, while it will provide the transfers of 45,000 bushels per hour to the liners. In connection with the elevator will be ten and a half miles of rubber belting. There will also be a cleaning plant with a capacity of 3,000 to 6,000 bushels per hour, and a drying plant of 500 to 700 bushels capacity.

There will in addition be completed this season a marine tower jetty or pier 400 feet long of solid cribwork substructure and concrete superstructure, with a quay wall in front of the elevator and a mile of railway tracks connected.

Work in connection with the up-to-date harbour workshops and storage warehouses will be started following the recent purchase of the property between the Dominion Textile Company's Hochelaga mills and the St. Lawrence Sugar Refinery. Sidings will be run from the high level railway into the yard and warehouses, permitting a rapid handling and shipment of the stores.

On Tarte pier, two reinforced concrete sheds, one storey high, will be erected for the South African and West Indies trade, a second storey to be erected later.

Since last season 35 contracts have been awarded for the construction of the new elevator alone. Mr. F. W. Cowie is chief engineer of the Montreal Harbour Commission.

Recent Enactments at Montreal

The Quebec legislature now having closed its annual session, a brief review of its work may be of interest:

First in importance, perhaps, was the enactment which authorizes the city council to proceed with the laying of permanent street pavements at the cost of the fronting properties. In the case of streets in which the roadway is fifty feet wide or less, half of the cost of the roadway will be charged up against the proprietors on either side. Where the street is over fifty feet wide the extra width will be laid at the cost of the city. Montreal has arranged for a loan known as Working Capital, amounting to some \$5,000,000, for permanent works of this nature. The cost of the permanent works will come out of this fund, and the frontage proprietors will repay the city by an annual tax covering a period of 40 years. Montreal is one of the last important cities in Canada to adopt this system. Once a permanent pavement is laid at the cost of the proprietors the city must maintain the same in perpetuity; that is to say, all repairs and relaying of worn out pavement must be done at the expense of the corporation. On the other hand, where

streets have in recent years been paved by the city it is ordered that when new pavement is next required it shall be put down at the expense of the fronting proprietors.

In accordance with another piece of legislation just passed at Quebec the city council will shortly pass a new by-law relative to cuttings or openings in the streets. Such cuttings have always been a source of contention between the city and contractors and corporations operating public utilities, not to say of annoyance to the citizens. In the case of the Gas Company, electric light companies or others requiring to make excavations for the installation or repair of wires or pipes it has often happened that weeks, and even months elapsed before the filling in was properly done and the surface restored in as good condition as before. Under the new law a deposit must be made with the city covering the amount of the estimated cost of the proposed excavation. The city will have authority and will be obliged to fill in and restore the cutting, including the surface, to its former condition, the cost to be paid out of the deposit made in the case. This will insure the prompt closing up of pavement cuttings and will avoid the annoyance and accidents that have been so frequent hitherto.

Another enactment empowers the city to pass a by-law compelling builders to locate cut-off pipes inside houses. The old method of having the key or stopcock in the sidewalk is very expensive, on account of repairs. The city officials will be authorized, at discretion, to turn off the water and place seals upon the supply.

Strenuous opposition was encountered with the Tramways Bill, which provides for the amalgamation of the Montreal Street Railway Company, the Montreal Park and Island Railway Company, the Montreal Terminal Railway Company, and the Public Service Corporation. The officials of these companies are now taking the necessary steps looking towards consolidation.

Labor Conditions at Winnipeg

Strikes and Rumors Thereof, and Probable Developments—Many Millions to be Expended on New Work

Winnipeg, March 29, 1911.

Railway contractors may be considered as having the centre of the stage at the present time in the Canadian West, and there is feverish activity in the supply field. In addition to the many contracts already let by the Canadian Pacific Railway, the Canadian Northern Railway has awarded contracts for almost a thousand miles of work which will amount to roughly \$8,000,000.

Though it will be noticed from the price that this is almost entirely prairie work, still there are several large bridges which will have to be put in and a tremendous amount of grading through rock or partly rock country. It means a tremendous market for supplies of all sorts and should mean a struggle to get enough men and horses to push the work through on schedule time. The Cowan Construction Company and the Northern Construction Company have divided the work between them, but they are preparing to sublet the largest part of the work. With the exception of 200 miles, all of the work is east of the Rockies. Edmonton, Calgary, Moose Jaw, North Battleford and Vancouver will be the chief outfitting points as nearest the various contracts, though much of the preliminary work in this line is being done in Winnipeg.

The English company which is putting in the big irrigation works west of Medicine Hat has also let a big contract for grading recently and this work will be carried on at the same time. It is rumored that this company is being

backed to a certain extent by the C. P. R. and their methods of developing the irrigation tract are very similar.

Activity in Real Estate and Building Circles.

But railroad work by no means has the whole of the call, for Winnipeg is awakening in a very positive manner. For the past two weeks real estate circles have been eagerly watching the movements of the Hudson's Bay Company. It was rumored that they were going to change the location of their stores in order to get nearer the heart of the business section. It was finally announced that they were going on Portage avenue, west of the Eaton Company stores. The first work will be the erection of a three-storey building on the frontage between Vaughan and Colony streets and 300 feet in depth. This will be designed to carry five additional stories as they are needed. The effect of this announcement has been startling, and Portage avenue frontage has doubled in value in some instances. Many new buildings along the avenue are being discussed, though the plans as yet are but tentative. Similar improvements in the stores of the company at Calgary, Edmonton, Victoria and Vancouver are under discussion.

There is a lot of work planned in the west which will interest small builders. The Grand Trunk Pacific is preparing to erect 140 new depots along various lines of their system. They will be what is known as the standard type of depot. The necessary lumber and timber has been ordered by the company ready for delivery.

Work on the new Y. M. C. A. building, which will be located on Vaughan street, has been begun, and the contract has been let for the removal of the existing buildings. The excavation will be started at once, and as soon as some minor changes have been made in the plans contracts will be called for the erection of the building. Though the probable price has not been announced it will run into several hundred thousands of dollars.

Business expansion has caused several wholesale firms to consider the building of extensions to their premises. The R. J. Whitla Company have prepared plans for an addition of 40 x 160 feet, eight stories in height. The J. H. Ashdown Company has called for contracts for a warehouse 80 x 134 feet, six stories in height. The Grose and Walker Company will add two stories to their present building, and the Manitoba, Ontario and Western Land Company are planning to remodel the Notre Dame block, with the construction of two additional stories.

The excavation for the foundation of the new power house of the Winnipeg Electric Railway Company is almost completed, and the contractor is rushing the finishing touches on their cooling-water intake which has been carried out into the Red River near the plant. It is expected that piling and masonry work will start there at an early date, and rush orders have been issued for the early completion of the work. The necessary plant has already been ordered. At the new agricultural college, also, excavation has been started and orders for material are now being placed.

In the supplementary estimates brought down by the provincial government the sum of \$800,000 is provided for work on the Agricultural College buildings, \$300,000 for the Insane Asylum at Brandon and \$500,000 for new Parliament Buildings. It is not expected that this latter sum will be called for this year, but the college and asylum will be rushed through.

The Foundation Company, Limited, recently completed the work of sinking the huge concrete foundation pillars for the foundation of the new Dominion Express Building to be erected at the corner of St. James and St. Francois Xavier streets, Montreal. The work has been going on for about two months and has attracted a great deal of atten-

tion. Forty-two steel caissons had to be sunk to a depth of from 85 to 90 feet from the surface to the solid rock. Each caisson contained a steel tube and the whole was filled to concrete, making a solid concrete pillar reinforced with steel work. This week the Foundation Company is removing its material, and as soon as the site is clear Messrs. Peter Lyall & Son, the building contractors, will begin the construction of the splendid office building to be constructed on this historic corner this year.

Canadian Railroad Development

The Grand Trunk Pacific Railway is to make surveys for a 25-mile extension of its branch now under construction south from the main line to the Embarrez river. This 25-mile extension will carry the line into the Brazeau coal fields. Phelan & Shirley have the contract for the extension to the Embarrez River and work will be completed in September.

Thomas Malcolm, the contractor, who recently completed the International R. R. from Campbellton, N.B., to Edmundston, has made a proposition to the New Brunswick government on behalf of the Quebec & New Brunswick Railway Company, to construct the St. John Valley road, from Grand Falls to St. John, the line when completed to be leased to the Canadian government and operated as part of the Intercolonial system.

The Chatham, Wallaceburg & Lake Erie Railway, Chatham, Ont., is reported to be considering extending its inter-urban line from a point near Cedar Springs to Blenheim and also on to Rondeau. At present the lake terminus of the line is at Erie Beach. Another development in view by this line is to build a bridge over the river at Wallaceburg with a possibility of still further tapping the country to the north.

The Quebec legislature has granted authority to the Montreal & Southwestern Railway & Power Company to construct an underground railway terminus in Montreal. The underground route as projected will tunnel the St. Lawrence river from Adirondack Junction, and enter Montreal by underground, establishing a terminus in the central part of the city. The itinerary of the road is through the Counties of Beauharnois, Laprairie, Huntingdon and Chateaugay, starting from Adirondack Junction, on the C. P. R. line, and running southwest along the St. Lawrence to the United States boundary.

The Board of Engineers for the reconstruction of the Quebec bridge have held frequent conferences and have made considerable advance on the modification of the plans of the bridge. The channel span will be between 1705 and 1800 feet in length and the trusses will be 88 feet apart on centers in vertical planes. It has been decided to omit the highways and electric car tracks, thus providing for railway service only and effecting an economy of \$2,500,000. This is considered to be amply justified by the fact that electric service is not likely to reach the bridge site for many years and there is no present traffic for roadways unless for sightseers from Quebec.

From the Northwestern Steel & Iron Works, Eau Claire, Wis., we have received a copy of the firm's new 1911 concrete machinery catalogue. This catalogue is replete with information that appeals to us as being absolutely indispensable to the trade. The factory where "Northwestern" concrete machinery is made is built entirely of concrete and is the largest of its kind in existence. During the past three years it has been enlarged three times—a striking proof of the popularity and efficiency of Northwestern concrete machinery. The plant has 100,000 square feet of floor space. Within the past year a large new foundry has been

added, also important additions to the manufacturing plant have been made. Contractors will find Northwestern concrete mixing machines particularly worthy of their careful investigation.

Personal News and Notes

The Vancouver Board of Works have submitted a resolution recommending that City Engineer Clement be given a bonus of a year's salary, \$4,000, upon his retirement.

The Vancouver Board of Works recommend an advance of wage for city laborers, establishing a minimum rate of \$2.80 per day.

At least six firms are expected to tender for the construction of the ships of the Canadian navy. Proposals are to be received up till May 1st, and the correspondence indicates considerable competition. Ten ships are to be constructed, and at Canadian yards.

The Crown Gypsum Company, Limited, are building a new mill at Lythmore, Ont. The plant will be increased to five times its present capacity. The Toronto office of this concern is at 24 Yonge Street Arcade and is in charge of Mr. O. A. Cole, sales manager.

Construction will shortly be commenced upon a modern 6-storey building to be known as the Savoy Hotel at the corner of Yates and Quadra streets, Victoria. The building will contain from 175 to 200 rooms and will be of fireproof construction throughout. Mr. W. D'O. H. Rochfort, Victoria, is the architect.

Vancouver, B.C., is establishing new building records. The permits issued to date in this city for 1911 approximate \$3,500,000 in value. Vancouver stood sixth on the list of building totals of American cities for January. The five leading were New York, Chicago, Philadelphia, Los Angeles and San Francisco. Vancouver's increase over January, 1910, was 123.7 per cent., the highest jump recorded on the continent.

Mr. Henry Hadley, Jr., B.Sc., town engineer of Verdun, Que., is one of the youngest, and also, it might be said, one of the most wide-awake municipal engineers in the province of Quebec. He was born in Montreal 27 years ago



Town Engineer Hadley, of Verdun, Que.

and educated at the Montreal High School, proceeding to McGill University, from which he graduated in civil engineering in 1906. After graduating he took a post-graduate course, concentrating his studies upon water purification and

sanitation. His professional work has been confined exclusively to municipal engineering. He was appointed to his present position at Verdun in 1908.

Mr. B. J. Arnold, a well-known civil engineer and hydro-electric expert, of Chicago, was a recent visitor to Vancouver. Mr. Arnold expressed astonishment at the growth of Vancouver during the last few years and said emphatically that if he were not anchored in the east he would most certainly locate in the Canadian city. As consulting engineer Mr. Arnold has been retained by New York, Pittsburg and other large cities. He is chief subway engineer of Chicago.



Mr. Mason H. Baker, formerly Assistant City Engineer of St. Thomas, Ont., who has now received the final appointment of City Engineer, succeeding Mr. Jas. A. Bell.

Owing to the increased development of their water turbine business in Canada Messrs. Escher, Wyss & Company, of Zurich, Switzerland, have found it necessary to establish an office at 408 Lumsden Building, Toronto, in charge of their chief engineer, Mr. Heyerdahl. In future all enquiries regarding Canadian business should be addressed to Mr. Heyerdahl, who will be pleased to furnish full information and to submit tenders when desired.

The annual bonspiel smoker of the Winnipeg Builders' Exchange was held on the evening of Tuesday, March 28th, in the assembly rooms of the Exchange at the corner of Portage avenue and Hargrave street. Among the donors of cups and prizes were the Carter-Halls-Aldinger Company, the National Supply Company, Limited, the Winnipeg Paint & Glass Company, Limited, the Shipman Electrical Company, Alsip Brick, Tile and Lumber Company, Limited, Gate City Brick Works Limited, Sprague Lumber Company, Stone Wood Flooring Company, Limited, and Allan, Killman & McKay.

According to a dispatch from Winnipeg, that city is on the eve of a period of unexampled activity. Permits for a number of large buildings will be taken out within the next few weeks. In Vancouver, where building operations are well under way, a large number of permits for big buildings have already been issued. Vancouver, so far, leads all Canadian cities, and even leads Seattle, thus realizing one of its great ambitions, but the Winnipeg lists rarely show any great activity until April, though there have been more permits granted this year than for the corresponding period in 1910, when the record for \$15,000,000 was made. The officials are confident that there will be more building in Winnipeg this year than ever before.

Contracts Department

News of Special Interest to Contractors, Engineers, Manufacturers and Dealers in Building Supplies.

Information for insertion in these columns is invited from Architects, Contractors, Engineers, etc.

Waterworks, Sewerage and Roadways

Berlin, Ont.

Tenders for construction of covered concrete storage reservoir for the Berlin Sewerage Commission are called until April 10th. Plans, etc., at office of H. Johnston, town engineer.

Brandon, Man.

Tenders are called until April 13th for paving, etc., of seven streets. R. E. Speakman, city engineer. Advertisement in "Tenders and For Sale Department" of this issue.

The council decided to have the paving prior to the laying of the street railway rails which would cost about \$80,000. The Mayor and Alderman McKenzie were appointed as a committee on ways and means.

Chilliwack, B.C.

J. B. Croly, city road superintendent, after a careful inspection of the streets, made his report to the council. He estimates the cost of macadamizing them to be over \$66,000. This cost includes the curbing, draining, and paving of streets with rock; engineer's expenses and tools; lumber, nails, gravel, cement, etc., and workmen's insurance. The council is anxious to have the improvements carried out, and a by-law, asking the ratepayers to sanction the floating of a 40-year debenture loan, will be submitted in a few weeks.

Edmonton, Alta.

Tenders are called until May 2nd for supply of material and labor for concrete sewer (10 ft. 6 in.) in internal diameter and about 3,290 feet long. A. J. Latornell, city engineer. Advertisement in "Tenders and For Sale Department" of this issue.

Tenders addressed to the City Commissioners will be received until April 17th for supply of sewer pipe and fittings. Specifications, etc., at the Stores and Works Department, Kinistino avenue.

Fort William, Ont.

Tenders are called until May 4th for paving with asphalt block, sheet asphalt or bitulithic. Plans, etc., at office of John Wilson, city engineer. Advertisement in "Tenders and For Sale Department" of this issue.

Gleichen, Alta.

The waterworks by-law will have to be voted on again. The \$36,000 voted on previously was more than the borrowing powers of the town allow, the assessment being \$50,000, and the limit of the borrowing powers \$35,000.

Lethbridge, Alta.

The cost of the various improvements to be carried out during 1911 is as follows: Street extensions, \$5,500; street grading, \$52,000; sewer main extensions, \$72,000; cement sidewalks, \$75,000;

water main extensions, \$100,000; storm sewers, \$41,000; sewage disposal, \$70,000; street paving, \$103,000; street railway tracks, \$10,000; parks, \$88,700. By-laws empowering the city to borrow the various sums will be voted upon by the ratepayers early in April.

Moose Jaw, Sask.

Tenders are called until April 17th for supply of water meters. J. M. Wilson, city engineer; W. F. Heal, city clerk. Advertisement in "Tenders and For Sale Department" of this issue.

Montreal, Que.

The Montreal Road Department are about to ask the city council to vote \$45,000 for tools and implements such as concrete mixers, stone crushers, steam rollers, and shovels, which will be required in connection with the extensive operations in the line of road and sidewalk improvements to be made during the coming season.

North Battleford, Sask.

On April 10th a vote will be taken on a by-law for \$38,000 for waterworks and sewerage extensions.

Oxford Centre, Ont.

Tenders are called until April 10th for construction of the Parking drain in the Tp. of East Oxford, which consists of trenching, laying and covering of 5,212 feet of the drain according to specifications of F. J. Ure; also for furnishing at yard of nearest railway station the following clay tile or second grade sewer pipe; 923 ft. of 14-in. 1,077 ft. of 12-in., and 2,226 ft. of 10-in. and 386 ft. of 7-in. F. G. Jackson, clerk, East Oxford, Oxford Centre.

Prince Albert, Sask.

Tenders addressed to the City Commissioners will be received until April 15th for construction of main intercepting sewer, requiring 5,740 lin. ft., 4 ft. 6 in. x 3 ft.; 4,640 lin. ft. 4 ft. 3 in. x 2 ft. 10 in.; 2,798 lin. ft. 4 ft. x 2 ft. 8 in. concrete sewer, and 19 manholes. Alternate bids for reinforced pipe will be received. Andrew Holmes, chairman.

Port Arthur, Ont.

The Storage capacity of reservoir on Current River will be increased 24,000,000 cubic feet by increasing height of dam 6 feet and replacing the old wooden structure with concrete. The additional storage will give a continuous capacity of 1,000 horse power for two days. Estimated cost is \$25,000.

Regina, Sask.

Tenders addressed to the City Commissioners, will be received until April 10th for supply of the following: about 10,000 bbls. Portland cement, 13,000 cu. yds. gravel. L. A. Thornton, city engineer.

Tenders are called until April 15th for supply of one Squeegee street washing machine. A. J. McPherson, city

commissioner. Advertisement in "Tenders and For Sale Department" of this issue.

Saskatoon, Sask.

Tenders are called until April 21st for the furnishing of material for water and sewerage works. Jas. Clinkskill and W. B. Neil, city commissioners. Advertisement in "Tenders and For Sale Department" of this issue.

Souris, Man.

Tenders which were received on March 20th for machinery were rejected and new tenders will be received until April 10th for the following: two gasoline or oil engines; 2 pumps, duplex, triplex or turbine; two compression tanks; one air compressor, together with all necessary piping, shafting and belting. Information obtained from town engineer, V. H. Williams; J. W. Breaker, secretary-treasurer.

St. Boniface, Man.

M. P. Blair, city engineer, writes that the bill before the legislature allowing the city to spend the amount of money specified for the reservoir contract recently given to L. Benoit, has been passed. The figure was \$32,330. Four firms tendered at \$33,398; \$34,980; \$34,716, and \$37,969.

Toronto, Ont.

Tenders addressed to the Chairman, Board of Control, will be received until April 11th for construction of concrete walks on over 15 streets; also sewers on six streets, etc. G. R. Geary, mayor.

Tenders are called until April 11th for the following: concrete paving, hardware, stable fittings. G. R. Geary, mayor. Advertisement in "Tenders and For Sale Department" of this issue.

Tenders addressed to the Chairman, Board of Control, will be received until April 11th for supply of 18 copper screens for the main pumping station shaft, No. 1. Specifications at office of the city engineer. G. R. Geary, mayor. Advertisement in "Tenders and For Sale Department" of this issue.

Vancouver, B.C.

Tenders addressed to Wm. McQueen, city clerk, will be received until May 31st for supply of steel pipe; also for 18-in. flexible joint, c.i. pipe. Specifications at Waterworks Office.

The Waterworks Committee will call for tenders for the delivery of 66,300 feet of water main pipe ranging from 18-in. to 34-in. in diameter to be used in connection with the extension of the Seymour Creek waterworks system. Tenders are to be in by May 31st. By-laws for \$200,000 for water systems in Hastings Townsite and D. L. 301 will be submitted. The engineer's report on these districts covered 16 miles of pipe.

Winnipeg, Man.

According to the plan submitted by Col. Ruttan, city engineer, in regard to the Portage avenue sewer problem, a

new sewer on the south side from Smith to Carlton is included.

Tenders addressed to the Chairman, Board of Control, will be received until April 13th for supply of 5-18-in. valves for the Domestic Waterworks. Specifications, etc., at offices of city engineer, 223 James avenue. M. Peterson, secretary.

AWARDED

Brantford, Ont.

It has been decided to let the street paving from Colborne street to the T. H. and B. station, to the Bitulithic Co. Secord & Son get the contract for brick between the Street Railway Company tracks for the distance. Godson & Co.

Port Arthur, Ont.

This city awarded the contract for 100 Trident water meters, four sizes, to Walsh & Charles, Winnipeg, \$1,524.15.

Vancouver, B.C.

Evans, Coleman & Evans secured the contract for eighty tons of pig lead at \$3.70 per 100 lbs. Robertson, Godson & Co. and Crane & Co. also put in bids. Evans, Coleman & Evans were awarded the contract for supplying steel pipe for water mains, \$43,217.85; and Robertson & Godson the tender for supplying valves, \$5,062.65.

Crane & Co. were awarded the contract for the supply of eighty Ludlow hydrants at a total price of \$3,333.67, the other tenderers being the Canadian Fairbanks Company and Robertson,

Railroads, Bridges and Wharves

Fort William, Ont.

The C. P. R. are planning extensive improvements. The most important will be a coal dock and coal handling plant on Island No. 1. The storage capacity will be 1,000,000 tons coal and will cost \$3,000,000 (estimated). Double tracking east will be begun this year. A cleaning elevator will be erected near elevator D.

Headingley, Man.

An appeal is being made to Aime Bernard, M.P.P., and Hon. Robert Rogers for the government to act in the matter of the erection of a bridge on the Assiniboine river here.

Hamilton, Ont.

The Board of Control has received a route plan of the Canadian Northern, showing how its line will run from Bronte to the eastern limit of Wentworth county.

Toronto, Ont.

Tenders for excavation in connection with Jane street subway, West Toronto, are called by the C. P. R. until April 8th. A. L. Hertzberg, division engineer.

The plans of the G. T. R. for its proposed new bridge over Humber river have been approved by the Minister of Public Works, subject to certain conditions, said to effectually guard the public interest.

Winnipeg, Man.

The amended plans of the Midland Railway mean that in the meantime the tracks may come in on the level to Nena street, where there will be a subway, that there will be a subway at Isabel street, that Ellen street will be closed altogether between Ross and Pacific, provision of some kind being made whereby foot passengers may get across

the tracks on Ellen street, either by a subway or overhead bridge, and that the company will build a passenger station facing Paulin street. Two of the amended sections in the Railway Act are as follows:

"Any and all railway companies operating or running trains from any point in the United States to any point in Canada.

"The White Pass Railway fought against this amendment, but the Dominion railway board refused to entertain its objection.

"It would appear that if it cannot be successfully contended that the Midland Railway of Manitoba is not in any way, according to the foregoing sections, in foreign control, then it is not free from the power of the board of railway commissioners for Canada.

"Any and all railway companies incorporated elsewhere than in Canada and owning, controlling, operating or running trains or rolling stock or over any line or lines of railway in Canada, either owned, controlled, leased or operated by such railway company or companies, whether in either case, such ownership, control, or operation is acquired by purchase, lease, agreement, control or stock, or by any other means whatsoever.

AWARDED

Quebec, Que.

M. J. O'Brien, the well-known railway contractor, is the successful tenderer for the building of the first section of the Quebec and Saguenay Railway, extending from just below Ste. Anne de Beaupre to Murray Bay, a distance of 56 miles. Later on the road will be extended to the mouth of the Saguenay. Mr. Rodolphe Forget, president. The contract will involve the expenditure of nearly two millions. The road is to be completed by September, 1912.

Public Buildings, Churches Schools, etc.

Altona, Ont.

Tenders are called until April 7th for erection of school here. Plans, etc., at residence of A. Reesor, Altona, secretary.

Brantford, Ont.

Revised plans for the John H. Stratford Hospital have been received from Mr. Green, Buffalo. An entirely new building will not be erected at present. Alterations according to plans estimated to cost about \$30,000. Plans will be discussed.

Belmont, Ont.

Tenders addressed to M. L. Holmes, secretary-treasurer, will be received until April 15th for erection of red brick school, S. S. No. 7, South Dorchester. Plans, etc., at office of above or at the home of the architect, N. R. Darrach, St. Thomas.

Brandon, Man.

Tenders addressed to H. Brown, city clerk, will be received until April 6th for work in connection with erection of 5-stall central fire hall station of reinforced concrete construction with exterior walls of pressed brick. Plans, etc., at office of W. A. Elliott, architect. Estimated cost, \$30,000.

Comber, Ont.

Jacques & Williamson, Windsor, are preparing plans for a new Presbyterian

church here for which tenders are called until May 1st.

Calgary, Alta.

A by-law to expend \$45,000 on purchase of fire hall site; also two, \$55,000 and \$20,000, for construction of buildings in the Exhibition grounds in Victoria Park will be submitted on April 10th.

There will be a referendum vote taken among all the trade unions affiliated with the Trades and Labor Council, in the city, to decide on the project to build a new labor temple. It has been proposed to build a temple to cost in the neighborhood of sixty-five thousand dollars.

Edmonds, B.C.

Reeve Weart and Councillors Rumble and McDonald were appointed a committee to confer with Architect Somerville as to certain alterations to his plans for the \$25,000 municipal hall.

Two school by-laws will be submitted to the ratepayers on April 8. No. 1 for \$75,000, provides for the purchase of seven new school sites at an average cost of \$10,000, also for the provision of school board offices at a cost of \$5,000. No. 2 for \$8,000, for expenditure in making improvements to the present schools, and also for the acquisition of a school site in the vicinity of Capital Hill, at a cost of \$2,700.

Eburne, Point Grey, B.C.

Archbishop McNeil has completed negotiations for the purchase of 16 acres on the Shannon road on behalf of the nuns of the Order of the Good Shepherd. Fairview Monastery. Clearing work will be commenced immediately.

Farnham, Que.

Tenders addressed to the Director of Contracts, Militia Headquarters, Ottawa, will be received until April 10th for construction of rifle range here. Plans, etc., at offices of the Officer Commanding the Quebec Command, Montreal and with the town clerk here.

Galt, Ont.

The Lincoln avenue Methodist congregation will call for tenders at once for erection of their church.

Guelph, Ont.

The joint committee of the County Council and the Finance Committee of the City Council decided to recommend the erection of a new jail at a cost of about \$20,000.

Tenders are called until April 15th for all trades in the erection of four large buildings for the Homewood Sanitarium here. Plans, etc., at office of the architects, G. M. Miller & Co., Toronto. Advertisement in "Tenders and For Sale Department" of this issue.

Herbert, Sask.

The council have decided to erect a town hall this summer.

Hamilton, Ont.

Stewart & Witton are the architects in charge of the erection of the new 20-room school in the east end. Noted in March 15 issue.

Kingston, Ont.

It is announced that next Fall the erection of a large "union building" for the students of Queen's University, to cost about \$75,000, will be started.

Kamloops, B.C.

An administration building, costing \$50,000, is to be erected in connection

with the Tranquille Sanitarium, Kamloops.

London, Ont.

No decision has been reached as to the erection of joint municipal building.

A new Methodist Church will probably be erected this summer in the north end of the city to replace the present Richmond street North Mission, of which Rev. S. A. Anderson is in charge.

Montreal, Que.

The Directors of the Montreal Arena Company have under consideration alterations and improvements costing about \$15,000.

Extensive alterations and an addition of some importance are being planned in connection with the Engineers' Club, Beaver Hall Square. The cost of the improvements will be in the vicinity of \$90,000. Messrs. Saxe & Archibald are the architects.

Mr. C. Bernier, architect, Montreal, has called for tenders to be in by April 15th for a new Normal School to be known as the "Couvant de la Presentation" at St. Hyacinthe. This will be a five storey stone structure to cost in the neighborhood of \$100,000.

Merritt, B.C.

The Nicola Valley Agricultural Association is considering plans for the erection of a permanent building. The securing of a site for a permanent home has been practically completed. Mr. A. W. Monland, manager of the Bank of Montreal, president.

North Vancouver, B.C.

The by-law for expenditure of \$46,000 on schools was carried; also that for city hall additions.

North Burnaby, B.C.

It is stated that the Burnaby school trustees, if the school by-laws receive the assent of the ratepayers, will purchase corner of Howard and Turner streets as a prospective school site.

Newdale, Man.

At a meeting of citizens the project to erect a consolidated school for the district here was endorsed. Estimated cost, \$10,000. R. Fletcher, deputy minister of education.

Nelson, B.C.

At the annual meeting of the Kootenay General Hospital a special committee was appointed to look into the question of the erection of a new wing or a new hospital. The estimated cost is \$6,000. E. F. Gigot, president; Geo. Johnson, secretary.

North Bay, Ont.

The council approved of a free site for the Carnegie library.

Niagara Falls, Ont.

The Provincial Directors of the Niagara Falls Hockey & Athletic Club are calling for tenders for sites for skating rink to occupy not less than 125 x 210 feet. E. C. Macfarlane.

North Battleford, Sask.

Contracts will be let for the new exhibition buildings in the near future. By-laws to expend \$4,000 to buy hospital site for the Sisters of Providence; \$4,000 for addition to fire hall; \$15,000 for exhibition grounds and buildings will be submitted on April 10th.

Newmarket, Ont.

Tenders addressed to L. G. Jackson, secretary, Methodist Church, will be

received until April 15th for masonry, plumbing, carpentering, heating, painting, electric wiring, etc., in whole or in part in connection with the remodelling of church. Plans, etc., at office of G. M. Miller & Co., General Trusts Building, Toronto. Advertisement in "Tenders and For Sale Department" of this issue.

Oshawa, Ont.

A Children's Shelter will be erected here at a cost of about \$5,000. Col. Farewell, county clerk.

Orangeville, Ont.

Tenders are called by Public Works Department, Ottawa, until April 18th for electric light fixtures, wiring, etc., for the post office here. Plans, etc., with caretaker, also with Thos. Hastings, postal station F. Yonge street, Toronto.

Owen Sound, Ont.

Tenders addressed to James A. Shields, secretary-treasurer, Bayview, Ont., will be received until April 8th for erection of new school, S. S. No. 11, St. Vincent. Materials, cement, brick, etc.

The council refused to grant a building site for library in park.

Ottawa, Ont.

Mr. A. L. Weeks has been chosen architect for the new First Congregational Church.

The Laurentian Club, 47 Slater street, have under consideration the enlargement of their quarters.

The Ottawa Canoe Club have a new club house at Rockliffe under consideration, to cost about \$10,000. G. P. Brophy, commodore.

A new Roman Catholic Church will be erected in the Glebe this summer. The site has already been purchased. The architect has not yet been chosen.

The plans drawn up by Building Superintendent Garnock for the addition to the Mutchmor street school have been approved by the P. S. Board and work will be commenced in about three weeks. Plans for new plumbing in Waller, Kent, Laurier avenue and Slater street schools were also approved at an estimated cost of \$4,000.

Port Arthur, Ont.

The following tenders were received for the erection of the addition to the municipal offices:

The appropriation for the erection of this addition was only \$12,000. Referred to the Board of Works.

J. L. McRae, \$15,150; R. Hamer, \$16,825; Seaman and Penniman, \$16,369; C. J. King, \$18,000, all of Port Arthur.

The council authorized the raising of the sum necessary for the purchase of the site recommended by the Library Board. Work is expected to commence on the erection of the library as soon as the frost is out of the ground.

Portage la Prairie, Man.

The Masonic order here will erect a Temple on Campbell street with 36 feet frontage.

Regina, Sask.

The members of Assiniboia Club have decided to erect a new club house on Victoria avenue at a cost of \$50,000. An offer of \$65,000 was received for their present property.

Regina, Sask.

A building will be erected on the lots in the rear of St. Mary's Church, to be used as a club room for the German congregation. It is understood provision will be made for an auditorium for theatrical purposes.

The plans for the new Methodist College show dimensions 205 x 65 feet, 4 stories; front elevation shows two towers. The materials used are brick, with sandstone trimmings; reinforced concrete used throughout; heating done by high pressure steam from the power plant. Tenders close on the 8th inst. and include the installation of a complete power plant. Brown & Vallance, Winnipeg and Montreal, architects. Noted in last issue.

Revelstoke, B.C.

The Revelstoke Curling Club have decided that a new rink, costing in the neighborhood of \$10,000, will be immediately proceeded with. A committee was appointed to secure options on suitable available sites and to secure estimates for a building sufficiently large to accommodate at least six rinks.

South Vancouver, B.C.

The school by-law providing for an expenditure of \$260,000 was carried. The passing of this measure entails the grant of \$75,000 from the government. The money will be utilized in the purchase of school sites, erecting new schools, etc.

Saskatoon, Sask.

The plans drawn up by W. W. LaChance, architect, for the new Saskatoon Club building, have been approved. Cost is estimated at \$18,000. Tenders will be called immediately.

The churches here (Methodist and Presbyterian) are considering amalgamation in their building projects, thus reducing the present required building of six small churches to three large edifices. The matter is under discussion.

The report of Meyer J. Sturm, consulting architect, of Chicago, on erection of hospital, is before the hospital board for consideration. It calls for an expenditure of about \$185,000. It is probable that the council will be asked to submit a by-law for that amount.

Strathcona, Alta.

It is stated that the new municipal hospital will be erected on University grounds.

St. Thomas, Ont.

Mr. James E. Wetherell, Provincial Inspector of Collegiate Institutes, in his report states that unless extra accommodation is provided for the classes in the Collegiate here, the government grant will be withdrawn. This will necessitate the expenditure of \$25,000 or \$100,000, if new Collegiate is built.

Toronto, Ont.

Tenders are called until April 15th for all trades required in erection of a hall for the Musical Protective Association. Chas. J. Read, architect, Toronto. Advertisement in "Tenders and For Sale Department" of this issue.

The plan prepared by Mr. Geo. W. Gouinlock, architect, for the new building for Women for the Canadian National Exhibition Association shows a 2-storey structure of steel, red pressed

brick and stone trimmings at a cost of \$66,000.

A lot has been purchased by the committee for the erection of a Home for Working Girls on the corner of St. Patrick and Casimer streets. It is expected that work on the erection of the building will be shortly commenced. Miss Drummond, general secretary, Y. W. C. A.

St. Clement's Anglican congregation contemplate the erection of a church and Sunday school building at a cost of \$40,000. Plans are being prepared now for erection of a building at a cost of \$20,000, which will be extended as the funds warrant. Rev. John Bushnell, rector.

The Methodist church has extensive plans for expansion in the near future. Among the proposed plans are a building for institutional work on the corner of Queen and Church streets; the corner of Bond and Queen streets is considered a possible site for the new Book Room, which would be eleven stories, probably. Rev. Mr. Armstrong, pastor of the Metropolitan Church.

Vancouver, B.C.

W. Ridgway Wilson, architect, has prepared plans for the new Drill Hall to be erected on Bay street for the Fifth Regiment.

The tenders for construction of the building at Kitsilano for the Order of Oblates are being called. Father Taverrier is in charge.

A by-law will be submitted for \$150,000 for erection of a 6-storey modern office building to be used for city hall purposes on the site adjoining the present city hall. Alds. Enright, Cameron and McMasters are interested.

Tenders addressed to R. C. Desrochers, secretary, will be received until April 24th for construction of examining warehouse here. Plans, etc., at offices of J. E. Cyr, superintendent of Public Buildings, for Manitoba; Winnipeg; W. Henderson, resident architect, Victoria, and at the local post office.

The city council decided to abandon the plan of utilizing the reserve opposite Barnet as a site for the new isolation hospital, and ordered the purchase of two blocks of land in Hastings Townsite for the purpose. Owing to the extra cost necessitated by change of site, a new by-law to raise the money necessary for completion of building will have to be submitted.

The city council will shortly be asked to consider the erection of a City Hall building on the old hospital block property on Pendar street between Beatty and Cambie streets. The request will be dealt with in connection with the consideration of the by-law, notice for which has already been given covering the erection of an office block for civic work at the northwest corner of Pendar and Main streets.

Welland, Ont.

New tenders have been asked for the enlargement of the Presbyterian Church here.

The following were appointed on the committee to inquire into the inauguration of a technical school here: Messrs. H. F. Stoddard, G. H. Pettit, Dr. Howell and others.

Wolfville, N.S.

Tenders addressed to R. C. Desrochers, secretary, Public Works Department,

will be received until April 12th for construction of public building here. Plans, etc., at office of C. E. W. Dodwell, district engineer, Halifax, at local post office and at above department.

Winnipeg, Man.

The board of control recommend the granting of \$15,000 to the Salvation Army for the purpose of erecting a Home. Total cost estimated at \$33,000. Brigadier Burdett in charge.

Tenders addressed to the Chairman, Board of Control, will be received until April 12th for supply of all labor and materials required in erection of Tubercular Hospital Building. Plans, etc., at office of Geo. G. Teeter, architect, 604 Builders' Exchange Building. M. Peterson, secretary.

At the semi-annual meeting of the Winnipeg Presbyterian Athletic and Literary Association, it was announced that a company had been formed, capital, \$60,000, and that grounds in Winnipeg, will be purchased on which a grand stand and club house will be erected. President, S. H. Smythe; vice-president, T. D. Thompson.

AWARDED

Fort William, Ont.

Russell Bros. have secured contract for construction of addition to Central School, 64 x 145 feet, of reinforced concrete; cost, \$74,492.

Ottawa, Ont.

The following contracts have been awarded in the erection of Bethany Presbyterian Church: masonry and brickwork, C. and W. H. Lester; carpentering to C. A. McDiarmid and W. J. Tyndall; plastering to J. A. Campbell; painting to William Howe; J. A. Ewart, architect.

Peterborough, Ont.

Contract for carpentry of Murray Street Baptist Church has been given to McIntyre Brothers, and that for the stonework, Reese and Hawkins. The contracts for other work have not been decided. Architects, Burke, Horwood & White, Toronto.

Regina, Sask.

R. J. Burdette, secretary, Board of Trade, writes that the contract for the new Baptist Church at Regina has been let to Smith Bros. and Wilson, of Regina. Work will commence on the new structure at once and work will be completed on November 1st. The building will cost in the neighborhood of \$65,000.

Thorold, Ont.

The contracts for the construction of the Carnegie library are awarded as follows: stonework, Newman Bros.; carpenter work, R. S. Blank; plumbing, A. Riddell & Son; painting and glazing, Grenville Bros.; wiring, Barrett Electric Company. Estimated cost, \$10,000; architect, A. E. Nicholson, St. Catharines.

Toronto, Ont.

Tenders for the construction of the new Caledonia Road school were awarded to the lowest bidders as follows: H. Lucas and Son, masonry, \$29,971; M. Hutchinson, carpentry, \$17,555; J. T. Flowers, roofing, \$3,420; Robert Bennett, fireproof flooring, \$3,965; W. J. Hadock and Son, plastering, \$4,675; Fred Armstrong Co., plumbing, \$2,520; J. R. Seager, heating and ventilation, \$9,480; Johnston Temperature Regulation Co., heat regulators, \$983; making a total estimate to date of \$72,669.

Vancouver, B.C.

The contract for the building of the pavilion in Stanley Park was let for the sum of \$12,250 and the bandstand for \$1,485, both to U. G. Patterson, of Cedar Cottage.

Victoria, B.C.

The contract for supplying desks for the schools of British Columbia has been awarded to Clarke & Stewart, of Vancouver. They will furnish the government with about 1,800 Poragon desks to be delivered to the order of the department at Vancouver or Victoria before the 14th of May next.

Winnipeg, Man.

The contract for the excavation of the foundation of the new central Y.M.C.A. building on Vaughan street was awarded W. J. Holmes. The building is to be 140 x 120 feet and on account of the soft nature of the ground, considerable piling will have to be driven into the soil. At the Y.M.C.A. it was stated that the price agreed upon was by the foot, as some of the piles will have to be driven from 20 to 40 feet into the soil, and that the price varied as to the condition met. J. H. G. Russell, McArthur Building, architect.

Residences

Calgary, Alta.

A large apartment house is to be erected on Sixth avenue east for John Lineham, which will contain 100 rooms and will cost \$75,000.

Collingwood, Ont.

W. Shenkman will erect an apartment house on corner of Stewart and Cumberland streets.

Tenders for erection of brick dwelling will be received until April 15th. Plans, etc., at Collingwood Hardware store. J. S. McDonald, proprietor.

Edmonton, Alta.

A building permit was granted to W. B. Poncher, Seventh street, for residence, \$9,000.

T. A. Davies is erecting a \$11,500 house on Twenty-fifth street, a permit for which has been issued.

Montreal, Que.

Tenders are being called for extensive alterations to the residence of H. W. Blaylock, 616 Sherbrooke street. Saxe & Archibald are the architects.

Ottawa, Ont.

F. Diamond will erect apartment houses on Frank street near Bank.

L. Petegorsky and James Wilson will erect an apartment house on O'Connor street.

Toronto, Ont.

Tenders for erection of residences are called until April 10th. James L. Hayill, architect, Toronto. Advertisement in "Tenders and For Sale Department" of this issue.

Winnipeg, Man.

W. F. L. Orris, 385 Elgin avenue, will erect a large apartment house on Carlton street, south of Broadway.

AWARDED

Winnipeg, Man.

G. Howard Aikins has contracted for the erection of a residence at Armstrong's Point, to cost about \$16,000. The building will be constructed of cut stone and pressed brick, with stone trim-

mings. Work on the building will be commenced immediately. F. R. Evans, architect.

Westmount, Que.

Messrs. Saxe & Archibald, architects, for Mr. J. D. Hathaway, who is building a new residence on Aberdeen avenue, Westmount, to cost about \$12,000. Contracts have been awarded as follows: masonry, Fussing & Jorgensen; carpentry, C. Pauze; plastering, MacIntyre & Co.; plumbing, W. J. McGuire; roofing, Campbell & Gilday; painting, J. N. Arcand; electric work, the Sayer Electric Company.

Business Buildings and Industrial Plants

Brockville, Ont.

Messrs. Delahaye purpose spending about \$200,000 on new buildings as additions to their plant.

Claresholm, Alta.

There is a talk of a beet factory being established here; also one at Strathmore and one at High River. The C. P. R. are favoring the project.

Chilliwack, B.C.

The plans for the new Bank of Montreal here awaiting approval of head office, show as the materials, granite and pressed brick; two storeys; size, 32 x 80. C. D. Brynmner, manager, New Westminster branch.

Edmonton, Alta.

A permit was granted to R. P. Husel, of the Union Land & Investment Co., for the erection of block, \$25,000. Work will start at once.

J. McCulla, proprietor of the King Edward Hotel, will erect a business block to cost about \$20,000. H. A. Magoon, architect. Tenders have been called.

A building permit was granted for the Tegler building, \$120,000. Architect, H. A. Magoon; contractors, W. H. Archibald & So., Winnipeg, Man. Sub-contracts are being let.

It is stated that Theodore A. Burrows, ex-M.P., is considering the installation of two big mills in the country west of this city; one on the McLeod river; and one on the Pembina river. D. B. McDonnell, manager.

It is stated that the Canadian Bank of Commerce has purchased the north-west corner of Second and Jasper avenue and not the National Trust property as generally reported. It is understood that the bank will erect a large block in the near future.

It is understood that Nicholson & Bain are having plans prepared for a new warehouse on Eighth street; a large wholesale grocery firm of Winnipeg are also preparing to build a large block on Eighth street; Revillon Bros. will commence immediate construction on the wholesale block planned for their property on Fourth street. J. E. Brown, manager.

The proposed building for the Great West Saddlery to cost about \$100,000, will be erected on Jasper avenue. E. Hutchings, Winnipeg, president; R. Hutchings, Calgary, vice-president.

Plans are out for the wholesale warehouse of the Ames, Holden & James McCready Company, to be erected on

Third street. A. L. Johnson, Winnipeg, general manager.

The proposition regarding the G. T. Pacific Hotel is said to be considered favorably by the council. It is thought that excavation will start at once on the site on McDougall avenue, on which option has been held. Estimated cost, \$1,500,000. Mr. Tait, solicitor, G.T.P.; general manager, Mr. Chamberlain. Regina is spoken of as another favorable location for an hotel.

Fort William, Ont.

Tenders are called until April 5th for erection of freight shed for the C.P.R. Frank Lee, division engineer, Winnipeg.

Kelso, Ont.

The following buildings were destroyed by fire on the 31st ulto.: the Miller House, having 200 rooms; the Bank of Ottawa; the Prospect Hotel; Campbell and Clark's restaurant; Davies & Dunn's store. Estimated loss, \$100,000.

Montreal, Que.

The Place Viger Hotel under C. P. R. management will be enlarged and remodelled this spring.

Moose Jaw, Sask.

The Times Company, Ltd., called for tenders until April 3rd for the removal of building, and excavating for their new site.

The council will submit a by-law to raise money to build a hotel which is needed to supply accommodation if before May 1st private capitalists will not guarantee immediate construction for the city. W. F. Heal, city clerk.

Merriitt, B.C.

The Royal Bank of Canada will install a branch here. Inspector Wright; supervisor of branches, Mr. Crosby.

Newcastle, N.B.

Mr. J. W. Miller, formerly associated with the Miller Tanning & Extract Co., at Milverton, it is stated, will shortly erect a tannery, etc., here, to cost about \$125,000.

Nelson, B.C.

J. A. McDonald has purchased a site for his new jam factory, which will be two storeys, 100 x 50 feet.

Owen Sound, Ont.

The by-law for knitting factory will be submitted again to the ratepayers. The date fixed is April 24th.

Ottawa, Ont.

John Brouse will erect a row of stores on O'Connor street.

Cummings Brothers will erect a planing mill at Westboro.

P. Horwood, Taylor and Horwood, architects, have prepared plans for a commercial building for Donald Fraser, to be erected on O'Connor street.

The Dunning Sheet & Metal Works, corner of Electric and Creighton streets, state that they will rebuild their plant recently destroyed by fire, at once.

The C. P. R. called for tenders until April 1st for removal, etc., of houses Nos. 31, 41 and 43, and house in rear of No. 39 Bayview road. J. Y. Caldwell, 99 Bank street, agent.

Pointe aux Tremble, Que.

The sash and door factory of Louis Beaudry and the adjoining building were destroyed by fire on the 29th ulto. Estimated loss on former, \$50,000.

Prince Albert, Sask.

H. H. Huter is getting out plans for a 4-storey brick building on Central avenue. He will also build a three-storey building on Eleventh street.

Port Arthur, Ont.

L. Walsh is preparing to erect a new coal shed 30 ft x 250 ft. on the water front. Storage capacity 3,000 tons of hard coal. J. L. McRae is contractor.

Regina, Sask.

The Armstrong, Smyth & Doswell block on Scarth street was damaged to the extent of about \$40,000 on the 30th ulto.

St. John, N.B.

The Crosby Molasses Co., Ltd., has secured the Magee property on the Marsh road. Plans are now being prepared for erection of warehouse and it is expected work will be commenced shortly.

Sherbrooke, Que.

We are advised that nothing has been decided as yet as to size, etc., of the new general office for the Quebec Central Railway Company.

Tamworth, Ont.

The Barrie block here was destroyed by fire on the 30th ulto. Estimated loss, \$7,000.

Toronto, Ont.

The Wm. Davies Co., Ltd., have purchased the site of the Carlton Street Methodist Church.

Sellers & Gough, furriers, have purchased the southeast corner of Yonge and Dundonald streets; it is also stated that the Home Bank of Canada has purchased the southwest corner of Yonge street and Alcorn avenue.

Messrs. Geo. Wright and E. C. Carroll, of the firm of Geo. Wright and Co., proprietors of the Walker House, have purchased the Caer Howell property on University avenue with a purpose, it is stated, of erecting a first-class hotel, at an estimated expenditure of about \$1,500,000. Work will probably commence this summer.

Tenders addressed to F. H. Herbert, architect, 65 Adelaide street east, will be received until April 11th for erection of 6-storey brick, steel and reinforced concrete fireproof building at King and Parliament streets for the Aluminum & Crown Stopper Company as follows: concrete, cut stone and brickwork; reinforced concrete; structural steel; carpenters' work; roofing and galvanized iron work. Plans, etc., at office of the architect.

Vancouver, B.C.

The shingle mill of the Pitt River Lumber Mills Company was destroyed by fire on the 28th ulto. It is stated that the company will rebuild on the same site near the C. P. R. tracks.

The British Columbia Steel Corporation, it is stated, have accepted the plans of the United Engineering & Foundry Co., 1590 Grant street, Pittsburg, Pa., for the steel plant to be erected at Port Mann. The C. N. R. is said to be interested.

Victoria, B.C.

Thos. Potter, proprietor Lion Hotel, Chambers street and Queen's avenue, proposes to erect a new hotel to cost about \$15,000.

Excavation will commence shortly on
(Continued on page 61)

Tenders and For Sale Department

City of Moose Jaw, Saskatchewan

Main Drainage Works

Sealed tenders endorsed "Tender A" and "Tender B" will be received by the undersigned City Clerk until 8.30 o'clock p.m., on Monday, April 10th, 1911.

Any tender received after the above-stated time will be declared informal.

Contract "A."

Supplying material for and constructing a Sewage Disposal Plant complete, including Pump House, Sedimentation Tanks and Percolating Filter, also the supply of materials for and the laying of a Trunk Sewer and Water Main.

Contract "B."

Supplying two Electrically Driven Centrifugal Pumps and Auto Starters complete with all piping, connections, etc.

Plans and specifications for Contract "A" may be obtained from the City Engineer, Moose Jaw, upon receipt of a marked cheque for the sum of \$25 to be held until the return of plans and specifications, and for Contract "B" plans and specifications will be sent upon request.

The lowest or any tender not necessarily accepted.

J. M. WILSON, City Engineer. W. F. HEAL, City Clerk.
Moose Jaw, Feb. 18th, 1911. 9-14

City of Moose Jaw, Saskatchewan

SEWER AND WATER EXTENSIONS

Sealed tenders endorsed "Tender 28," "Tender 29," "Tender 30" and "Tender 31," will be received by the undersigned City Clerk until 8.30 o'clock p.m. on Monday, April 10th, 1911.

Any tender received after the above stated time will be declared informal.

Contract 28.—The laying of approximately 30,700 lin. feet of tile pipe sewer, building man-holes, etc.

The laying of approximately 29,700 lineal feet of cast iron water main, placing valves, valve boxes, hydrants, etc.

Contract 29.—The supplying of approximately: 29,600 lineal feet of 6-in. c.i. water pipe.

112 lineal feet of 4-in. c.i. water pipe.

132 6-in. cast iron reverse curves.

34 6-in. cast iron crosses.

72 6-in. cast iron tees.

29 4-in. off 6-in. cast iron tees.

23 4-in. cast iron tees.

95 6-in. cast iron plugs.

Contract 30.—The supply of approximately: 28,000 lin. feet of 6-in. vitrified tile sewer pipe. 26,600 lin. feet of 8-in. vitrified tile sewer pipe. 5,225 lin. ft. of 10-in. vitrified tile sewer pipe. 1,100 lin. ft. of 12-in. vitrified tile sewer pipe.

25 8-in. tees.

75 6-in. tees.

25 8-in. ¼ bends.

100 6-in. ½ bends.

25 8-in. stops.

25 10-in. stops.

400 4-in. to 6-in. increasers.

Contract 31.—The supply of approximately:

65 6-in. 3-way hydrants.

147 6-in. gate valves.

29 4-in. gate valves.

150 6-in. valve boxes.

29 4-in. valve boxes.

88 manholes, frames and covers.

Plans and specifications for Contract 28 may be seen at the office of the City Engineer, Moose Jaw, and at the offices of the Canadian Engineer at Toronto and Winnipeg.

Plans and specifications for Contracts 29, 30, and 31 will be sent upon request.

The lowest or any tender not necessarily accepted.

J. M. WILSON, City Engineer. W. F. HEAL, City Clerk.
Moose Jaw, Feb. 24, 1911. 9-14

Steam Shovels

We own and have for sale near Buffalo, N.Y., two Vulcan 75-ton 2½-yard steam shovels; late model, with new extra large boilers and in excellent condition; also one 70-ton. These will stand most rigid inspection and we are offering them at unusually low prices. Confer with us.

WILLIS SHAW MACHINERY CO.,

171 La Salle Street,

T.F.

Chicago, Ill.

City of Winnipeg

Electrical Distribution System

Tenders For

Switching Equipment

for Substation No. 1

Tenders will be received by the undersigned up to 11 a.m., of Thursday, April 27th, 1911, for the supply and installation in Sub-station No. 1, on King Street, Winnipeg, of electrical switching equipment for this station. Plans and specifications may be obtained at the office of the Power Engineers, Smith, Kerry & Chace, Carnegie Library Building, Winnipeg.

Each tender must be accompanied by marked cheque for five (5) per cent. of the amount of the amount of tender. The Board reserves the right to reject any or all tenders or to accept any bid which may appear to the City's advantage.

M. PETERSON,

Secretary.

Board of Control Office,
Winnipeg, March 27, 1911.

14-15

Bridge Tenders

Sealed tenders addressed to the Chairman, Board of Works, Owen Sound, will be received up till 6 p.m., Friday, April 7th, 1911, for the following:

1. 9th Street Bridge—

(a) Steel superstructure, span 53 ft., width 40 ft.

(b) Reinforced concrete floor for same.

(c) Concrete abutments for same.

(d) Reinforced concrete arch, span 50 ft., width 40 ft.

2. 10th Street Bridge—

(a) Steel superstructure, span 69 ft., width 66 ft.

(b) Reinforced concrete floor for same.

(c) Concrete abutments for same.

(d) Reinforced concrete arch, span 66 feet, width 66 feet.

3. Removal of old bridge and construction of temporary one.

A certified bank cheque payable to the Treasurer of the Town of Owen Sound for 5 per cent. shall accompany each tender, to be returned in case of non-acceptance, and to be forfeited in case the accepted tenderer declines the contract or fails in the performance thereof.

Plans and specifications may be seen at the office of the Town Engineer.

Tenderers for steel superstructure to submit plans and strain sheets.

The lowest or any tender not necessarily accepted.

J. K. LESLIE, R. McDOWALL, C.E.,
Chairman Board of Works. Town Engineer.
Owen Sound, March 7, 1911. 11-14

Tenders Wanted

Tenders for the construction of a covered concrete storage reservoir 62 feet x 31 feet, for the Berlin Sewerage Commission will be received by A. H. Millar up to 6 p.m., April 11th, 1911. Plans and specifications may be seen at the office of Herbert Johnston, Town Engineer.

A. H. MILLAR, EPHRAM BRICKER,
Secretary. Chairman,

Sewerage Commission.

Berlin, March 28, 1911.

14-14

City of Winnipeg

Electrical Department

Notice to

Electrical Contractors

Notice is hereby given that owing to the inferior quality of rubber covered wire now on the market having proved unsatisfactory, the City will in the near future call for and insist upon the use of a higher standard.

The specifications are now under consideration and await the final action of the National Code Committee who meet in New York this month.

As the higher grade insulation will of course be correspondingly higher in price than the grade now supplied, this notice is given so that in figuring on new work you may make allowance for same.

F. A. CAMBRIDGE,
City Electrician.

Winnipeg, March 20, 1911.

13-13

Town of Brampton

Pavement Construction

Sealed tenders addressed to the Town Clerk will be received up till 6 p.m., Monday, April 17, 1911, for the construction of approximately 8,000 square yards of pavement and 3,500 lineal feet of concrete curb and gutter. Different classes of pavement to be constructed are: 1. Asphalt Block; 2. Vitrified Brick; 3. Bitulithic; 4. Bituminous Macadam.

Plans and specifications may be seen at the Town Engineer's or the Town Clerk's Office. Marked cheque for \$500 or 5 per cent. of tender submitted must accompany each tender.

Lowest or any tender not necessarily accepted.

W. M. TREADGOLD, W. C. YOUNG,
Town Engineer. Town Clerk.
Brampton, March 21, 1911. 14-14

TENDERS WANTED

Tenders will be received for all trades for extensive addition and alterations to the Methodist Church at Newmarket.

Plans may be seen with L. G. Jackson, Newmarket, or at the office of G. M. Miller & Co., architects, Toronto. Tenders to be sent to either of the above on or before April the 15th inst. The lowest or any tender not necessarily accepted. 14-14

TENDERS WANTED

Tenders for all trades for a residence will be received at the office of the undersigned up to 5 p.m., Monday, April 10th, 1911.

JAMES L. HAVILL, Architect,
Mall Building,
King and Bay Streets,
TORONTO, ONT.

14-14

City of Regina

Fire Hall Equipment

Sealed tenders addressed to the City Commissioner, City Hall, Regina, Sask., will be received up to Monday, April 17th, 1911, for the following Fire Hall equipment: One Combination Hose and Chemical Wagon, 1,700 feet of Double Jacket Rubber Lined Fire Hose, 2 Hydrant Gate Valves, Two Play Pipes, and other apparatus. All information will be furnished on application to the undersigned, or to W. White, Chief of the Fire Brigade, Regina.

A. J. McPHERSON,
City Commissioner.

14-15



Department of Railways and Canals

Ontario—St. Lawrence Canals

GALOPS CANAL

Sealed tenders addressed to the undersigned and endorsed "Tender for improving Upper Entrance to Lock No. 28," will be received at this office until 16 o'clock on Saturday, April 15.

Plans, Specifications, and Form of Contract to be entered into can be seen on and after March 18th, at the office of the Chief Engineer of the Department of Railways and Canals, Ottawa, and at the office of the Resident Engineer of the Ontario—St. Lawrence Canals, Cornwall, at which places Form of Tender may be obtained.

Parties tendering will be required to accept the fair wages Schedule prepared or to be prepared by the Department of Labor, which schedule will form part of the contract.

Contractors are requested to bear in mind that tenders will not be considered, unless made strictly in accordance with the printed forms, and in the case of firms, unless there are attached the actual signature, the nature of the occupation, and place of residence of each member of the firm.

An accepted bank cheque for the sum of \$6,000 made payable to the order of the Minister of Railways and Canals must accompany each tender, which sum will be forfeited if the party tendering declines entering into contract for the work at the rates stated in the offer submitted.

The cheque thus sent in will be returned to the respective contractors whose tenders are not accepted.

The cheque of the successful tenderer will be held as security, or part security, for the due fulfilment of the contract to be entered into.

The lowest or any tender not necessarily accepted.

By order,
L. K. JONES,
Secretary.

Department of Railways and Canals,
Ottawa, March 21st, 1911.

Newspapers inserting this advertisement without authority from the Department will not be paid for it. 14-14

CITY OF MOOSE JAW
Saskatchewan

Sealed tenders will be received by the undersigned City Clerk for the following supplies until 8.30 p.m. o'clock on Monday, April 17, 1911:

Any tender received after the above stated time will be declared informal.

Three hundred 3/4-inch Water Meters.

Fifty 3/4-inch Water Meters.

Twenty-five 1-inch Water Meters.

Twelve 2-inch Water Meters.

The lowest or any tender not necessarily accepted.

J. M. WILSON, W. F. HEAL,
City Engineer. City Clerk.
Moose Jaw, March 27, 1911. 14-14

City of Edmonton, Alberta

Sealed tenders marked "Tenders for Trunk Sewer," will be received by the City Commissioners up till 3 p.m., May 2nd, 1911, for the supplying of all materials and the construction, in tunnel of a concrete sewer ten feet six inches (10 ft. 6 in.), in internal diameter and approximately 3,290 feet long.

Plans and specifications and all particulars may be obtained from the City Engineer's office, Edmonton, on deposit of a marked cheque for the sum of \$25.00, which will be held until the return of plans and specifications. Duplicates of which may be seen at the office of the Contract Record, 220 King street west, Toronto, Ont.

Lowest or any tender not necessarily accepted.

CITY COMMISSIONERS.

A. J. LATORNE, City Engineer,
Edmonton, Alta. 14-16



Department of Railways and Canals,

Canada

Ontario—St. Lawrence Canals

CORNWALL CANAL

Sealed tenders addressed to the undersigned and endorsed "Tender for improving Upper Entrance to Lock No. 19," will be received at this office until 16 o'clock on Saturday, April 15th.

Plans, Specifications, and Forms of Contract to be entered into can be seen on and after March 18th, at the office of the Chief Engineer of the Department of Railways and Canals, Ottawa, and at the office of the Resident Engineer of the Ontario—St. Lawrence Canals, Cornwall, at which places form of tender may be obtained.

Parties tendering will be required to accept the fair wages Schedule prepared or to be prepared by the Department of Labor, which schedule will form part of the contract.

Contractors are requested to bear in mind that tenders will not be considered unless made strictly in accordance with the printed forms, and in the case of firms, unless there are attached the actual signature, the nature of the occupation, and place of residence of each member of the firm.

An accepted Bank cheque for the sum of \$1,500 made payable to the order of the Minister of Railways and Canals must accompany each tender, which sum will be forfeited if the party tendering declines entering into contract for the work, at the rates stated in the offer submitted.

The Cheque thus sent in will be returned to the respective contractors whose tenders are not accepted.

The cheque of the successful tenderer will be held as security, or part security, for the due fulfilment of the contract to be entered into.

The lowest or any tender not necessarily accepted.

By order,
L. K. JONES,
Secretary.

Department of Railways and Canals,
Ottawa, March 21st, 1911.

Newspapers inserting this advertisement without authority from the Department will not be paid for it. 14-15

Applications for Positions

Applications, addressed to the undersigned will be received up to and including 10th April, 1911, for the following positions in the Harbour Commissioners' Service:

General Foreman;
Crib Construction Foreman;
Assistant Superintendent for the Dredging Fleet;
Cost Clerk and Checker.

Applicants to state age, qualifications and salary expected.

DAVID SEATH,

57 Common St., Montreal, Secretary
March 31st, 1911. 14-14

CITY OF BRANDON

Street Paving

Sealed tenders marked "Tenders for Paving," will be received by the City Clerk, Brandon, Manitoba, until 12 o'clock at noon on Thursday the 13th day of April next, for paving the following streets in the City of Brandon:

Rosser avenue, Twelfth street to Sixth street.
Pacific avenue, Eleventh st. to Eighth st.
Princess avenue, Tenth street to Eighth st.
Eleventh street, Rosser ave. to Pacific ave.
Tenth street, Princess ave. to Pacific ave.
Ninth street, Princess ave. to Pacific ave.
Eighth street, Princess ave. to Pacific ave.

Tenders are invited for Wood Block, Asphalt Block, Sheet Asphalt, Granitoid, Bitulithic and Vitrified Brick, on 6-inch and 8-inch concrete foundation, or other kinds of pavements.

Proprietors of patented pavements are requested to furnish their special specifications.

An accepted bank cheque for 5 per cent. of amount of tender must accompany each bid.

The lowest or any tender not necessarily accepted.

Further particulars can be obtained from City Engineer's Office.

R. E. SPEAKMAN,
City Engineer.
Brandon, March 31, 1911. 14-14



TENDERS

East Toronto Fire Hall

Bulk tenders, or separate tenders, for the several works mentioned below, in connection with the above building, will be received by registered post only, addressed to the undersigned, up to noon on Tuesday, 11th April 1911.

1. Concrete Paving, etc.
2. Hardware
3. Stable Fittings.

Plans and specifications may be seen and forms of tender and all information obtained at the office of the City Architect, City Hall, Toronto.

Envelopes containing tenders must be plainly marked on the outside as to contents.

The usual conditions relating to tendering, as prescribed by city by-law, must be strictly complied with, or tenders may not be entertained.

Tenders shall submit with their tenders the names of two personal sureties in the bond of a guarantee company.

The lowest or any tender not necessarily accepted.

G. R. GEARY, Mayor,
Chairman Board of Control.

City Hall, Toronto,
March 28, 1911. 14-14

TENDERS WANTED

Sealed tenders, addressed to John Slatter, the Armouries, Toronto, will be received until 12 o'clock noon, Saturday, April 15th, 1911, for all trades required in the erection of a Hall for the Musical Protective Association.

Plans and specifications may be seen at the office of the Architect, Charles J. Read, 404 Confederation Life Bldg.

The lowest or any tender not necessarily accepted.

Toronto, Ont., April 3, 1911.

14-14

TENDERS WANTED

Tenders for all the trades required in the erection of four large buildings for the Home-wood Sanitarium, Guelph.

Plans and specifications may be seen at the office of G. M. Miller & Co., Architects.

Sealed tenders to be delivered at the office of the architects on or before the 15th of April.

The lowest or any tender not necessarily accepted.

G. M. MILLER & CO., Architects,
Toronto, Ont.

14-14

City of Regina

Tenders for

1 Squeegee Street Washing Machine

Sealed tenders addressed to the undersigned will be received until 12 o'clock noon, April 15, 1911, for 1 squeegee street washing machine for the City of Regina.

A. J. McPHERSON,
City Commissioner.

Regina, Sask.

14-15

City of Saskatoon

Waer Works and Sewerage Works

Sealed tenders, addressed to the City Commissioners, Saskatoon, and marked as to contents, will be received up to 12 o'clock noon on Friday, April 21st, 1911, for the following material:—

Contract No. 89.—Furnishing cast iron pipe and specials.

Contract No. 90.—Furnishing fire hydrants, gate valves, and valve boxes.

Contract No. 91.—Furnishing sewer pipe and junctions.

Contract No. 92.—Furnishing manhole frames and covers.

Specifications, instructions to bidders, general conditions, forms of tender, and forms of agreement, may be seen at the office of the City Engineer, Saskatoon, or at the office of "The Canadian Engineer," at the following addresses:

Toronto, 62 Church Street.

Montreal, Board of Trade Building.

Winnipeg, Room 315 Nanton Building.

Copies of instructions to bidders, and forms of tender, will be furnished on application to the City Engineer, but copies of plans and specifications will not be furnished.

The lowest or any tender not necessarily accepted.

JAMES CLINKSKILL,
W. B. NEIL,
City Commissioners.

Saskatoon, Sask.,
March 30th, 1911.

14-15

City of Moose Jaw Saskatchewan

Sealed tenders will be received by the undersigned City Clerk until 8.30 o'clock p.m., April 17th, 1911, for the supply of a Gasoline Traction Engine of not less than 20 h.p., and not more than 25 h.p.

The lowest or any tender not necessarily accepted.

J. M. WILSON,
City Engineer.

W. F. HEAL,
City Clerk.

Moose Jaw, Mar. 31st, 1911.

14-14



Notice to Contractors

Tenders will be received by registered post only, addressed to the Chairman of the Board of Control, City Hall, up to noon on Tuesday, April 11, 1911, for the supply of Eighteen Copper Screens for the Main Pumping Station, Tunnel Shaft No. One.

Envelopes containing tenders must be plainly marked on the outside as to contents.

Specifications and forms of tender may be obtained at the office of the City Engineer, Toronto.

The tenderers shall submit with their tender the names of two personal sureties (approved of by the City Treasurer), not members of the City Council, or officers of the Corporation of the City of Toronto, or in lieu of said sureties, the bond of a guarantee company, approved as aforesaid.

The usual conditions relating to tendering as prescribed by City By-law must be strictly complied with or the tenders will not be entertained.

The lowest or any tender not necessarily accepted.

G. R. GEARY, Mayor,
Chairman, Board of Control.

City Hall, Toronto,
March 28, 1911.

14-14

City of Toronto

Tenders Wanted for Construction Equipment

Separate or bulk tenders, on prescribed forms, will be received, by registered post only, addressed to the Chairman of the Board of Control, City Hall, Toronto, Canada, up to noon on Tuesday, April 11th, 1911, for the delivery of the following:—

(1) Two (2) full circle swing traction steam shovels, one and a quarter (1¼) yard dipper.

(2) Six (6) saddle tank locomotives, 36-in. gauge.

(3) Forty (40) four yard (4 yd.) dump cars, or fifty-four (54) three yard (3 yd.) dump cars, 36-in. gauge.

(4) Four (4) double truck flat cars, 36-in. gauge.

(5) (a) Two hundred (200) tons 30-lb. steel rail.

(b) Twenty-four (24) No. 5 switch leads.

(c) Seventy-five (75) kegs of spikes.

(d) Eighteen hundred (1800) pair of fish plates.

(e) Twenty (20) kegs bolts and nuts.

Envelopes containing tenders must be plainly marked on the outside as to contents.

Specifications and form of tender may be obtained upon application from Department of Railways, Bridges and Docks, City Engineer's Office, Toronto.

The lowest or any tender not necessarily accepted.

G. R. GEARY (Mayor),
Chairman Board of Control.

City Hall, Toronto,
March 27th, 1911.

18-13

BRIDGE TENDERS

Sealed tenders will be received by Jas. Beattie, Esq., Clerk of Wellington County, Fergus, Ont., until 2 p.m. on Wednesday, April 19, for the construction of an 80 ft. concrete arch bridge, 26 ft. wide, with ornamental railing, at Fergus.

Plans and specifications may be seen at the offices of the undersigned.

BOWMAN & CONNOR, Engineers,
36 Toronto Street, Toronto,
and Court House, Berlin, Ont.

JAS. BEATTIE, County Clerk,
Fergus, Ont.

J. A. WILKINSON, Chairman of Com.
Morrison, Ont.

14-15

PAVING

City of Fort William, Ont.

Sealed and endorsed tenders, addressed to the Chairman of the Works Committee, will be received at the office of the City Clerk before 5 o'clock p.m., of May 4th, 1911, for the paving with asphalt block, sheet asphalt or bitulithic of:—

May street, 46 ft., curb to curb., approximately 5,700 square yards.

Brodie street, 46 ft., curb to curb., approximately 8,400 square yards.

Plans, Specifications and Forms of Tender may be obtained at the office of the City Engineer.

Each tender must be accompanied by a marked cheque for \$1,000.

The lowest or any tender not necessarily accepted.

JOHN WILSON,
City Engineer's Office,
Fort William, April 1, 1911.

14-16

Township of North Easthope

Tenders Wanted

Sealed tenders marked "Tenders for Western Drain," and "Tenders for Kichne Drain," will be received by the undersigned up to 2 p.m. on April 17, 1911. The council will proceed to consider the tenders immediately after the above hour at the Town Hall, North Easthope.

Plan, profile and specifications can be seen at the clerk's office, Amulree, or at the office of John Roger, O.L.S., Mitchell.

The Western Drain commences on Lot 33, Con. 7, and has its outlet on the Northern Gravel road.

The Kuhne Drain commences on Lot 24, Con. 7, and has its outlet on Lot 38, Con. 2.

A deposit of \$100 is required on the Western Drain contract and \$200 on the Kuhne Drain contract. Cash or marked cheque.

The lowest or any tender not necessarily accepted.

J. D. FISHER,
Tp. Clerk, North Easthope,
Amulree P.O.

Dated the 3rd day of April, 1911.

14-15

Miscellaneous

Advertisements under this heading two cents per word per insertion.

WANTED — American firm manufacturing dynamos, motors, etc., wants representatives in Eastern and Western Canada to handle a complete line of direct current machines from 3 to 500 kilowatt, besides special electrical and motor equipments for driving printing presses. Apply Box 255, Contract Record, Toronto, Ont. 13-14

WANTED—Large Minneapolis firm manufacturing structural and ornamental iron work wants representatives in Western Canada. Apply E. J. McIntyre, 4059 Perry street, Chicago, Ill. 13-14

Business Buildings and Industrial Plants

(Continued from page 57)

the site for the Savoy Hotel to be erected on the corner of Yates and Quadra streets. The plan prepared by W. D. H. Rochfort, architect, shows a building six storeys high 60 x 120 feet, of steel construction throughout. Dr. S. M. Harman is the owner.

Windsor, Ont.

The Detroit, Belle Isle & Windsor Ferry Co. purpose erecting a large warehouse beside the present customs office to cost about \$15,000. Tenders are being called.

Woodstock, Ont.

Libby, McNeil & Libby will not locate here this season as at first anticipated.

Welland, Ont.

Coincident with the report from Chicago regarding the merger of wagon and agricultural implement manufacturers, is one that Deer & Company, by which the consolidation will be known, will build here and manufacture other lines of farm machinery besides plows. The headquarters of the concern are at Moline, Ill. Noted previously.

Winnipeg, Man.

F. R. Evans is the architect for erection of the additional buildings proposed by D. Ackland & Son, 73 Higgins avenue. Two new warehouses will be erected.

Tenders addressed to J. A. Hudson, architect, 608 Builders' Exchange, will be received until April 8th for erection of store and apartment block for Mr. H. R. Shaefer.

Tenders addressed to Frank R. Evans, 506 Somerset Block, Portage avenue, architect, will be received until April 6th for erection of addition to the Enright Building on Jarvis avenue. Plans, etc., at office of architect.

Peter Lyall & Sons, on behalf of an English syndicate, have asked for a building permit for a 16-storey building to cost one million dollars, on Main street between Notre Dame avenue and Water street, the site being 150 feet on Main, with 200 feet depth to lane.

AWARDED

Brandon, Man.

The contract for a three-storey business block for Mr. J. Burchill has been awarded as follows: general contract, A. E. Bullock; heating, plumbing, etc., the Brandon Heating and Plumbing Co. Cost of building, \$14,500. Shillinglaw and Marshall, architects.

Espanola, Ont.

The Spanish River Pulp and Paper Company have awarded the contract for the pumps for their new million dollar mill to the John McDougall Caledonian Iron Works Company, Limited, of Montreal. The contract includes two 10-in. turbine pumps for the water supply; one 6-in. turbine pump for fire purposes; two 8-in. pumps for carrying off the white water; and two 10-in. turbine pumps for carrying the ground wood stock.

Toronto, Ont.

Contract was awarded to A. B. Ormsby, Limited, for the galvanized iron, windows, doors and roofing work on the Wilson Lytle & Badgerow factory.

Power Plants, Electricity and Telephones

Brandon, Man.

The provisional plan of the street railway prepared by City Engineer Speakman, was adopted by council. It was decided to submit a by-law for \$300,000 for construction of the road. Noted in issue of March 29th.

Brantford, Ont.

It is stated that the bill providing for an electric road from Port Dover to Galt via Brantford has passed.

Edmonton, Alta.

The industrial committee of the city council will grant a gas franchise to the International Heating and Lighting Co., of Cleveland, Ohio. The maximum price was fixed at \$1.65 per thousand cubic feet. The agreement between the city and company will be submitted to the ratepayers in the course of a few weeks.

Hamilton, Ont.

The city council, ratified the appointment of E. J. Sifton, London, as an expert to draw up plans, etc., for a municipal light and power plant.

Hull, Que.

City Engineer Chene is preparing estimates of the cost of erection of a number of lamps similar to those in use in Ottawa for lighting the streets.

London, Ont.

It will be necessary to purchase two new transformers for the Niagara power station on Horton street. Superintendent Glaubitz.

Lethbridge, Alta.

It is proposed to commence operations on a street railway system which will require the supply of new boilers, alternating-current generating unit, about 1,500 k.v.a. capacity, and a rotary converter set. Arthur Reid, superintendent.

Moncton, N.B.

The ownership of the Electric & Gas Lighting plant has passed over to the Moncton Tramways, Electricity & Gas Company. Work on the installation of natural gas supply and street railway will be commenced as soon as frost is out of the ground. Mr. Sumner, vice-president; O. P. Boggs, manager. Noted in issue of March 15th.

Montreal, Que.

Property at Cedar Rapids capable of generating, it is estimated, about 150,000 h.p., has been purchased by D. Lorne McGibbon, who is said to be closely identified with the Canadian Light & Power Co., Beauharnois. It is anticipated that about \$4,000,000 will be spent in development work.

Oak Bluff, Man.

The citizens will ask the council for its support in the arranging for a street car service for the municipality.

Ottawa, Ont.

The street railway extension committee will recommend to council that the street railway line be extended to the cemeteries by St. Patrick street. By having a single track no bridges would need widening and the grading, etc., would cost about \$14,500, while to go by Montreal road, two bridges would be necessary, which would cost about \$70,000.

Portage la Prairie, Man.

Negotiations are stated to have been opened with Winnipeg for the purchase of about 3,000 h.p. from the new power plant at Point du Bois.

Port Arthur, Ont.

The street railway will be extended from High street to Algonquin street on Red River Road, 4,000 feet, as soon as material is received.

Sturgeon Falls, Ont.

The report on the supplying of electric power and lighting and water, estimates the outlay for such at \$50,000. The money is not on hand for such an expenditure and the council are considering the advisability of arranging with some company to erect a pumping station, the council to have the option of purchase when practicable.

St. Vital, Man.

Work will begin this spring on the municipal electric railway here.

Saskville, N.B.

Local men with backing, it is reported, are about to become owners of the N. B. and P. E. I. Railway, running from here to the Straits of Northumberland, and will put on electric cars.

Toronto, Ont.

The Ontario Railway and Municipal Board have approved of the construction of loop on Louisa street.

Tenders addressed to G. R. Geary, Chairman, Board of Control, will be received until April 11th for transformers for the hydro-electric system. Specifications obtained from the Toronto Hydro-Electric System, City Hall.

The Ontario Government is considering, though it has not definitely decided, to extend the Hydro-Electric power line from St. Thomas to Windsor; and to spend \$2,000,000 on the work. The extension from St. Thomas to Windsor will be 128 miles long, with about 400 miles of high-tension wire. The proposed line will supply a number of municipalities between the two cities. The Hydro-Electric Commission arranged with the New York and Ontario Power Company to supply power for the Eastern municipalities, such as Napanee, Kingston, Lansdowne, Brockville, Lynn, Prescott, Cardinal, Morrisburg, and Athens. Prices and other details will be laid before the Eastern Municipalities' Power Union at a meeting to be held in Brockville or Kingston. In the north, the commission has closed a contract with the Simcoe Power Company, and the power will be transmitted to Penetanguishene, Midland, and Waukegan.

Winnipeg, Man.

Tenders addressed to the Chairman, Board of Control, will be received until April 10th for erection of stepdown transformers and accessory equipment for pumping station. Specifications, etc., at office of City Engineer. M. Peterson, secretary.

It is likely that several important extensions will be established during the season, including those of rural telephones, on the government telephone lines. E. C. Paterson, Chairman, Manitoba Government Telephone Commission.

Tenders are called until April 27th for supply and installation in sub-station No. 1, King street, of electrical switching equipment. M. Peterson sec-

retary, Board of Control. Advertisement in "Tenders and For Sale Department" of this issue.

AWARDED

Quebec, Que.

The Quebec Railway, Light, Heat and Power Company have awarded the contract for the construction of the new branch of the line from Beauport to Kent House, to Lonergan Bros., of this city.

Miscellaneous

Brantford, Ont.

Tenders addressed to E. P. Worthington will be received until April 8th for erection of business block. Plans, etc., at office of the architect, Geo. W. Hall.

Calgary, Alta.

Tenders are called until April 15th for erection of solid brick business block on Seventh avenue east for the Alberta Loan and Investment Co., Ltd. Hodgson, Bates & Butler, architects, Grain Exchange Building.

Fergus, Ont.

Tenders are called until April 19th for bridge here. Bowman & Connor, engineers. Advertisement in "Tenders and For Sale Department" of this issue.

Galt, Ont.

Tenders addressed to Joseph McCartney, town clerk, will be received until April 17th for Portland cement, lumber, hardware, castings, sand and gravel required for 1911 by the board of works.

Grandview, Man.

This municipality will spend about \$4,500 in the purchase of fire equipment.

Moose Jaw, Sask.

Tenders are called until April 17th for supply of gasoline traction engine, etc. J. M. Wilson, city engineer; W. F. Heal, city clerk.

Ottawa, Ont.

Tenders addressed to the Chairman of the Ottawa Improvement Commission were called until April 3rd for supply of the following: hardware and explosives, lumber, shingles, coal.

Tenders are called until April 15th by the Department of Railways and Canals for improving upper entrance to Lock No. 19, Cornwall Canal. Secretary, L. K. Jones. Advertisement in "Tenders and For Sale Department" of this issue.

Tenders for improving upper entrance to Lock No. 28, Galops Canal, St. Lawrence Canals, will be received until April 15th by the Department of Railways and Canals, L. K. Jones, secretary. Advertisement in "Tenders and For Sale Department" of this issue.

The Dominion Department of Public Works has awarded the following contracts: Maritime Provinces, 15-inch suction dredge, to la Cie Pontbriand Ltee., of Sorel, Que., for \$59,865; Annapolis Royal, N.S., ice piers, to E. R. Reid, of St. John, N.B., for \$37,200; Ottawa, Victoria Memorial Museum, screens, partitions, pedestals, etc., for sculpture galleries, to George Goodwin, of Ottawa, for \$8,000; St. John, N.B., installing lighting system in No. 6 extension and No. 7 warehouse, to Vaughan Electric Co., Ltd., St. John, N.B., for \$1,361.94; Listowel, Ontario, public building, to

John Avery, of Mitchell, Ont., for \$21,195; London, Ont., addition to military stores building, to John Burdon, of London, for \$2,182; Tillsonburg, Ont., public building, to Shultz Bros. Co., Ltd., of Brantford, for \$24,801; Battleford, Sask., public building, interior fittings, to Berlin Interior Hardware Co., Berlin, Ont., for \$2,225; Nelson, B.C., public building, alterations and additions, to John Burns and Sons, of Nelson, for \$9,300; Victoria, B.C., assembling and erecting Victoria rockbreaker, to the Victoria Machinery Depot Company, for \$12,150; Sidney, N.S., customs office, fittings, Chapel Brothers and Co., Ltd., Sidney, for \$400; Harriston, Ont., public building, to George A. Proctor, of Sarnia, for \$18,943; Vernon, B.C., public building, heating system, to Colbert Heating and Plumbing Co., Ltd., Victoria, B.C., for \$2,135; Montmorency County, Quebec, pier, to Clouthier and Gaudreau, at itemized prices, approximating \$9,237.33.

Quebec, Que.

Tenders addressed to Aug. Malouin, secretary, fire committee, will be received until April 18th for a fire engine, capable of throwing 800 gals. of water per minute, with an intake straight pull of 30 feet without a syphon, and guaranteed for five years.

Regina, Sask.

Tenders are called until April 17th for fire hall equipment, etc. A. J. McPherson, city commissioner. Advertisement in "Tenders and For Sale Department" of this issue.

St. Vital, Man.

Tenders addressed to V. Mager, reeve, Box 1372, Winnipeg, will be received until April 10th for clearing and grading Kingston Row from St. Mary's Road to Suffolk avenue. For further information apply to R. Wilson, care Hudson Bay Company, Winnipeg. E. A. Poulain, sec.-treas., Riel, P. O.

Scott, Sask.

Tenders for drilling a deep well for the Waterworks System here will be received until May 1st. Geo. M. Phillips, secretary-treasurer.

Tp. of North Easthope, Ont.

Tenders are called until April 17th for drains. J. D. Fisher, Tp. Clerk. Advertisement in "Tenders and For Sale Department" of this issue.

Toronto, Ont.

Tenders addressed to G. R. Geary, will be received until April 11th for freight and passenger elevator at Electrical Sub-station on Duncan street. Specifications at the Toronto Hydro-Electric System Offices, City Hall.

Yorkton, Sask.

Tenders are called until April 15th for construction of about 75 miles of rural telephone line in this district. Tenders for work and material separately. W. R. Cowan, Yorkton, Sask.

Wright, Jr., attorney, and R. G. Hake, insurance agent, all of Detroit, and F. C. Kerby, barrister, Windsor, Ont.

Sun Brick Company, Limited, Toronto, incorporated, capital, \$200,000. Incorporators, F. W. Booth, bookkeeper; W. Booth, lumberman, and W. A. Werrett, solicitor, all of Toronto.

The Onodaga Oil and Gas Co., Ltd., Brantford, incorporated, capital, \$90,000. Incorporators, J. H. Spence, manufacturer; R. E. Ryerson, merchant, and W. A. Hollindrake, barrister, all of Brantford.

The Orford Building & Supply Company, Limited, Highgate, Ont., incorporated, capital, \$40,000. Incorporators, W. L. Tape, Orford, farmer, D. Paterson McPhail, physician, Highgate.

McFarlane-Douglas Company, Limited, Ottawa, incorporated, capital, \$300,000. Incorporated to take over the business carried on by McFarlane & Douglas, Limited, manufacturers of and contractors for architectural and other sheet metal building material, etc. Incorporators, T. D. McFarlane, manager, J. R. Douglas, superintendent, and T. A. Beament, barrister, all of Ottawa.

La Compagnie Hydraulique Stadacona, Quebec, Que., capital, \$1,000,000; incorporated to manufacture or distribute, etc., electricity. Incorporators: L. H. Gaudry, merchant; Adjutor Potvin, merchant; P. E. Bernier, advocate, all of Quebec.

The Accumulator Lighting Company, Limited, Winnipeg, Man., incorporated, capital, \$50,000. Incorporators, A. R. Sutherland, agent; T. Froggatt, manager; J. D. Suffield, barrister, all of Winnipeg.

The General Machinery Company, Limited, Toronto, incorporated, capital, \$40,000. Incorporators, H. H. Williams, manufacturer; B. W. Folger, E. L. Middleton, barristers, all of Toronto.

Canadian Moloney Electric Company, Limited, Windsor, Ont., incorporated, capital, \$150,000. Incorporators, D. McKenzie, hotel keeper; J. W. Hanna, barrister, and O. Nantais, real estate dealer, all of Windsor, and J. J. Mullen, St. Louis, Mo., manufacturer.

The Carrette-Kirk Co., Ltd., St. Boniface, Man., capital, \$50,000; incorporated to carry on the business of plumbers, steam and gas and hot water fitters, etc. Incorporators, C. D. Kirk, superintendent; J. A. Charette, metal worker, and W. Glass, plumber, all of Winnipeg.

The Acme Electric Appliance Co., Limited, Brantford, Ont., incorporated, capital, \$300,000. Incorporators, G. Brereton, fruit dealer, and O. M. Mackie, promoter, both of Hamilton, A. Sheard, Brantford, and N. G. Patterson, Cambridge, Ohio.

Standard Struction Co., Que., have registered.

Brennan & Cairnie, contractors, Montreal, have registered.

Charles Vezina, plumber, Quebec, is reported to have assigned.

Matte & Ruelland, painters, Quebec, are reported to have dissolved.

H. A. Burgess & Co., contractors, Ottawa, are reported to have assigned.

W. E. James, plumber and steamfitter, is stated to have assigned to W. A. Sole.

New Companies

Robertson Paint and Varnish Company, Limited, Toronto, incorporated, capital, \$100,000. Incorporators, J. A. Robertson, A. A. Robertson, and C. M. Robertson, Montreal, manufacturers.

Canadian Automatic Heating and Refrigerating Company, Limited, Windsor, capital, \$250,000. Incorporators, T. W. Brown, commercial salesman, C.

Contract Record

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April 12, 1911

No. 15

The Qualifications of a Contractor

In the course of a speech at the annual dinner of the Contractors' Protective Association of New York, Capt. D. L. Hough, president of the United Engineering & Constructing Company, of New York, summed up in a few words the qualifications required of a contractor. He said:

"There is no class of work that takes as varying qualities or so many qualities as contracting. It appeals to men who are optimistic and to those who have born in them the longing for doing things. The contractor must be a man, first, of that most uncommon thing, common-sense; and he must have physical sense, the sense that tells a man without calculating where lies the centre of gravity; the sense that tells a man values without estimating; the sense that tells a man quantities without measuring. He must have magnetism in order to gather his men about him. He must have a reputation for justice in order to hold them. He must be forceful in order to inspire energy in others. He must be a lawyer and buyer. He must have the ingenuity of the inventor and the grasp of the field-marshal. He must be a diplomat, and he must be a politician. He must also know when not to be a politician. He must be a financier, and, I regret to say in these days, an advertiser, and he must be a prophet."

The Engineer as Sole Arbitrator

Arbitration methods are discussed in an interesting letter published in this issue under the signature of Mr. Archibald Currie, the new city engineer of Westmount, Que. Mr. Currie condemns the practice of making the engineer his own judge in case of dispute and names three alternative methods, of which, all things considered, and under the principle of choosing the least evil, we prefer, perhaps, the practice in vogue in Great Britain. None of such methods, however, can ever be entirely satisfactory and the solution is yet to be named. It may be that a satisfactory tribunal might be found in some association combining the dual interests—such an institution, for instance, as

the American Society of Engineering Contractors—but we would like to have some further opinions from those who have actually suffered (or gained?) as a result of the inequalities of the present system.

Another Unjust Contract Clause

In our last number we published an interesting paper by Mr. Daniel J. Hauer, in which a number of clauses inimical to the interests of the contractor were discussed at some length. That the list of such clauses is not exhausted is evidenced from the following form of contract used on an important piece of railroad construction in Canada:

"All machinery and other plant, materials and things whatsoever provided by the contractor for the work hereby contracted for, and not rejected under the provision of the last preceding clause, shall from time to time of their being so provided, become, and until the final completion of the said work, shall be the property of the commissioners for the purpose of the said works, and the same shall on no account be taken away, or used or disposed of except for the purpose of the said works, without the consent in writing of the engineer, and the commissioners shall not be answerable for any loss or damage whatsoever which may happen to such machinery or other plant, materials or things, provided always that upon the completion of the works and upon payment by the contractor of all such moneys, if any, as shall be due from him to the commissioners, such of the said machinery and other plant, materials and things as shall not have been used and converted in the works and shall remain undisposed of, shall upon demand, be delivered up to the contractor."

This clause can mean much more than a first reading would seem to indicate, says our Chicago contemporary, the Contractor, in editorial comment of the above. It is not ambiguous, but it can be construed in several ways. Under most circumstances an injury would not be done to the contractor, but circumstances could arise, under which the well meaning contractor might find that he had signed away his rights to his property, and he might not have any redress.

To some extent the trouble, should trouble occur, is caused by covering two things in this paragraph, namely, materials and machinery or plant. Many contractors do not cover well enough, the item of furnishing different kinds of materials. This should be done, for on some jobs the materials cost many thousands of dollars, and at times become a large part of a contract. Thus, the contractor should have assistance in purchasing his materials, that is, if we assume that the contractor should only have a nominal capital, and the company is building the work on its own capital, which is already in hand. To assist the contractor in a matter of this kind, it is only necessary to have named in the contract a price for materials delivered on the line of the work, and a price for the material in place. The price for material delivered should have only a fair profit in it, for if it is excessive, fraud and trickery may enter into the furnishing of it.

A clause somewhat like this would then be an excellent thing, and would be a protection both to the contractor and the owner. Suppose a contractor had to furnish a million feet of timber, and he had made a contract for his needs with several mills. Then suddenly the price of timber went up, and the contractor already had several hundred thousand feet delivered. It might be quite a temptation to the contractor to sell a lot of this timber at a handsome profit, to the detri-

ment of his work. Under this clause the engineer could prevent the contractor disposing of this material. On the other hand, the contractor should be protected in his purchases. He should be furnished with bills of material promptly, and he should order his materials from these bills. Then he should be paid promptly for all materials delivered, and, if, at the end of the job, there is any material left over, the contractor should be paid for it, whether the owner wishes the material or not, as it was ordered by the engineer's instructions, and the contractor should not be responsible.

One thing objectionable in this clause regarding materials is due to the fact that although it states the materials become the property of the commissioners as soon as they are delivered, yet the risk and responsibility of the care of them is to rest upon the contractor. This should, in the writer's opinion, be changed to read that the materials will be paid for "as delivered," and should be held at the risk of the contractor until paid for "in place."

The great injustice that can be done under this clause is in regard to outfit and machinery. It is evident, or should be, that plant and material cannot be furnished for a contract on the same basis, yet under this clause this is provided for, and here is where the contractor may be seriously injured.

Under ordinary circumstances there would not be any trouble, but if the contractor perfected his contract for any reason, or should the organizer become provoked at the contractor, and wish to injure him, then the contractor would not be able to remove any of his plant or machinery to another job until the commissioners or their engineer gave permission in writing. Thus the contractor's outfit could be confiscated for the life of the contract he had undertaken, even after the breach of contract had occurred, even if the breach was caused by the owner. This the contractor may not only lose his contract, but also his outfit, temporarily, by means of which he makes his living. The clause does not openly provide for this, but it can be so construed, and a careful reading will show it. Clauses giving the owner the right to take over the contractor's outfit, in case of a forfeiture or breach, were once very common, but it was found that it was almost equal to a total confiscation, as after the contractor gave it his plant, it was generally so misused, that it would be almost worthless when the contractor again came into possession. Suits brought to recover the damages to the plant were generally won by the contractors, with the result that such clauses have in most cases been dropped from contracts.

Now we have one that confuses plant with materials to be furnished, and it is evident that a revision is necessary.

Sewage Purification Plants as Nuisances

In a paper before the Institute of Chemical Engineers, Mr. George C. Whipple, in a paragraph headed "Purification Plants as Nuisances," called attention to certain precautions which should be taken in designing and locating sewage purification plants. The paragraph was as follows:

"Purification works themselves may be a source of nuisance. There is a natural opprobrium attached to a region where such works exist that results in a recognized deterioration of property values. The processes used for the purification of sewage not in-

frequently result in odors that may be distributed over considerable areas. Where the purification works are entirely covered, as some kinds of works may be, little or no nuisance may result, but where, for example, the sewage is first submitted to putrefaction in a septic tank and the septic effluent then sprayed into open air upon the surface of sprinkling filters this exposure of the atomized liquid results in the liberation of odors that may reach distances of half a mile from the plant, depending upon the amount and character of sewage treated, the local topography, prevailing direction of the wind, humidity in the atmosphere and other conditions.

"Frequently high winds will carry the spray itself for several hundred feet with inevitable bacterial pollution of the air. In the operation of sprinkling filters also it has been found that at certain seasons of the year swarms of flies breed in the porous beds. These are very troublesome in the immediate vicinity of such works. In considering the need of sewage purification it is proper to balance these nuisances against those resulting from the discharge of unpurified sewage into a body of water. It not infrequently happens that the installation of sewage purification works merely substitutes one nuisance for another."

A cause of nuisance, possibly even more common than those mentioned, is the failure to use sufficient care in operating the plant, either to prevent nuisance or to secure the highest efficiency, says the Municipal Engineer, commenting upon Mr. Whipple's remarks. It is altogether too common for cities, having once constructed a plant, to expect it to operate automatically, with no attention whatever, or to place in charge some one with no great amount of intelligence and no experience whatever in purification plants, and thereafter pay no attention to the results obtained by him. In some cases State Boards of Health are empowered to require the construction of sewage purification plants, but have no control over their operation; and a city upon which the construction of such a plant has been forced by the State Board, finding that it has no further authority in the matter, absolutely neglects the plant. A plant so neglected is almost certain not only to fail to make any adequate return for the money invested in it, but may result in actual nuisance. In either a water or a sewage purification plant care in operation is fully as important as in designing or construction.

The Bishop Construction Company, of Montreal, has been awarded the contract for building that part of the Quebec & Saguenay Railway between Cape Tourment, the present terminus of the old Quebec, Montmorency & Charlevoix Railway, now known as the Quebec Railway Company, to Murray Bay, P.Q. It is expected that the line will eventually be extended along the north shore as far as Tadousac, where an all-the-year-round port will be established. Tadousac, noted for its attractions as a summer resort, is situated below Quebec city on the St. Lawrence River at the entrance of the Saguenay River. The principal object of building a railroad along the north shore of the St. Lawrence River is to advance the possibilities of Tadousac becoming an all-year port. The Bishop Construction Company is organizing its forces so that work can be started at the first sign of spring. Construction of this line is considered quite difficult, from the fact that the roadbed must be hewn out of the side of precipitous cliffs overhanging the St. Lawrence.

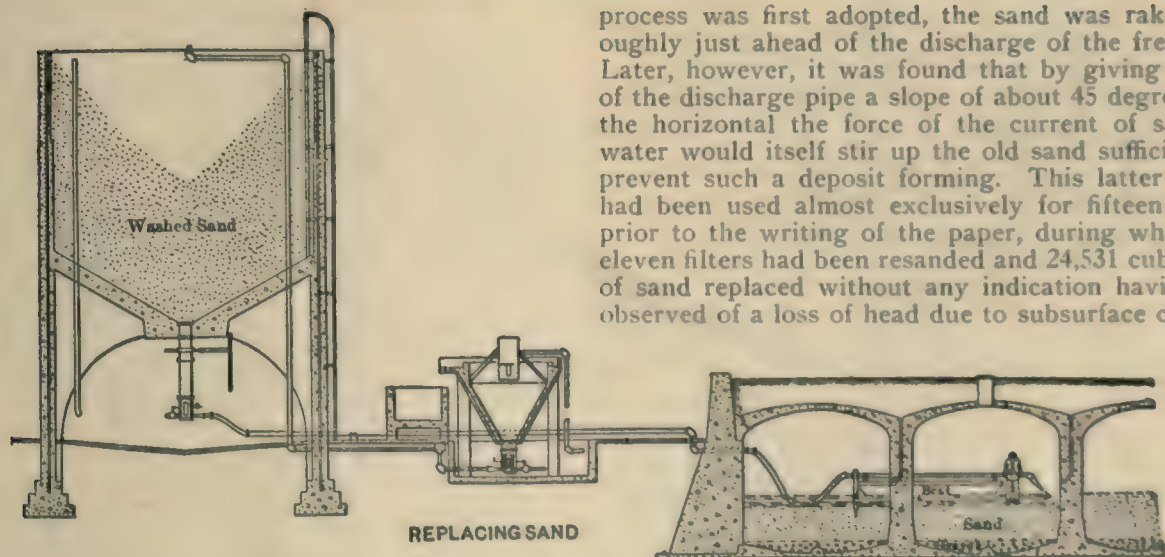
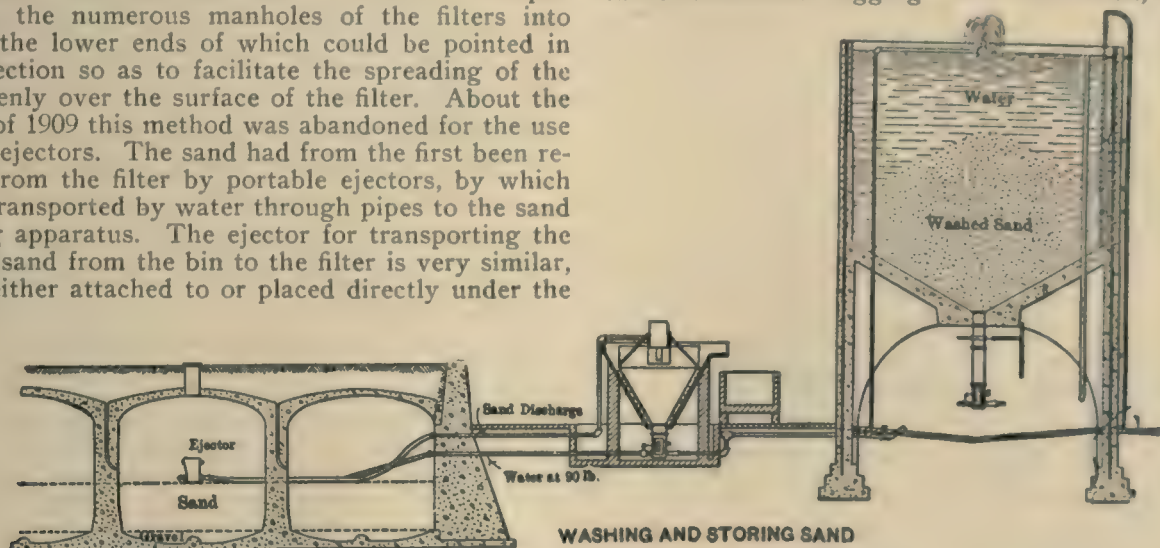
Operating Methods in a Filtration Plant

Interesting Data from Washington, D.C.—Replacing Washed Sand by Ejectors—Amount of Sand Removed by Scraping—Costs

In a paper before the American Society of Civil Engineers, Mr. E. D. Hardy, superintendent of the Washington, D.C., water purification plant, gave a description of some of the methods employed and results obtained during five years' operation of the plant. One of the most interesting of these is the manner of handling and washing the sand. His description of this we abstract as follows:

"For the first three years of operation the sand was carried from the sand bins in carts and dumped through the numerous manholes of the filters into chutes, the lower ends of which could be pointed in any direction so as to facilitate the spreading of the sand evenly over the surface of the filter. About the middle of 1909 this method was abandoned for the use of sand ejectors. The sand had from the first been removed from the filter by portable ejectors, by which it was transported by water through pipes to the sand cleaning apparatus. The ejector for transporting the washed sand from the bin to the filter is very similar, and is either attached to or placed directly under the

the sand is attached a 3-inch pipe which is supported on a boat, and the sand is discharged through this pipe to the point required. Work is first begun at the far end of the filter, and the boat is gradually swung from side to side of the filter and at the same time backed toward the front end. At first it was feared that during the filling a small quantity of mud would be deposited on the surface of the old sand, and covered by the new layer, and that this mud would ultimately cause subsurface clogging. For this reason, when the



Diagrammatic Sections showing methods of Removing, Washing and Storing Sand, and Returning and Placing the Cleaned Sand

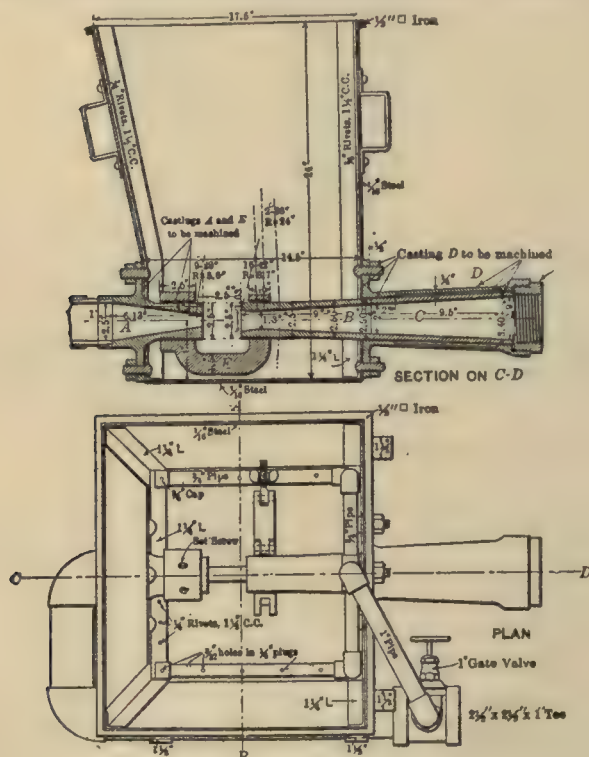
outlet gate of the sand bin. From the ejector the sand which flows into it from the bin is carried through a line of 4-inch fixed pipe to the interior of the filter; one or more lengths of 3-inch hose on the end of this pipe permitting the sand to be distributed over all parts of the bed at will. In resanding a filter it is first filled with water to the proposed depth of the sand layer. To the outlet end of the hose which distributes

process was first adopted, the sand was raked thoroughly just ahead of the discharge of the fresh sand. Later, however, it was found that by giving the end of the discharge pipe a slope of about 45 degrees from the horizontal the force of the current of sand and water would itself stir up the old sand sufficiently to prevent such a deposit forming. This latter method had been used almost exclusively for fifteen months prior to the writing of the paper, during which time eleven filters had been resanded and 24,531 cubic yards of sand replaced without any indication having been observed of a loss of head due to subsurface clogging.

The filters resanded in this way have been considered more efficient than those in which sand was replaced with carts.

During the year 1909-1910 the average depth of sand removed per month by scraping was 1.314 inches, there having been three months in which no sand was removed and one month (March, following a month when there had been no scraping) in which 3.64 inches

were removed. In removing the sand from the filter the average monthly rates in cubic yards per hour during 1909-1910 varied from 6.2 to 11.8, the mean of the monthly rates being 9.2. In replacing the sand by ejector the average rate per cubic yard per hour varied from 7 to 17.7, the mean being 10.0. The cost of handling the sand, not including any charge for the quantity of water used, during the fiscal year 1909-1910 was as follows, the items being per million gallons pumped to the filter: Scraping averaged 5 cents, ranging from 2 cents to 10 cents. Ejecting averaged 10 cents, ranging from 3 cents to 21 cents. Washing averaged 1 cent, ranging from 0 to 4 cents. Smoothing averaged 1 cent, ranging from 0 to 2 cents. Raking averaged 1 cent, ranging from 0 to 2 cents. Resanding averaged 8 cents, ranging from 1 cent to 27 cents. The total cost averaged 26 cents, ranging from 9 cents to 57 cents. Stated in cost per cubic yard of sand handled, the monthly averages were as follows: Scraping, average 7 cents, ranging from 6 cents to 12 cents. Ejecting, 14 cents, ranging from 9 cents to 25



Details of Sand Ejector

cents. Washing, average 2 cents, ranging from 0 to 4 cents. Smoothing, 1 cent, ranging from 1 to 2 cents. Resanding, 10 cents, ranging from 5 cents to 17 cents. Total cost per cubic yard of sand, general average 34 cents, the monthly average ranging from 25 cents to 51 cents.

The cost of pumping water for removing and washing sand, including all labor, materials and repairs, was 6 cents per cubic yard of sand ejected and washed; and 3 cents per cubic yard was the cost of water for replacing sand. The latter should be increased by one or two cents on account of the fact that while sand is being replaced a slight upward flow is maintained through the filter. This upward flow is not believed to be absolutely necessary but is always used as an additional safeguard against the formation of a layer of mud on the old sand.

A flight of stairs has been erected in Paris over which 14,000,000 persons have shuffled without so

much as scratching the surface. These steps are almost as imperishable as if they had been built of huge diamonds, for in the concrete of which they are constructed a generous proportion of carborundum has been introduced and since carborundum is almost as hard as the diamond, it has given the concrete a wearing quality which no marble or granite could possibly approach.

In a cartoon published in the April number of one of our exchanges, reciprocity with the United States is depicted as an April fool joke in the shape of a brick concealed in a hat and laid temptingly in the way of an ingenuous-looking little boy who is just contemplating his opportunity.

Erratum—The Toronto office of Messrs. Escher, Wyss & Company have notified us that the plant referred to in a paragraph published on page 33 of our issue of March 29, 1911, is the Adamello power plant (head 3,000 feet) in northern Italy, and not that at Isola. The latter plant, however, was also built by the Zurich firm, the head being 1,200 feet and the output of each of five being 2,850 h.p.

The use of a water sprinkling apparatus attached to the steam road roller has effected a considerable saving in road work in the Uxbridge Rural District, England. In his annual report the engineer of the district states that before fixing sprinkling apparatus on the roller it was necessary to hire a horse and man for the water cart the whole time the roller was working, at a cost of never less than \$1.68 per day. The engineer also states that the substitution of coke for coal for the steam roller has resulted in a saving. He has found that a chaldron of coke (2,500 to 2,900 lbs.) at \$3, lasts as long and does as much work as a long ton of coal at \$4.32.

It is safe to predict that before very long the name "Portland," as applied to cement, will be spelled with a small "p." The word is already almost a common noun, in such wide and common use to designate a definite and well-known product that the origin of the name is ordinarily lost sight of. In such cases it is the inevitable tendency of common usage—and usage, in the long run, determines what is proper in style—to drop the capital letter. So we shall some day read of American as compared with foreign "portlands," just as we now read of American plaster of "paris," "cyclopean" concrete work, international "boycotts," and the "herculean" tasks that confront the political campaign managers in 1912.—Cement World.

Fred. Cook, of the Press Gallery, Ottawa, has in preparation a "Who's Who in Canadian Manufactures and Industries," which should have a wide field of usefulness in this country. Forms are now being circulated.

The Grand Trunk Pacific Railway, B. B. Kelliher, Chief Engineer, Winnipeg, Man., proposes to construct large grain elevators at West Fort William on Lake Superior. The scheme includes three big piers devoted to the grain traffic, on which will be placed six elevators of 10,000,000 bushels capacity each. The plans provide for the handling of 2,400 cars a day in these elevators.

The Selection of Contractors' Outfit

Considerations Second only in Importance to Actually Obtaining the Work — Proper Equipment Means Economy, Efficiency, Success

By Daniel J. Hauer

Next to obtaining contracts there is no more serious problem that is presented to the contractor than that of purchasing outfit or plant to perform his work. At one time tools and machinery were spoken of almost entirely as "contractor's outfit," but to-day the term "plant" is used extensively, especially in connection with charges regarding this item of expense. No doubt the newer term will entirely supplant the older one.

The question of how much is needed and also the proper kind of plant should be a matter of careful consideration. Then, too, it is necessary to take stock of what outfit is already on hand and determine if it can be used to advantage on a new job. A contractor's experience must, to some extent, be his guide in reaching a decision on such matters. Also the amount of capital he controls will be a ruling factor. That mistakes are made in this connection need hardly be stated, and considerable money is lost by errors in judgment and through ignorance in selecting the proper outfit to use. Some contractors seem to believe that any makeshift is good enough, while in reality they are losing money by not having the proper machinery. Some expensive tool may have been used on one job, having been selected for its adaptability to that particular piece of work. For the next contract it is not so well adapted, yet instead of selling and trying a new style or size machine, the old one is worked, relying on the ingenuity of the contractor or the friendship of the engineer to pull the job through to a successful finish. Contractors as a class seem to be too bigoted and allow their prejudice to warp their judgment in this matter. There was a day when prices were high and conditions were better so that almost any man could make money at contracting, but that day has passed as the business has become a profession. To make money at contracting it is necessary to practice economy in the true sense of the word, surround one's self with competent men and outfit suited to the work. Thus contractors should on the lookout for new inventions and styles of tools and also try to adapt tools gotten up for other work to their own.

Even in the case of small tools and implements this is true. Many contractors seem prone to use only such tools as have been in use for years and to pay but little attention to improved styles of tools. This is quite noticeable in regard to wheelbarrows. There are now numerous styles and sizes of barrow made, that are designed for special work, and savings can be effected by using these special wheelbarrows, yet many contractors only buy one style of barrow, and use this on all jobs. Thus a contractor using barrows for excavating foundations will use the same ones for the concrete work, for which purpose they may be entirely unsuited. The beds of barrows meant for earth are too shallow and not shaped properly for concrete, for with extremely wet mixtures only two or three shovelfuls of concrete can be handled without the concrete slopping out on the sides. Earth barrows are not even suited for the raw materials for concrete, but a wheelbarrow with a high front and sides,

yet admitting quick dumping of its contents, either over the front or sides, should be selected.

In most cases it is advantageous in hauling concrete to use a concrete buggy. These carry a much larger load and, if the proper runways are laid down, will allow of the concrete being handled much quicker by the men, and at the same time considerable labor will be saved. The writer knows of a foundation job, where an average of seven hundred cubic yards of concrete were handled each day with these buggies. The men not only carried a large load, but were able to move at a trot without letting up on this pace during the day.

For some work, even a larger amount of concrete can be carried by a push cart. Several such carts with an automatic end gate for dumping are on the market and from one-half to one cubic yard can be carried in a single load. A serviceable push cart, not only for concrete work, but also for earth excavation can be built by any contractor's blacksmith.

Conveying Concrete

In many cases concrete or the raw materials for it are being transported by hand when conveying machinery should be used. Bucket and belt conveyors have been used quite extensively and can be adapted to many conditions, and are found quite economical for large quantities. Chutes and pipes are also being used for conveying concrete. Various patented hoists are used, and from the hoisting towers the concrete is distributed to the forms.

There are many kinds of concrete buckets and most of them are patented. Some are meant to dump under water, some are for use on cableways and derricks, some are designed to dump in narrow forms, and some on large, flat surfaces. Some are constructed so that they may be used as buckets and also as the bodies of dump cars. Orange peel and clam shell buckets have not been used in connection with concrete as extensively as they should. Whenever and wherever they have been tried money has been saved. For re-handling sand and aggregate they are valuable as they not only dump automatically but load in the same manner when concrete is discharged into hoppers, these buckets can be used for placing the concrete, allowing the mixer to work continuously.

Experiments have of late been made to convey concrete through four-inch pipes by means of compressed air. Some of the experiments have been successful, while others have only been partially so, but there seems to be little doubt that concrete can be and will be transported in this manner, and for some classes of work this method should prove economical.

There are many makes and styles of concrete mixers on the market, and all of them no doubt possess some merit, but they differ very materially both in the quantity and quality of the concrete which they will mix. Then, too, they vary as to their maintenance and the care that must be given them. Some makes are frequently out of order, so that much money is lost by men waiting for repairs to be made. Then, too,

some machines are poorly adapted to certain classes of work, and in buying and using these facts must be considered. Likewise the method of charging should be taken into consideration. One thing seldom investigated by contractors as it should be is the horse power needed to run a mixer. Mixers vary exceedingly in this respect. For small boilers exposed to the weather a single horse power saved means the saving of seven pounds of coal per hour.

Economy of Bins and Hoppers

Bins and hoppers, too, are useful and economical in connection with concrete mixers. Not make-shift affairs, but well designed and constructed bins should be used. For most purposes hopper bottom bins are to be preferred. When this bin is divided into several compartments, to hold different materials, and the bin is to be filled by means of dump buckets, then the top of the bin should be sloped towards the operator, who handles the buckets, so that he can see as he dumps the material, thus preventing it from being mixed. Bins can often be built in sections so that they can be taken apart, and assembled again after being moved, while others can be mounted on wheels and moved at will.

Wagons are used extensively by contractors, and for so many different purposes, that the selection of the proper wagon for each purpose is of importance. For earth hauling and similar work the patented dump wagons, of which there are many makes on the market, are superior to any other style of wagon. It is true that a very good substitute for a dump wagon can be made by using scantlings or poles for a bottom and 12 to 14-inch planks for the sides and an ordinary running gear. These are known as "slat bottom wagons," and for long hauls can be used to advantage, but a man on the dump is absolutely necessary as some one must assist the driver in dumping. The frame can be set in place just before the wagon is loaded. It takes about two minutes to dump a slat bottom wagon, while it is possible to dump a drop bottom patented wagon without stopping the team and latch up the bottom on the way back. It is easily seen that not only much time is saved when a large amount of excavated material is to be hauled, but less wagons will be needed.

Some writers have stated that slat bottom wagons are justified for long hauls, as the time on the dump needed to unload is necessary to spell the horses. On long hauls horses can be spelled, even with drop bottom wagons, and a man is saved on the dump. The only excuse for using slat bottom wagons would be that the amount of material to be hauled does not justify the purchase of dump wagons. To-day, though, dump boxes to fit any running gear can be purchased, and used even for a small amount of material.

One objection to dump wagons is that they are of little use for moving any material that will not dump by gravity, nor are the beds shaped for hauling material which comes in large pieces. There should be no question as to the use of dump wagons when material that can be dumped is being hauled daily, but when wagons are to be used for other purposes, then a contractor should have the ordinary wagons, with their beds and dump boxes for earth and such materials. Dump boxes are valuable, but for regular daily work they are not as economical as the dump wagons.

For some purposes rear end dump wagons should be used. There are a number of different styles for a different purpose. Most of them have higher bodies

than the drop wagons, but as a rule they are of greater capacity.

Dump Cars

The size and character of dump cars to be used for different works is sometimes a difficult problem. Cars may be divided first as to their size. Those of three cubic yards capacity or less are classed as small cars. Other sizes range up to 40 cubic yards capacity and are classed as large cars.

In considering any car proposition one should bear in mind that if the contract is one that demands a certain style of car, and the job is large enough to pay interest on the amount needed to purchase the cars, naturally the special cars should be bought, but if the amount of work is only nominal, then it may not be economical to purchase a special car, but rather one that will be adapted to the work and also be useful for other purposes. This rule is applicable to the purchase of any large amount of equipment.

Small cars for transporting earth, concrete and similar materials are generally more economical than carts, cars, wagons and other vehicles, for short hauls, provided there is enough work to be done to justify laying the track. This, however, is a small item, when "industrial tracks" are used, for these tracks come in sections, with metal ties fastened to the rails with clip bolts, and can be laid in position and fastened together quickly. Regular rails laid on steel or wooden ties can be used, and for small cars even a wooden rail proves satisfactory.

One advantage that small cars have over other vehicles for transportation is the fact that one horse can pull or operate more than one car. If the haul is short, even though the grade be steep, one horse will pull one car, while a second car is being loaded, and will move the second car after returning the first to be loaded. Thus, at least one and possibly two or three horses are saved. Cars with a capacity of less than one cubic yard can also be pushed for short distances by men.

On level grades or on descending grades one horse can often pull two or three small cars, so that they can be operated in trains. Hoisting engines can also be used for this purpose, and at times gravity can be utilized to move the cars, using power only in one direction or for a very short distance. On the down trip both wooden and steel cars are used, the steel cars dumping more cleanly. The latter are thus to be preferred for concrete. Small cars are made in many different styles, yet they can all be grouped into two classes—side dumps and rotary dumps. There are a number of different kinds of side dumps, although all are either "one-way" or "two-way" dumps. A very common kind of two-way dump car in use to-day is the V-shaped, rocker car. This is easily handled by one or two men and can be tilted to load easily.

Rotary dump cars are especially useful in building embankments as they can dump over the end of the bank, thus saving building a trestle from which to dump. Then, too, they can be loaded from any side, and as one end is open for dumping purposes, it makes the car lower, which is an advantage when loading by hand.

Large dump cars are used in connection with steam shovels or other loading machinery, or for ballasting track. Other styles of cars used for these purposes are: flat cars and gondolas with swinging sides that are unloaded with a large plow or unloader. The dump cars either dump through the bottom or the side, or a combination of the two. Some have a great range of

dumping, and spread the material as it is dumped, while others must have powerful spreaders to follow after them.

For steam shovel work the large patented dump cars do not seem to be in favor with most contractors. One reason, no doubt, is that the price is high, while another is that some are leased and not sold. There can be little doubt that one of the economic blunders made in most steam shovel work is that the cars used are too small. Even though the same yardage is carried, the large cars mean more economical train operation, as the journals of the cars are larger, the wheels likewise being larger and better made. Brasses do not wear out quickly, and the length of the train being shorter it is controlled by the locomotive more readily. As a rule, though, the yardage carried in a trainload of large cars will be greater than that composed of smaller cars. The smaller cars, such as four, six and eight cubic yards capacity, are generally built for a narrower gauge track than the larger cars. For some purposes the three-foot gauge is well adapted, but in the writer's opinion, the standard gauge track is the best for most construction work. In the latter case cars and engines are better balanced and operate more easily in proportion to their loads, the track laid is generally more substantial, supplies of coal and other materials for the work can be hauled to their place of destination over the contractor's track. This last point alone may mean many thousands of dollars on an extensive job.

Power Drills Effective and Economical

There is much money lost by contractors on railroad construction by failure to use power drills. In some sections drills are being used extensively and the use everywhere is growing rapidly. Even for light work hammer drills can be used. The cost of a drill and light boiler hardly exceeds \$500, and its work would so far exceed that of men with striking hammer or churn drills as to more than pay the interest and depreciation in a year's time. Certainly power drills should be used on all tunnel work, yet even to-day tunnels are being driven by hand.

Even in the matter of hand shovels and picks care must be exercised in selection. Picks vary much in their length and weight, and are pointed differently. Stone picks, railroad picks and contractor's picks are all meant for different kinds of work, and are economical each in its own place. Yet many contractors use the same style and weight of pick for all purposes.

The same thing is true in regard to shovels. Many contractors think any old shovel will do, but a different shovel is needed for concrete work than that for earth digging or rock shoveling. There should be long handled and short handled shovels in every outfit. Round pointed shovels are used for rock, and square pointed for earth. Spades, too, in stiff plastic clay, are useful and it is well to have some on every job, as a man in some materials can save all the picking.

A great waste in a small item sometimes results from the use of the wrong kind of hand buckets. The one in most common use is the galvanized iron bucket, which is soon bent out of shape. A well made bucket should be used, and although their price may seem high, yet much money is saved with such buckets. There are now sold a number of styles of good buckets manufactured especially for use by contractors.

Scrapers are not always used when they should be, nor are the proper kind always employed. In the western states brick scrapers are used extensively on railroad embankments and canal work, yet one seldom finds them among a contractor's outfit in the east.

The conditions in the west are more suitable for brick scrapers, but they could be used to excellent advantage in the southern states and other parts of the east. Four-wheeled scrapers are very useful tools, yet few contractors have used them.

There are many kinds of excavating machines on the market to-day, yet we see much work that could be done by machinery being executed by hand. This is especially so of trench work. There are a large number of very successful machines in use for excavating trenches and ditches.

Clam shell and orange peel buckets are very economical excavating tools. In connection with derricks and derrick cars and dredges their range of work is extensive. These buckets are built for hard and soft digging, and as the number of men needed to operate them is small, the cost is very low.

Steam shovels are money makers, yet losses are often sustained through serving them with insufficient trains or with outfit of the wrong kind.—The Contractor.

Certain Considerations Affecting the Selection of Bitumens and Mineral Matter.

Everywhere highway engineers are giving much thought to the use of bitumen in the construction of macadam roads; and while the standardization of specifications for bitumens in the forms of oil, asphalt, tars and pitches is probably near at hand, I believe that sufficient thought is not being given generally to the mineral matter used in conjunction with the bitumen. Whether the bitumen be used in the body of the roadway, or to form a waterproof and resilient mat on the surface to protect the macadam from wear by abrasion, the results from this form of road construction will largely depend upon the mineral matter and its suitability for the bitumen used. The same difficulty was experienced in the first sheet asphalt pavements that were laid.

In the construction of bituminous roads and pavements, I am of the opinion that a great many bituminous materials, when properly used, may prove entirely satisfactory, but that the use of these same cementing products may result in complete failure, if the mineral matter has not been suitable. Not only may the cementing properties of most bitumens be lost by the use of too much mineral dust, but whether oil, asphalt, tar or pitch is used, it is also fully as essential to study the character of the available mineral matter, as it is to determine the nature and character of the bitumen to be used.

Experience has shown that the life of an asphalt or bitulithic pavement depends as much upon the character of the aggregates as it does upon the cementing bitumen, and this theory holds good in the formation of a bituminous concrete or a bituminous wearing surface for a macadam road.

Different bitumens vary in their ability to penetrate the mineral matter. Coal tar products possess a penetration property not usually found in oil-asphalt cements, and further in using these last in the construction of a bituminous macadam road, it is necessary that the stone be free from dust to secure proper adhesion. With the coal tar products this precaution is not so essential, but in a broad sense, mineral dust

* Paper by Jas. C. Travilla, Street Commissioner, St. Louis, Mo., presented at the recent meeting at Minneapolis, Minn., of the American Association for the Advancement of Science.

is about as objectionable as moisture in the construction of bituminous roads.

The life of a bituminous road or pavement depends as much upon the wearing qualities and the grading of the mineral matter that forms the roadway surface, as it does upon the adhesive and cohesive properties of the bitumen.

A soft limestone wearing surface of a bituminous macadam road, provided the road be constructed according to the generally accepted practice of placing the large stone on the bottom, will not prove a success if subjected to heavy traffic. If the process of construction be reversed, however, good results may be obtained, since crushing strength varies as the square of the lineal dimensions. This method affords stability in road construction that cannot be obtained in the usual way. The life of the road may be increased by a cushion coat of fine material matter to absorb the impact of the calks of the horses' shoes and to lessen the abrasion caused by steel wagon tires.

My experience in the construction and maintenance of roads and pavements leads me to believe that the nearer the approach to a resilient wearing surface, the longer will be the life of the road or pavement. For example, a treated wood block pavement is to a certain degree resilient which adds to its life and increases its desirability; extremely hard-burned vitrified brick will not wear as uniformly nor as well as softer brick and where a cushion coat of clay or sand only a fraction of an inch in depth is maintained over the surface of the brick, the life of the pavement is greatly increased; an asphalt pavement in which the cement is very hard will wear much more rapidly than one in which a softer cement has been used, and likewise, the squeegee coat of a bitulithic pavement adds much to the life of the latter. Not brittle at low temperature, nor extremely soft at high temperature are two desirable requirements characteristic of resilient road construction bitumens.

The statement that certain heavy road oils on the market "carry" a certain per cent. of asphalt, does not mean much to a road engineer familiar with their use. It is admitted that the greater per cent. of asphalt, the better the oil for the work; but an oil carrying sufficient asphalt to have adequate adhesive and cohesive properties for making a bituminous concrete or bituminous wearing surface, is other than what is ordinarily sold for the purpose. Such an oil-asphalt product could not be handled in the tank cars now in the service of the oil companies, since they do not possess the necessary steam coil capacity to raise the temperature sufficiently high for successful handling.

Grades of Oil for Surface Treatment

St. Louis has specifications for four grades of oil for surface treatment, and from careful study of results during the past three years, I am fully satisfied that there is place for each grade.

The grades of oil used are as follows:

No. 1.—Residuum oil, having a gravity of 30 deg. Be., it is applied cold and is used on cinder roads and for the purpose of giving life to the surface of a road that has previously been treated with a heavier product and is becoming dusty. Being merely a dust layer, it should not be considered as having any binding properties.

No. 2.—Residuum oil, having a gravity of 20 deg. Be., it is applied hot and is recommended for park roads and roads that are not main arteries of travel.

No. 3.—Residuum oil, having a gravity of 16 deg. Be., it is applied hot and is used on the main thoroughfares having a mixed traffic and acts as a temporary binder for the mineral matter.

No. 4.—An oil-asphalt compound having a gravity of 12 deg. Be., it is applied hot and is recommended for any type of road, since it simply forms a binder for the mineral matter which actually bears the traffic.

In the use of all the grades of oil referred to, with the exception of No. 1, there should be a covering of mineral matter, uniformly distributed over the surface of the oil to a depth of from $\frac{1}{8}$ to $\frac{1}{2}$, depending upon the amount and gravity of the oil applied.

The work of treating a road surface after applying the oil and mineral matter is not completed for several weeks. As soon as the road is open for traffic, it is necessary to give it attention for some time to take care of any wet spots that may appear.

It must not be presumed that surface treatments will provide a dustless roadway from April to November, without any additional work. What would be the appearance of any improved street, under heavy traffic, if not properly cleaned for a period of six months? It is therefore necessary to properly patrol treated road surfaces to keep them in a cleanly condition. It is also essential that all road intersections be treated, as the dust and dirt carried onto a road will materially shorten the life of the treatment.

When traffic and road conditions have been ideal, we have had surface treatments last through two summers with every indication of at least a year or more of wear without attention other than the maintenance. This condition, however, will not exist on the average highway and it is not reasonable to presume that a road receiving such a wearing surface should have a long life. The cost of treatment being inexpensive, considering the results, the work may be done each year.

Care Needed in Concrete Work

The Cleveland Chapter of the American Institute of Architects, the Cleveland Engineering Society and the Builders' Exchange joined in appointing a committee to investigate the collapse of a four-storey reinforced concrete building which was being erected for the Henke Furniture Company, of that city. The collapse was a disastrous one accompanied by the death of four persons and the injury of seven others. The commission paid nine visits to the ruins, held seventeen public sessions at which eighty-six witnesses were examined, besides twenty-eight private sessions.

The commission held that the initial failure was due to the premature removal of forms and supports in the third storey, and found that the architectural supervision was deficient, that the concrete used was of poor quality and not properly placed, while the owner and the city had a share in the responsibility for failure to watch the work and enforce the ordinances. The conclusion of the committee was that the collapse gave no reason to condemn the use of concrete in combination with steel, provided the concrete was composed of proper materials, accurately measured and thoroughly mixed; the steel sufficiently strong and properly placed; the work installed by competent contractors and workmen; and the specifications, drawings and construction properly executed under the direction of competent designers and inspectors.

Initial Cost of Concrete and Wood Piling

Fallacies Entertained by Architects and Owners—The Respective Merits of Both Forms of Construction—Comparison of Actual Costs

By Philip J. Kealey

When, in the construction of any large building structure, an investigation of the foundation site has shown that piling will have to be used, the engineer or architect is immediately confronted with the advisability of selecting either of two types, wood or concrete.

In this selection of the kind of piling many things will undoubtedly be considered by the engineer, such as the permanency of the concrete piling, the ability of securing a perfect bond between the pile and the foundation piers of footing, and the additional loading which a concrete pile will safely carry compared to a wood pile. Also, since concrete piling is comparatively new, the engineer will probably consult with the agents of a concrete pile, who, feeling that the burden of the proof is in them, will bring forth many additional arguments as to why concrete piling should be used and why wood piling should not be considered. They will show that wood piling is only safe from decay when below the ground water line, necessitating considerable excavation and extra concrete in the piers to bring the work up to the grade of the top of concrete piles, which of course can be left protruding if desired. Then it will be proven that by the constant lowering of sewer grades in many of the cities, this ground water line is being lowered with the result that pile foundations which were all right a year ago may be unsafe and dangerous to-day, and an expensive rebuilding of them becomes necessary. Many other arguments favoring the use of the concrete pile will be brought out, but Mr. Architect interrupts to ask what the piling will cost his client. The answer in all probability is that the concrete piles will cost about \$1 per foot in place, while timber piles can be secured at a price varying from 22 to 30 cents per foot driven. At once the favorable impression created by the concrete pile agents begins to vaporize, the owner is consulted and nine chances to ten he wants to economize in every way possible, so that when assured by his engineer that the wood piles are safe, he decides that the concrete piles are an expensive luxury and the former are driven. In vain the concrete pile engineer shows that while the initial cost may be more, the investment is permanent and no depreciation takes place, and that less feet of concrete piling will be required to support the same load than will of timber. The difference in initial cost is a disparagement too great to overcome.

It is to show the fallacy of the conclusion arrived at by the architect and owner in the above paragraph that this article is written and to prove that even on the prices quoted the first cost of the concrete piling will be less expensive in many cases. The cost data hereinafter given were carefully collected. The conditions under which the work was prosecuted were most favorable and the unit prices are quite reasonable.

In the erection of a large industrial shop in the Chicago district during the summer of 1910, a pile foundation was necessary and the question as to the

kind of piling arose. The building site was on filled ground, near a river, with the ground water line approximately 14 feet below grade, and the piling depended largely on skin friction for bearing power.

A proposal was made to furnish concrete piles at \$1 per foot, but wood piles were selected because they could be secured at 23½ cents per foot in place. The piles were designed to carry 20 tons each and the number of piles varied from 4 to 9 under each pier. The contractor was allowed 12 cents per foot for each foot followed.

Driving.—The following is the cost data on the pile driving operation:

Total piles driven, approximately	1,250
Total linear feet driven, approximately	50,000
Total linear feet followed, approximately	6,000
Actual cost of pile (to company) per foot driven 25.15 cts.	
Actual cost of one pile (driven)	\$10.21

The piles were driven during July and August.

Sawing off Heads.—The piles were cut with a cross cut saw about 4 feet long worked by two men who received 35 cents per hour each. The heads were hoisted out by a three-leg derrick and single block, six men being required to hoist up and dispose of them. These laborers received 25 cents per hour. Water existed in many of the holes which varied from 12 to 15 feet in depth. The average cost to cut off each head, get in out of the hole and dispose of it was 38 cents. The unit cost varied from 17½ cents to \$1.35.

Excavation.—The cost per cubic yard for excavation was \$2, which price included back-filling. The pier holes were in many instances full of water, entailing pumping, sheeting was necessary to prevent caving, double and triple casting of dirt was frequently required and much of the material handled was slush, so that the price per yard was not excessive. The amount of excavating required for various size piers and the cost per pile was as follows:

4 piles 6x6x14.5=19.3 cu. yds. at \$2=\$38.60, or \$9.65 per pile
5 piles 6.5x6.5x14.5=22.7 cu. yds. at \$2=\$45.40, or \$9.08 per pile.
7 piles 7x7x14.5=26.3 cu. yds. at \$2=\$52.60, or \$7.51 per pile
9 piles 7.5x7.5x14.5=30.2 cu. yds. at \$2=\$60.40, or \$6.71 per pile.

The majority of the piers rested on the smaller number of piles so that the average cost of excavation per pile was \$8.61.

Concrete Caps and Piers.—The cost of the concrete work in the piers was \$5.40 per cu. yd., the contractor furnishing all materials and forms. From the detail drawings the cubical contents of the piers are found to be as follows: 4 pile, 6.3 cu. yds.; 5 pile, 6.8 cu. yds.; 7 pile, 8.0 cu. yds.; and 9 pile, 8.7 cu. yds. At \$5.40 per yd. the cost of the concrete work in place was as follows:

4 pile 6.3 cu. yds. at \$5.40 = \$34.02, or \$8.50 per pile
5 pile 6.8 cu. yds. at \$5.40 = \$36.72, or \$6.17 per pile
7 pile 8.0 cu. yds. at \$5.40 = \$43.20, or \$6.17 per pile
9 pile 8.7 cu. yds. at \$5.40 = \$46.98, or \$5.22 per pile

The average price per pile for the concrete cap

* In Engineering-Contracting.

and the pier from cap to footing grade, was \$7.15.

Recapitulation.—From the foregoing figures the following table summarizing the cost of a pile in the various size piers is obtained:

Item.	Cost Per Mile.			
	4 pile.	5 pile.	7 pile.	9 pile.
Driving and following ...	\$10.21	\$10.21	\$10.21	\$10.21
Sawing heads	0.38	0.38	0.38	0.38
Excavating and backfill..	9.65	9.08	7.51	6.71
Concrete	8.505	7.34	6.17	5.22
	\$28.745	\$27.01	\$24.27	\$22.52
	4	5	7	9

Cost of completed pier \$114.98 \$136.01 \$169.89 \$202.68

Concrete Piles.—Numerous tests have shown that where the loading is supported by skin friction, a short tapering concrete pile will sustain as great or greater a load than a long wood pile and for that reason it was proposed to use 24 ft. piles on this work had concrete piles been selected. In tests made in just such soil conditions as existed in this case, it was demonstrated that the concrete piles could stand from two to three times the loading, without settlement, that the wood piles could carry, but in order to be conservative 50 per cent. greater loading is assumed for a comparative basis of cost. The cost of a 4 pile cluster (assuming same loading as on wood piles) of concrete piles would be:

Piling, 4 at \$24	\$ 96.00
Excavation for cap at 2 cu. yds. at \$1.00	2.00
Concrete in cap 2 cu. yds. at \$5.40	10.80
	\$108.80

Assuming 50 per cent. greater bearing power, piles to be driven on 2 ft. centres, the cost of a 4 pile cluster would have been:

Piles, 3 at \$24.00	\$72.00
Excavation, 2 cu. yds. at \$1.00	2.00
Concrete cap, 2 at \$5.40	10.80
	\$84.80

This is a saving of approximately 26.5 per cent. of the initial cost of the wood piles. Upon the same premises, the cost of the different size piers would have been as follows:

Cost of Concrete Pile Piers				
Number of wood piles.	4	5	7	9
Cost of concrete piles..	\$72.00	\$96.00	\$120.00	\$144.00
Cost of excavation ...	2.00	2.00	3.00	3.00
Cost of cap	10.80	10.80	16.20	16.20
Total cost	\$84.80	\$108.80	\$139.20	\$163.20

A comparison of the cost of the complete wood pile piers necessary to take care of the same loading, with the concrete piles and the per cent. saving in initial cost in favor of the latter is shown in the following table:

Size of Wood Pile Piers.				
	4-pile.	5-pile.	7-pile.	9-pile.
Concrete	84.80	108.80	139.20	163.20
Wood	114.98	135.05	159.89	202.68
Per cent saving in initial cost	26.4	19.45	18.1	19.5

It is evident from the above figures that a saving of over 20 per cent. of the initial cost of the foundation work would have been effected by the use of concrete piles, under the conditions which existed on this job. This saving is brought about by avoidance of expensive excavation and deep concrete piers necessitated by the wood piling and would be approximately the same percentage in the nine-pile cluster, as it is in the four-pile.

On further analysis, it would appear that where

the ground-water line is 8 feet or more below grade, the initial cast of the foundation work below grade would be less if concrete piles were selected in preference to wood, although the cost of concrete piles would be \$1 per foot and wood piles 25 cents per foot driven.

Competition for Plans for Working Men's Homes

The Model Homes Association of Ottawa has inaugurated a competition among architects' draughtsmen for designs of workingmen's homes. For some time the class of houses erected by builders for this purpose has not been satisfactory and the association is convinced that houses of better appearance and more adapted to the requirements can be erected at no greater cost.

The originator of the plan was Mr. C. P. Meredith, the well-known Ottawa architect. His Excellency, Earl Grey, and many leading government officials have become patrons of the association.

Circulars will be sent out through the Dominion so as to give all draughtsmen a chance to compete. Architects are invited to send in plans on a non-competitive basis. The best designs submitted will be reproduced and kept on file at the City Hall. These will be available upon application and for a small fee. The scheme will have no adverse effect upon the architectural profession inasmuch as the maximum value of the houses will be \$2,500.

There are 18 classes of houses for which designs are asked and prizes of \$15, \$10 and \$5 will be awarded in each class. The closing date for submitting plans is May 20. Full particulars may be obtained upon application to Mr. A. J. Hazelgrove, Hon. Secretary, Model Homes Association, 126 Sparks street, Ottawa.

The contract has just been awarded and work started in connection with the establishment of a Swiss Guides' Village in the Rocky Mountains one mile from the town of Golden, B.C. This enterprise is under the direction of the Canadian Pacific Railway Company, and will add one more attraction to the Columbia Valley. The novel little village will consist of six Swiss chalets which will be the home of as many mountain climbers and their families. The cottages will be attractively situated on the mountain side some 200 feet above the railway track, and they are to be all completed by September 1, when the families of the guides are expected to arrive in this country. For several years past it has been the custom for these guides to return to their homes in Switzerland at the close of the mountain climbing season, returning to Canada the next summer. This move indicates that the institution inaugurated by the Canadian Pacific Railway as an experiment a few years ago, is to be a permanent feature of tourist life in the Rocky Mountains. The name of the new village will be Edelweiss.

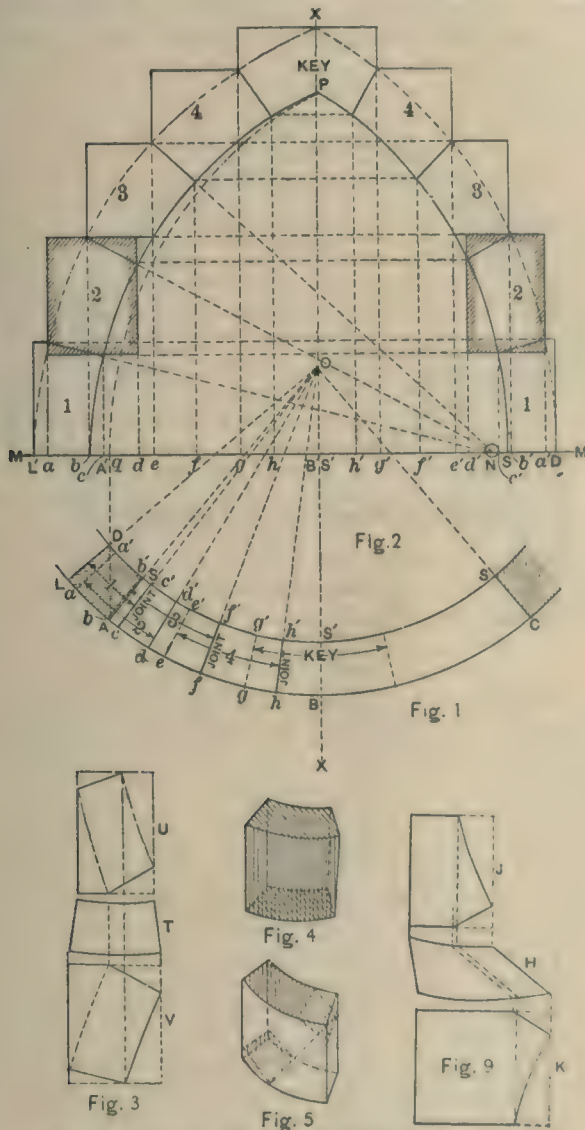
Although spring is rather late this year around the Ottawa Valley, Mr. J. A. Jamieson, manager of the Jamieson Lime Company, Renfrew, has already started his kilns to meet the demand of his large and growing trade. Renfrew Lime, put out by this company, is becoming known from one end of the country to the other for its superior quality. Users after paying the difference in freight rates through long haulage claim great saving and satisfaction. Mr. Jamieson last year took over the plant of the Renfrew Brick & Tile Company, which, with his own extensive plants, now places him in a better position than ever to meet the increasing demands for his products.

At Sydney, N.S., extensive works are being erected for the Dominion Iron & Steel Company. The total estimated expenditure is \$4,000,000.

Problems of the Building Contractor

Developing the Soffit of a Gothic Arch in Stone—A Novel Form of Roof Construction—Bonding Layers of Concrete

The masonry problems which often confront the builder are of a nature to call for considerable ingenuity and skill in solving them, and one of the fields in which these problems are likely to arise with considerable frequency is in the construction of masonry arches of various kinds. In the sketches which are presented herewith are shown the method of developing the soffit of a Gothic arch in stone as demonstrated by Albert Watts, of Birmingham, England,



Figs. 1 to 5, inclusive, Show Plan, Elevation and Details of Arch having Splayed Jambes

Developing the Soffit of a Gothic Arch in Stone

writing to one of our London contemporaries. Fig. 1 represents a plan of the arch, Fig. 2 an elevation, while Figs. 3, 4, 5 and 6 clearly indicate the shape of some of the stones used in the construction of an arch having splayed jambs. In Figs. 7, 8 and 9 is represented an arch with square jambs.

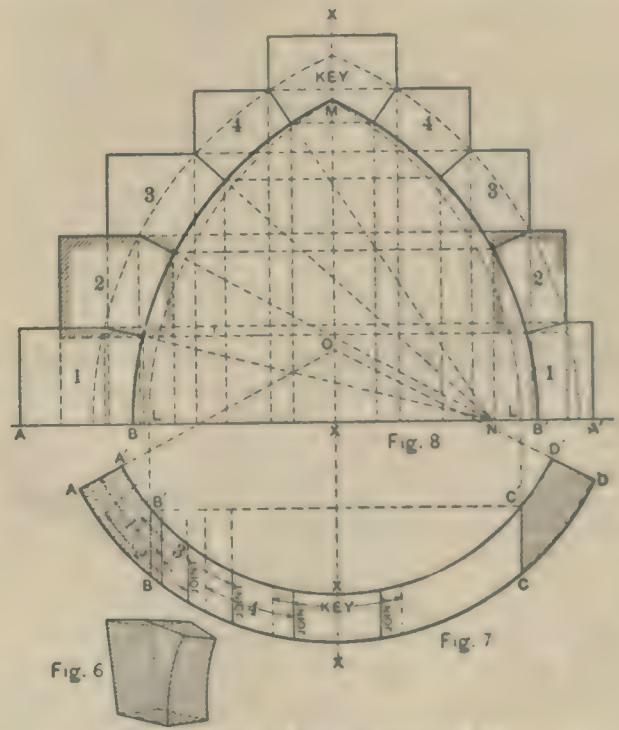
To develop the soffit of the arch indicated in Figs. 1 and 2 we first draw the plan A, B, C from the radius O to the circle required for the face line of the arch, marking off

the opening of the arch A-C in plan.

Having determined the thickness of the arch, draw the lines A C radiating to the centre O, these lines giving the splayed jambs, while S S represent the opening inside the arch.

To set up the elevation, Fig 2, mark off the height of the soffit at P on the centre line X X, then develop the line L A B in plan and mark it off on elevation at L' A' B'. Having done this, draw the soffit A' P from the radius N, this being the development line of the soffit (the dotted line q P being the soffit line, square section). Divide the line A' P into the number of stones required and strike the joints from the radius N. Build up the stones as shown at 1, 2, 3, 4 key. Now drop lines from outside as shown at L', a, b, c, d, e, f, g, h. Transfer these to plan and from each draw lines radiating to the centre O, the lines representing the soffit joints, and the dotted lines the back joints of each stone, thus giving the bed molds and the developed face molds 1, 2, 3, 4 for the outside of the arch.

To develop the inside of the arch lay out on the elevation the line D S S' in plan, then transfer the lines a', b', c', d', e', f', g', h'; protect these lines to the elevation and draw



Figs. 6 to 9, inclusive, Relate to a Gothic Arch having Square Jambes

horizontal lines parallel to the springing line M M from the soffit joints and beds. Where the soffit lines intersect the lines c', d', f', h', draw the line S P through these points and we have the development of the soffit line inside the arch. From these intersections draw the joints to where the bed lines intersect the lines a', c', e', g', and we have the development of the inside face molds, 1, 2, 3, 4 key.

To work arch stones, No. 2, the molds required are the

bed mold T, and inside face mold U, and outside face mold V, as shown in Fig. 3. The height of the stone is obtained from the elevation, which is shown by the shade lines. Commence by working the bottom and top beds parallel to each other, then apply bed mold on both beds and work it through, which will give a stone as shown in Fig. 4. Then apply inside and outside face molds, as shown by dotted lines, Fig. 5; work the joints and soffit through and we get the finished stone, as shown in Fig. 6.

To develop the soffit of the square jamb arch, Figs. 7 to 9, proceed as described in the previous example. First set out the plan A B C D, A' B' C' D', Fig. 7, then developing it out on elevation A B X X' B' A', Fig. 8. Only in this case the inside elevation will be a little larger than that of the outside on account of the plan line B' X' being longer than the plan line B X, because of the jambs being square to the line B' C' in plan instead of radiating to the centre O, as in the arch where splayed jambs are shown, and the joints also will be square to the line B' C' in plan as shown, this causing the bed molds to be different in shape to those previously shown.

The dotted lines L M L in elevation show the square section of the arch, and the soffit lines B M B' show the developments of the inside and outside the arch.

To work the stone, No. 2, the molds required are shown in Fig. 9, where the bed mold is a different shape to the bed mold shown for the previous arch; but, nevertheless, the stone is worked and the molds applied in just the same manner.

In Fig. 9 H shows the bed mold, I the inside face mold, and K the outside face mold.

A six-storey reinforced concrete building in Boston, for the use of a motor car company, has circular columns of the same diameter as the upper and lower stories and has a long span floor construction permitting a deep turntable well of large diameter in each storey. The exterior faces of the walls, says The Scientific American, are relieved by panels and moldings integral with the body of the wall. The front wall corresponds with the brick and stone face of an adjacent building and has a rather elaborate trimming of concrete, dentals, and carved stone, all of which, except the last, are cast integral with the body of the wall.

New Method of Bonding Layers of Concrete

The problem of securing a perfect and durable bond between successive layers of concrete, is one of which every cement worker realizes the importance, says the Cement World. Special interest therefore attaches to the reported development of a new method of accomplishing this desired object. It is the discovery of Mr. J. A. Jamieson, of Montreal, Que., and is said to have been employed with highly satisfactory results in a variety of work, including the construction of a reinforced concrete elevator and a reinforced concrete conduit 10½ feet in diameter and 8,000 feet long, working under 33 feet head.

The surface of the concrete, approximately horizontal, is allowed to stand until water which may have flushed to the top has disappeared. When this result is attained, and while the mass is still moist, the entire surface is covered with a 1 to 1 dry mixture of cement and sand, to a thickness of about ½ inch. If necessary, this is protected with tarpaulins or boards. The moisture on the fresh concrete produces a partial set in the dry mixture. This is true of the particles in direct contact with the green concrete, the effect diminishing rapidly and the upper portion of the dry mixture remaining unaffected. The next layer of concrete is applied without removing the dry layer, the moisture in the fresh concrete completing the set through the half-inch dry layer, and producing a decided bond of the two courses. Briquet-

tes made of cement mortar in two parts and joined by this method, developed a strength more than half as great as others made of the same material in a single piece. This would seem to be quite a satisfactory test.

Concrete Roof Trusses

A novel and interesting form of roof construction in reinforced concrete has just been completed in a London public bathhouse at Hammersmith.

The arched ribs shown in the section were taken as standing independently and were spaced 12 feet apart. The weight of the galleries was taken into consideration, but no allowance was made for them as stiffeners. Taking the arch ribs and purlins at 1 1-3 cwt. per cubic foot and the roof covering at 1-6 cwt. per square foot, the weight of half the arch was found to be equivalent to a vertical pressure of 18.9 T and a horizontal thrust of 14.2 T. The concrete was composed of gravel, sand and cement in the proportions

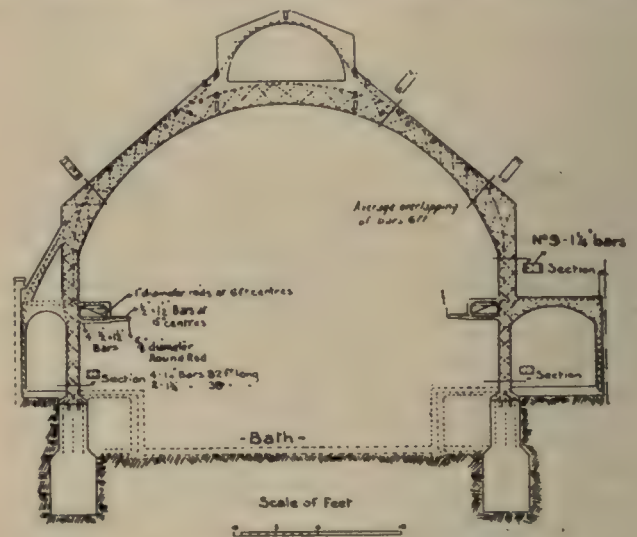


Diagram illustrating details of Reinforced Concrete Roof Trusses

of 4:2:1. The Kahn system of reinforcement was used throughout. The general type of construction is sufficiently indicated by the illustration, for which we are indebted to The Builder.

The entire plaster mill plant of the Albert Manufacturing Company, Hillsborough, N.B., was destroyed by fire recently at a probable loss of from \$125,000 to \$150,000. The company, with commendable enterprise, has decided to rebuild on a large scale and the manager, Mr. Osman, is now in New York making the necessary arrangements with the other directors of the company. The site is now being cleared and building operations will proceed at once. During recent years this company has made rapid progress by reason of its enterprising and business-like methods, and the temporary break in the continuity of its success will in no wise affect the ultimate destiny of the industry.

Six years ago the J. I. Case Threshing Machine Company put on the market their power steered 10-ton steam road roller—the only one of its kind on the market. The intervening time has witnessed many developments in their various lines of manufacture. This year they are turning out an excellent line for road building. In addition to the road roller and road sprinkling wagons they are now featuring Perfection graders and drags, rock crushers, rotary stone screens, rosters, road scrapers, railroad and township plows, Troy reversible bottom dump wagons, Case municipal tractors, and Case contractors' hauling engines.

Long-Span Concrete Beams

A large reinforced concrete building, having a number of unusual features, has been built in Manchester, England, for the Young Men's Christian Association. "The Builder," of London, from which these notes are taken, states that the building is 97 x 108 feet in plan and that it consists of practically seven floors and two basements. The building is about 75 feet high from street level to the main roof and about 100 feet high above the lowest basement floor. The most unusual features are the swimming pool between the fourth and fifth floors and the details of the main auditorium and the gymnasium. The main auditorium is about 26 feet in clear height, 52 feet wide and 84 feet long, entirely free of columns, the gallery, of a maximum width of 11 feet 9 inches, being cantilevered out from the columns along the walls. The fourth storey, immediately above the auditorium, is occupied by class rooms, and since there are no columns in the auditorium the floor is carried by three beams of 50 feet span, which also carry the gymnasium floor immediately above. The loads made it necessary that these beams be very deep and they were consequently formed in the walls between classrooms and were pierced at the centre by a doorway for the corridor. The beams are 12 in. wide and 12 ft. deep. The gymnasium is 52 ft. wide and 92 ft. long, and like the auditorium, is free of columns. Immediately above it are two fives courts, the walls of which are used as girders for carrying the floor of the courts, that is, the floor above the gymnasium, and the running track, which is carried by rods, encased in concrete, at the outer edge and by the walls on the other side. These walls, acting as beams, are 53 ft. 10½ in. long, 15 ft. 5 in. deep and 14 in. wide. The front of the running track gallery forms a continuous beam between the hangers. The swimming tank, 21 ft. wide and 60 ft. long, is between the fourth and fifth floors, with its bottom 50 ft. above the street level. It is constructed entirely of concrete and is carried by seven transverse beams of 26 ft. clear span. The architects were Messrs. Woodhouse, Gorbett & Dean, of Manchester, and the structural engineers, the Trussed Concrete Steel Company, Limited, of Westminster.

Floor Beams in Mill Construction

"The method of connecting the floor beams to the walls and each other is of the utmost importance (in mill construction), and it is in the method of doing this that most designers fail," says F. W. Dean, of Boston, in a recent paper. "A floor beam should form a continuous tie from wall to wall in order to be effective. It should not be strained while it is being put up, or afterwards, until some disturbing event occurs to bring it into action as a tie. The method of securing it to the wall should be such that neither the brickwork nor the beam fastenings shall be strained until the disturbing event occurs. Into the brickwork there should be built a cast iron plate with side ribs, or, better still, a cast iron beam box, to take the end of the beam. There should be nothing cast on this plate or box to enter slots or holes in the beam, as is often done. The plate, or bottom of the box, should project into the mill far enough to receive a lag screw, and this should be the means of securing the beam to the plate or box, for reasons that will appear.

"Where the beams butt against each other over the columns they should be fastened to each other by two forged steel dogs, with inclined ends driven into holes on top of the beams and not on the sides. The beams are thus drawn together and are virtually one piece. After this is done the lag screws in the wall plates or beam boxes can be put in, thus making a rigid tie across the building without straining any part, splitting the ends of the beams, or

pulling the bricks apart. By this method of connecting the beams to the walls, when the dogs are driven, if the beams move they can slide on the wall plates. After the beams are dogged together, lag screws should be put through the column caps, thus holding the column in place, and try tying the beams together on the underside. Grooves are made on the top of the beams for allowing the dogs to be depressed so that the planks can be laid over them. By placing the dogs on top of the beams they are invisible and cannot come out."

Impermeability Tests of Concrete

In order to discover some method of waterproofing which would produce impermeability in mortar and concrete only 4 in. thick when subjected to a head of water of 100 ft., and which would not be prohibitive in cost, a series of tests was made at the Engineering Experiment Station of the Iowa State College, Ames, Ia., by Mr. W. A. Burton. The specimens were in the form of pipes, 18 in. long, 6 in. in inside diameter and 4 in. thick. The concrete was mixed in proportion of 1:2:3½, though there were a few specimens mixed 1:3:5. Atlas Portland cement, fairly well graded sand with 35 per cent. voids, gravel retained on a No. 8 sieve and running up to 1½ in. in diameter, and crusher-run stone passing a 2½-in. screen were used. The mix was moderately wet, so that it would quake with a little agitation. The waterproofing materials were clay, alum and soft soap, and reground cement. A few wires were imbedded for reinforcing. The pipes were tested between bulkheads of 2½ x 16 x 16-in. plates held against the ends by eight 1-in. bolts. A ¼-in. rubber gasket was placed between the plate and the pipe.

In the first set of tests, made with pipe 60 days old, the measurement of water passing in 20 minutes at the end of three hours was chosen as the standard. At the end of this time the pipe would in most cases have reached its maximum leakage. In some of the best pipes it appeared later that maximum leakage may not come for a couple of days, but still there was not much leakage after 24 hours. In the second set of tests it was first intended to find a pressure for each kind of pipe at which there would be no leakage after 24 hours, but this was found to involve so many guesses that instead it was decided to test at the age of 90 days under the same condition as in the first test, except that the measurement was made at the end of 24 hours instead of 3 hours. All of the best pipes tested as well or better in the 90 than in the 60-day test.

The following summary gives the conclusions reached by Mr. Burton: All of the tests showed that broken stone is much better for impermeability than gravel. The effect of clay, which had been prepared by grinding until 98 per cent. passed a No. 200 sieve, was rather disappointing. When the cement was replaced by 10 per cent. of clay the leakage was decidedly cut down as compared with specimens having only 5 per cent. of clay. One specimen containing no waterproofing showed practically no leakage. The soap and alum waterproofing gave very satisfactory results, the pipe tested when 90 days showing practically no leakage at the end of 24 hours. This specimen was afterwards kept under a 45-lb. pressure for 12 days. The maximum leakage, 10 drops per minute, occurred on third, fourth and fifth days. It then decreased to one drop per minute. The pipes made with reground cement showed less leakage than any of the rest, the leakage being practically nil under a pressure of 50 lb. per square inch. Tensile tests indicated that soap and alum do not materially affect the strength, and that reground cement increases it, the strength of these briquettes being about 25 per cent. in excess of those made with ordinary cement.

Correspondence and Current Topics

"Dr. Peter Gillespie, Dean"—Cement Interests and the Exhibition Authorities — The Engineer as Sole Arbitrator: Suggested Alternatives

Editor, Contract Record:

I desire to call your attention to a pamphlet being distributed in Canada by the Hercules Waterproof Cement Company, of Buffalo and New York, which gives a summary of tests made by me last summer on some of their Hercules Strengthening and Waterproofing Compound.

In the first place, I am incorrectly described therein as "Dr. Peter Gillespie, Dean, Department of Civil Engineering in the University of Toronto."

In the second place, in justice to the public and myself, I wish to state that certain parts of my report have been omitted, and that in consequence, the impression obtained by the reader of the summary of tests in the pamphlet is quite different from what the public would receive from reading the report I submitted to the company.

I have notified the Hercules Company that I object to the summary of the report as set out in the pamphlet, and I have requested them to discontinue its publication. The Ontario Lime Association, the agents of the Hercules Compounds in Canada, inform me that they are in no way responsible for the contents of the pamphlet.

Very truly yours,

Peter Gillespie,

Lecturer in Applied Mechanics,
University of Toronto.

Cement Interests and the C. N. E.

Editor, Contract Record:

We believe that cement users are too busy during the Canadian National Exhibition to attend a Cement Show and take full interest therein. The machinery exhibited at such a season would lack the improvements and perfections it would naturally have if the makers had the benefit of the slack winter season to work out their schemes of improvement after their former product had been subjected to a season's test and the imperfections had been brought to light. Without improvements in the machinery line the exhibit would cease to attract cement users.

Yours truly,

"Concrete Workers."

Concrete Industry Deserving of Better Recognition

Editor, Contract Record:

We have read Mr. Snaith's letter in a recent issue of your journal, and are inclined to agree with him. It is a fact that the cement shows both in the United States and Canada have always been held in the winter months. As these exhibitions are held for the benefit of concrete men and as it is generally very difficult, if not impossible, to place concrete work in freezing weather, the winter time seems to be the most appropriate to hold these exhibitions. The contractors generally are not busy and have ample time to attend the exhibition and convention. Coming as they do just before the opening of the building season these shows afford the opportunity for contractors to select additional equipment for their season's work.

The only advantage of holding this exhibition in conjunction with the Toronto Fair is that the general public

attend the Canadian National Exhibition in great numbers, and with a large number of people it is their annual holiday. Furthermore, the Toronto Exhibition generally gets a greatly reduced rate on the railroads.

I doubt very much whether we could interest the Toronto Exhibition Board to the extent of getting a building for concrete exhibits. For years these people have refused to recognize the exhibitors of concrete machinery and have treated them very badly, setting aside no permanent space where this type of machinery can be exhibited. Every year we have found ourselves moved to a different location, and the exhibits are split up and spread at different points on the grounds.

We believe that the concrete industry should receive some recognition by the Toronto Exhibition Board, and a permanent space should be allotted to exhibitors of concrete machinery and products, so that the public who are interested in this wonderful building material will know where to find these exhibits. It is to be hoped that the Canadian Cement and Concrete Association will appoint a delegation to take up this matter with the Toronto Exhibition Board before the next annual fair.

In our opinion we hardly think a cement show can be pulled off successfully in conjunction with the Toronto Exhibition.

Yours truly,

Ideal Concrete Machinery Company, Limited.

Engineer as Sole Arbitrator

Westmount, April 4th, 1911.

Editor, Contract Record:

The leader on the above subject in your issue of the 29th ultimo is one deserving the attention of all engineers, municipal and otherwise.

The position of engineer as sole arbitrator on his own work is, to say the least, dangerous. While the engineer is in the best position to interpret his own specification, there often comes a breaking point between contractor and engineer when litigation or arbitration is forced upon the parties.

A point that is often lost sight of is that a specification is drawn up for the convenience of all parties to the contract. That being so, the engineer is in no position to be sole arbitrator.

The writer holds no brief for contractors but has only a desire to see engineers protect themselves and at the same time protect their employers.

Three methods of settling disputes suggest themselves:

1. Both parties to resort to the law courts. Without throwing any reflection on our legal brethren, this method cannot be regarded as satisfactory. It is costly and long, and very often incorrect.

2. In Great Britain, a practice often adopted is that the engineer names another member of the profession as sole arbitrator and the contractor agrees to this before signing the contract.

3. In South Africa, the writer found the following method to be satisfactory:

A list of names of engineers was printed in the specification and the contractor, before signing his contract, had to name one of these engineers as the sole arbitrator. This

may seem to anticipate difficulties but in my opinion not more so than when an engineer names himself sole arbitrator.

Yours truly,

Arch. Currie.

Styles of Woodwork

Editor, Contract Record:

Wishing advice on the purchasing of some literature dealing with woodwork, and in particular with the various "styles" or "periods," I have been recommended to appeal to you. A short explanation will enable you to see my difficulty more clearly. I am a ship's hull draughtsman (steel work). The firm I am with found it necessary to send me over to the joiners' shop to lift the bevells of the doors, windows, etc. However, I find that I have also to get out full size details, and as these are in different "styles" I am somewhat put out. For instance, the dining room is to be Colonial style, the smoking room Flemish, I think, something else, "Adams," and another "Queen Anne."

Can you recommend me any book which treats with these various "styles?" As a draughtsman I prefer a book giving sketches rather than photographs.

Yours sincerely,

Draughtsman.

Read "A History of Architecture," by Prof. Banister Fletcher, page 578—The "Queen Anne," "Georgian," "Piedmont and Portico" or "Eighteenth Century" style.

Books of Reference

Adam, R. & J.—Works in Architecture; 3 vols., folio 1773-1822.

Adam, R. & J.—Decorative Work of—(a selection of plates reproduced from the above. Folio 1901.)

Belcher, J. and M. E. Macartney—Later Renaissance Architecture in England—2 vols., folio 1897-1901.

Blomfield (R.)—A History of Renaissance Architecture in England, 2 vols.

Gibbs, (J.)—Book of Architecture—Folio 1728.

Papworth (W.)—Renaissance and Italian Styles of Architecture in Great Britain.

The Georgian Period—A set of portfolios containing measured drawings of Colonial work—Published by American Architect and Building News.

Corner & Soderholtz—Books of Photographic Reproductions—"Colonial Architecture of New England."

Chandler—Colonial Architecture of Maryland, Pennsylvania and Virginia.

Ewerbeck—Flemish Renaissance (Die Renaissance in Belgium and Holland. Vols. I., II.)

The Importance of Bent Glass in Architecture

It is nearly a hundred years since architects sought for glass to be made to given curves, and while the art of bending glass has been practised to a limited extent for upwards of seventy-five years in the district known as "Glass House Fields," London, England, the extensive use of it by architects for building is of much more recent date. Especially of late, in London, Paris, Brussels and other continental cities its use has become extensive for show windows.

It has become the practice to brilliantly illuminate the streets at night, which (in moderate weather), are acceptable promenades. Store or shopkeepers advertise their wares after closing hours by a well-lighted window, and this is made more effective when the public can go under the shelter of the main buildings. Many of the finest shop fronts are so constructed as to admit of this. Some recede from the street line for a considerable distance, almost producing an arcade effect, while others are so arranged as to form a rotunda. These, where frontage admits, have spacious, imposing vestibules which are dressed at night in some ready way like an ordinary window. The effect of these display windows is very beautiful, some having their ceilings adorned

with mirrors in bold geometrical design interspersed with electric illuminating lamps.

Excellence, utility, and even a charm are secured by using bent plate glass for shop fronts, not obtained by straight lines. Glass, like sheet metal, has imparted to it a stiffness when bent, so that where the superstructure admits of it, bent panes of glass may be joined together, in a continuous line, by very light bars. In fact, where conditions are favorable, bars may be dispensed with, the two edges of the panes being merely butted together.

Where bent glass is used, the design should have a bold treatment with the curves to as large a radius as possible. These curves produce the best effect besides being the cheapest. A section of an ellipse is equally as effective as a segment of a circle, such plates being bent over their entire surfaces, however slight it may be. The original richness of plate glass is not only preserved, but is enhanced by the charms of its curvature. Canadian architects have not had the advantage which bent glass affords until quite recently, owing to its having to be imported from Europe. After waiting months for bent glass, it often happened that it would be broken in transit. Bent plates of very large dimensions are now easily obtained from Canadian glass benders, thus enabling our architects to produce as fine a class of store fronts as any of the continental creations.

Labor Matters at Montreal

The Master Carpenters and Joiners' Association of the Montreal Builders' Exchange has voluntarily granted an increase to carpenters in that city for the coming season. The amount is not stated but the increase will go into effect on July 1st and the masters reserve the right to pay the higher rates to deserving workmen entirely at discretion. The present average pay for journeymen carpenters is 30 cents an hour.

No serious labor trouble is anticipated in the building industry for the coming season, it being expected that the carpenters will accept the offers of the association. The brick and stone masons last September signed an agreement with the exchange on the conclusion of the strike in those trades, the agreement being binding for two years hence. Plasterers and painters have been demanding increases, the former asking for an eight-hour day with a minimum rate of 45 cents an hour from the middle of June. The employers have offered to meet the men more than half-way by proposing a minimum rate of 42½ cents for a nine-hour day to the end of October, and eight-hour day from the first of November, and the full rate of 45 cents from the first of January, 1912. The proposal is still under consideration by the operative plasterers. Master builders state that it would be a great inconvenience to have one trade working only eight hours while the others work nine, and that when the eight-hour day does come, it would be better to make it general.

In the case of the painters, the masters refuse to accede to demands for a minimum rate of thirty cents an hour, stating that present conditions do not warrant it, and have decided to run "open shop," with a graded scale of pay according to ability. The open shop principle will also be maintained in the electrical and plumbing trades for the current year.

The progressive city of Saskatoon, Sask., has a hospital scheme involving an expenditure of \$185,000. Mr. Meyer J. Sturm, of Chicago, is the architect.

Toronto carpenters are endeavoring to get a minimum wage of 40 cents an hour. This proposition has virtually been declined by the employers. Negotiations are still in progress.

New Town Engineer of St. Lambert, Que.

Mr. A. S. Dickison, who has just been appointed town engineer of St. Lambert, Que., was born in New Brunswick at Fredericton, where he graduated as a civil engineer, after which he took a post-graduate course at Cornell. His first professional engagement was in railway construction work. He next became city engineer at Westbrook, Maine. Following this he was appointed superintendent of an extensive steel works, now a branch of the United States Steel Company. On the completion of this engagement he opened an office of his own and did considerable work for the United States Government as a consulting engineer and inspector of warships. Just before returning to Canada a year ago, Mr. Dickison installed a 250-ton refrigerator plant at Baltimore, Maryland, and a 70-ton plant near Philadelphia, Pa.

Mr. Dickison is an expert in industrial plants, having been engaged for fifteen years in their construction and operation, and he is a specialist in refrigeration, the operation of



M. A. S. Dickison, Town Engineer of St. Lambert, Que.

gas engines and the manufacture of abrasives, his experience in these special lines in the United States having been very extensive. He is at present engaged on the equipment of an "abrasives" plant for the John Cowan Company, Limited, of Montreal.

Mr. Dickison has already entered upon his new duties under the council of the town of St. Lambert, where the citizens recently voted in favor of a loan of \$225,000, to be spent on improvements such as sewers, permanent sidewalks and street paving.

Personal News and Notes

Calgary has excellent prospects for a good building season. There is little danger of a disagreement between the unions and the Builders' Exchange.

A big building year is opening up at Edmonton, Alta. Two million dollars' worth of work will be commenced within the next month. No labor troubles are in sight.

Mr. J. S. Irvin has just returned to Ottawa after a three months' stay at Spokane, Wash., where he organized and was elected president of a new cement company.

Estimates for a cement plant to cost \$750,000 that will provide a mill with a 2,000 barrel capacity, and a payroll of three to four thousand dollars a week, are being prepared by Allan Haines, F. J. Klossosk and R. D. Hassan, experts

employed by the million-dollar Edmonton syndicate that will develop the marl beds fifteen miles west of Edson on the Grand Trunk Pacific.

A meeting of the American Institute of Electrical Engineers was held at the University of Toronto on April 7. A dinner was afterwards served at the Engineers' Club, 92 King street west, Toronto.

The St. Lawrence Bridge Company, of Montreal, have secured the contract for the Quebec bridge at \$8,650,000. A cheque representing 15 per cent. of the contract price has been deposited by the firm.

David Seath, the Secretary of the Montreal Harbor Commissioners, invites applications until April 10 for the following vacancies: general foreman, crib construction foreman, assistant superintendent for the dredging fleet, cost clerk and checker.

The annual banquet of the Edmonton Builders' Exchange was held at the Yale Hotel, Edmonton, on April 3rd. The president, Mr. R. J. Manson, presided. Elaborate arrangements had been made and the event was a most successful one. A number of guests were present from the other provincial exchanges.

April 1st was the appropriate day chosen by 200 employees of the building trades at Lethbridge to go out on strike as a protest against open shop, which has been declared by the local exchange. The strike was only of one day's duration and is stated to have been instituted solely as a protest.

Mr. C. H. Topp has almost completed his survey of Sooke Lake and has submitted an interesting report to the Victoria council. This report has been turned over to the water commissioner and the city engineer, who will make their recommendations to the incoming council. It will be remembered that Mr. Topp's appointment on this work was vetoed by the mayor, but so far without effect, since the engineer had received official notification to proceed with the work.

The Winnipeg Builders' Exchange is again embroiled with the bricklayers' union of that city, which claims that last May an agreement was reached whereby the men were to receive 67½ cents an hour for an eight-hour day after January 1st, 1911. The rate is now 62½ cents for a nine-hour day. The Exchange very rightly contends that the union violated its part of the agreement last year at the time of the dispute with the Lyall-Mitchell Company. The men have decided to leave the decision with the executive at Indianapolis.

Asphalt Mastic Floors are described and illustrated in an interesting booklet which we have received from the American Asphaltum Rubber Company. These floors are claimed to be absolutely waterproof, acidproof and sanitary. They are given with a five-year guarantee and are sold with the approval of the United States government inspectors. Among the many large firms for which the company has completed contracts may be mentioned the International Harvester Company, Chicago, and Swift & Company, Chicago. Estimates and full particulars will be furnished on request.

We have received from the Canada Foundry Company a catalogue of the Cochrane open feed water heaters and the Cochrane heaters and receivers, manufactured by the Harrison Safety Boiler Works, Philadelphia, Pa. The Cochrane heater utilizes the exhaust steam from engines, pumps or turbines to heat water for boiler feeding or other purposes. It is claimed that it does the work of sixteen per cent. of the boiler room equipment and that it effects a saving of one-sixth of the total expense.



Sawmill and Block Cutting Plant of the Dominion Carbolineum Works, Ltd., Vancouver

Creosoted Wood Blocks in Highway Work

Selected upon Merit, and after Exhaustive Tests, by Leading Cities of the World — Description of Modern Plant at Vancouver

Well-kept highways have from time immemorial been an evidence of civilization, culture and the desire to trade. Savage races who were content with mere trails have passed without leaving a tangible mark whereby historians might record their coming and going, but the road-builders made history. When the Romans set out upon their career of world-subjugation their first care was to connect up the conquered states by means of an Imperial highway, the excellence of which established a model to be copied by modern builders and become the starting point of the magnificent highways which are to-day the boast of England and France. The Azteas of Mexico were builders of good

roads, and it is cause for regret that the fact facilitated their destruction by providing Cortez and his adventurous band with the facilities for a successful invasion of their capital city.

In Canada the construction of good roads is being prosecuted with vigor and a regard for fundamental principles. Cities and towns are laying down countless miles of pavement, and villages and country municipalities are promoting trade by co-operating in the construction of macadamized leading roads. As might be expected from the push and enterprise animating its people, Western Canada is well to the fore in the good work, and even in this com-



30,000 Yards of Paving Blocks Piled for Seasoning



The Retorts, Showing also Loaded Cages



Water Shipping Facilities—Dock and Derrick.

paratively undeveloped province of British Columbia the problem of better roads is being given earnest attention everywhere, with the result that vast sums are being expended on the construction of modern pavements and roadways of the best type. The provincial government is aiding in the good work by building a splendid highway from the coast through the mountains to the border of Alberta, where connection will be made with a system planned by the governments of the prairie provinces, by means of which it will be possible a few years or so hence for tourists to drive their automobiles or carriages in comfort and safety from Winnipeg to Vancouver, and thence by ferry to Nanaimo or Victoria, where connections can be made with the magnificent highways being built on Vancouver Island for sight-seeing purposes.

So much for the trend of the times and roads in general. However, it is with a material used in the construction of the highest class of pavements that we have to deal in the scope of this article. We refer to creosoted wood blocks, which



Railroad Shipping Facilities—Loading Cars with Paving Blocks.

are now being endorsed by the cities of Chicago, New York, London and Paris, for heavy traffic streets, after exhaustive tests of all other kinds of paving. The merits of creosoted blocks have been recognized and admitted for years, and recent improvements in the method of laying have greatly aided their popularity.

Modern Creosoted Block Plant

The plant of the Dominion Carbolineum Works, Limited, was established on Coal Harbor, Vancouver, some ten years ago by Mr. W. H. Harvey, the present energetic head of the company. Mr. Harvey had studied the chemistry of woods in the east for some years, and realizing the opportunity awaiting him in the development of the city and province, he lost no time in investing his money in an up-to-date wood block plant—the only one of its kind in Western Canada. The business grew and prospered to such an extent that the Coal Harbor site became too small for its needs and in the fall of 1908 the company acquired their present site of 21



The Great Bridges at Vancouver, paved with the product of the Dominion Carbolineum Works, Ltd.

acres in South Vancouver. The property fronts on the North Arm of the Fraser River, and is skirted by the Vancouver-Eburne-New Westminster line of the British Columbia Electric Railway Company. Work was at once commenced on the new buildings, the erection of which was completed in August of last year, when the old site was abandoned. The new plant was designed to be, and undoubtedly is, the finest of its kind in the Dominion, the capacity being more than treble that of the Coal Harbor plant.

The sawmill is 250 x 44 feet in size, with a block mill wing 90 x 38 feet. The building is of massive construction, iron covered, and rests on piles driven to hardpan. The mill is operated exclusively for the production of material for the making of wood blocks. The fir log when taken from the water enters at the south end of the mill, where saws remove the slabs and sappy timber, the choice planks passing on to other saws which cut them into three and four inch cants. These pass through a huge planer which dresses all four surfaces at one operation to exact dimensions, after which the cants pass to two sets of block gang saws in the block mill, having a capacity of 50,000 blocks per day of nine hours. At these saws (which operate back and forth on a sliding arbor, making 25 cuts to the minute, and four blocks per cut), the blocks are subjected to three cullings for imperfections, such as large or loose knots, gum, and ring-shake. The selected blocks are then packed into steel lattice work cages or cars, each holding about 80 square yards of blocks. When filled the cages are run over a narrow-gauge track to the creosoting cylinders, about 50 yards distant, which hold eight and twelve cages respectively. These cylinders are 65 and 100 feet in length, the diameter of each being 7 ft. 6 in., they are built of three-quarter inch boiler plate. The massive steel castings forming the doors of these huge retorts were the first jobs turned out at the new steel foundry of the Vancouver Engineering Works, where the retorts and cages were also constructed. When one of the retorts has been filled with laden cages the heavy doors at either end are slid into place and secured with numerous heavy bolts which lock the edges hermetically. Creosote is then allowed to run into the retort from a 30,000 gallon circular steel reservoir above until the contents are completely submerged, when live steam is turned into the many coils inside the retort, and the process of boiling the sap out of the timber begins. The blocks are allowed to remain in the retort until the exhaust gauge shows that all the sap has been completely eliminated, which usually occurs in about fourteen hours. At this stage in the process of "cooking" oil pressure is applied in order to fill the pores of the wood with the hot creosote, the pressure being kept up until the specified amount of creosote has been absorbed. The required pressure is secured by using a very powerful triplex pump to force more creosote into the already full cylinder. If the natural wood juices have been thoroughly removed the timber under the great pressure applied will immediately start to absorb this additional creosote, it being some time after the starting of the oil pump before the pressure gauge records any considerable increase in pressure. On the completion of the process the oil reservoir in the retort is then elevated by compressed air into the reservoir from which it was released, the doors are removed, and the cages containing the treated blocks are run out to the piling ground, where the blocks are carefully piled, covered, and permitted to remain until well seasoned. The larger of the two retorts is principally used for the treatment of long bridge timbers and piles. It is the intention of the management to install another large retort in the near future, the many orders for creosoted timbers and piles already justifying this further expansion.

The blocks are manufactured from logs of selected Douglas fir of medium growth, only live green logs being

used. This practice of using green and unseasoned timber is contrary to general usage in the manufacture of wood blocks in the United States, but president Harvey has learned through his close study of the business that when Douglas fir has become even partially seasoned the wood juices are coagulated into a hard gum which necessitates very severe treatment to dissolve and replace with the creosote. Severe heat and pressure in creosoting weakens the timber along the laminations and injures very materially the tensile strength. The object in view in using the green timber is the injection of the oil into the tissues in as gentle a manner as possible in order that the timber may be thoroughly impregnated and yet retain its original strength.

When the company first commenced the manufacture of wood blocks for paving the timber for the blocks was purchased from local mills. It was speedily discovered, however, that owing to the best part of the logs being used for other purposes, the plank received from the mills were of very indifferent quality and naturally produced blocks very inferior to the standard desired. This it was that prompted



Steam and Compressor House

the company to undertake the large outlay necessary to establish their own sawmill, but they have the satisfaction of knowing that only one or two similar concerns on the American continent are as well equipped.

The manufacturing end is operated altogether by electric power, a radical departure now marking the operation of the more modern sawmill plants on the coast. Individual motors are used for groups of machines, so that one part of the mill may be instantly closed down for adjustment or repairs while the other units are still operating. Four motors are in use, two of 200 h.p., one of 30 h.p., and one of 25 h.p., while a direct-connected 75 h.p. turbine pump of 750 gallons per minute capacity is being installed solely for fire protection purposes. Belting and transfer chains are driven from the basement floor, and in other ways the desire of the management to secure up-to-date conditions is quite apparent.

The narrow-gauge tracks leading to and from the retorts are so arranged that shipments may be made by rail or water with equal facility. The retorts being open at both ends, permits the treated and untreated charges to be handled as desired. The dock is equipped with a five-ton steam derrick to handle piles and bridge timber to and from the water or scows.

The entire plant is thoroughly protected by a complete system of hydrants and stand-pipes supplied with ample hose. The pump house on the waterfront is continually oc-

cupied by at least one man day and night. Water pressure may be given instantaneously by turning on the electric turbine pump, thus assuring almost perfect protection from fire.

Some Interesting Details

The sawmill, creosoting cylinders and reservoirs, power house, tracks and platforms, men's dwellings and docks, are built on cedar piling driven to bed rock, thus assuring solidity and permanence.

Steam for heating the retorts is supplied from a 100 h.p. boiler installed in a brick and iron power house adjacent to the cylinders. Sawdust and shavings from the mill are used for fuel, being delivered to the furnace by an excellent blow-pipe system installed by John R. Tacey, the Vanocuver expert in that line. The installation works so perfectly that all refuse is removed from the machines, the floors appearing at all times as if recently swept. The boiler also operates the air compressor used for elevating the creosote from the retorts to the overhead reservoir.

The creosote is secured in Glasgow and Liverpool, coming via Blue Funnel steamers around the Horn. It is shipped in steel drums containing 90 Imperial gallons. The usual shipment numbers 1,000 drums, or sufficient to fill one hold of the vessel. The last consignment arrived a few weeks ago per s.s. Oanfu.

About seventy men are employed constantly in and about the plant. Substantial and well equipped bunk-houses have been provided, each man having his own little sleeping compartment. Partitions do not run to the top, thus permitting a free circulation of fresh air admitted by ventilators. The dining hall is presided over by a capable chef, the bill of fare being superior to that found in many city restaurants.

The company is planning the erection of a new office building, the present structure being required for a general store and post office. The ten acres of the site at present in bush will also be cleaned up and improved along the water frontage of 1,350 feet.

Mr. W. H. Harvey is president and general manager of the company, and his son, Mr. W. W. Harvey, is secretary-treasurer.

The Market for the Product

The company has met with great success in securing a market for their blocks in Vancouver, practically all of the business district and many of the residential streets being paved with Dominion wood blocks. The mileage at present in use will be largely increased in the near future by the additional work authorized for this year. The first piece of paving supplied by the company has been down some ten years, and is still in splendid condition despite the constantly heavy traffic. This fact, together with the reliable character of all their work, is responsible for the many large contracts placed with the company during the last few years, and which led to the extension of their plant. It is significant that the Canadian Pacific Railway Company has lately adopted Dominion wood blocks for paving the long platforms at all divisional points throughout the mountains and prairies. The company are now filling a large order for creosoted timbers and paving for the two new bridges being constructed at Winnipeg.

One Man Power

A few years ago people spoke of the "Seven Wonders of the World," but in this day there are such a diversified number of wonders that the original seven seem very small indeed.

Even ten years ago, had anyone said that one man could make five thousand pressed brick in one day by hand, he would have been labeled a fanatic on the spot; but ten years

bring huge changes, for to-day the Peerless Company, of Minneapolis, Minn., are putting on the market a machine which is well called peerless. The claims they make for it are exceedingly strong, but so far as we know these claims have not been refuted. The Peerless machine will turn out as many brick, so it is claimed, as any \$10,000 plant manufactured, and at the same time do this with one-third less men. That statement is strong. The Peerless is remarkable for its ease of operation. By referring to the cut here you will notice the tamping device, which is automatically lifted by two large coil springs that do away with a large percentage of the work. By referring to this drawing you will see that the tamp on the bricks must be absolutely accurate, making. Cement brick are more and more coming into public use, inasmuch as they are far superior to clay brick, and by the use of the Peerless, can be made much better and cheaper. Not only this, they are absolutely fireproof, and instead of deteriorating with age, they become harder and harder.

The Peerless machine is substantially made of iron and tool steel, and is strong, compact and durable. Its working parts are the very essence of simplicity, and with ordinary care it will last a life time.

One of the strongest features of the Peerless machine is its price, as one does not have to invest a small fortune in a machine, and another small fortune in getting a place to operate it. Their catalogue tells you all about it. It is an



The Peerless Brick Machine

interesting catalogue, too, and it will interest every man who wishes to save money. A post card addressed to the Peerless Brick Machine Company, 92 Adelaide street west, Toronto, will bring this to you. Write for it.

To the Tiffin Wagon Company, Tiffin, Ohio, we are indebted for a copy of an interesting booklet containing a description of their various lines of municipal and contracting vehicles. The Tiffin Company have an unequalled assortment of dumping wagons, street cleaning and sanitary carts, and heavy trucks. Although they have only been in this department of the business for three years, they have effected during that time such improvements that their name is coming to be regarded as a standard in this line. Noteworthy among the latest products of the firm are their automatic street flushing machines, sprinklers and road oiling wagons. Municipalities and contractors will be well advised to secure the company's catalogues.

Contracts Department

News of Special Interest to Contractors, Engineers, Manufacturers and Dealers in Building Supplies.

Information for insertion in these columns is invited from Architects, Contractors, Engineers, etc.

Waterworks, Sewerage and Roadways

Calgary, Alta.

On April 24th a by-law will be passed upon by the electorate to raise \$66,000 for the purpose of improving, laying out, and beautifying the parks and boulevards. W. D. Spence, city clerk.

Camrose, Alta.

On April 21st a by-law will be submitted to authorize waterworks expenditure to the amount of \$83,000.

Chilliwack, B.C.

T. F. Sinclair, of New Westminster, will be asked to make a thorough inspection of the ground, ascertain levels and estimate the cost to the city for a complete sewer system which is considered by the council.

Clinton, Ont.

The by-law to extend waterworks system at a cost of \$5,000 has been approved.

Cornwall Centre, Ont.

Tenders addressed to John Mullin, Tp. Clerk, are called until May 1st for construction of Stoney Creek drain in the Tp. of Cornwall. Plans, etc., at office of the above or at the office of Magwood & Walker, Cornwall.

Esquimalt, B.C.

The residents of the district between the E. & N. railway tracks intend to establish a sewerage system estimated to cost about \$125,000. A. R. Wolfenden, Jas. McAdam and T. B. Sedger are interested.

Galt, Ont.

Tenders addressed to Joseph McCartney, town clerk, will be received until April 17th for supply of Portland cement, lumber, hardware, castings, sand and gravel required for the season of 1911.

Harrow, Ont.

Tenders addressed to J. H. Madill, tp. clerk, will be received until May 1st for drainage work on Wellington and Maple avenue drains.

Kamloops, B.C.

The question of extension of waterworks is being considered, including a new reservoir and a larger main on Victoria and Main streets, and possibly a new power house.

Melville, Sask.

A vote will be taken on the following by-law on April 24: \$63,000 for waterworks for a main storm-water sewer.

Montreal, Que.

Chief Engineer Janin has suggested that the little river St. Pierre be covered by concrete, cost, \$117,000.

Moose Jaw, Sask.

A \$175,000 loan was authorized for sewer and water extensions, and \$50,000 for an incinerator.

Oshawa, Ont.

The Board of Works received four tenders for the asphalt block paving as follows: Ontario Asphalt Block Company, of Windsor, \$43,128; Secord & Sons, Brantford, \$44,059; McGuire & Sons, Toronto, \$44,587; Allen & Kingthorne, Toronto, \$45,786.

Ottawa, Ont.

City Engineer Ker is making enquiries regarding street sprinklers, a new kind of oil for macadam roads, and also an oil for asphalt pavements.

Penticton, B.C.

Tenders are called by F. E. Tily, municipal clerk, for the construction of infiltration chambers, reservoir works, and excavation for and laying of pipes for waterworks system here; also for pipe, c.i. and specials; wrought iron, galvanized; hydrants, valves and other fittings; meters; steel pipe, lapwelded; and for excavation and laying of pipes and fittings and general construction. Tenders for materials must be in by May 15th; for construction by May 1st. F. H. Latimer, engineer for the municipality.

Regina, Sask.

Tenders are called until April 26th for c.i. pipe. L. A. Thornton, city engineer. Advertisement in "Tenders and For Sale Department" of this issue.

Tenders are called for sewage pumps and motor switchboard and apparatus for sewage disposal works until April 30. John Marshall, chief engineer, trunk sewer works. Advertisement in "Tenders and For Sale Department" of this issue.

Revelstoke, B.C.

The by-law granting \$9,000 for purchasing road machinery for permanent roads was given approval by the ratepayers.

Ridgetown, Ont.

On April 25th the ratepayers will vote on a \$35,000 by-law for installation system of waterworks. D. Cochrane, town clerk.

South River, Ont.

Bids wanted for laying about 3,000 square yards of cement sidewalks, council to supply all material; level sandy bottom. H. O. Boorse, clerk.

South Vancouver, B.C.

Councillor Burgess has broached the advisability of erecting a municipal rock crushing plant on the North Arm of the river, and there crushing the rock and distributing it to the roads as needed. Estimated expenditure on roads, \$1,000,000.

Tofield, Alta.

The by-law to raise \$8,000 as expenditure for the initial installation of a municipal water system was carried.

Toronto, Ont.

The City Engineer has recommended the construction of pavements and road-

ways involving an expenditure of over \$97,000.

Tenders addressed to G. R. Geary, chairman, board of control, will be received until April 25th for supply of a priming equipment for centrifugal pumps at the Toronto Filtration Plant. Advertisement in "Tenders and For Sale Department" of this issue.

The following are the streets which are to be widened, with the respective costs: St. Clair avenue, \$473,612; Danforth avenue, \$301,000; Bloor street, \$136,000; Anderson street, \$113,925; Greenwoods avenue, \$50,000; Vaughan road, \$7,000; Chelsea avenue, \$1,950; total, \$1,084,087.

Welland, Ont.

On April 26th a by-law will be submitted to the people authorizing waterworks expenditure to the extent of \$75,000. Former by-law \$52,000, for waterworks is repealed. G. R. Boyd, clerk.

Winnipeg, Man.

The tenders of the Canada Iron Corporation of Montreal for 800 tons of water main pipes was recommended to council.

Tenders addressed to the board of control will be received until April 19th for supply f.o.b. city yards of one 10-ton and one 8-ton asphalt rollers. The rollers may be gasoline or steam driven; if the latter, boiler must be horizontal. M. Peterson, secretary.

AWARDED

Calgary, Alta.

The portable asphalt plant will be supplied by the Bitulithic Paving and Contracting Company. This plant has a capacity of from 800 to 1,000 yards a day. The rock crusher, which is guaranteed to crush 100 tons a day, will be taken from the W. H. Baxter Company for \$2,506. A five-ton steam roller will be supplied by the Western Equipment and Supply Company for \$2,248.50, delivered and duty paid. The dump wagons, required in connection with the work, will be supplied by Mussels Limited, at a cost of \$1,155.

Fort William, Ont.

The following tendered for labor and certain material in laying water main: Culiton & McRae, \$21,114 (accepted); Stewardson Bros., \$22,850; A. Cameron & Sons, \$32,810; I. Waki & Co., \$28,500; City Engineer, \$24,620 (all of Fort William).

Oshawa, Ont.

The contract for asphalt block pavement was awarded to Ontario Asphalt Block Company, Windsor, Ont., at \$2.49 per square yard. F. Chappell, C.E., engineer in charge.

Port Arthur, Ont.

Wells & Emerson, 17 Cumberland street, were the successful contractors for supply of sewer pipe, \$1,215. W. R. & H. R. Seine, 197 Arthur, received the

contract for lead pipe, \$785. J. Antonisen, 242 Arthur street, engineer in charge.

Souris, Man.

We are advised that M. S. Holmes, Portage la Prairie, was awarded the contract for the laying of sewers and water mains here. Tenders were received from Dunnville on the east and Swift Current on the west. Vernon H. Williams, engineer in charge, Souris.

St. Thomas, Ont.

The following tendered on walks, curbs, etc., for current year: G. A. Ponsford, St. Thomas, cement walk (sand), 72 cents ft.; cement walk (granite), 15 cents ft.; curb, 25 cents ft.; curb and gutter, 45 cents ft.; curb with walk, 13½ cents ft.. A. E. Ponsford, St. Thomas, cement walk (sand), 11½ cents ft.; cement walk (granite), 15 cents ft.; curb and gutter, 45 cents ft.; curb with walk, 13 cents ft.; curb, 26 cents ft. (Accepted). M. H. Baker, engineer.

Toronto, Ont.

The City Engineer was awarded the contracts for pavements on a dozen streets at the aggregate cost of \$109,327. The Barber Asphalt Company was awarded the contract for paving Dingwall avenue at \$3,267, which was \$32 below the City Engineer's tender. The contracts for concrete sidewalks and curbs were secured in all but three cases by the City Engineer.

Railroads, Bridges and Wharves

Calgary, Alta.

The Grand Trunk Pacific plans of the entrance to the city were approved. The final route shows a crossing of the Elbow river a short distance above the C. P. R. track and the terminal station at the Barrack grounds.

The Canadian Northern Railway has decided not to cross the Elbow river at all, but to keep its station on the south side. The company owns 130 acres comprising the Lindsay estate and will establish its station and yards there.

Grosse Isle, Que.

Tenders addressed to R. C. Desrochers, secretary, Department of Public Works, will be received until April 26th for construction of extension to the western wharf at the Quarantine Station here. Plans, etc., at above department; at the office of the district engineers at Quebec and Montreal.

Kingston, Ont.

H. B. R. Craig, C.E., city engineer, writes that the work on the new drawbridge for which tenders were called until April 5th, has been delayed for time being on account of certain negotiations between city and an industry which proposed to locate here, falling through. All companies asking for information were notified in time so as to prevent their doing too much work in the matter. It is expected that the drawbridge will be constructed at some time in the near future.

Newcastle, N.B.

Engineers MacVey and Mallory, of the Public Works Department, Fredericton, were here taking soundings for a new bridge on the Miramichi. The bridge will contain a draw, as provided for under the Dominion government regulations, and consequently there will be

no interference with the passage of the lumber and ore steamers.

Ottawa, Ont.

The closing of part of the present canal, the opening of a new one on the western side of the city, and a tunnel from the central station to the Union station, are recommended by City Engineer Ker, and W. F. Tye, consulting engineer, Toronto, to the city council as the best solution to the problem of railway entrances into this city. The idea is to have a general entrance for all railways, including electric lines, into the city, along the present canal reserve from the "Deep cut."

This is very much the same plan as was proposed by Engineer Cauchon, for the C. P. R. several months ago, but the plan now recommended includes taking up the cross-city line of the Grand Trunk Railway, and bringing it from the Central station to the Union station in the same tunnel as the C. P. R. The tunnel will cost about \$1,500,000.

Owen Sound, Ont.

Tenders for the new cement government wharf here will be called shortly and the work commenced early in May. The new wharf will extend 67 feet. J. G. Sing, government engineer.

Port Hope, Ont.

The council have asked for plans and specifications for the electric light bridge.

White's Cove, N.S.

Tenders are called by Public Works Department, Ottawa, until May 3rd for extension to Wharf at White's Cove, N.S. R. C. Desrochers, secretary.

AWARDED

Calgary, Alta.

Contracts on this division of the C. P. R. have been awarded as follows: Red Deer roundhouse, Dominion Equipment and Supply Company, Winnipeg; five standard No. 5 stations at Tompkins, Suffield, Burdett, Bow Island and Redcliffe, J. E. Lussier, Medicine Hat; six-stall engine house addition at Red Deer, Carter-Hall's Aldinger Company, Winnipeg; No. 1 bunkhouse, Red Deer and Calgary, G. M. Eaton, Strathcona; extension to Medicine Hat depot, brick and stone, G. E. Lussier, Medicine Hat.

Crediton, Ont.

The contract for concrete abutments and floor for bridge here was awarded to J. Lawson, Crediton, \$1,960.

Kenora, Man.

The C. P. R. subway at north end of Main street is to be built immediately. The contract was let to C. G. Anderson, Winnipeg, and calls for the completion of the work by July 10. Geo. H. Archibald was also given a contract for several small bridges and culverts between Winnipeg and Brandon.

London, Ont.

Contracts for the construction of ten bridges, the first of a large number to be erected in the county as soon as the weather moderates, were awarded as follows: Bridge over Dingman's Creek on Wellington road, 40-foot span, Andrew Bain, \$532; culvert over drain, Wellington road, 10-foot span, E. W. Kelly, \$237; bridge over Dingman's Creek, between Dorchester and Westminster Townships, 16-foot span, Andrew Bain, \$328; culvert over drain

crossing line between Dorchester and Westminster townships, 10-foot span, Andrew Bain, \$140; bridge between concessions 4 and 5, London township, 45-ft. span, Freeman Talbot, \$779; bridge between lots 8 and 9, concession 5, London township, 16-foot span, Freeman Talbot, \$519; bridge, London township, 40-foot span, Freeman Talbot, \$789; bridge over Doty's Creek, Nissouri West township, 40-foot span, Freeman Talbot, \$659; bridge between concession 5 and 6, Nissouri West township, 18-foot span, Andrew Bain, \$350; bridge between Delaware and Westminster townships, 20-foot span, Freeman Talbot, \$599. The bridges are all of steel and concrete construction. Chas. Talbot county engineer.

Quebec, Que.

The contract for the Quebec bridge has been awarded to the St. Lawrence Bridge Company, an amalgamation of the Dominion Bridge Company of Montreal and the Canadian Bridge Company of Walkerville. The cost of the bridge, according to the estimate of the engineers on the company's figures for the various parts of the work, will be \$8,650,000. The contractors for the structure agree to have the work completed by December 31, 1915. The first thing they are to do will be to purchase land and erect new shops, the whole to cost \$1,000,000, as no existing plant in the Dominion is sufficient to carry on such an extensive contract. The shops will be in or near Montreal and not in the neighborhood of the bridge site, as has been reported. The contracts for the steel has already been given to the United Steel Company, of Pittsburg.

Public Buildings, Churches, Schools, etc.

Arcola, Sask.

The Provincial Government will at once erect a new Land Titles office here. Cost, \$30,000.

Amherst, N.S.

Tenders are called until May 1st for erection of school house of brick with cement trimmings, etc. Leslie R. Fairn, architect, Aylesford; W. F. Donkin, town clerk. Advertisement in "Tenders and For Sale Department" of this issue.

We are informed that nine architects submitted competitive plans for the new public school here. Those of Leslie R. Fairn, Aylesford, N.S., were accepted. Estimated cost, \$40,000. W. F. Donkin, town clerk.

Barrie, Ont.

The Board of Education have decided to remodel the present Collegiate Institute as the cost of a new building is prohibitive. Further details awaiting the report of Stewart & Witton, architects, Hamilton.

Berlin, Ont.

The plans of E. H. Macklin, which indicate two 1-storey brick buildings at a cost of \$2,200 each, were recommended for the new Isolation Hospital. Mayor Schmalz; Mr. Cairnes, chairman board of health.

Brandon, Man.

A committee, of which D. Shiriff is chairman, was appointed by school board to confer with the board of trade

and council in regard to the securing of a Carnegie library.

Calgary, Alta.

The school board have purchased a site for a new 2-roomed school house in Parkview.

Architect L. Dowler has been instructed to call for tenders for the Bishop Pinkham College building, the plans having been approved. Rev. A. J. B. Dewdney, secretary.

Tenders addressed to W. D. Spence, city clerk, will be received until April 14th for construction of Central Fire Station. Plans, etc., at offices of the architects, Messrs. Lang & Major, and Hodgson, Bates & Butler, associate architects, Grain Exchange Building.

Campbellton, N.B.

Tenders addressed to H. H. Mott, architect, Room 6, Lounsbury Building, will be received until April 17th for erection of Methodist church and S. S. building here.

Collingwood, Ont.

The Fire Committee has chosen the site of the old drill hall as that for the new fire hall. Plans are stated to have been prepared for its erection.

Cookstown, Ont.

The Public Library Board are negotiating for a Carnegie library; the curlers are looking for a site for their new rink.

Cornwall, Ont.

Tenders are called until May 2nd for erection of County House of Industry and Refuge here. A. I. Macdonell, county clerk; A. L. Weeks, architect, Ottawa. Advertisement in "Tenders and For Sale Department" of this issue.

Cranbrook, B.C.

It is understood that in connection with the project for the erection of a club house for the new club a joint stock company will be formed.

Campbellton, N.B.

Tenders addressed to Harry H. Mott, architect, will be received until April 17th for erection of Methodist church and S. S. building here. Plans with above and also with H. H. Mott, architect, St. John.

Edmonton, Alta.

Tenders will be called by the Exhibition directors for the new stock pavilion, of which the cost is \$100,000. Plans have been submitted by the architect, Mr. Lines. The provisional plans for Industrial Building, the wing of which will be erected this year, were left for the building committee to report on.

Fernie, B.C.

It has been decided, with the sanction of the ratepayers, to enlarge the Central school to a sixteen roomed building. The city council will be asked to submit to the ratepayers a by-law to raise by debentures \$45,000 for building and equipping the enlarged school.

Fort William, Ont.

Tenders are called until April 15th for heating and plumbing in Public Library here. Hood & Scott, architects.

The board of education has decided to make the addition to Central school only four rooms.

Tenders will be received about May 1st for erection of Y. M. C. A. building here. Materials, brick and stone, 4-storeys, size (ground floor) 93 x 100. D. N. F. Nichols, architect, 499 Main

street, Winnipeg. G. H. Williamson, secretary. Noted in issue of March 29. Fredericton, N.B.

The Exhibition Association propose to erect a new amusement hall on the grounds and make improvements to other buildings, \$8,000.

Gretna, Man.

Tenders for erection of new brick school will be called. Cost, \$12,000.

Guelph, Ont.

The building fund for the Y.M.C.A. will probably exceed the amount aimed at by about \$10,000.

At a meeting of a joint committee from the city and county councils it was decided to build a new county jail and jailer's residence. The building will cost \$25,000.

Halifax, N.S.

Tenders addressed to W. M. Brown, architect, Roy Building, or to Rev. C. E. McManus, St. Mary's College, will be received until April 28th for construction of the Main Building of St. Mary's College. Plans, etc., at office of the architect.

Haileybury, Ont.

On April 24th a by-law will be voted on to raise \$3,500 for the erection of a public market building. T. H. Connor, clerk.

Hamilton, Ont.

Tenders were called until April 8th for erection of addition to City Hospital. Architects, Stewart & Witton, King and Hughson streets.

Kamsack, Sask.

Tenders addressed to John Bowes, sec.-treas., Box 48, will be received until May 1st for erection of addition to school in S. D. No. 1,251, the contractor to supply all material except the stone for the basement. Plans, etc., at office of the architect, E. G. Sherwood, 3 Commonwealth Block, Winnipeg, and at office of the secretary.

Kamloops, B.C.

Tenders have been called for excavation for new hospital here and construction of basement walls. Messrs. Rush-ton, Baynton, Bethune and others compose the new committee in charge. Architect, Mr. Bird. Revised plans are prepared and tenders for construction will be called. Estimated cost, \$100,000.

Little Bras d'Or, N.S.

Tenders addressed to J. W. McIsaac, will be received until April 14th for the erection of a church here.

Maisonneuve, Que.

The rector, Rev. Rural Dean Robinson, and Wardens, have been authorized to purchase land on Milton avenue, 100 ft. x 145 ft. as a site for a new church and rectory.

Montreal, Que.

Tenders addressed to R. C. Desrochers, secretary, Department of Public Works, will be received until April 26th for alterations to the Central post office building here. Plans, etc., at this department and on application to Mr. Theo. Daoust, architect, St. James street, Montreal, Que.

Moncton, N.B.

New tenders will be called for the 2-storey school for S. D. No. 8, Havelock. W. C. Barnes, architect, Moncton.

Moose Jaw, Sask.

The Salvation Army will shortly erect a new citadel on High street, near the Baptist church. They will also build a new residence for the officers on the corner of Ominica street and 13th avenue.

North Vancouver, B.C.

The Board of Trustees invite competitive design for an 8-roomed fireproof school until April 18th. Geo. Campbell, secretary, corner Second street and Lonsdale, P. O. Box 178.

Outremont, Que.

A building permit was granted for the erection of Baptist church, corner of Fairmount and Durocher streets, \$50,000.

Tenders addressed to J. Kruse, secretary, Town Hall, will be received until April 19th for erection of fire and police station on St. James avenue. Plans, etc., at office of the above and also at that of Messrs. Hutchison, Wood & Miller, architects, Royal Insurance Building.

Orillia, Ont.

Tenders are called until April 22nd by Department of Public Works, Ottawa, for construction of verandahs at the Hospital for Idiots, here. H. F. McNaughten, secretary. Advertisement in "Tenders and For Sale Department" of this issue.

Ottawa, Ont.

Tenders are called by public school board until April 21st for the plumbing in connection with the schools at Kent street, Laurier avenue, Slater street and Waller street. Plans, etc., at office of W. B. Garvock, superintendent of buildings. Crawford Ross, sec.-treas.

Penticton, B.C.

Plans for the new municipal building were submitted by the town architect, Mr. A. F. Pelton, and call for a concrete building to cost approximately \$16,000.

Peterborough, Ont.

Improvements to the extent of about \$16,000 were recommended for King Edward school. John Crane, chairman, Board of Education.

Portage la Prairie, Man.

The time for receiving tenders for the construction of a public building here is extended to May 3rd. R. C. Desrochers, secretary, Department of Public Works, Ottawa.

Regina, Sask.

It is stated that the First Baptist Church propose erecting a church at the corner of Victoria avenue and Lorne street during the summer.

Rosetown, Sask.

Tenders addressed to G. H. Irvine, secretary, school board, will be received until May 1st for erection of brick school here. Plans, etc., at office of the above and of the architects, Storey & Van Egmond.

Russell, Ont.

A covered rink for the Hockey club will be erected here. Manager, E. L. Bryan.

St. John, Que.

Plans for erection of municipal building are being considered.

Shetland, Ont.

Tenders addressed to J. L. Wilson & Son, architects, Chatham, will be received until April 15th for all trades in the

erection of a concrete block and frame church. Plans, etc., with B. W. Fansher, secretary, R. R. No. 5, Shetland, Ont., and with the architects.

Stratford, Ont.

Tenders for the improvements to County Hospital with the exception of the ventilating will be received until April 20th.

Summerland, B.C.

The council will call a meeting of ratepayers to discuss the erection of hospital estimated to cost \$15,000. Messrs. W. J. Robinson and E. B. May are interested.

South Vancouver, B.C.

The services of J. H. Bowman, architect, will probably be retained for the new school to be erected in Ward Five, the site for which has been selected.

Tillsonburg, Ont.

On May 1st the ratepayers will vote on a \$25,000 by-law for the purpose of rebuilding the public school here. A. E. Raynes, town clerk.

Toronto, Ont.

Plans for the new Central Y. M. C. A. building on College street have been completed and call for nine storeys and basement eventually, six of which will be constructed at once. Cost, about \$375,000. Burke, Horwood & White, architects.

Excavation has commenced on the site for the new Parkdale church, corner of Queen street and Callender avenue. The buildings will be of brick, with stone trimmings, and will cost about \$50,000. Mr. Burke, of Burke, Horwood & White, architect.

The congregation of West Presbyterian Church propose building their new church on the southwest corner of College and Montrose avenue. Work will commence as soon as possible, it is stated.

It is reported that the site for the new residence for the Lieutenant-Governor now on Bloor street east, will be changed for one nearer the Parliament Buildings.

Building permits were issued for Y. M. C. A., Broadview avenue, \$70,000; also for 3-storey school on Innes avenue; 1-storey brick chapel for Wycliffe College on Hoskin avenue, \$16,500.

Vancouver, B.C.

The site for the new Mount Pleasant school is ready and preparations for building will be made as soon as N. A. Leech, school architect, has finished plans. Excavation has been started on the site at the corner of Sixth avenue and Bayswater street.

The erection of a new building for the Vancouver Sailors' and Loggers' Institute came up for discussion at their last annual meeting. Work will be started if possible this year. Estimated cost, \$100,000. President, C. S. Douglas; secretary, R. C. Proctor.

The council have rescinded its resolution ordering the purchase of the Ross tract in Hastings Townsite for isolation hospital purposes. Direction was given for the acquirement of blocks 4, 9 and 10, in the southwest quarter section of D. L. 44, Hastings Townsite, for isolation purposes.

Mr. F. M. Rattenbury has been in-

structed to prepare plans for the various group of buildings necessary to complete Parliament Square. At the corners of Government and Superior and of Superior and Menzies streets respectively, will be erected the new museum and the new printing house. Work will begin on the library block which is estimated to cost about \$250,000, when detail plans for the principal building are ready, estimated at about five weeks' time.

Victoria, B.C.

The congregation of St. John have purchased a site for their new edifice. Plans are being prepared by Ridgway Wilson, architect. Estimated cost, \$80,000.

Watford, Ont.

The Congregational church at this place was destroyed by fire on the 7th inst. Loss \$3,000.

Windsor, Ont.

The proposal to erect a new General Hospital to serve the two municipalities was endorsed at a joint meeting and a committee named to secure a suitable site. The erection of the building will not be commenced for some time.

Whitby, Ont.

The Board of Education are calling until April 18th for plans and estimates from architects for erection of 6-roomed High School, with an assembly room. Dr. Chas. F. McGillivray, secretary.

Winnipeg, Man.

The Board of Control have recommended to council the erection of a new science and arts building for the Canadian Industrial Exhibition at a cost of about \$9,000.

AWARDED

Belleville, Ont.

The contract for the construction of the new Y. M. C. A. building has been let to Mr. William Alford, the lowest tenderer of the five contractors, \$28,961.

Calgary, Alta.

Gunn & Co. were awarded the contract for erection of new Wesley Church. The estimated cost is \$55,000, including furniture.

Lethbridge, Alta.

The contract for main Exhibition building was let to Hotson & Leader and includes the floor, which was added in a supplementary tender, for \$38,000. The next lowest tender was that of Smith Bros. & Wilson for \$40,725. The building must be finished by August 5.

Regina, Sask.

The First Baptist Church have let the contract for the structural work to Smith Brothers and Wilson. The building will be 68 feet by 118 feet. Estimated cost, \$60,000.

St. Boniface, Man.

The Convent of the Sisters of the Holy Names of Jesus and Mary, on Provencher street, will be enlarged this summer. J. A. Senecal, the well-known architect and builder, of St. Boniface, has been given the contract, \$120,000.

Simcoe, Ont.

The following tenders were received for the erection of public library: Nagle & Mills, \$9,871; R. E. Gunton, Simcoe,

\$10,735; P. E. Eecord & Co., Brantford, \$11,731; Leslie & Killer, St. Mary's, \$11,746; D. & L. A. Gunton, Simcoe, \$11,815; Shultz Bros., Brantford, \$11,980; Walter Gunton, Simcoe, \$13,600. A recommendation was made that a contract be entered into with Nagle & Mills on the basis of their tender for the building specified, but with such alterations as will bring the price for the completed building down to \$9,200. Mr. Shepard, architect.

Toronto, Ont.

The contract for the structural steel work at Caledonia Road School was awarded to Mr. W. H. Saulter at \$5,200. Frank Armstrong was awarded the contract for the carpenter work at \$20,856. The Property Committee at its last meeting awarded the contract to Mr. M. Hutchinson, whose tender was for \$17,555. A communication was read from Mr. Hutchinson stating that he had made a serious error in computing the cost of the work called for in the specifications, and that he wished to withdraw his tender, as he could not do the work called for at his original tender without loss.

Winnipeg, Man.

The contract for the dormitory building for the new provincial agricultural college at St. Vital, is stated to have been let to Thos. Kelly, \$200,000.

Residences

Brockville, Ont.

Tenders were called until April 15th for alterations and additions to residence of D. Cummings. A. S. Allaster, architect.

Harwich, Ont.

Tenders addressed to Rev. H. Cowan, minister, Harwich, will be received until April 21st for erection of St. Paul's Presbyterian Manse, Harwich Tp. Mr. P. McGeachy, chairman of committee. James L. Wilson & Son, architects, Chatham.

Toronto, Ont.

Mr. J. Garrett has purchased the corner of Howard street and Glen road, where a large apartment house will be erected.

Vancouver, B.C.

Mr. A. Davidson has presented plans for erection of 5-storey apartment house, Beach avenue, \$100,000.

Winnipeg, Man.

A. N. Power will erect a large apartment house on Goulbourne avenue to cost about \$30,000. The architect has not yet been chosen.

Tenders addressed to E. D. Tuttle, architect, 701 McArthur Bldg., will be received until April 20th for erection of residence for Mr. W. Argue.

Tenders were called until April 10th for erection of apartment block on Pritchard avenue for F. W. Handle. Plans, etc., at office of P. M. Clemens, 331 Garry street.

AWARDED

Victoria, B.C.

A residence will be erected by Col. E. G. Prior on St. Charles, \$17,000. Mr. Ridgway Wilson, architect. The contract has been let to Mr. Thomas Ash. Permit has been granted.

Business Buildings and Industrial Plants

Calgary, Alta.

The map showing location of G.T.P. terminals is before the city commissioners. It is expected that it will be approved.

Excavation has been commenced on the site for the Hudson's Bay Company, with W. L. Savage, New York City, in charge. Carter, Halls, Aldinger Company, Winnipeg, contractors.

Chatham, Ont.

The excavation for the factory for the American Pad and Textile Company will commence shortly. The Manson Campbell Company will extend their factory all the way between Adelaide and Prince streets. W. M. Drader is looking for a site for a new brick mill.

Dauphin, Man.

The plans for the fine new C. N. R. station here have arrived and show a building 110 x 50, stone basement, solid brick walls, 3-storied.

Edmonton, Alta.

Mr. Hopkins is the architect for the six-storey warehouse for the Great West Saddlery Company. Noted in last issue.

The Bank of British North America purchased the National Trust Company property on the northeast corner of Jasper avenue and First street. A new modern bank building will be erected on the site in a year or two. The bank recently purchased a site on Jasper avenue for \$70,000, but this will be offered for sale.

Fort William, Ont.

John Morton has purchased the corner of Syndicate avenue and Ridgeway street, on which it is stated a 4-storey building will be erected.

The Superior Plumbing and Heating Company, Victoria avenue, are calling for tenders for removal of rock from corner of Donald and May streets to Norah street.

Goderich, Ont.

The Kingston Furniture Company's plant was damaged to the extent of about \$50,000 on the 7th inst.

Guelph, Ont.

The lumber mill of George McAllister was destroyed by fire on the 4th inst. Estimated loss, \$15,000.

Hamilton, Ont.

The G. T. R. are considering seriously the erection of a new station here. A. E. Duff, general passenger agent. H. L. Frost, president, Board of Trade.

Highgate, Ont.

The Orford Building & Supply Co., Ltd., recently incorporated, will rebuild the departmental store destroyed by fire last fall at a cost of \$10,000. President, Dr. D. P. McPhail; secretary-treasurer, Sam. Haining.

Hillsboro, N.S.

The Albert Manufacturing Company will rebuild their plaster mill here at a cost of about \$100,000. Hon. C. J. Osman, manager.

Hull, Que.

The Hull board of trade will ask the C. P. R. to erect a new station in this city.

Kincardine, Ont.

Negotiations are being carried on with the council by Mr. James Malcolm in regard to the location of a furniture factory here.

Lakefield, Ont.

The Canada Cement Company has decided to double the plant here. A great deal of construction work is going on, besides the work of adding new machinery, etc., to the present complement. A. Butchart, manager.

Langenburg, Sask.

The hardware store of Denmark & Burton was destroyed by fire on the 4th inst. Estimated total loss, \$30,000.

Lethbridge, Alta.

Tenders were called until April 4th for excavation and concrete work in connection with erection of warehouse for the Western Supply & Equipment Company, Limited.

London, Ont.

Geo. White & Sons will erect a \$20,000 addition to their plant at once.

Medicine Hat, Alta.

Certain concessions have been granted by council for the establishment of a glass works here. The agreement calls for the erection of a hundred thousand dollar plant within one year of the date of the passing of the by-law, the employment of from 75 to 150 men, as well as the commencement of a similar plant before the end of five years. The city agrees to give two hundred and fifty thousand feet of gas per day, water and electric power at manufacturers' rates, and a site of five acres.

Tenders addressed to Bert D. Keck, architect, Crookston, Minn., or to the Moose Grocery Company, Moose Jaw, Sask., will be received at the office of the General Brokerage Company, Grand Forks, N. Dak., until April 21st for construction of a wholesale warehouse for the Medicine Hat Grocery Company, size of building 80 ft. x 110 ft. Plans, etc., at the Winnipeg Builders' and Traders' Exchange and at the local Exchange and at the offices of the architect and of Moose Grocery Company.

Montreal, Que.

The G. T. P. management are stated to be planning the erection of 140 new stations.

Moose Jaw, Sask.

W. Zimmerman is the architect in charge of the hotel to be erected here by local capitalists. Tenders for the excavation have already been called.

Ottawa, Ont.

Managers of a large bottling works have been in the city seeking a location for a factory. It is very probable that it will locate in Ottawa.

McFarlane & Douglas, Limited, it is announced, will erect a large factory here for the manufacture of fireproof steel doors, windows, office desks and cabinets. A building site has been purchased on Laurier avenue, 116 x 140 ft., adjoining property owned previously by them.

Peterborough, Ont.

The C. P. R. has submitted an agreement to the city which provides for the acquiring of a large amount of city property for the building of sidings and freight sheds, etc., in connection with the company's new Georgian Bay grain

route. The company agrees to have the line in operation in two years.

Port Arthur, Ont.

F. H. Keefer, K.C., is the authority for the statement that about \$7,500,000 British capital will be spent shortly on a pork-packing plant in this vicinity.

Red Deer, Alta.

It is understood that the C. N. R. will erect offices for the construction department near the Alberta Grain Company's elevator, which they have rented.

Work has been started on cleaning up the Northern Bank corner, ready for the excavations for the new bank building.

Regina, Sask.

It is reported that the National Trust Company will start construction on erection of their building at the corner of Cornwall street and 11th avenue.

The tenders for the new Imperial Bank are being called. It will be two storeys in height and will cost in the neighborhood of \$40,000. The building will be completed this year. Noted previously.

Saskatoon, Sask.

Cushing Bros. will erect a first-class planing mill, sash and door factory. They will produce power by steam and generate electricity as motor power for machinery. F. M. Beatty, local manager.

Seaforth, Ont.

The Scott block was destroyed by fire on the 4th inst. Estimated loss on building, \$14,000.

Stittsville, Ont.

The store owned by W. W. Mann was destroyed by fire on the 4th inst. Estimated loss, \$20,000.

Manchester, Robertson & Allison, Ltd., are planning the erection of a brick addition to their building, 50 x 20 feet.

Strassburg, Ont.

The hardware store owned by H. B. Devine was destroyed by fire last week. Estimated loss, \$30,000.

A factory for the manufacture of vinegar and pickles, with a capital stock of \$20,000, is to be established here.

Sydney, N.S.

Tenders for the construction of the fertilizer plant for Alex. Cross & Sons, Limited, Glasgow, to be erected here, will be opened shortly. Estimated cost about \$100,000; C. R. Walker, Canadian representative; Matthew Goldie, manager.

Toronto, Ont.

Notice has been served by the C.P.R. on all its tenants in the district bounded by Cherry, Water, Ocerend, Tate and Front street, to vacate their premises by the end of the month. Construction will then begin on the new freight yards and freight sheds which the company will erect in that section.

Victoria, B.C.

Tenders were received until April 12th for erection of 4-storey brick building and basement on Fort street for P. R. Brown. Thos. Hooper, architect

Wallaceburg, Ont.

Jacques & Williamson, architects, won the competition for erection of new hotel to be built for Mr. Chas. Dupont. Plans are now being prepared and tenders are invited until May 1st.

Winnipeg, Man.

Tenders are requested for the extension of the passenger car shops, by the C. P. R. management, until April 18th. Frank Lee, division engineer.

The architect in charge of the warehouse for the Ontario Wind Engine and Pump Co., Ltd., is G. M. Miller, Toronto. Estimated cost, about \$50,000.

The Hudson Bay Company has purchased property between Colony and Vaughan street for their large store. Estimated cost, about \$2,000,000. John Woodman, Canadian representative of the company's architects, London, Eng.

The property at the southeast corner of McDermot avenue and Dagmar street has been purchased by E. Loftus, 705 McArthur Building. It is understood that a large business block will be erected here and that clearing of the site and construction will commence at once.

Tenders addressed to D. W. McCuaig, chairman, Manitoba Elevator Commission, will be received until April 14th for tearing down the Dominion Elevator at Miami and also for rebuilding same at Grosse Isle, Man. Plans, etc., at office of the Manitoba Elevator Commission, 279 Garry street.

The Canada Cement Company, it is stated, will establish a plant here as quickly as possible. It will have a capacity of 400,000 barrels per annum. The plant will at first be confined to the grinding of clinkers shipped to Winnipeg from the east. Later, when completed, all the operations of manufacturing will be carried on there.

Plans for a fourteen storey building to be erected on Main street, were approved by the fire, water and light committee. It will take about two years to complete the building. The plans were presented by Peter Lyall, Jr., whose firm will erect the skyscraper, which will be 190 feet in height. It is said that the building is being built for an English syndicate.

AWARDED**Brandon, Man.**

Claydon, Bros., Winnipeg, have secured the contract for a new building for the Dominion Bank on Rosser avenue at a cost of \$20,000. Work will commence at once.

Galt, Ont.

The contract for erection of addition to plant of R. McDougall Co., has been let to Contractor Wm. Edmonds.

Lethbridge, Alta.

The J. E. Lussier Construction Company of this city, has been awarded the contract for building stations at Tompkins, Suffield, Burdett, Bow Island and Redcliffe, and a brick and stone extension to the Medicine Hat station, for the C. P. R.

Montreal, Que.

Messrs. Byers & Anglin have been awarded the contracts for the following: A two-storey factory on Chatham street for the Canada Paint Company. The structure will be of reinforced concrete and faced with brick; it will be 64 ft. x 160 ft., and the estimated cost is \$16,000. Work has already been started

on the foundation. Messrs. Nobbs & Hyde, architects. A concrete warehouse for Mr. Alphonse Piche, butcher, Dorchester street. It will be a four-storey structure and cost about \$18,000. Alterations in the Bank of Montreal, including the removal of a stairway and the construction of new flooring and office space, the whole to cost some \$10,000.

Vancouver, B.C.

Patrick J. Donohue, architect, Inns of Court Building, Vancouver, writes F. H. Foreshaw has secured the contract for erecting a 4-storey and basement hotel of reinforced concrete for Sam Kee, cost \$110,000. P. S. Donohue, architect, Inns of Court Building.

Victoria, B.C.

Dinsdale & Malcolm have been awarded the contract for the removal of the old buildings which now occupy the site for the structure to be occupied by the Union Bank of Canada and the Elliott building. K. T. Elliott, K.C., Summit avenue, is interested in the latter.

Woodstock, Ont.

The contract for erection of addition to the factory of the Crown Lumber Company has been given to Mr. Bachman, Muskegon, Mich. It will be of cement blocks, in size 155 x 70 feet, and one storey high.

Power Plants, Electricity and Telephones**Bowmanville, Ont.**

The by-law in favor of the sale of the electric light plant to the Seymour Power and Electric Company, a subsidiary of The Electric Power Company, carried.

Brandon, Man.

Mr. Farquharson, Fort William, who superintended the construction of street railway there, has been asked to confer with City Engineer Speakman in regard to the location of the route here.

Edmonton, Alta.

The city council has finally decided upon terms of agreement with the International Heating & Lighting Company, of Cleveland, for a franchise to manufacture and distribute artificial gas, and a by-law will be submitted to the ratepayers next month. The franchise is for 25 years, the city retaining the right to purchase by the end of that time and every five years thereafter. The initial price fixed by the agreement is \$1.65. The company guarantees to supply gas within 18 months. Their investment in the city will be over half a million dollars. Edmonton at the present time is the largest city on the continent which is without a gas supply.

Lakehurst, Ont.

Tenders addressed to David Weir, secretary, lakehurst, will be received until April 21st for digging of the holes, the erection of the poles and the stringing of the wires for any part of the construction of the municipal telephone line from Ennismore, here, a distance of 19 or 20 miles.

Moose Jaw, Sask.

Tenders are called until April 24th for supply of about 400 white cedar poles for use in the Electric Light Department. J. D. Peters, electric superintendent; W. F. Heal, city clerk. Advertisement in "Tenders and For Sale Department" of this issue.

Portage la Prairie, Man.

Alds. Charles Sharpe and Sweet and Mayor Garland were appointed on the committee to report on the power proposition as contained in a letter from Mayor Evans of Winnipeg.

Quebec, Que.

Orders have been placed for fifty freight cars of the Gondola type, 60,000 lbs. capacity, by the Quebec Railway, Light, Heat & Power Company. C. E., A. Carr, general manager.

Regina, Sask.

Tenders addressed to S. P. Porter, deputy minister railways, telegraphs and telephones, will be received until April 22nd for construction of the following lines: Moose Jaw, Swift Current, Abernethy-Strassburg, Saskatoon-Battleford, Wolseley-Windthorst, Saskatoon-Biggar.

Revelstoke, B.C.

The by-law granting the city council the sum of \$50,000 for the completion of power plant was approved by the ratepayers. The city will now be in a position to treat with the C. P. R. in the matter of furnishing power to shops.

Saskatoon, Sask.

The council has engaged Mr. J. B. McRae, engineering expert, of Ottawa, to report on the street railway proposition.

St. Thomas, Ont.

The following are the estimates of the cost of proposed street railway improvements as compiled by City Engineer, Mason H. Baker: Overhauling Belt line, \$18,970; overhauling Wilson avenue line, \$3,400; overhauling G. T. R. Station line, \$1,750; repairing present cars, \$2,500; three new cars, \$9,000; total, \$34,620.

Thessalon, Ont.

It is reported that this municipality will instal an electric light plant and power house.

Toronto, Ont.

The city council adopted the report of the special committee on subways for underground street railway traffic, which recommended that the city engineer be requested to prepare plans for a subway on Yonge street from the Union station to St. Clair avenue; that the board of control be requested to invite tenders forthwith, and submit the question to the people on the receipt of a reasonable tender; and that \$5,000 be provided to secure such detailed plans and specifications.

Victoria, B.C.

The B. C. Telephone Company will require equipment for about 900 additional telephones.

Weyburn, Sask.

Tenders are called until April 15th for construction of about 27 miles of telephone system by the North Weyburn Rural Telephone Company.

AWARDED**Calgary, Alta.**

The contract for building of coal conveyors and bunkers for the power house at Victoria Park has been awarded to Phillips & Lang, of Chicago, at a cost of \$42,300. The electrical machinery will be furnished by the C. W. Hunt Company, of New York. Contract must be completed within four months.

Contract for equipment for the electrical plant at Victoria Park were re-

commended as follows: a 1600 k.w. turbo-generator set from the Allis-Chalmers-Bullock Company, \$41,965. This is to be installed and in operation by August 22 next under a bond of \$5,000; The Belliss-Morcom Company tendered for a 1500 k.w. generator, but could not deliver it before ten months. Gorman, Clancey & Grindley's tender for a 2-ton crane at a cost of \$3,190. The Canadian Westinghouse Company for a 100 k.w. exciter for \$4,300, the lowest; the Allis-Chalmers-Bullock Company will have charge of removing and re-erecting the old boilers from the power house in the west end to Victoria park, and such necessary work as is required, at a cost of \$36,790.

Quebec, Que.

We are informed that the Quebec Railway, Light, Heat & Power Company, Limited, have awarded contract for construction of the double-track electric railway from Beauport Station to Montmorency Falls Park at Kent House, a distance of 3.3 miles. The railway will be rock-ballasting throughout, all 80-lb. A. S. C. E. steel rails, and the work is to be completed by June 20th. J. G. Brill Company, Philadelphia Car-builders; have supplied ten open single-truck car bodies for the Quebec County Railway. C. E. A. Carr, general manager.

Miscellaneous

North Bay, Ont.

The Insurance Underwriters in their report condemn the fire fighting appliances and waterworks system and recommend sweeping changes. N. R. Wilson, travelling inspector, Canadian Fire Underwriters' Association; M. W. Flannery, town clerk.

Ottawa, Ont.

Tenders are called until April 21st for improving lower entrance of Farran's Point Canal, St. Lawrence. Advertisement in "Tenders and For Sale Department" of this issue.

Tenders are called until April 14th by Department of Railways and Canals for supply and delivery of various articles of hardware, castings, for use on the Cornwall Canal. L. K. Jones, secretary. Advertisement in "Tenders and For Sale Department" of this issue.

Tenders are also called until April 21st for enlargement of Canal office on the Cornwall Canal. Advertisement in "Tenders and For Sale Department" of this issue.

Tenders addressed to R. C. Desrochers, secretary, will be received until April 25th for dredging required at the following: Big Creek, Big Island, Echo Bay, Kincardine, Port Elgin, Kingsville, Penetanguishene, River Thames, Salt Point (Presqu'île), and Wiarton.

The building permits recently issued include: James Wilson, dwelling, Strathcona avenue, \$3,500; A. D. Helmer, residence, Lisgar street, George Lester, builder, \$2,500; Dominion Methodist Church, alteration to entrance, J. A. Ewart, architect, George Crain, builder, \$2,500.

Hon. Charles Murphy outlined a plan before a meeting of the ratepayers of Ottawa and Eastview for preventing floods of the Rideau river. It is by dams at Porter's Island and some farther up the river. It will be taken up by the

ratepayers who will urge the government to take some action in this connection.

Toronto, Ont.

The following building permits have been issued recently Massey Estate, balcony to fire escape, Shuter and Victoria streets, \$5,000; G. S. Hope & Sons, 1 pr. semi-det. 2-storey brick dwellings, Shaw street, \$4,500; R. M. Mackey, 3 att. 2-storey brick dwellings, Lansdowne avenue, \$6,000; G. B. Cooney, 1 pr. semi-det. 2-storey and attic brick dwelling, Ossington avenue, \$4,000; Thos. Maguire, 2-storey brick dwelling, Dunvegan road, \$6,500; Chas. H. Neely, 2-storey and attic brick dwelling, Highlands avenue, \$8,500; Geo. Pudlew, 2½-storey brick dwelling, on Rosehill avenue, \$4,500; J. C. Sloan, 2-storey brick dwelling, Fairview Boulevard, \$4,500; A. Henderson, 2 pr. semi-det. 2-storey brick dwellings, Cooper avenue, \$7,400; R. C. Bustard, 2½-storey brick dwelling, corner Rowanwood & Cluny, \$9,000; J. H. Jackson, 1 pr. semi-det. 2½-storey brick dwellings, 11 Quebec avenue, \$4,900; John Hinds, 1 pr. semi-det. 2-storey and attic brick dwellings, Ossington avenue, \$5,000; R. C. Bustard, 3 det. 2½-storey brick dwellings, near Rowanwood avenue, on east side Cluny avenue, \$18,000; G. H. Webb, 2 det. 2½-storey brick dwellings, Indian road, \$8,000; H. H. Hudson, 2-storey brick dwelling, Russell Hill, \$6,500; F. G. McBrien, 3 pr. semi-det. 2-storey brick dwellings, cor Osler & Royce avenue, \$12,000; Mrs. Grafton, 1 pr. semi-det. 2½-storey brick dwellings, near Broadview north side Dearbourne, \$7,000; R. W. Harrison, 3 att. 2-storey brick dwellings, 20, 22, 24 Delaney Crescent, \$4,500; Robt. Luxton, 6 att. 2-storey roughcast dwellings, brick fronts, Globe, \$8,000; Mr. Steele, 2-storey brick store and dwelling, Gerard street east, \$5,500; Houghton & Breeze, 1 pr. semi-det. 2½-storey brick dwellings, Lappin avenue, \$4,600; J. C. Budreo, 3-storey brick stores and dwellings, Queen street, \$8,000; G. Brady & Son, 2 det. 2-storey and attic brick dwellings, Woodlawn avenue, \$8,000; Mrs. Alice Adams, 2½-storey brick dwelling, 9 High Park Boulevard, \$5,000; Morris & Thurston, 1 pr. semi-det. 2-storey brick dwellings, Wallace ave., \$4,500; E. Grainger, 1 pr. semi-det. 2-storey and attic brick dwellings, Balmoral avenue, \$6,000; S. B. Coon (in trust), 2½-storey brick dwelling, Rowanwood, \$4,200; S. B. Coon (in trust), 2½-storey brick dwelling, 26 Rowanwood avenue, \$4,200; W. A. Laughton, 2½-storey brick dwelling, 33 Dunvegan road, \$9,000; Robt. Ewing, 4 det. 2-storey and attic brick dwellings, north side Thorold, \$12,000; Waters & Elliott, 4 pr. semi-det. 2-storey brick dwellings, Campbell avenue, \$13,500; Waters & Porter, 3 pr. semi-det. 2-storey brick dwellings, west side Shaw street, \$12,000; Johnston & Day, 4 att. 2-storey roughcast dwellings, brick fronts, Sprout street, \$8,000; W. W. Hiltz, 3 det. 2-storey and attic brick dwellings, Hampton avenue, \$7,500; M. Yetman, 2 pr. semi-det. 2½-storey brick dwellings, west side Dufferin street, \$8,000; H. H. LeDrew, 3 att. 3-storey brick dwellings, 271-3-5 Westmoreland avenue, \$6,000; T. J. Bowen, 3 att. 2-storey brick dwellings, St. Helens avenue, \$7,500; J. J. Downey, 3 att. 2-storey brick dwellings, Indian road, \$7,500; J. J. Downey, 3 att. 2-

storey brick dwellings, Humberstone avenue, \$7,500; J. J. Downey, 1 pr. semi-det. 2-storey brick dwellings, Indian road, \$5,000; Wycliffe College, 2½-storey brick dwelling, Queen's Park, \$14,000; J. Bishop, 3 att. 2½-storey brick dwellings, 127-131 Mutual street, \$7,500; Niagara Navigation Company, 1-storey steel freight shed, foot of Yonge street, \$7,500; Waters & Elliott, 1 pr. semi-det. 2-storey brick dwellings, Yarmouth Gardens, \$4,500; A. A. Mitchell, 2 det. 2-storey and attic brick dwellings, Oriole road, \$8,000; Wm. Hodgkinson, 3 att. 2-storey roughcast dwellings, brick fronts, DeGrassi street, \$5,400; E. Smith, 1 pr. semi-det. 2-storey brick dwellings, Barton avenue, \$5,000; W. H. Baldwin, 2½-storey brick dwelling, 332 East Roxborough street, \$5,000; Waters & Elliott, 1 pr. semi-det. 2-storey brick dwellings, Yarmouth Gardens, \$5,000; Alex. Mills, 2-storey and attic brick dwelling, Highlands avenue, \$5,500; G. H. Webb, 2½-storey brick dwelling, Indian road and Walter street, \$4,500; A. McGill, 2 det. 2½-storey brick dwellings, Mavety street, \$6,000; W. W. Hiltz, 2 pr. semi-det. 2-storey brick dwellings, 71-73 Hampton, \$9,000; Wycliffe College, 3-storey brick addition to Wycliffe College (residence), \$12,000; Otto Higel, 1-storey brick factory, King street, near Bathurst, \$30,000; Dundas Building Co., 2-storey brick apartments, east side Roncesvalles avenue, \$20,000; Chas. Hough, 2 det. 2-storey and attic brick dwellings, east side Alhambra, \$7,000; J. E. Peterkin, 2 pr. semi-det. 2-storey roughcast dwellings, brick fronts, north side Strathcona, \$6,000; J. D. Allan, 3-storey brick apartments, south side Ulster street, \$7,500; A. Doney, 2-storey and attic brick dwelling, St. Clair avenue, \$6,000; F. L. Beecroft, 1 pr. semi-det. 2-storey and attic brick dwellings, 72-72½ Pembroke street, \$6,000; Fred. Brumhall, 2 pr. semi-det. 2-storey brick dwellings, north side Dupont street, \$8,000; J. H. Mills, 2-storey and attic brick dwelling, Indian road, \$4,600; E. M. Biette, 1 pr. semi-det. 2½-storey brick dwellings, Palmerston avenue, \$5,000; Mr. Dennis, 1 pr. semi-det. 2-storey avenue, \$4,500; Gordon Marr, 2 det. 2½-storey brick dwellings, north side Humberstone avenue, \$5,000; The McGee Estate, alterations to theatre, 93 Yonge street, \$10,000.

Whitby, Ont.

Tenders will be received until April 15th for \$8,850 2-years local improvement debentures, etc. J. White, town clerk. Advertisement in "Tenders and For Sale Department" of this issue.

Late News

Brandon, Man.

The date for receiving tenders for street paving has been extended to April 28th. R. E. Speakman, city engineer. Advertisement in "Tenders and For Sale Department" of this issue.

Calgary, Alta.

The announcement is made that the T. Eaton Company, Limited, Toronto, will erect in Calgary a large departmental store. W. J. Gunn has been here in connection with the location.

Montreal, Que.

Tenders addressed to David Seath, secretary, Harbor Commissioners, will be received until April 18th for the con-

(Continued on page 60)

Tenders and For Sale Department

Steam Shovels

We own and have for sale near Buffalo, N.Y., two Vulcan 75-ton 2½-yard steam shovels; late model, with new extra large boilers and in excellent condition; also one 70-ton. These will stand most rigid inspection and we are offering them at unusually low prices. Confer with us.

WILLIS SHAW MACHINERY CO.,
171 La Salle Street,

T.F. Chicago, Ill.

City of Winnipeg

Electrical Distribution System

Tenders For Switching Equipment for Substation No. 1

Tenders will be received by the undersigned up to 11 a.m., of Thursday, April 27th, 1911, for the supply and installation in Sub-station No. 1, on King Street, Winnipeg, of electrical switching equipment for this station. Plans and specifications may be obtained at the office of the Power Engineers, Smith, Kerry & Chace, Carnegie Library Building, Winnipeg.

Each tender must be accompanied by marked cheque for five (5) per cent. of the amount of the amount of tender. The Board reserves the right to reject any or all tenders or to accept any bid which may appear to the City's advantage.

M. PETERSON,
Secretary.

Board of Control Office,
Winnipeg, March 27, 1911. 14-15

PAVING

City of Fort William, Ont.

Sealed and endorsed tenders, addressed to the Chairman of the Works Committee, will be received at the office of the City Clerk before 5 o'clock p.m., of May 4th, 1911, for the paving with asphalt block, sheet asphalt or bitulithic of—

May street, 46 ft., curb to curb., approximately 5,700 square yards.

Brodie street, 46 ft., curb to curb., approximately 8,400 square yards.

Plans, Specifications and Forms of Tender may be obtained at the office of the City Engineer.

Each tender must be accompanied by a marked cheque for \$1,000.

The lowest or any tender not necessarily accepted.

JOHN WILSON,
City Engineer's Office, City Engineer.
Fort William, April 1, 1911. 14-16

City of Regina

Fire Hall Equipment

Sealed tenders addressed to the City Commissioner, City Hall, Regina, Sask., will be received up to Monday, April 17th, 1911, for the following Fire Hall equipment: One Combination Hose and Chemical Wagon, 1,700 feet of Double Jacket Rubber Lined Fire Hose, 2 Hydrant Gate Valves, Two Play Pipes, and other apparatus. All information will be furnished on application to the undersigned, or to W. White, Chief of the Fire Brigade, Regina.

A. J. McPHERSON,
City Commissioner.
14-15

City of Regina

Tenders for 1 Squeegee Street Washing Machine

Sealed tenders addressed to the undersigned will be received until 12 o'clock noon, April 15, 1911, for 1 squeegee street washing machine for the City of Regina.

A. J. McPHERSON,
City Commissioner.
Regina, Sask. 14-15

City of Saskatoon

Water Works and Sewer- age Works

Sealed tenders, addressed to the City Commissioners, Saskatoon, and marked as to contents, will be received up to 12 o'clock noon on Friday, April 21st, 1911, for the following material:—

Contract No. 89.—Furnishing cast iron pipe and specials.

Contract No. 90.—Furnishing fire hydrants, gate valves, and valve boxes.

Contract No. 91.—Furnishing sewer pipe and junctions.

Contract No. 92.—Furnishing manhole frames and covers.

Specifications, instructions to bidders, general conditions, forms of tender, and forms of agreement, may be seen at the office of the City Engineer, Saskatoon, or at the office of "The Canadian Engineer," at the following addresses:

Toronto, 62 Church Street.

Montreal, Board of Trade Building.

Winnipeg, Room 315 Nanton Building.

Copies of instructions to bidders, and forms of tender, will be furnished on application to the City Engineer, but copies of plans and specifications will not be furnished.

The lowest or any tender not necessarily accepted.

JAMES CLINKSKILL,
W. B. NEIL,
City Commissioners.

Saskatoon, Sask.,
March 30th, 1911. 14-15

Township of North Easthope

Tenders Wanted

Sealed tenders marked "Tenders for Western Drain," and "Tenders for Kichne Drain," will be received by the undersigned up to 2 p.m. on April 17, 1911. The council will proceed to consider the tenders immediately after the above hour at the Town Hall, North Easthope.

Plan, profile and specifications can be seen at the clerk's office, Amulree, or at the office of John Roger, O.L.S., Mitchell.

The Western Drain commences on Lot 33, Con. 7, and has its outlet on the Northern Gravel road.

The Kichne Drain commences on Lot 24, Con. 7, and has its outlet on Lot 38, Con. 2.

A deposit of \$100 is required on the Western Drain contract and \$200 on the Kichne Drain contract. Cash or marked cheque.

The lowest or any tender not necessarily accepted.

J. D. FISHER,
Tp. Clerk, North Easthope,
Amulree P.O.

Dated the 3rd day of April, 1911. 14-15



Department of Railways and Canals, Canada

Ontario—St. Lawrence Canals

CORNWALL CANAL

Sealed tenders addressed to the undersigned and endorsed "Tender for improving Upper Entrance to Lock No. 19," will be received at this office until 16 o'clock on Saturday, April 15th.

Plans, Specifications, and Forms of Contract to be entered into can be seen on and after March 18th, at the office of the Chief Engineer of the Department of Railways and Canals, Ottawa, and at the office of the Resident Engineer of the Ontario—St. Lawrence Canals, Cornwall, at which places form of tender may be obtained.

Parties tendering will be required to accept the fair wages Schedule prepared or to be prepared by the Department of Labor, which schedule will form part of the contract.

Contractors are requested to bear in mind that tenders will not be considered unless made strictly in accordance with the printed forms, and in the case of firms, unless there are attached the actual signature, the nature of the occupation, and place of residence of each member of the firm.

An accepted Bank cheque for the sum of \$1,500 made payable to the order of the Minister of Railways and Canals must accompany each tender, which sum will be forfeited if the party tendering declines entering into contract for the work, at the rates stated in the offer submitted.

The Cheque thus sent in will be returned to the respective contractors whose tenders are not accepted.

The cheque of the successful tenderer will be held as security, or part security, for the due fulfilment of the contract to be entered into.

The lowest or any tender not necessarily accepted.

By order, L. K. JONES,
Secretary.

Department of Railways and Canals,
Ottawa, March 21st, 1911.

Newspapers inserting this advertisement without authority from the Department will not be paid for it. 14-15

City of Edmonton, Alberta

Sealed tenders marked "Tenders for Trunk Sewer," will be received by the City Commissioners up till 3 p.m., May 2nd, 1911, for the supplying of all materials and the construction, in tunnel of a concrete sewer ten feet six inches (10 ft. 6 in.), in internal diameter and approximately 3,200 feet long.

Plans and specifications and all particulars may be obtained from the City Engineer's office, Edmonton, on deposit of a marked cheque for the sum of \$25.00, which will be held until the return of plans and specifications. Duplicates of which may be seen at the office of the Contract Record, 1334 Board of Trade Building, Montreal, Que.

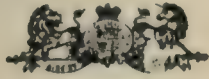
Lowest or any tender not necessarily accepted.

CITY COMMISSIONERS.

A. J. LATORNE, NELL,

City Engineer,
Edmonton, Alta.

14-15



Department of Railways and Canals, Canada

St. Lawrence Canals

CORNWALL CANAL

Tender for Hardware, Castings, &c.

Sealed tenders for supplies addressed to the undersigned, will be received until 16 o'clock on Friday, April 14th, 1911, for the supply and delivery of various articles of hardware, castings, for use on the above canal for the year 1911-1912.

Specifications, forms of tender and other information may be obtained from the purchasing agent of the Department of Railways and Canals, Ottawa, on and after this date.

The lowest or any tender not necessarily accepted.

By order,

L. K. Jones, Secretary.

Department of Railways and Canals,
Ottawa, March 30, 1911.

Newspapers inserting this advertisement without authority from the Department will not be paid for it.

15-15



Notice to Contractors

Tenders will be received by registered post only, addressed to the Chairman of the Board of Control, City Hall, up to noon on Tuesday, April 25, 1911, for the supply of a Priming Equipment for Centrifugal Pumps at the Toronto Filtration Plant.

Envelopes containing tenders must be plainly marked on the outside as to contents.

Specifications and forms of tender may be obtained at the office of the City Engineer, Toronto.

The tenderers shall submit with their tender the names of two personal sureties (approved of by the City Treasurer), not members of the City Council or officer of the Corporation of the City of Toronto, or in lieu of said sureties the bond of a Guarantee Company, approved as aforesaid.

The usual conditions relating to tendering as prescribed by City by-law must be strictly complied with or the tenders will not be entertained.

The lowest or any tender not necessarily accepted.

G. R. GEARY, Mayor.

15-15
Chairman Board of Control.
City Hall, Toronto, April 4th, 1911.

BRIDGE TENDERS

Sealed tenders will be received by Jas. Beattie, Esq., Clerk of Wellington County, Fergus, Ont., until 2 p.m. on Wednesday, April 19, for the construction of an 80 ft. concrete arch bridge, 26 ft. wide, with ornamental railing, at Fergus.

Plans and specifications may be seen at the offices of the undersigned.

BOWMAN & CONNOR, Engineers,
36 Toronto Street, Toronto.
and Court House, Berlin, Ont.

JAS. BEATTIE, County Clerk,
Fergus, Ont.

14-15
J. A. WILKINSON, Chairman of Com.
Morrison, Ont.

CITY OF REGINA
Saskatchewan, Canada

Tenders for Sewage Pumps and Motor. Switchboard and Apparatus. For Sewage Disposal Works.

Sealed tenders marked "Tenders for Sewage Pumps, Disposal Works," will be received by the City Commissioners, Regina, until 12 o'clock noon, April 30th, 1911, for the supply of One 1,000,000 gallons per 24 hours capacity Pump and Motor. Switchboard and Apparatus.

Full particulars may be had upon application to the Chief Engineer, Trunk Sewer Works.

The lowest or any tender not necessarily accepted.

(Signed) JOHN MARSHALL,
Chief Engineer,
Trunk Sewer Works.

April 6th, 1911.

15-17



Department of Railways and Canals, Canada

Ontario—St. Lawrence Canals

CORNWALL CANAL

Sealed tenders addressed to the undersigned and endorsed "Tender for Canal Office Enlargement" will be received at this office until 16 o'clock on Friday, April 21.

Plans, specifications and form of contract to be entered into can be seen on and after April 3, at the office of the Chief Engineer of the Department of Railways and Canals, Ottawa, and at the office of the Resident Engineer of the Ontario—St. Lawrence Canals, Cornwall, at which places form of tender may be obtained.

Parties tendering will be required to accept the fair wages schedule prepared or to be prepared by the Department of Labor, which schedule will form part of the contract.

Contractors are requested to bear in mind that tenders will not be considered, unless made strictly in accordance with the printed forms, and in the case of firms, unless there are attached the actual signature, the nature of the occupation, and place of residence of each member of the firm.

An accepted bank cheque for the sum of \$500 made payable to the order of the Minister of Railways and Canals must accompany each tender, which sum will be forfeited if the party tendering declines entering into contract for the work, at the rates stated in the offer submitted.

The cheque thus sent in will be returned to the respective contractors whose tenders are not accepted.

The cheque of the successful tenderer will be held as security, or part security, for the due fulfilment of the contract to be entered into.

The lowest or any tender not necessarily accepted.

By order,

L. K. JONES, Secretary.
Department of Railways and Canals,
Ottawa, March 30, 1911.

Newspapers inserting this advertisement without authority from the Department will not be paid for it.

15-15

Tenders for Debentures

Tenders will be received at the Town Clerk's Office, Whitby, up to Saturday, 18th April, 1911, for \$8,500, 20 years Local Improvement Debentures, bearing interest at 5 per cent. payable annually, in payments of \$710.15. Debentures dated 1st May, 1911, and payable at Town Treasurer's Office, Whitby.

By law validated by Ontario Legislature

JOSEPH WHITE,

15-15

Town Clerk

TENDERS
FOR
COUNTY HOUSE OF
REFUGE

Sealed tenders will be received by the undersigned, up to noon of Tuesday, May 2nd, 1911, for the erection of a County House of Industry and Refuge at Cornwall.

Plans and Specifications can be inspected at my office in County Building here, at the store of Mr. J. A. C. Hunt, Alexandria, at residence of Mr. C. E. Cameron, Iroquois, or at the office of Mr. A. L. Weeks, architect, Ottawa.

Marked cheque for 5 per cent. of tender, payable to my order, to accompany tender. Cheques will be immediately returned to unsuccessful tenderers after contract awarded.

Dated at Cornwall this 8th day of April, 1911

ADRIAN I. MACDONELL,

15-16

County Clerk



Department of Railways and Canals, Canada

Ontario—St. Lawrence Canals

Farran's Point Canal

Sealed tenders addressed to the undersigned and endorsed "Tender for Improving Lower Entrance" will be received at this office until 16 o'clock on Friday, April 21.

Plans, specifications and form of contract to be entered into can be seen on and after April 3, at the office of the Chief Engineer of the Department of Railways and Canals, Ottawa, and at the office of the Resident Engineer of the Ontario—St. Lawrence Canals, Cornwall, at which places form of tender may be obtained.

Parties tendering will be required to accept the fair wage schedule prepared or to be prepared by the Department of Labor, which schedule will form part of the contract.

Contractors are requested to bear in mind that tenders will not be considered, unless made strictly in accordance with the printed forms, and in the case of firms, unless there are attached the actual signature, the nature of the occupation, and place of residence of each member of the firm.

An accepted bank cheque for the sum of \$5,000 made payable to the order of the Minister of Railways and Canals must accompany each tender, which sum will be forfeited if the party tendering declines entering into contract for the work, at the rates stated in the offer submitted.

The cheque thus sent in will be returned to the respective contractors whose tenders are not accepted.

The cheque of the successful tenderer will be held as security, or part security, for the due fulfilment of the contract to be entered into.

The lowest or any tender not necessarily accepted.

By order,

L. K. JONES, Secretary.
Department of Railways and Canals,
Ottawa, March 30, 1911.

Newspapers inserting this advertisement without authority from the Department will not be paid for it.

15-15

CITY OF MOOSE JAW Saskatchewan

Tenders

Sealed tenders will be received by the undersigned City Clerk up to 8.30 p.m. on Monday, April 24th, 1911, for the supply of approximately 400 White Cedar Poles, for use in the Electric Light Department.

Specifications and full particulars may be obtained on application to the undersigned or to J. D. Peters, Electrical Superintendent, Moose Jaw.

Tenders to be at a price f.o.b. Moose Jaw and to be endorsed "Tenders for Electric Light Poles."

The lowest or any tender not necessarily accepted.

W. F. HEAL,
City Clerk.

15-16

Tenders for School Building

Tenders will be received by the undersigned, up to Monday, the 1st day of May next (1911), at 5 o'clock p.m., for building a school house of brick with cement trimmings, on Hickman street, West Highlands, Town of Amherst, according to plans and specifications which may be seen at Town Office, Amherst, and at the office of Leslie R. Fairn, architect, Aylesford, N.S., on and after Monday, April 17th, instant. Contractor to do all work and supply all material.

Tenders to be sealed and marked "Tenders for School Building" and must be accompanied with a certified cheque for \$500 payable to the Town of Amherst, which amount will be forfeited to the said Town should the party whose tender is accepted neglect or refuse to execute a satisfactory contract to complete the work.

The Town Council do not bind themselves to accept the lowest or any tender.

By order of Town Council
W. FRED DONKIN,
Town Clerk.

Amherst, N.S., April 8, 1911.

15-17



Department of Public Works Ontario

To Contractors

Sealed tenders addressed to the undersigned and addressed "Tender for Verandahs," will be received at this Department until noon on Saturday, the 22nd April, 1911, for the construction of Verandahs at the Hospital for Idiots, Orillia.

Plans and specifications can be seen at this Department and at the above institution. An accepted bank cheque payable to the order of the Hon. J. O. Reaume, Minister of Public Works, for five per cent. of the amount of the tender and the bona fide signatures and addresses of two sureties or the bond of a Guarantee Company, approved by this Department, for the due fulfilment of the Contract must accompany each tender. Cheque will become forfeit to the Crown in the event of the successful tendered refusing to carry out the work within ten days after the acceptance.

The Department will not be bound to accept the lowest or any tender.

By order,
H. F. McNAUGHTEN,
Secretary, Public Works Dept.

Department of Public Work, Ontario,
Toronto, April 10th, 1911.

Newspapers publishing this advertisement without authority will not be paid for it. 15-15

Toronto Main Drainage

Low Level Interceptor:

Section No. 5—3,350 linear feet.
Section No. 6—2,830 linear feet.
Section No. 7—3,778 linear feet.
Section No. 8—3,238 linear feet.

Sealed tenders for the laying of reinforced concrete pipe sewer complete will be received by registered post only, addressed to the Chairman of the Board of Control, Toronto, Ontario, up to noon of May 9th, 1911. The concrete pipe to be laid will be supplied by the City. The diameters are as follows: For Section No. 5, 60 inches; for Section Nos. 6, 7 and 8, 66 inches.

Plans and specifications will be on file at the office of the CONTRACT RECORD, B-34 Board of Trade Building, Montreal, after Monday, April 18. Plans may be seen, and specifications and further information obtained from the Main Drainage Works, City Engineer's Office, Toronto.

G. R. GEARY, Mayor,

15-16 Chairman, Board of Control.

CITY OF BRANDON

Street Paving

Sealed tenders marked "Tenders for Paving," will be received by the City Clerk, Brandon, Manitoba, until 12 o'clock at noon on Friday, the 28th day of April next, for paving the following streets in the City of Brandon:

Rosser avenue, Twelfth street to Sirth street.
Pacific avenue, Eleventh st. to Eighth st.
Princess avenue, Tenth street to Eighth st.
Eleventh street, Rosser ave. to Pacific ave.
Tenth street, Princess ave. to Pacific ave.
Ninth street, Princess ave. to Pacific ave.
Eighth street, Princess ave. to Pacific ave.

Tenders are invited for Wood Block, Asphalt Block, Sheet Asphalt, Granitoid, Bitulithic and Vitrified Brick, on 5-inch and 6-inch concrete foundations, or other kinds of pavements.

Proprietors of patented pavements are requested to furnish their special specifications.

An accepted bank cheque for 5 per cent. of amount of tender must accompany each bid.

The lowest or any tender not necessarily accepted.

Further particulars can be obtained from City Engineer's Office.

R. E. SPEAKMAN,
City Engineer's Office, City Engineer.
Brandon, March 31, 1911. 14-16

VICTORIA, B. C.

Tenders Wanted

Sealed bids marked "Tenders for Pavement" will be received by the purchasing agent up to 4 o'clock p.m. of Friday, April 28, 1911, for paving with asphalt approximately forty miles of street. Plans and specifications may be obtained at the City Engineer's office. The lowest or any tender not necessarily accepted.

WM. NORTHCOTT, ANGUS SMITH,
Purchasing Agent. City Engineer.
Victoria, B.C., April 10, 1911. 15-15

Positions Wanted

Advertisements under this heading one cent a word per insertion. Box No ten cents extra

Position wanted as general foreman bridge or structural work, open for engagement, 10 years experience, technical education, thorough knowledge of the trade in all its branches. Box 256, Contract Record, Toronto, Ont., 15-15

POSITION WANTED—AS Foreman on railway, sewer, or other contract work, by man of wide experience. At liberty to accept favorable terms immediately. Address, Box 260, Contract Record, Toronto, Ont. 15-17

Late News

(Continued from page 57)

struction of two concrete wharf sheds on the Tarte Pier. Plans, etc., with F. W. Cowie, chief engineer.

Ottawa, Ont.

Tenders addressed to P. E. Ryan, secretary, Commissioners of the Transcontinental Railway, will be received until April 25th for coaling stations, with inclined trestle approaches, for coaling locomotives; ash-pits and cinder hoists at Transcona, Man.; Reditt, Ont., and Graham, Ont. Plans, etc., at office of Gordon Grant, chief engineer, and of S. R. Boulin, district engineer, St. Boniface.

Toronto, Ont.

A site has been chosen on Broadview avenue for the new working women's home, and a campaign to raise the required \$20,000 started. Mrs. J. B. Leathes, Oriole road, is interested.

Tenders are called until May 9th for the laying of reinforced concrete pipe sewer complete, etc. R. G. Geary, chairman, Board of Control. Advertisement in "Tenders and For Sale Department" of this issue.

Victoria, B.C.

Tenders are called until April 28th for paving with asphalt about forty miles of street. Wm. Northcott, purchasing agent. Angus Smith, city engineer. Advertisement in "Tenders and For Sale Department" of this issue.

CITY OF REGINA

Waterworks

Cast Iron Pipe

Sealed tenders marked "Tenders for Cast Iron Pipe" will be received by the City Commissioners until 12 o'clock noon, April 26th, for supply of approximately:

900 tons 18-in. c.i. pipe.
150 tons 6-in. c.i. pipe.

Alternative prices on steel pipe will be considered.

Full particulars may be had on application to the City Engineer.

A marked cheque for \$2,000 must accompany each tender.

The city reserves the right to reject any or all tenders.

(Signed) L. A. THORNTON,
City Engineer.

15-15

Contract Record

ESTABLISHED 1886

A Weekly Journal of
Building, Contracting, Engineering, Public Works
Municipal Progress, Advance Information

PUBLISHED EACH WEDNESDAY BY

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SUBSCRIPTION RATES

Canada and Great Britain, \$2.00 U.S. and Foreign, \$2.50

Vol. 25

April 19, 1911

No. 19

Hostility of Labor Unions to Increasing Efficiency

Upwards of fifty bricklayers employed in the erection of a paper mill at Hudson's Falls went on strike the other week owing to an attempt made by the contractor, F. B. Gilbreth, of New York, to carry out the work along certain lines of scientific management. Under Mr. Gilbreth's scheme it is possible for the more skilful workers in many cases to double their wages, but the bricklayers' union believe that with the measurement of their output their cause will be weakened, and that it is incumbent upon them to take protective measures for the trade as a whole.

The methods instituted, or rather invented, by Mr. Gilbreth have lately received a good deal of attention. In the discussion has been told what Gilbreth has been doing in changing methods in general contracting work that have varied little in centuries, the bricklayers' trade for example. The bricks, the mortar and the methods of laying the bricks remain practically the same as when bricks were first used. By experiment Gilbreth found that he could reduce the number of motions in laying a brick from eighteen to five or six. He devised an adjustable scaffold that did away with waste effort in stooping to pick up the brick. Cheaply paid helpers arranged the bricks and mortar in a carrier, after the bricks had been sorted and inspected. Introducing his method on a Boston building he was erecting, he proved that where in a certain class of work 120 bricks to the hour had been a record, his men could now, with less fatigue, average 350 an hour. In the Hudson's Falls contract on which the strike has now been declared a new record in building construction was being established. The possibilities of increasing efficiency along the Gilbreth plan may, according to some observers, accomplish a change in business comparable only to the shift from hand labor to machine production.

A good deal of attention is being devoted to experimental work in Great Britain and Germany as

well as in the United States. In the United States Frederick W. Taylor, an engineer, has had for the last eight or ten years a corps of experts installing his ideas in large factories. Taylor believed that even in a simple occupation like shovelling improvement could be made over the old haphazard method. By experiment he proved that a first-class man would do his biggest day's work with a short shovel load of about twenty-one pounds. Putting his theory into practice at the Bethlehem Steel Works, he secured extraordinary results. A hundred and forty-six men proved equal, without physical strain, to do work that had formerly taken 600. The wages paid were higher than under the old scale, but the cost of handling material in that yard was reduced from seven to eight cents a ton to three and a half cents, and the experiment in "scientific management" resulted in an annual saving of more than \$75,000 a year. Taylor carried his experiments from simple operations to complicated machine work. In the cutting of steel he increased the capacity of an operative and of a machine from two to nine times. In the Taylor machine works at Philadelphia the time of manufacture of one highly specialized machine was reduced from eight months to six weeks. The profits increased enormously and the wages went up 33 per cent. without change in the hours of labor.

The attitude of hostility of the labor unions to such methods of increasing efficiency is no more reasonable than the hostility of another day to machine as opposed to hand labor. Labor is, at bottom, at least equally interested with capital in increasing output. Time saving devices have increased not lessened the work to be done, the demand for men to do it and the wages to be earned.

A novel scheme for washing gravel has been in use at Bangor, where construction has been under way for some time on a new mechanical filtration plant, which is being built by the New York Continental Jewel Filtration Company, to replace the existing water purification works. The concrete aggregate is delivered in piles near the work and carried from them to the mixer in wheelbarrows. The gravel contained a certain amount of loam and it was considered necessary to wash it before incorporating it in the concrete. To accomplish this, holes were punched in the bottoms and sides of the wheelbarrows, converting them practically into sieves. Between the mixer and the storage piles a water pipe was connected up with a large perforated nozzle at its discharge end. Each wheelbarrow load of gravel on its way to the mixer was rolled under the nozzle and streams of water discharged upon it, the material being churned about with a spade to expose the lower part of the load to the cleansing action of the water. The water and the loam which is flushed out passed out through the perforations in the wheelbarrow and the clean gravel was then carried to the mixer and used.

The Board of Fire Underwriters has made public its report on the Triangle Waist Factory fire. The number of dead is placed at 145, and the number of operatives who escaped at 360. The underwriters recommend: A fire drill and private fire department in all factories; stairways in fireproof shafts reached by outside balconies; inside stairs in masonry shafts with sprinklers in every building over sixty feet high; wire glass and metal frames for all outside windows.

to fire fighters in a general conflagration. The windows, which are ordinarily a point of early attack from surrounding fires, are safeguarded by steel window facings and the doorways by metallic doors.

Reliability of Estimates

A few years ago it was a common impression that an engineer's estimate was always greatly exceeded in actual construction—an idea not altogether without foundation. It is now recognized that there is much greater reliability in the estimates of experienced engineers. A recent report of the Board of Estimate and Appointment of New York gives the estimated and actual costs of 321 pieces of public work in the five boroughs, totalling \$29,434,059 in cost. Between 1902 and 1909, inclusive, the totals of all estimates showed a gradual change from an excess of actual over cost of 2 per cent., to an excess of estimated over actual of 9½ per cent. Taking the totals by boroughs, and averaging the eight years, we find that in Manhattan the actual cost was 100.4 per cent. of the estimated; in Brooklyn it was 86.5 per cent.; in the Bronx, 93.2 per cent.; in Queens, 89.4 per cent., and in Richmond, 113.9 per cent.

An interesting feature presents itself when we inspect the items under the heads of sewerage, grading and paving respectively. In every case the percentage of actual to estimated cost is higher for sewers than for either of the other two. The estimates for paving, on the other hand, were higher than the cost in every year for every borough, except in one instance. The grading estimates were sometimes too low and again too high. It would appear from this that even the experience of years has been insufficient to prepare the engineers of the sewer departments to make sufficient provision for the unforeseen difficulties in the way of sewer construction which are so generally encountered and are increasing every year.

The Man Who Wins

The man who wins is the man who does,
The man who makes things hum and buzz,
The man who works and the man who acts,
Who builds on a basis of solid facts;
Who doesn't sit down to mope and dream,
But humps ahead with the force of steam;
Who hasn't the time to fuss and fret,
But gets there every time—you bet!

The man who wins is the man who climbs
The ladder of life to the cheery chimes
Of the bells of labor, the bells of toil,
And isn't afraid that his skin will spoil
If he faces the shine of the glaring sun
And works in the light till his task is done—
A human engine with triple beam
And a hundred and fifty pounds of steam.

—Brush and Pail.

According to the construction programme of the railways for Western Canada 170 new towns will be built in the west this year. The Canadian Pacific Railway will establish 50, the Grand Trunk Pacific 24, and the Canadian Northern Railway no less than 96. Surveys have been made for most of these and a few of them will be divisional points.

Applying Asphalt Filler in Brick Pavement Construction

In its report at the last annual convention of the Illinois Society of Engineers and Surveyors the Committee on Roads and Pavements stated that the pouring method, as has been very commonly used, of applying the asphalt filler for a brick pavement should be abolished, as it was both wasteful and inefficient. It was stated that by using a wide fan-shaped snout to the can from which the filler is poured, keeping the asphalt very hot and working from the gutters up to the crown the material may be cheaply and quickly applied. Following the application of the hot asphalt a squeegee in the hands of a competent workman should be used to remove the surplus of material and in such a manner that the chilled material is not worked over any brick which had not been previously coated direct by the flow from the pouring can. It was stated that in this way all joints are more perfectly filled than in any other way and no cold material can get into them or bridge them. The snout of the pouring can should be not less than 6 inches wide and not more than ¼ inch in the clear opening between sides. This admits of very rapid pouring of hot material, but will not pass any that is chilled. It has the further advantage of being a definitely fixed rule for inspectors to follow and absolutely precludes any possibility of there being a misunderstanding about the proper temperature of the filler when it is applied.

Effect of Fire on Concrete Floor

"An interesting note comes to us from the West on the effect of fire upon the strength of a concrete floor," says the Quarterly of the National Fire Protection Association. "The building in which it occurred was of reinforced concrete and brick, and original estimate of loss was made on the basis that the concrete floors and ceiling were not damaged sufficiently to be torn down. The owner refused to accept these figures, claiming that the concrete had been damaged and weakened. He requested that the building be tested by putting on a weight of 400 lb. to the square foot, and if the flooring deflected more than 3/16 in. same was defective and would have to be removed. This was the original test made by the architects when building was completed and turned over to the owner.

"A panel 14½ x 18½ ft. in the northeast corner of the building was first tested, and when a weight of 250 lb. to the square foot was put on, the floor deflected 5/16 in. Another panel was tested and a deflection of 4/16 in. to 250 lb. was noted. There were eight panels, all approximately 14½ x 18½ ft., which were involved in the fire, and as a further test it was decided to try one panel in another part of the building which had not been damaged by fire, in order to see how the same would show up. The sand used for testing was therefore removed to this panel, and with the same weights, viz., 250 lb. to the square foot, this panel did not deflect over 3/32 of an inch.

"The test seems to demonstrate the virtues as well as the defects of concrete construction. As there were about 60,000 lb. of powdered bricks burned, a tremendous heat was created, which would have meant a total loss to the building had it been of any other construction. At the same time, there is indicated by these tests a defect in concrete which it may be impossible to overcome, and that is, that the reinforcing steel used in its construction undoubtedly expands under a certain heat, causing the concrete to weaken."

Cost Keeping on Concrete Bridge Work

Comments on Contracting and Slipshod Methods of Estimating Employed — Description of a Satisfactory Form of Cost Recording

By Daniel B. Luten*

Contractors should keep complete cost records, showing the distribution of cost against the separate items that go to make up the structure; and such cost record should show the complete cost to date at regular and frequent intervals, i.e., daily or semi-weekly. The contractor should be able at any time to turn to his records and quickly ascertain the cost on each separate item of construction. Such a cost record is essential to a proper understanding of the cost of the structure, is valuable in determining the rating of the foreman in charge, and is the only safe basis for determining bids on future work.

To illustrate in greater detail, let us assume that a small concrete bridge is to be publicly let to the lowest bidder, and that its estimated cost is perhaps \$10,000, which must not be exceeded. Some eight or ten bidders may appear, of whom one or two will usually be all that have had any previous experience, and only one perhaps will have kept detailed records of cost. All the others bid on a gamble. John Smith, who has had some experience in building a rubble retaining wall, estimates the total measure of concrete in the bridge at 2,000 cubic yards, and recalling that the actual ingredients contained in a yard of concrete are perhaps a dollar's worth of cement, a little steel, and some gravel from the creek, believes that he can build the structure for \$4 per yard, or a total of \$8,000. Since this is well within the engineer's estimate, he adds a liberal margin of 10 per cent. profit, overlooks all floods and contingencies, forgets about insurance and overhead charges, and perhaps lands the job, and the engineer being also inexperienced, estimates his next proposed bridge by this last one, and thus makes his next estimate on a still lower basis, for he does not wish to appear foolishly high in the eyes of the contractor or the board. Thus the matter of bids is on a continual down grade, whereas the bidder who estimated his work properly, including all items at a reasonable allowance, bid \$18,000, including 25 per cent. profit, to which he should be entitled when the dangers of washout and inclement weather are not otherwise taken into consideration. In view of the engineer's estimate, the high bid, although undoubtedly the best bid, seems foolishly high by contrast.

The contractor who thus estimates his work safely, uses an estimate sheet as follows, Fig. 1, in which each and every item that goes to make up the cost of a highway bridge is included:

What each of the items represents in actual cost is known only to the experienced contractor and cannot be given here because it would be of local value only and would be found misleading for any other field. But even the novice in estimating will come far nearer the truth by making a guess for each item and then taking the total, than if he bases his price on the yardage of concrete alone.

There is a popular notion also that the cost of a concrete bridge may be estimated roughly by multiplying the span in feet by the width of roadway by

\$2. In other words, that the cost approximates \$2 per square foot of roadway projected on the span. But this is a dangerous rule, because it gives only the lowest approximate cost for very favorable conditions, and may vary several hundred per cent. The height of the bridge from bed of stream to roadway affects the cost quite as appreciably as the span of roadway. Yet the above rule-of-thumb makes no allowance for height or for numerous other elements that go to make up the cost of the bridge and which vary from place to place. The only safe way to give an estimate on a concrete bridge is to draw it to scale, compute its contents, and then follow the estimate sheet. The contractor who has made a specialty of concrete bridge erection can usually approximate the cost of a

ESTIMATE			
Right of Way			
Temporary Bridge			
Removing Old Bridge			
Excavation—Yards Wet			
Excavation—Yards Dry			
Cofferdams			
Sheeting and Shoring			
Piling			
Palisade Piling			
Steel		Lbs. @	
Placing		Bd. Ft.	
Lumber			
Erection			
Concrete			
	Bbls. Cement		
	Yds. Gravel		
	Yds. Stone		
	Yds. Sand		
	Labor, Mixing and Placing		
Waterproofing			
Wiring		Yds. @	
Drains, Conduits, etc.			
Paving		Sq. Yds. @	
Sidewalks		Sq. Ft.	
Curbs		Lin. Ft.	
Railing			
Lamps and Wiring			
Removal of Centering			
Superintendence			
Bond, Insurance, etc.			
Moving Plant, etc.			
Total Field Cost			

Fig. 1

proposed bridge by its similarity to some other bridge which he has erected and of which he recalls the details of cost. There is no other safe way.

The low bidder previously referred to, who secures the contract, goes happily to work. Firm in the belief that he has a paying contract, he takes his time on excavation, overlooking the fact that a dollar saved on a profitable contract is just as good as a dollar saved on a losing contract, until he hears the completion of the bridge, when he happens to find by subtracting his bills still to be paid from his money available, that he is already on the wrong side of zero profits. Then begins a scramble to save all he can, just at the very time when most consideration should be given to true lines and good finish, and as a result the bridge that would have been a monument to its designer and to its builder is made an artistic failure because of a profitless contract. Concrete bridges will never attain their deserved success by such methods. And if a contractor will not avail himself of information from more experienced men that will enable him to bid safely, he ought to be everlastingly lambasted by the engineer when he tries to skimp on the wind-up. To the end that he may not again forget!

A desirable form of cost record for concrete bridges is shown in the accompanying forms, Figs. 2

*Extracted from a paper read before the American Society of Engineering Contractors.



Constructional View of the Concrete Storage Plant of the Montreal Light, Heat and Power Company

Concrete Storage Plant at Montreal

The coal storage and handling plant recently erected for the Montreal, Light, Heat and Power Company on Harbor street, Montreal, by Messrs. D. G. Loomis & Sons, of that city, is perhaps unique in the matter of construction. It is entirely of concrete and consists simply of a roof supported by a number of pillars without walls or partitions. The design and specifications were drawn up by Messrs. Loomis & Sons, and the Kahn System of reinforcement was used. The length of the structure is 480 feet and the width 190 feet. The roof has a slant of about half an inch to the foot so that the supporting pillars vary from 38 feet to 43 feet in height. Each pillar is 18 inches square, and they are placed in rows 20 feet apart, making 9 bays running the whole length of the structure. The bracing consists of four brackets three feet outstanding on the beam and 4 feet vertical distance on the column. The roof is a 3-inch concrete slab. Owing to the nature of the subsoil, piles had to be driven under half of the building, while gravel and clay form the foundation under the other half. The concrete pillars were sunk a distance of 7 feet to the piles and hardpan. A coal carrying crane runs on the lower flange of an 18-inch steel I-beam, hung from the concrete roof-beams. The concrete beams which support the roof and the I-beam are 5 feet 8 inches apart on the centre.

To construct the false work for the building it was necessary to resort to unusual measures, owing to the extreme height of the roof. The column forms were first erected in the usual manner and between every pair of columns was placed the 6 by 8 inch strut. This was reinforced at the top so that the whole weight of the 20-in. by 20-in. girder beams and roof-slab was brought down on the column forms and on the strut. The side of the beam-forms was made up of 3-in. by 14-in. timber joists, thus leaving the interior of the structure exceptionally free from struts during construction. Owing to the height of the column it was found necessary also to build up the column reinforcement after the column forms had been placed. The

reinforcement for each column consisted of four round one-inch rods—one at each corner throughout the entire length of the column—and surrounding these rods was a cage made of Kahn ribbed metal bent to rectangular shape. This was slipped into the form in section one on top of the other until the top of the column was reached, when the filling was proceeded with.

This structure was built as a store house for coal



An Interior View of the Work

for the Light, Heat and Power Company, close to their gas house. It is easy of access from the harbor front, and owing to the facility with which coal can be handled at the gas works it will mean a saving of thousands of dollars every year to the company. The structure has been equipped with the latest devices in the shape of carrying cranes so that from any part of the building the huge buckets can be let down into the coal and a cartload at a time can be lifted and conveyed wherever it is wanted in a few moments' time.

Horseshoe Dam on the Bow River, Alta.

Noteworthy Features of an Interesting Engineering Work at Horseshoe Bend—Long Earthen Embankment and a Reinforced Concrete Spillway

By A. S. Dawson, Chief Engineer C. P. R. Irrigation Department

The Horseshoe Dam, a mammoth structure which is attracting the attention of the engineering world all over this continent, is being built on the Bow river at a point locally known as Horseshoe Bend, about three miles southwest of Bassano, which is 83 miles east from Calgary, Alta. The function of the dam is to divert water into the main canal of the eastern section of the irrigation block.

an earth dam is now under construction, to which the spillway structure will be joined.

The earthen embankment will have a maximum height of about 45 feet, a total length of about 7,000 feet, and at its highest point is 350 feet in width at the base. It will contain one million cubic yards.

The wetted slope is to be 4 to 1, the dry slope 3 to 1, and the top width 32 feet, with a freeboard of 9



Coffer Dam Construction, Canadian Pacific Railway Dam at Horseshoe Bend.

At this point the ordinary low water level is elevation 2515.00. The elevation of the sills of the canal headgates is 2549.63, and it was desired to raise the water to give a depth of 11 feet above these sills, making normal water level at the dam 2560.63.

The dam is to be a composite structure, consisting of a long and high earthen embankment on the south bank of the river, and a reinforced concrete spillway in the existing river channel, connected at its northerly end with the canal headgates.

Just above the site of the dam, the river makes a long bend, in the shape of a horseshoe, which gives the locality its name. The dam is located at the toe of the horseshoe. At this point, the river is approximately 600 feet wide. The north or the left bank of the river has a narrow bench immediately at the water's edge and only a few feet above it, beyond which is a cut bank rising over 100 feet above the bed of the stream.

The south or right bank has a gravel beach rising gradually until it forms a tongue between the two legs of the horseshoe. This tongue has a broad, flat top several hundred feet in width, and rises gradually to the general prairie elevation. The general elevation of the surface of this tongue near the river is about 25 feet above the bend of the stream. On the tongue,

feet above normal water level. Provision has been made for under drainage, and its upper slope will be paved either with boulder concrete or reinforced concrete slabs. The foundation of the earth portion consists of a deposit of river silt over coarse gravel and boulders, which in turn overlies dense blue clay.

The spillway was designed to pass over its crest 100,000 second feet without raising the surface of the pool above elevation 2562.63, or 13 feet over the crest, which required a free length of weir of about 600 feet. To allow for end contraction on account of the piers necessary to support the movable crest, an aggregate length of 650 feet between piers was decided on.

As the crest of the dam and the sills of the canal headgates were fixed at elevation 2549.63, the additional depth of 11 feet for which the canal was designed, had to be maintained by some form of movable crest for the entire length of the spillway, in order to pass extreme floods. This movable crest will be divided into 24 sections and supported between piers giving 27 feet clear spans. These openings will be regulated by structural steel gates, either in the form of segmental Taintor gates or by "Stoney" sluices.

In the determination of the spacing of the buttresses due consideration was given to the effect upon the cost of construction, the time required to build the

structure, and the limitations in length of the gates corresponding to the spacing of the buttresses, with the result that these are to be at 15 feet centres, with every second buttress carried up in the form of bridge piers, with clear spans of 27 feet. Emergency gates will also be provided in case of necessary repairs to be made to the main gates.

The spillway proper is to be a reinforced concrete structure of the so-called Ambursen type, consisting of a heavy floor built upon the bed of the stream with suitable cut-off walls at its upstream and downstream edges, and upon this floor will be erected parallel buttresses of substantially triangular outline, having a slope on the upstream edge of about 45 degrees. Upon brackets or haunches projecting from the faces of the buttresses and parallel to the upstream edges will be cast concrete slabs to form a deck, terminating at the top of the buttresses in a curved crest and passing

retained by the gates above referred to. It will contain about 40,000 cubic yards of concrete, and two and one-half million pounds of reinforcing steel. Provision will be made for a road bridge on top of the structure.

The abutments connecting the spillway with the earth dam will be in the form of reinforced concrete retaining walls of the counterfort type, with a view of cutting off all possibility of leakage at this point.

The question of the operation of the gates has not yet been decided upon, but either a small power plant, consisting of vertical turbines with direct connected generators, will be installed inside the dam for this purpose, as well as lighting, or else natural gas will be made use of.

The canal headgates will form an integral part of the spillway structure at its northerly end. They will consist of five openings each twenty feet, controlled



Pile Trestle at Horseshoe Bend, erected by earthwork contractors for transporting 1½ million cubic yards from Main Canal B to Dam on opposite side of river.

down over the downstream edge of the buttress in the form of an apron suitably curved to correspond as nearly as possible to the path of the overfall flood waters. In front of the dam, the floor will be carried downstream a distance of about 90 feet, forming a tumbling hearth.

In general, the cross section of the spillway is what is known as the Ogee section, and consists of constructing a downstream face of the dam between the crest and the floor in the form of a reverse curve, the lower edge of this curve being tangent to the floor of the structure, so that the overfalling nappe should be led down the face of the dam and turned into a horizontal direction tangential to the river bed with the least possible disturbance, while passing over the face of the structure.

The spillway is founded on a deposit of sand, gravel, and boulders, overlying a thick stratum of stiff, blue clay. At the upper and downstream edges of the structure, as well as at the centre, heavy cut-off walls are being carried well down into the clay and well bonded to the body of the carpet.

The structure is to be 720 feet in length between abutments, with a maximum height of 40 feet to the overflow crest, above which 11 feet of water will be

by Stoney sluices. These gates will control the discharge through a main canal of 70 feet bed width, carrying 11 feet of water, and designed to discharge 3,000 cubic feet per second.

The city of Toronto wants pure water but not if it is going to spoil the appearance of the Island shore. In spite of the city engineer's protest the civic Island committee have forbidden the contractors, Messrs. Dill, Russell & Chambers, to take any more sand off the beach.

The contractor for the Cumberland street fire hall at Ottawa obtained the work upon a bid of \$21,000. After \$17,000 had been paid and the work was rather more than half done he made an assignment for the benefit of his creditors. The architect admitted that the figures on the contract were far too low. This case should appeal to the opponents of the lowest tender system.

Mr. H. M. Burwell, of Hermon & Burwell, reporting to the city water committee of Vancouver, B.C., estimates the cost of a supply main from Capilano Creek to the suburban district of Point Grey at \$302,820. The report is still under discussion.

Principles of Modern Road Drainage

Practical Suggestions looking to the Most Satisfactory Construction—The Use of Side Drains, Tile Drains and Catch Basins

By F. J. Ure, A. M. Can. Soc. C. E., City Engineer of Woodstock, Ont.

The principles underlying road drainage have been so thoroughly inculcated into the minds of road builders and municipal representatives by Mr. Campbell, Mr. McLean and others that it would seem as if nothing more could or need be said to emphasize the need of a solid (that is, a dry) foundation for the road. I shall therefore take it for granted that everybody concedes the necessity for getting and keeping the water out of a road, and give a few practical suggestions as to how this may best be accomplished, based entirely upon my own experience.

Open side drains are useful and necessary to carry off the water in heavy rainfalls, but should not be depended upon for the drainage of the subgrade. In the first place they are not usually deep enough for that purpose, and if they are deep enough they are unsightly and dangerous; and in the second place they do not draw the water out of the soil as well as a tile drain.

Installation of Tile Drains

Tile drains should not, as a rule, in my opinion, be placed in the middle of the road bed, for in that case the water will be drawn from the open ditches and from the soil beyond, through the road-bed, and while a drain so placed will eventually dry out the road-bed, it does not keep it dry, while if the drain is placed at the sides of the road, and if the road has a proper crown, very little water will ever get into the road-bed. If the land through which the road passes is nearly level, then a drain should be placed on each side, preferably in the shoulder of the road-bed, say about 10 feet from the centre, but if the road ditches are not too far apart a drain laid in the bottom of the open gutter, with about two and a half feet of covering, will be less expensive and will give good results.

However, if the land has a decided slope away from the road on one side, then one drain placed on the higher side (that is, the side from which the water comes), will be found sufficient. Nothing less than 4-inch tile should be used, as the smaller sizes are much too easily blocked up. Larger sizes may be necessary where outlets are long distances apart. In many cases the owners of the adjoining lands are using the open ditches as an outlet, or they may wish to connect their private drains with the road and in such cases it will be mutually advantageous to put in larger tile and share the cost. It should not be necessary to point out the necessity of securing for all the drain a good and permanent outlet, and yet being one of the hardest things to get it is one of the things frequently neglected and a great deal of money is thereby wasted. If the outlet is into an open ditch or natural creek, the end of the tile should be protected by a small concrete abutment, or if the tiles are near the surface, as they often are, a very good way is to lay the tile in concrete and cover them over with say 4 inches of the same material, thus making a continuous concrete pipe of such length as the circumstances seem to require.

If the outlet is to be into another covered drain I would recommend that the junction be made in a suitable catch basin. Speaking of catch basins, I consider them of great advantage to a drain if built in a permanent and suitable way. I have had experience with all kinds of catch basins and in my opinion the best, and therefore the cheapest, is the one built in place, and of concrete. It should be about 2 feet square inside and have a concrete bottom and top, the former to be about 12 inches below the bottom and the latter to be level with the surrounding surface and fitted with a removable cast iron grating of sufficient weight to insure its remaining in its proper place. Some of the advantages of the catch basins are: (1) That they admit surface water into the drain readily and insure the drain working to its full capacity, even when the ground may be frozen. (2) They are useful as inspection holes and enable one to ascertain if all parts of the drain are in working order (3) The pit in the bottom serves as a trap to catch all sediment that may get into the drain. (4) They serve as a vent to let the air escape from the drain and enable it to run to its full capacity, which obviously a drain sealed at both ends will not do. For this last reason I like to have a catch basin near the upper end and at such other points as may seem advisable.

The Drainage Laws, and a Simplified Procedure

In cases where new outlets have to be provided or old ones improved, and where large tile have to be provided in order to accommodate the drainage of adjoining lands, the aid of one of the Drainage Acts will sometimes have to be invoked. Usually the Ditches and Watercourses Act is the one most suitable. I am not one of those who have a mania for tinkering with the drainage laws, but in my opinion it would be a distinct improvement if a "County Road Superintendent" were given power to call meetings and sign agreements under the Act instead of requiring this to be done by the Warden of the County, who often resides at a long distance from the scene of action. A plan frequently adopted in my county, to shorten and simplify the procedure (while not complying with the Act) has been found to work out very satisfactorily and at a minimum of expense. This plan is as follows: the superintendent goes over the road and finds out what private individuals are likely to be affected by the necessary drainage of the road and gets them all, if possible, to sign a document agreeing to waive all their rights to the Statutory Notice and leave the whole matter in the judgment of the township engineer, who then comes on, surveys the drains and outlets, fixes the size of the tile and the amount each man should contribute, puts it in the form of an award and files with the clerk. The superintendent lets the contract or carries the work out by day labor and collects the cash from the individuals and turns it over to the county treasurer. While this method is not strictly "according to Hoyle," it is at least a cheap and expeditious way of settling a multitude of small cases that if dealt with separately

would involve so much trouble, delay and expense that the county might better pay the whole shot than bother with it. Of course if any one refuses to sign the agreement his case must be dealt with in the regular way. One result of this policy has been a very marked improvement in the appearance of the roadside and adjoining lands. Waste places, marsh grass, willows and bullrushes disappear and a general cleaning up usually follows.

I have been speaking largely of my own experience in the County of Oxford, where natural or artificial outlets are generally easily obtained. Of course, we occasionally have bits of swamp road where we have to be content in the meantime with surface drainage only, but these isolated cases will not exist long, as the covered drain is rapidly taking the place of the open ditch. To show how rapidly this is taking place in my county, I have taken the trouble to go back over the work done in 1910, and I find that I have land out under the Drainage Acts 40 miles of tile drains, of which 5,700 feet were of 18-inch tile, 12,600 of 16-inch, 15,600 of 14-inch, 45,000 of 12-inch, 35,000 of 10-inch, 30,000 of 8-inch, and 70,000 less than 8-in. in diameter. The tile alone cost about \$19,000, and when drain and placed in the drain cost about \$35,000. This, of course, is exclusive of private drains and county road drains of the first, of which there is no second, and of the latter there would be about 8 or 10 miles.

I find that my subject covers "Drainage Laws," which is usually taken to mean a criticism of existing laws with suggestions for amendments. I do not propose to take up that branch of the subject, not that I think they are fairly satisfactory and workable, in proof of which I would cite my own experience last year, when between \$50,000 and \$60,000 worth of drainage work was spread on the tax rolls without a single dollar being spent in litigation and without a single appeal to the County Judge. Of the 42 drainage schemes initiated not a single one was abandoned.

Concrete Tile Plant at Woodstock

A great deal of difficulty has been experienced in the past in getting a sufficient number of tile, particularly of the larger sizes. This difficulty has been largely overcome in this district by establishing in Woodstock a plant for making cement concrete tile. The tile are machine-made and steam-cured and being made of crushed gravel and Portland cement in the proportions of about 4 to 1, and being uniform in size and shape, compare very favorably with the best clay tile, so far as appearance and ability to stand rough usage go. They fit together well and appear to make an ideal drain. This plant has been in operation only about six months and has turned out about 130,000 tile, half of them being from 8 in. to 16 in. in diameter and the remainder under 8 inches.

Specifications for Scrubbed Concrete Surfaces*

For all surfaces of concrete that are to be exposed to view face forms shall be straight, smooth, evenly matched, and watertight, and so framed and fastened together at corners and angles with screws or clamps as to be detachable and removable without the necessity of jarring or of prying against the concrete. Any offsets that may appear at joints shall be dressed off flush, and any openings at joints or corners, or any known holes or other voids, shall be plugged flush with some stiff plastic substance such as clay mixed

with plaster of Paris or sand. Before placing the concrete the whole surface of the face form shall be coated with petroleum or other water repellant to prevent adhesion of the concrete.

The concrete shall be thoroughly mixed, be wet enough to flush and be spaded against the face form to the point of being completely flushed against the form, i.e., until the cement soup or grout follows and envelops the spade. Then the spade is to be used to ram the concrete near the face so as to push the aggregate of the concrete forward to the face, care being taken to obtain a uniform mix and texture at the face.

The work of placing concrete shall be continuous throughout definite stages so that joints between different days' work shall be at some feature line, or be made truly straight and level.

On the day after placing concrete, or later, as will be determined according to the temperature and the weather and the setting quantity of the cement used, while the concrete is friable and pulverable, the forms shall be carefully removed and the concrete surface immediately scrubbed until the surface film is removed and the aggregate is exposed to a uniform degree, and then rinsed off with water and kept moist for several days. If any void spaces appear or if spalls are broken off the defects shall be patched with similar mix immediately after the scrubbing, using the hand or wooden float—not a steel trowel—for applying and smoothing the patches. After they are sufficiently set—say within from 5 to 24 hours—all patches must be scrubbed to the same texture as the general surface and be rinsed clean and kept moist for several days.

If a granolithic surface is specified it shall be made by placing against the face forms in advance of the body concrete a fine granolithic or facing concrete composed of 1 part Portland cement, 1½ parts sand, and 2½ parts pebbles or crushed granite or other approved stone as may be selected, screened to pass ½-inch and be retained on ¼-inch screen, thoroughly mixed and soft enough for full flushing. This granolithic must be maintained between the body concrete and the face form in a thickness of about 1 inch, care being taken that the body concrete is rammed into and perfectly united with it. If iron or wooden mold-boards are used to retain the granolithic against the face while placing the body concrete, care must be taken that the board is not permitted to remain until initial set takes place, but be frequently jarred and raised slightly at short intervals to prevent the formation of shuts and seams and air spaces between granolithic and concrete.

For scrubbing the surface ordinary fibre brushes with a light stream of water from hose or can will be sufficient if the set is not too hard. If set is harder, wire brushes followed by fibre brushes and rinsing may be used.

If for any reason a portion of the face form can not be or fails to be removed before the concrete has become too hard for removing the surface film by scrubbing, the hard face shall be treated by sand-blasting or tool-dressing to a texture matching the scrubbed portion. If it be tool-dressed it shall be cleaned after tooling by washing it with a 1 by 10 solution of muriatic acid and water, then thoroughly rinsing with water to remove all traces of the acid.

In scrubbing, or sand-blasting, or tool-dressing, care must always be taken to avoid roughening or blunting corners of the work, and to maintain all edges sharp.

Proposals and Bonds in Contract Work

Binding Nature of Preliminary Agreements—How Contractors are Affected by Low Estimates—Certified Cheques and Bidding Bonds

By Daniel J. Hauer

Proposals made for construction work, either on regular forms or by letter, are preliminary contracts and are binding on contractors. The contractors can be held to them, but the party to whom they are made can reject them. Some construction contracts make proposals a part of the regular contract and they are incorporated in the articles of agreement. Thus proposals should not be made without thought and contractors should realize that any proposal made, can be made binding on him. To hold a contractor to a proposal, when he wishes to revoke it, a suit at law is necessary. In order to avoid such suits, and to enforce proposals, certified cheques or bidding bonds are demanded, when proposals are made. These, however, will not hold a contractor, should he desire to forfeit them. In most cases, though, they serve as an incentive to make good the proposals.

Proposals for Public Work

Proposals for public contracts are, as a rule, made on forms prepared for the purpose, and are sometimes made a part of the contract. All proposals, whether for public or private work, should be made out strictly according to the form, and for the work as outlined, and for such items as are listed. The plans and specifications should also be followed, and all instructions given regarding bids and proposals should be carried out to the letter. It is only in this manner that the proposal can be considered formal. If the proposal is informal in any respect, then by protest of other bidders, or on public work by protest of a taxpayer or industrial or commercial organization, the bid or proposal must be thrown out.

Should the contractor wish to make another offer, as to plans, methods of doing the work, or a change of specifications, or even as to different materials being used, he should fill out the proposal form according to instructions, and on another form or by letter submit an alternate proposal. He has then conformed to all the necessary requirements. Should his methods of doing the work, or other features of the construction be patented, he should have the owner ask for alternate propositions, and if this is not possible he must then submit his proposal in proper form.

In making proposals the contractor should be careful as to figures written on the forms. Mistakes are easily made in placing decimal points and also in putting in ciphers. Such mistakes can be very disastrous to contractors. For this reason all proposal forms should have space provided on them for writing out the prices submitted as well as to giving them in figures. Care should be exercised in making out proposals as to the units of work that prices are to be submitted upon, as cubic feet are used in some localities, while cubic yards may be the unit in other places. Many other units also vary.

Limiting Proposals

Nearly all proposals are dated, whether they are made by letter or on regular forms. On the other hand a limit of time for the acceptance of the proposal is seldom given. This may be important in some cases. Ordinarily, the award is made on proposals received within a few days or a few weeks. Under such circumstances a limit on the time of acceptance is not necessary, but if the letting is held up some time, say some weeks or months, then it might make a de-

cided difference to the contractor. He may obtain several other jobs, or conditions under which he bid may change. The prices of materials may go up, so that there is no longer a profit in the proposed job at the figures submitted. For these reasons a time limit on the acceptance should be named. If the proposal does not state that the prices are for immediate acceptance then it becomes necessary to write a letter after the proposal is made, notifying the owner (or his agent) that unless the proposal is accepted within a certain time it is to be cancelled. This is what every wide awake merchant does when he quotes prices upon his goods. Unless a time limit is set the contractor can be held to his proposal for months after it is submitted. The writer has known of cases of this kind. In New York City, on October 26, 1910, 75 bids were received on the building of a new subway, and up to date an award has not been made, yet it is doubtful if any contractor, who bid, has withdrawn his proposal or set a limit on the acceptance of it.

A complication that may arise in this connection is upon public contracts, where certified cheques are deposited with the bids. Although the contractor may withdraw his proposal, yet the owner may be able to hold the contractor to his bid by refusing to give back the certified cheque.

Engineer's Estimate

It is customary on all construction work for the engineer for the owner to make an estimate of the cost of the proposed work. Seemingly this estimate is of small importance to contractors, yet it may be a vital matter before the job is finished. Contractors should be interested in engineers' estimates.

What is an engineer's estimate? For years it has been little more than a guess at the cost of the proposed work, even when the actual quantities of the work to be done are known and changes in construction are not found necessary. To a more or less extent this has been caused by engineers using prices of other construction work, in making estimates, rather than actual costs. The result has been that the estimate made by such an engineer has been the engineer's guess. If the quantities were subject to change and the prices guess work, it is evident that the total estimate may vary exceedingly as finally completed. There have been numerous examples of this character. A long list of great undertakings that have cost many times the estimated cost could be cited. The most recent example is that of the Panama canal.

However, a marked improvement has been made in this connection during the past decade. Engineers are learning much about costs, and much has been written on the subject, so that in some cases engineers are more proficient in such matters than contractors, many of whom still guess at construction costs. Nor are engineers always to blame for incomplete surveys and low estimates. Frequently tentative estimates are used on purpose by officials of corporations and promoters, as complete estimates on underground exploration and surveys have in the past, in many cases, been poorly made with the result that from lack of knowledge the work has cost much more than the estimated figure. Then, too, sweeping and decided changes in the plans, that the engineer may have advocated from the start, are ordered after the estimate has been made. It has been stated that

a competent engineer, knowing as he does that these things will affect his estimate and throw discredit on his work, does wrong in submitting himself to such criticism, but we must bear in mind that engineering positions are difficult to obtain, and even if the engineer resigns, another will no doubt take his place and do the same things.

How Contractors are Affected by Under Estimates

Contractors often suffer from the discrepancies and blunders in estimates. Should the work be of a public nature, the ultimate contract price may exceed the appropriation, and the contractor may be held up on his work, or on his final payments, or it may even happen that the contractor cannot recover for all the work that he has done. If the contract is a private one, the extra cost may mean the financial ruin of the enterprise, with the consequent stoppage of the work, and a possible heavy money loss to the contractor. These things often happen,

Another manner in which contractors are affected by engineers' estimates is in the letting of work, and the use of engineers' estimates in accepting and rejecting bids. For instance, an engineer's estimate for a proposed sewer may be much too low, and after a number of contractors have each spent several hundred dollars and considerable time in making investigations and estimates and in submitting proposals, they are informed that their bids are rejected. This may happen several times for the same job. The writer believes that when the engineer's estimate is to be used as a basis for accepting and rejecting bids, this estimate should be made public before the bids are submitted, so that the contractor can have the estimate verified, and if it is found too low, need not waste time and money in bidding.

This is being done on the New York State Barge canal. To make public the engineer's estimate is to show confidence in contractors, and inasmuch as the engineer and his assistants have spent considerable time and money in getting up the estimate it would be of vast assistance to the contractor, who may have but a few days to make an estimate. If the estimated quantities are made public, and as a rule they are, then there is every reason why the estimated price of the engineer should not be made public. In public contracts the proposal is often made a part of the contract, so it would seem advisable to make the engineer's estimate a part of the contract. This would serve several purposes. It would fix upon the engineer the responsibility of making a correct estimate. It would serve to fix the cost of the work, and to show prospective profits, in case a contractor, after under-estimating the work and obtaining the contract, finds he is losing money and, by picking a flaw in the contract or specifications, throws up the job and brings suit for prospective profits. Then the engineer's estimate being a part of the contract, could be introduced as the work of an expert, showing the cost of the construction with a reasonable profit, as made up before the contract was let.

Certified Cheques and Bidding Bonds

In asking for proposals, especially on public contracts, it is customary to stipulate either a certified cheque, a bidding bond or a cash deposit. The cash deposit is seldom used, except when the amount is small. There is often demanded a small cash deposit from the bidder on receipt of the plans and specifications, which sum is given back upon the return of the plans and specifications in good condition.

Certified checks and bidders' bonds to some extent guarantee the assumption of a contract by the successful bidder, and show his standing. A bidding bond has many features to commend it. A bonding company, through its experts, passes upon the financial standing of the contractor, as well as his reputation for making and carrying out contracts. This is a help to the engineer, whose investigations into such

matters must be limited. Then, too, the bonding company will insist upon the contract being signed properly and promptly, in order to be relieved of its responsibility. The contractor's only valid objection to such a bond is its cost, which is small.

Many contractors prefer to deposit a certified cheque. There are many abuses regarding this custom. It is seldom stated how long such cheques are to be held before they are returned to the unsuccessful bidder. This is wrong, as many contractors of limited means cannot afford to indefinitely wait for the return of such sums of money, and are frequently compelled to borrow money to allow these cheques to remain on deposit. This could be avoided by stating specifically the length of time cheques are to be held. Then, too, the amount of the cheque should be given as a specific sum, large or small, according to the size of the contract, and not a per cent. of the amount of the bidder's proposal. Frequently 5 or 10 per cent. of the bidder's estimate is the amount asked. In the latter case this at times may give to competitors information regarding a contractor's bid, as bankers are frequently interested in contracting operations as partners of contractors, and such knowledge coming to them is certain to be taken advantage of and used by the banker and his friends. Then, too, the amount of the cheque could leak out in other ways. Some specifications call for cheques only on local banks, which is a discrimination, as strangers to these banks may at times have to pay for certification.

A practice to be commended is that adopted by some divisions of the Army and Navy Departments of the national government, of having contractors make an annual guarantee bond to cover proposals made during the year. This does away with certified cheques. These bidding bonds guarantee that the contractor will enter into a contract within the time limit named.

Construction Bonds

In nearly every contract of any magnitude or importance there is a clause calling for a bond to be made by the contractor in favor of the other party to the agreement. These bonds are either furnished by a surety company or are personal bonds. Personal bonds are not much used now, as no one wishes to see a friend lose money on his account, and they are only furnished either for very small contracts or when surety companies refuse to write the bond.

There are three forms of bonds in general use on construction work:

(1) A bond made for a stipulated sum or a per cent. of the amount of the contract for the faithful performance of the work at the contract prices.

(2) A bond, not only calling for the completion of the work within a specified time, but also calling for a fixed sum to be forfeited each day the job is delayed beyond the contract time.

(3) A bond similar to the second one, but also allowing a daily bonus for each day that the contract is finished before the day named in the bond.

Besides the bond a percentage of the monthly estimates is also retained by the company until the contract is completed.

The amount of the ordinary bond is either a stated sum or a certain percentage of the total amount of the bid, the life of the bond being until the work is completed and final settlement made between the parties to the contract. The purpose of the bond is to hold the contractor to his agreement, yet the cost of the bond is paid indirectly by the other party to the contract, as the contractor probably has included its cost in with the other expenses of the work. The more irksome and strict, the longer its life, the greater is the cost

of the bond. An engineer, by making his bond too strict and objectionable, may injure his employer's interests rather than serve them.

The first named bond is the one most frequently used and covers most classes of work satisfactorily.

The second and third are bonds used for jobs upon which a strict time limit is set and when the completion of the job is of great importance and the matter of a day or week is of momentary value to the owner.

Retaining Percentages

It is the custom on most contracts, in addition to having a bond, to retain a percentage of the monthly estimates until the job is completed. This is known as "the retained percentage," and besides protecting the owner against overpaying the contractor on monthly estimates, which are supposed to be approximative only, also serves to compel the faithful performance of the contract. The amount generally retained is 10 per cent., although on some contracts 15 and even 20 per cent. of the monthly estimates is sometimes held by the owner. On hazardous jobs such as deep foundations and dams 25 per cent. is sometimes retained and the writer has known of one case where 33 1/3 per cent. of the estimates were retained. Occasionally general contractors, who sublet much work, have 10 per cent. retained from their estimates and they retain 15 per cent. of their sub-contractor's monthly estimates.

If the contractor breaks his agreement the retained percentage is forfeited. Each month the amount of the retained percentage is increased and the danger of forfeiting this actual cash is a greater incentive to the fulfilling of the contract by the contractor than the bond. Thus, instead of compelling a contractor to make such a large bond for the entire life of the contract, it could be stipulated that a bond for a nominal amount only be made, to run until the retained percentage reaches a specified amount, or for half the life of the contract, when the forfeiting of the percentage will act as security for the contractor doing his work. This, with equitable specifications, will reduce the cost of the bond and thus reduce to some extent the total cost of the work. Fair and equitable contracts and specifications mean not only cheaper construction but also that a contractor can be held to his work more easily. Such forms of contract and specifications, in themselves, are a good bond.

The writer knew of one contract that called for the holding of only a percentage of the monthly estimate, until a specified sum was in the company's hands, when the estimated sums were paid in full. A contractor figuring on that called for both a bond and a large retained percentage. That called for both a bond and a large retained percentage.

Bonds with penalty clauses are always expensive, and in case of any dispute, even where they state that the amount forfeited is in the nature of liquidated damages, the courts look with disfavor on such contracts and bonds, and actual damages must be proved to have been incurred before the courts will allow them. So it is with contracts with both bonds and forfeit clauses. When it is necessary to have such contracts, the bonds should be made the same amount as the penalty, and not less, as is too often done.—The Contractor.

Can Enamelled Metal Culverts be made Commercially Successful

There are many engineers who labor under the misapprehension that what is most durable is necessarily most economic in the long run. This fallacious idea exists largely because many engineers have not been thoroughly taught the essential principles of engineering economics, says En-

gineering-Contracting. A wooden trestle is frequently the most economic form of railway or wagon road bridge, in spite of the fact that its life may not exceed 10 or 12 years. Money at 6 per cent. compound interest doubles itself in 12 years. Hence if an everlasting bridge of some material other than wood cannot be built for less than double the cost of the wooden bridge, it is not usually true economy to build the everlasting bridge. This holds true in any community where money is worth 6 per cent. to the average taxpayer, for if the excess cost of the everlasting bridge were loaned at 6 per cent. interest, it would yield enough interest to rebuild the perishable bridge in 12 years' time and still preserve the principle intact.

The same reasoning holds good of culverts. Throughout the far west timber culverts have been extensively used in years past, simply because engineers perceived that true economy was often obtained by using a cheap though perishable material. Within more recent years, corrugated iron culverts have sprung into popularity, because their low first cost and rapidity of construction made them the most economic form of culvert under certain conditions—not merely most economic in first cost, but most economic after making due allowance for depreciation and interest on investment.

In culvert construction there is also a factor that every experienced road and railway engineer appreciates, namely the difficulty of estimating the proper size of culvert opening. How often does it happen that not enough water ever passes through a culvert to fill one-quarter its area of cross-section. And, on the other hand, how often is a culvert flooded by the first heavy rain, and embankments badly eroded because of inadequate culvert capacity. So often do such things occur that an experienced engineer realizes it to be frequently economic to build as cheap a culvert as possible, if only to use it to ascertain what size of culvert opening is needed. After all has been said that can be said of formulas for predicting the run off from a given area, there remains the fact that they are only engineering guesses. Hence the need of experimental data in every locality to determine the run off after heavy rains or thaws.

For these reasons, even if a corrugated iron culvert were as short lived as wood, it would merit extensive use. But there is reason to believe that such culverts when made of pure iron, and well galvanized, have a life that is by no means short. Extensive experiments made by Mr. Allerton L. Cushman, now of the Institute of Industrial Research, Washington, D.C., and formerly in the service of the government office of public roads, resulted in proving that the rusting of steel and iron is due primarily to galvanic action between the iron and other elements contained in it. Having proved this fact, the obvious method for preventing rusting was to use as pure an iron as possible and to coat it heavily with a non-oxidizing material. Certain manufacturers were quick to grasp the commercial value of this fact, and, accordingly, we have the non-corrosive, galvanized, corrugated metal culvert.

It is not unlikely that still further improvements in the art of metal preservation will add still more to the durability of this type of culvert. For example, why is it not commercially feasible to enamel the metal instead of galvanizing it? The cost would be increased, but would not the added life justify the added cost? A well-known bridge engineer recently expressed the opinion that within a few years practically all bridge steel would be enamelled. Already a part of the floor system of a steel bridge has been built of enamelled steel sections, and at a cost that is by no means prohibitive.

It is our belief that an enamelled metal culvert can be made that will be even more widely used than the galvanized metal culvert, and that both types will have their particular fields of usefulness.

Primarily for the Building Contractor

Temporary Timbering in Concrete and Terra Cotta Construction (by Owen Maginnis)—Methods, Cost and Progress of New Work

In the construction of buildings in which concrete or terra cotta is largely used it becomes necessary to provide some form of framing to support for a short time the constituent materials and to act as guides for placing and regulating their exact position. This is generally accomplished through the medium of timber forms, or "false work," as it is sometimes termed. As an illustration we will take the matter of "Bucks," which, though they seem a comparatively simple detail, are yet one of the important and indispensable auxiliaries to work of this class. Observe, for example, Fig. 1, which illustrates the timbering for a doorway 3 ft. in width and 7 ft. in height. It will be seen that it consists of

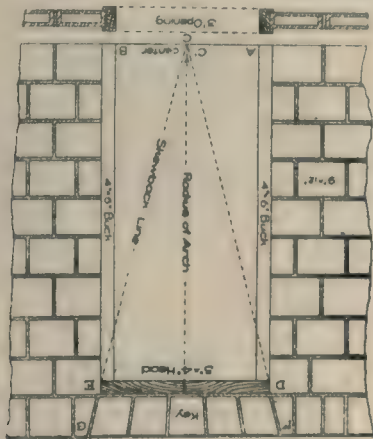


Fig. 1.—Timbering for a doorway 3 ft. wide and 7 ft. high.

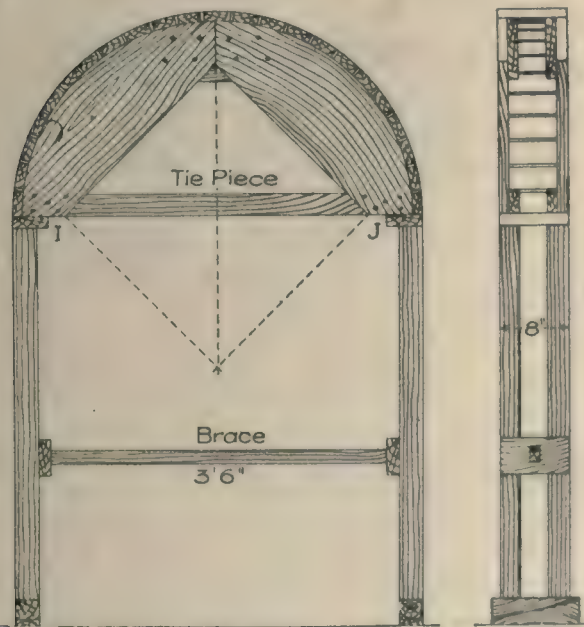


Fig. 2.—Elevation and section of "centering" for semi-circular opening

two side studs or uprights of spruce timber 3 in. thick and 4 in. in width, the latter dimension being the same as the thickness of the partition blocks which measure 9 x 12 in. and are 4 in. thick. This frame is topped by a head timber of the same size, intended to temporarily support a lintel spanning the opening.

In order to maintain the blocks in true position both longitudinally and transversely they are set in grooved timbers, as shown by the plan in Fig. 1, or they have $\frac{3}{4}$ -in. strips nailed on the edges and projecting 1 in. so as to form grooves to hold the terra cotta fireproof blocks and "grounds"

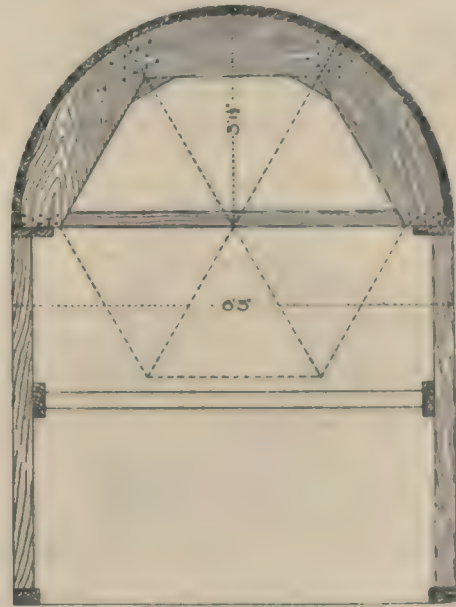


Fig. 3.—Method of building a semi-circular centre, using two or more built-up frames.

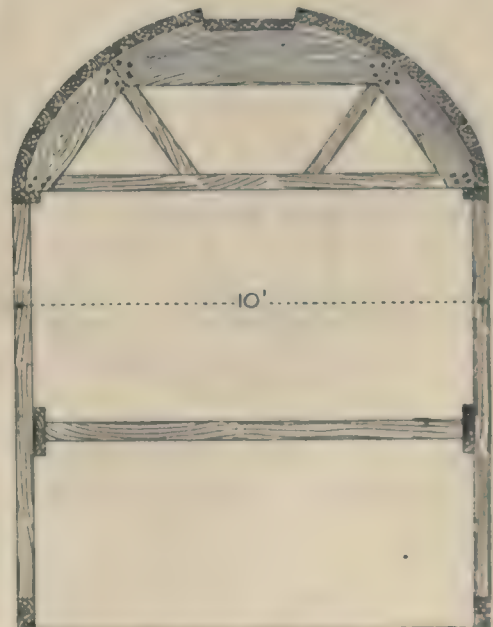


Fig. 4.—An elliptical "form" for a wide span

for the plastering. The head piece spanning the opening must be similarly formed, if acting as a lintel, always allowing for the key block, on which the whole stability of the lintel depends.

Perhaps, however, the opening may be topped by a curved head or one which is part of an arc of a circle, as indicated

ed by the dotted line in Fig. 1. In this case it will be necessary to ascertain the angle of the skew-backs, and to do this divide the width of the opening A-B into two parts and locate the centre as at C' for the arc. Connect the points C and D, also C and E, producing these lines to F and G, respectively—the depth of one 9-in. block. By driving a nail at C' the point is established for determining the radial joint lines of all the blocks to form the lintel or arch.

For a reinforced concrete lintel, boards or planks will require to be nailed on each side of the head buck D-E and wide enough to reach to its intended height. To prevent spreading apart it must be well secured with cleats on the top edges and the side bucks must be similarly treated.

For a semi-circular opening of moderate width it is usual to construct the centering or form after the manner indicated in Fig. 2, which represents an elevation and also a cross-section. The first important step is the measurements, and it cannot be too strongly emphasized at this point that

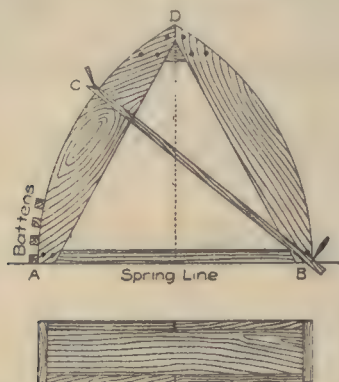


Fig. 5.—Method of constructing a simple Gothic "centre"

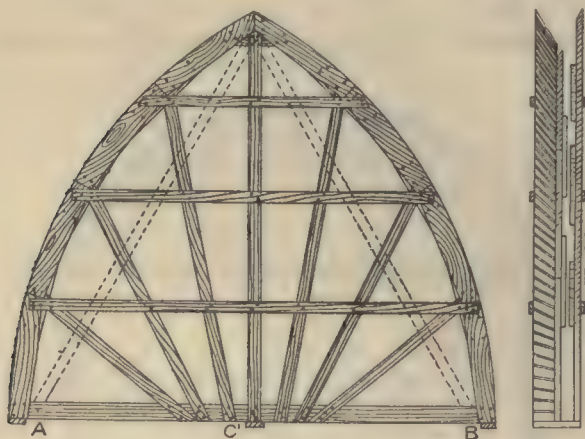


Fig. 6.—Elevation and section of Gothic centre for a 20 ft. span.

these measurements must be accurate. The four bucks, studs or uprights, as they may be termed, must be sawn to the height of the spring line I-J less the thickness of the tie battens at the centre and the wedges at the foot. Assuming that the distance to this line is 6 feet, then each upright will be 5 feet 9½ inches—allowing 1 inch for battens and 1½ inches for wedges.

In setting, the top ends must be levelled across with an accurate spirit level, as there may, perhaps, exist inequalities in the floor levels. In the same way the measurements for the lengths of the horizontal braces cut in between to keep the bucks or uprights from opening or springing must be made. This may be done by deducting the thickness or measuring the distance between with two laths, holding the two with both hands and then sliding one lath upon the other until the end of each touches an upright—a method which, by the way, can be used for diagonals, heights or

widths, as may be required, although the ends should be pared to chisel points when applied to angles.

In Fig. 3 is shown the method of building a semi-circular centre or "form" for a span, using two or more frames built up in sections of three pieces each end battened together with strips long enough to equal the thickness of the concrete or terra cotta wall. The frames are spaced about 4 in., 6 in. or 8 in. apart, according to the weight of the material to be carried.

Fig. 4 represents an elliptical form cut out or sunk at the apex for a key block, which evidently projects below the surface of the soffit. In this centre the timbers, on account of the wide span, must be heavy—not less than 3 in. in thickness—and it may be remarked at this point that it seems strange there has never yet been printed even by the most eminent authorities any fixed data in the way of figures or tables specifying the exact dimensions of timbers necessary for temporarily supporting different loads and

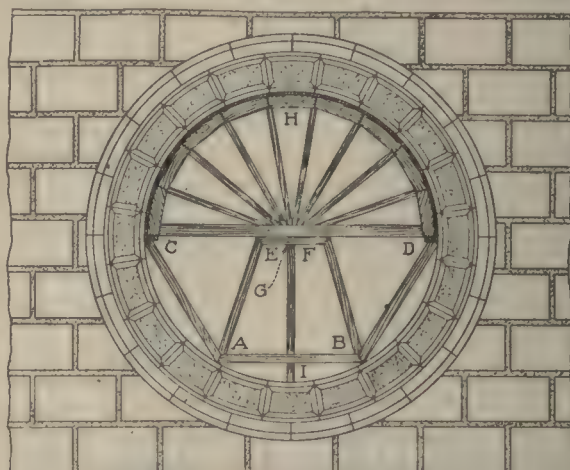


Fig. 7.—Temporary timbering for full circular window, piercing a thick wall.

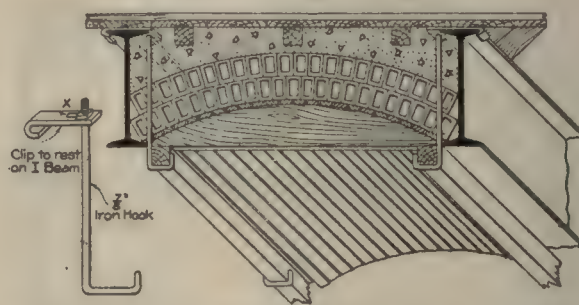


Fig. 8.—Method of supporting flat arches between floor beams when very deep, with view of clip and hook used for the purpose.

materials for the several forms of arches. Most of these small arches in building construction are made by carpenters and builders from guesswork or practical experience. In engineering work the designers generally designate the forms, materials and sizes of the false work and centering, but in architecture and building it is, as a rule, left to the builders, for their best judgment and execution.

Boards for concrete "forms" can follow the curvature of the heads or be straight, provided they be wide enough to exceed the arch rings.

The views presented in Figs. 5 and 6 represent Gothic forms or centres, the first being comparatively simple in construction, but the second is well worthy of attention, as it represents a scheme which can be followed with safety in church building, either for concrete or terra cotta. Referring to Fig. 6, which represents the framework, or centre, for a 20-ft. span, the battens A and B rest on the topmost

plates of the supporting columns, which are assumed to be placed 20 feet between centres. The soffit is bevelled to a V-shape, as shown by the vertical section. In a case which the writer has in mind there were three of these forms placed 12 inches apart, the centre one following the angle and being one-half less in height than that shown.

In Fig. 7 the reader will perceive the proper method of constructing a form of temporary timbering for concrete or terra cotta blocks for a full circular window, piercing a very thick wall. This framework ostensibly is intended to carry the semi-circular work above the diameter or centre spring line C-D. The invert below on the continuation of the soffit line C-A-B-D has been already made and set to the contour represented and placed in position in a full ashlar wall to a diameter on the line C-E-F-D of 18 feet, so that the upper semi-circle must be supported from the invert.

To do this the timber A-B, in compression, must be

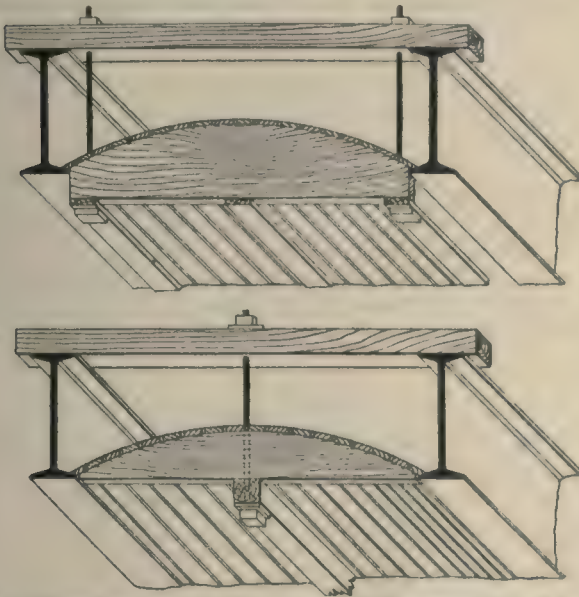


Fig. 9.—Two methods of temporarily supporting flat arches of concrete or terra cotta between floor beams

placed absolutely level with the ends sawn to the lines radiating to the centre G. The timbers A-C and B-D must then be cut and set, and afterwards the centre H-D constructed as shown.

In the construction of all temporary timbering in building construction safety is, of course, the most important factor, so the forms must be of the best mechanical design in order not only to insure the safety of the men working on or around it, but to guarantee the positive permanence of the completed work. The timbers must be ample in size and at least three times as strong as necessary. They must also be properly placed, especially when they are in compression. All poor material should be thrown aside, the nailing should be thoroughly done and the work executed by skilled, conscientious and reliable mechanics. It should always be directed by a foreman or superintendent fully experienced in this special branch of building and who should make sure it is fully adequate for the purpose for which it is intended before being loaded. If these measures were adopted there would be far less records of accidents of collapses.—Building Age.

The Value of Concrete in Reducing the Cost of Insurance

At a recent meeting of the National Association of Cement Users of America, Mr. Emile G. Perrot gave the following particulars of the value of concrete in reducing the cost of insurance: "The large steel sprinkler tank and

tower of the Victor Talking Machine Company, Camden, N.J., is an instance of the beneficial result derived from the use of concrete from an insurance standpoint. This tank holds 100,000 gallons of water, the bottom of which is 125 feet from the ground. The total height of tank and tower is 174 feet. The diameter of the tank is 20 feet. The tower is erected on filled ground near a river, and the foundations of the four legs are supported on concrete piles. By reason of the close proximity of buildings belonging to other owners, the Victor Talking Machine Company desired to take out indemnity insurance on the structure as originally designed—that is, without any concrete protection, so that in case of a fire in the buildings adjacent, and the collapse of the tower, the damage to adjoining property would be covered. This, they were informed, would cost \$500 per annum. It was finally decided not to put any insurance on the structure, but instead to invest about \$4,000 in fireproofing the tower with concrete. A little reflection will show that the investment fully pays for itself, not only financially, but by practically making the tower immune from fire and the destructive agencies of the atmosphere, which it would not be if left unprotected. If we charge against the tower the interest on \$4,000 at 6 per cent. per annum we have \$240 as the carrying charge for the absolute protection against fire, instead of a \$500 charge for no absolute protection to person or property, but simply to cover any damages for which the company might be liable in case of a collapse of the tower. This clearly shows how it pays to carry your own insurance by taking precautions to avoid damage to persons or property by making a building fireproof. Further, the saving on the insurance premium will pay for the fireproofing in about 15 years, so that at the end of that time the original cost of the fireproofing will be wiped out. This, of course, is based on the assumption that insurance would be carried on the tower if it were not fireproofed."

Cost of Granolithic Finish in Concrete Floors

The following figures of cost for the finished surface of granolithic concrete floors are average results obtained by a Boston construction company during their long experience in laying this class of floor.

For a 1-inch finished floor surface laid integral with and at the same time as the structural concrete, finishers being paid 50 cents and laborers 20 cents per hour, costs figured for 100 square feet of finished surface:

Finishers' time	\$1.00 to \$1.30
Mixing and placing concrete	.42
Cement, 1 11/100 barrels	1.40
Sand, 3 1/2 feet at \$1	1.55 1/2
Fine stone, 3 1/2 feet at \$2	.12
	.25

\$3.19 to \$3.64 1/2

If laid after the structural concrete has set and not integral with it, the total cost of the floor will be about \$1.50 more per 100 square feet. If finished surface is reinforced with 1/4-inch steel bars 12 inches on centers to prevent cracking, add extra labor for mixing and placing concrete 40c., and extra labor finishing 30c., or 70c. per 100 square feet, and for placing steel, 50c. per 100 pounds, with cost of steel about \$3 per 100 feet laid down.

The city council of Victoria, B.C., are stated to be considering the appointment of a new city engineer. Six months ago Mr. Angus Smith, the present incumbent of the office, was re-engaged for a trial period. At a recent meeting of the council Mr. Smith recommended the appointment of Mr. S. H. Reynolds as assistant engineer. This would appear to have brought matters to a head.

Fine New Structure at Vancouver, B. C.

The Metropolitan Building, now being erected on Hastings street, Vancouver, west of the post office building and immediately adjoining the home of the Vancouver Club, is ten storeys high, of steel, brick and concrete construction, and will be one of the finest of the new blocks now under way or recently added to the city's already large list of big structures. For the Terminal City Club there has been built on the north end of the company's building a two-storey club building 90 x 100 feet, access to which will be made by the main Hastings street entrance through the palm room,



Metropolitan Building, Vancouver, now under construction.

20 x 40 feet, to the foyer of the club, which will also occupy the following space in the main building: On the left of the palm room a ladies' reception or tea room, and on the right an office, telephone booth, corridor and staircase to second floor, and a private dining room. On the second and third floors of the main building the club will have twenty-

two guest rooms, bathrooms and barber shop, access to which will be had only from the club premises. The main building, facing on Hastings street on the south and Burrard Inlet on the north, will contain 196 large offices, the rooms facing the north having a magnificent view of water and mountains.

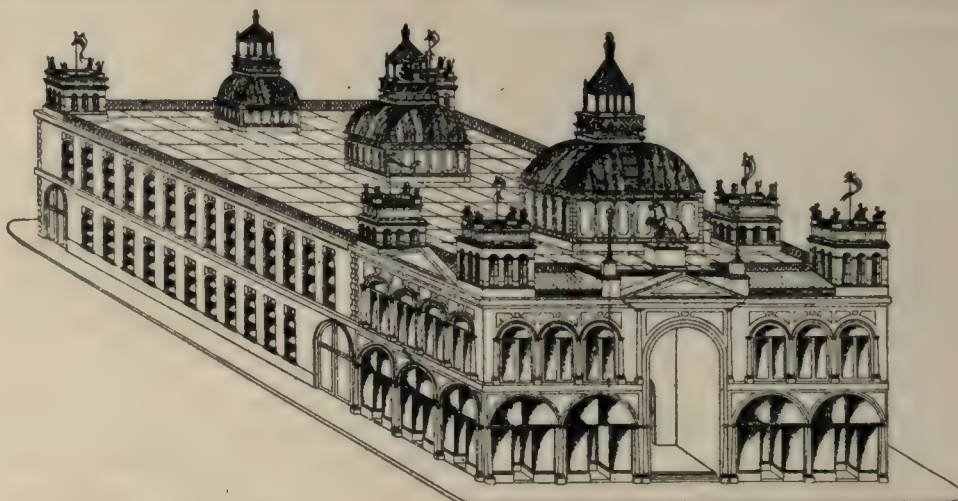
Each office is supplied with marble washstands, messenger and telegraph service, janitor service, electric light, steam heat, linoleum, electrical fixtures and other conveniences. The building will be equipped with three high-speed elevators, giving a continuous service day and night, Sundays and holidays alike.

The contracts for the building were let on the 24th of March, 1910, and the building will be entirely completed in about six weeks, at a cost, including the land, of about \$500,000.

Plans Completed for Montreal Hippodrome

Messrs. Laferriere & Hurtubise, architects, Montreal, Que., have completed plans for the new Hippodrome, which is to be erected by a company capitalized at half a million dollars. The Hippodrome will accommodate 10,500 people and will contain a theatre and racing track. The roof will be of armored glass, which will not only serve to illuminate the interior, but will afford an excellent roof garden. The ground floor corners of the building will be occupied by stores. The construction will be of a very substantial character, largely of steel and concrete, and fireproof throughout, according to information furnished the Contract Record representative by Mr. Brosseau, the promoter of the enterprise.

Our Montreal representative informs us that the extension of the Place Viger Station of the C. P. R. is scheduled to be completed about the middle of June and that the alterations to the hotel are due to be finished early in July. With the approach of warm weather a large force of men has been put to work on this job and good progress is being made. The roof and skylights are finished, the partitions in the first floor are in place and the plastering is well under way. The brick work for the mid-way is being pushed up rapidly. The new bridge leading from Notre Dame street to the hotel and station will run at right angles to the viaduct between Berri and Montcalm streets and this is expected to be finished in the latter part of June. Mr. R. Graves, manager of the Viger hotel, states that from present indications this year's tourist season will be greater than any of its predecessors.



The proposed New Hippodrome to be erected at Montreal.

Engineering "Expectancy" Keen at Ottawa

Report on Railway Entrances the Cause of Considerable Speculation —The Rideau River Problem—Late Spring Delays Building Season

Correspondence of the Contract Record

Ottawa, April 14, 1911.

There is a great deal of expectancy in Ottawa just now as to what is going to happen here in the engineering line within the next few years. The report of Engineer Tye and City Engineer Ker on the railway entrances into the city is one of the chief sources of speculation. The report recommends the closing up of the present Rideau canal at the deep cut about three-quarters of a mile from Central station and having all the railways come into the city by this way. The Grand Trunk already comes into the city along the southeast side of the canal and the C. P. R. comes in over the G.T.R. rails in this section, using the same station. The report suggests that the bed of the canal be used for the C.P.R. and other lines that in the future will desire to get into the centre of the city. From Central station there would be tunnels for both the G. T. R. and C. P. R. under Wellington street, to come out on the western side of the city, near the present pump house. The C. P. R. would thus connect with its lines to the west at the present yards at Union station. The Grand Trunk has a siding running into Booth's mills near this point and it would continue approximately along this siding and connect with its Parry Sound line west of the city. At present the Grand Trunk through trains come into Central station, then back out to Ottawa East and go west across the city. The suggestion is that this cross-city line be taken up altogether and the land bought by the city for a boulevard. The rest of the property could be sold for building lots, as it cuts through one of the best residential sections of the capital.

When the Rideau canal was first surveyed it was intended to run from Dowes lake on the southwest corner of the city almost directly north to the Ottawa river. The present report suggests that this connection be built now to come into the Ottawa river above the Chaudiere Falls. Here the harbor for the city would be built, connecting with the Georgian Bay canal which otherwise would not touch Ottawa, the government plans being for it to cut through Hull.

Providing, however, the government says that the Georgian Bay canal is not to be built, then the report recommends that the canal be left as it is and the C. P. R. lines brought into the city on its west bank with a tunnel through the city much as before but at a considerably higher grade.

As the government has committed itself to the Georgian Bay canal it is hardly likely that the alternative scheme would be necessary.

The plan is very nearly the same as the C. P. R. has proposed for some time and is therefore very satisfactory to that company. However, the G. T. R. is not so favorable, and its officials have promised another scheme which it is expected will be made public at an early date.

The proposal of the engineers has the strong feature that it will do away with the necessity of a great deal of expensive bridge building.

Another important engineering proposal is to prevent the Rideau river from flooding its banks in New Edinburgh and Eastview. At present the river overflows every spring. The bottom of the river is very uneven. It has a series of small lakes which are separated by very shallow rapids. The bottom of the lakes are much lower than the bottom of the rapids between. During the winter the anchor ice lodges in these shallow spots and blocks up the river, and since its banks are very low it overflows in the spring, doing a great

deal of damage. A former plan prepared for the government was to dredge out these shallow spots which would, no doubt, have been effectual in stopping the floods, but would have drained the lakes in the summer time, entirely spoiling their present beauty. The present proposal, according to a plan prepared by Mr. N. Cauchon, consulting engineer for Hon. Charles Murphy, is to build embankments on each side of the river and to construct a dam at Porter's Island, a short distance from the point where the Rideau river flows into the Ottawa. The level of the river would thus be raised ten feet and in the winter would freeze over at this level. When the spring freshets came the water would be drawn off under the ice through sluices in the dam and there would be no lodging of anchor ice. The embankments would be converted into beautiful driveways. However, this would have to be constructed directly to the Ottawa river, via MacKay lake, to drain this area.

Building Season Late

The late spring has greatly retarded building operations in the city. The heavy expense of building foundations and excavating in the cold weather has resulted in most of the smaller buildings being postponed. However, during the latter part of the week operations were much more active and the rush on account of the weather delays will be all the greater. The prices of building materials are very much the same as for some months past. The prices of cut stone will advance about 5 cents per lineal foot as the result of the previously announced advance in wages to stonemasons.

The agreement existing between the builders and builders' laborers expires on May 1st, and at the last meeting of the Builders' Exchange a communication was received from the laborers asking for another agreement, but not specifying any terms. Accordingly a meeting of the builders and laborers will be held very soon, when it is expected that an amicable arrangement will be made.

McFarlane & Douglas will erect a large addition to its factory on Slater street. It will be solid brick, two storeys high and 141 feet by 66 feet. J. A. Ewart is preparing plans. In this building steel work such as fireproof doors, safe cabinets, lockers, etc., will be manufactured. At present, it is claimed, no firm is manufacturing these articles in Canada.

Mr. Jno. R. Booth, the industrial wonder of the Ottawa Valley, recently celebrated the 85th anniversary of his birth by a hard day's work at Chaudiere, starting in at an hour when two or three younger generations were still asleep. Mr. Booth was born at Waterloo, Que., on April 5, 1826. He went to Ottawa 50 years ago and commenced his business career with a small shingle mill at the Chaudiere. One of the enjoyable features of the annual convention of the Canadian Society of Civil Engineers held at Ottawa last year was a visit to the great industry over which Mr. Booth now presides.

The Western Bridge & Equipment Company, Chatham, Ont., are applying for a charter to change their name to the Chatham Bridge Company, Limited. The capitalization will be \$200,000. They have obtained from the city a free site of seven acres and a fixed assessment for ten years. The erection of a new plant, 82 by 200 feet, of steel and concrete construction, will be commenced at an early date.

Canadian Railroad Development

J. H. Knight, of the Valley Construction Company, Waitsburg, has secured a contract for several miles of work on Vancouver Island and will commence operations there immediately.

The Grand Trunk Railway has ordered 40,000 tons of steel rails from the Sydney, Cape Breton mills, to replace 200 miles of its tracks in Western Ontario. The company will ship 209 miles of the displaced track to the west for yards and sidings on the Grand Trunk Pacific. Some of these rails have been in use since 1869, having been imported from England.

Engineers of the Canadian Pacific Railway are now preparing a route which will give that road an entrance into the downtown section of London, Ont. At present the company's station and freight sheds are in the north end. To secure a downtown station the company plans to build from Pottersburg to the city, and connect with the Pere Marquette, which has running rights into the Grand Trunk station. All the big factories are at the south end of the city in the district in which the Canadian Pacific Railway spur is proposed.

The Grand Trunk Pacific Railway (B. B. Kelliher, chief engineer, Winnipeg, Man.), has awarded extensive contracts to J. D. McArthur, Winnipeg, Man., and Foley, Welch & Stewart, St. Paul, Minn. The McArthur contract calls for the construction of branch lines: Foley, Welch & Stewart will be engaged in work between Prince Rupert and Edmonton, doing grading at both ends. The following branch lines are to be constructed: Calgary branch, 143 miles; Battleford branch, 59 miles; Melville-Regina branch, 68 miles; Alberta coal branch, 68 miles; Regina-Boundary branch, 110 miles; Moose Jaw branch, 49 miles; Prince Albert branch, 72 miles; Biggar to Calgary, 50 miles. In addition to this work on the branch lines, it is expected that 265 miles of new work will be done on the main line. On the line west from Edmonton there will be built 165 miles, and on the line east from Prince Rupert 100 miles will be built. On the branch lines the road into Calgary will be completed. At the present time there has been built of this branch 80 miles. The balance comprises 143 miles. Connection with Battleford will be made through the construction of a line from Oban north. The line into Regina from Melville on which work has been done for the past two years will be completed. In the far west a line will be built into the coal fields from Bickerdike and will be known as the Alberta coal branch. In southern Saskatchewan two lines will be built, one from Regina to Moose Jaw, and one from Regina to the international boundary. On the latter grading was done last year, but the former project is one on which nothing has yet been done. Farther north in Saskatchewan work will be done on two lines, on the road from Biggar to Calgary and on the road from Young to Prince Albert. On the former 50 miles will be built, and on the latter 72. In connection with the construction of these lines it will be necessary to do important bridging. Among the rivers which are to be crossed are the Skeena, the Athabasca, the Red Deer, and the Prairie Creek. The total cost of the construction of these lines is stated to be in the neighborhood of \$17,000,000.

U. S. Steel Company in the Canadian Field

Mr. J. H. Plummer, president of the Dominion Iron and Steel Company, and Mr. M. J. Butler, general manager, were in Ottawa last week interviewing the members of the government in a final effort to secure a temporary extension of the bounties on wire rods, which expire on July 1st next.

Mr. Plummer states that with wire rods placed on the free list, under the reciprocity proposals, the Canadian man-

ufacturers are left with absolutely no protection against the United States Steel Company, which can dispose of its surplus product in Canada at cost or less than cost price. There being no duty there can be no application of the "dumping clause," and already, he states a contract is being made at Hamilton for the laying down of steel rods there from Pittsburg at a price considerably lower than the American market price, and with which the Dominion Iron and Steel Company could not possibly compete except at a loss. He maintains that if a temporary extension of the bounties on wire rods for two years were given it would enable the company to gradually convert its present wire rod plant into a mill manufacturing some other form of iron or steel, which they could produce profitably in competition with the United States Steel Company.

Personal News and Notes

Lynch & Gangysh have opened a stone yard at Saskatoon.

McKee & Cruickshank, general contractors, of Red Deer, have dissolved partnership.

William P. Coleman, architect, has opened an office at 406 Northern Block Building, Regina.

Peterson & Par, engineers and contractors, of Vancouver, are reported to have dissolved partnership.

J. L. White, of Sioux City, S.D., is in charge of the installation of a water system at Melville, Sask.

The Canadian Equipment and Supply Company, of Calgary, has increased the capital stock to \$200,000.

The Sandstone Brick and Sewer Pipe Company, Limited, of Calgary, has obtained a charter.

Mr. W. J. Laughlin, contractor, Chilliwack, B.C., has been appointed building inspector for that city.

Over four hundred thousand dollars worth of buildings will be erected in Vernon, B.C., this year.

W. W. Blair, architect, of Winnipeg, was at Nelson recently inspecting the new C. P. R. hotel.

Farely Bros., contractors, of Winnipeg, have incorporated with a capital of \$20,000.

The Canada Metal Company will establish a branch of their business at Winnipeg.

Harvey & Moorehouse, engineers and surveyors, of Kelowna, B.C., have opened an office at Penticton.

The North Battleford Concrete Company will begin the manufacture of cement blocks and pipe as soon as spring opens.

F. A. Ross has commenced business in wholesale building supplies in Room 4, Masonic Temple Block, Prince Albert.

Messrs. Hotson and Leader, contractors and builders, of Lethbridge, have opened an office in Medicine Hat, of which T. J. Dupew will be local manager.

Enormous deposits of gypsum have been discovered near Spatsum, B.C., on the main line of the C. P. R., and a large refinery will be established there.

In a fire at Albernie, B.C., the headquarters office of Janse & McDonnell, railroad contractors, was burned. The loss was not a serious one.

C. K. MacLean, landscape architect, has just completed a comprehensive scheme for the beautifying of the public parks at New Westminster, B.C.

Employees of the Hamilton Bridge Company have commenced work on the new steel bridge which is to span Coal Creek, near Fernie, B.C. The old bridge is being torn down.

The Dominion Tar and Chemical Company, the capital of which has been furnished by English capitalists, is build-

ing an extensive plant about six miles east of Winnipeg, and a mile straight north of the Transcontinental shops. F. W. Coates is the manager in charge. The plant will cost in the vicinity of \$200,000. The work of the new concern will consist wholly of creosoting wood for preservation purposes.

Mr. H. G. James, architectural engineer, has opened an office on Magog street, Sherbrooke, Que.

The Grand Trunk Pacific plan the expenditure of \$17,000,000 in Western Canada this year. Of this amount Regina and district will come in for a good share.

The Board of Water Commissioners of St. Thomas, Ont., have retained Mr. Jas. A. Bell, formerly city engineer, as consulting engineer.

Loring P. Rixford, of San Francisco, has been awarded the first place in the plans for the new Union Club building to be erected on Humboldt and Gordon streets, Victoria, B.C.

H. K. Agnew, sales manager of the Hanbury Manufacturing Company's Brandon branch, has resigned to take a similar position with the North Pacific Lumber Company, of Burrard Inlet, B.C.

At Calgary, Alta., excavating is proceeding apace for the new stores to be erected by the Hudson's Bay Company. A photograph just to hand shows nearly a score of teams on the job.

Mr. Geo. T. Dodge, late of the Department of Public Works, St. John, N.B., was married recently at Fredericton, N.B. Mr. Dodge will reside in Montreal, where he will follow his profession of civil engineer.

Negotiations are being conducted by the Canadian Northern Railway and the British Columbia Steel Corporation, capitalized at \$10,000, for the location of a big steel plant at Port Mann. Work will be commenced at once.

The organization of the Medicine Hat Builders' Exchange has been completed. Mr. John Trimble was elected president; Mr. E. A. Forrester, vice-president; and Mr. J. D. Everard secretary-treasurer.

The provincial government of British Columbia will expend over four million dollars this year for roads, bridges, wharves, public buildings and other improvements. Of this sum Vancouver Island will receive nearly half a million.

Messrs. Vickers, Son & Maxim, the English shipbuilding firm, deny the report that they have received any contract from the Canadian government other than for establishing a repairing dock at Montreal.

C. W. Dean, of New York, formerly of Winnipeg, died last week of heart disease. In western Canada the late Mr. Dean had acquired a considerable reputation as a contractor for C. P. R. bridge work.

Mr. Ernest Anson, a well known civil engineer, of London, Eng., and for many years prominently identified with important railroad construction in India, was a visitor to Edmonton, Alta., last week. Mr. Anson left later for Saskatoon, where he remained for two or three days.

Canadian Pacific Railway officials are discussing a project to extend Granville street, Vancouver, through the present station out to the Inlet, on steel and concrete arches, for the purpose of having a direct connection between the street and the big passenger steamers.

A noteworthy building project in British Columbia is the extension of the Parliament buildings at Victoria, upon which the provincial government will spend a million dollars. Mr. F. M. Rattenbury, architect, Victoria, is at work on the plans.

The threatened strike of the Lethbridge building trades, resulting from the declaration of open shop by the Builders'

Exchange, has blown over, and all the various units are at work. Building operations have resumed their normal level and a busy season's work is in prospect.

With a view to showing the activity in municipal circles at Vancouver, B.C., a local paper figures that the city is expending \$500 an hour for labor, irrespective of the pay roll for contract work, which is nearly as heavy as during the busiest period of last year.

Ald. John Clark, of McDiarmid & Clark, Brandon, Man., was the successful bidder for the construction of the new Hospital for the Insane, to be erected at Brandon. Mr. Clark's tender was \$454,878, this being the lowest. Six other bids were received, of which the highest was \$529,000.

F. T. Wilson, resident engineer for the C. P. R. at Vancouver, has resigned his post in order to engage in private practice in that city. Thos. Lees, resident engineer at Brandon, Man., will succeed him at Vancouver, while V. J. Melsted, Winnipeg, will succeed Mr. Lees as resident engineer at Brandon.

The British Columbia Marine Railway, of Vancouver and Victoria, is making preparations necessary to enable the company to tender for war vessels to be constructed for the Canadian navy. A dry dock 900 feet long and 100 feet wide, to cost \$3,000,000, will be built at Esquimalt, with a modern shipyard in connection. A well-known Clyde shipbuilding firm is interested with the Marine Railway Company in the big project.

"Kiton" Soluble Coal Tar for Waterproofing Damp Walls

There has just been placed upon the Canadian market a tar preparation called "Kiton," which is obtained by subjecting coal tar to a physical process, through which it is rendered soluble in water. All the characteristics of tar are retained in this preparation, which when diluted with water is readily applied to any surface, as easily as ordinary paint. As a preservative Kiton has a wide sphere of application, but it is particularly well adapted and valuable for the waterproofing of large areas, such as extensive foundations, tunnels, waterworks, roofings, floors, and so on. In ordinary building work, for the waterproofing of stone, brick, cement and plaster walls, and particularly for cellars, it is invaluable.

The manner in which Kiton is used is simplicity itself. According to the thickness of the coat required one part of Kiton is dissolved in one or two parts of cold water. After thorough stirring, preferably with a stiff brush, the solution is ready for use. The solution can be thinned down sufficiently to be used with a sprayer, particularly advantageous in larger work, but for whatever purpose Kiton is required the work of tarring can be done more expeditiously and economically than with ordinary coal tar, dispensing entirely as it does with the troublesome and often dangerous tar kettle.

The instant the applied coat of Kiton is dry it is insoluble, impervious to moisture and weatherproof. Unlike ordinary tar it will never "run" when exposed to the heat of the sun. This unique preparation has met with instant and unqualified success in Europe since it was first introduced, some two years ago. Kiton will undoubtedly find a large field of usefulness and a ready market in Canada, where builders and contractors will be quick in taking advantage of its many time and labor-saving qualities.

For further information, prices, delivery, etc., apply to F. P. Mansbendel, General Distributor for Canada. His temporary address is 212 Huron street, Toronto, Canada. See also advertisement in this issue.

Contracts Department

News of Special Interest to Contractors, Engineers, Manufacturers and Dealers in Building Supplies.

Information for insertion in these columns is invited from Architects, Contractors, Engineers, etc.

Waterworks, Sewerage and Roadways

Brockville, Ont.

Tenders are called until April 20th for supply of lumber for sidewalks and street purposes; Portland cement; salt glazed vitrified sewer pipes; sand, and cut and steel wire spikes. J. A. MacKenzie, chairman, board of works.

Chilliwack, B.C.

T. F. Sinclair's report on sewerage system, etc., estimates the cost at \$67,800, which includes work, material, supplies and guarantee. The scheme proposed by Mr. Sinclair is a flush vacuum system and about $5\frac{1}{4}$ miles of piping will be put down for the price mentioned. Steps will be taken to ascertain if privileges can be obtained from the government to empty the refuse in the Fraser river. If this is received then measures will be formed and a by-law submitted to the ratepayers. The work of installing a sewerage system and the macadamizing of the streets can go on at the same time.

Collingwood, Ont.

Tenders will be received by K. S. Macdonell, town engineer, up to May 3rd for paving of streets throughout the town. For further particulars see advertisements in "Tenders and For Sale Department" of this issue.

Coquitlam, B.C.

The by-law to raise \$150,000 for new roads was carried. The by-law to raise \$50,000 for sidewalks also carried.

Edmonton, Alta.

Orders to make a thorough test of the asphalt found in the north and to bring out two tons of the material for this purpose have been received by F. B. Cream, who is exploring in the McMurray district this summer for the government. The department of the interior has sent out the orders and it is stated that the asphalt would be turned over to the experts of the United States for a thorough examination and report.

Fort William, Ont.

Tenders are called until May 4th for paving with asphalt block, sheet asphalt, or bitulithic, etc. Plans, etc., at office of City Engineer John Wilson. Advertisement in "Tenders and For Sale Department" of this issue.

Hamilton, Ont.

Tenders addressed to Geo. H. Lees, chairman, board of control, will be received until April 19th for the brick setting for five boilers to be installed at the Beach Pumping Station. S. H. Kent, city clerk.

London, Ont.

The local improvement committee of the city council are outlining a scheme for extensive pavements. Reports on the various kinds will be considered in regard to the various foundations on which

they will be laid on the different streets. Ald. Richter, chairman.

Tenders will be received by the Board of Water Commissioners, London, to April 27th for waterworks supplies, including brasswood, lead pipe, iron pipe, iron castings, stop cocks, boxes, steel hydrants, valves and valve chambers. H. J. Glaubitz, general superintendent. Advertisement in "Tenders and For Sale Department" of this issue.

Melville, Sask.

A by-law to raise by way of loan \$63,000 for construction of waterworks, etc., will be submitted to the ratepayers on April 25th; also that for \$5,000 for construction of storm sewer, etc. R. B. Taylor, mayor; John Crow, secretary-treasurer.

Moncton, N.B.

Tenders for new sidewalks to cost about \$9,000 will be asked shortly. Engineer McBeath in charge.

Montreal, Que.

Tenders for the construction of Montreal's filtration plant will be called for within the next two weeks. It is expected that the tenders will have been awarded by the end of next month, and the work involving an expenditure of two million dollars, is to be completed in September, 1913. There are four contracts to be let. In the first place ten pumps will be provided, and after that the pre-filter and the main filter will be under contract, as well as the concrete covering over the filter beds, as the water, while in the process of being filtered, will not be exposed to the air.

Moose Jaw, Sask.

The following tenders were received for pumps, sewer and water extension, sewerage disposal plant, etc.:

Sewage Disposal Works — Manders Bros., Edmonton, \$124,023; Geo. H. Archibald & Co., Winnipeg, \$129,500; Flanagan & Murphy, \$134,585; Navin Bros., Moose Jaw, \$143,713; Moose Jaw Construction Co., \$149,641; City Engineer, \$146,306; Simple Concrete Piling & Construction Co., \$139,000.

Sewage Pumps—Canada Foundry Co., Toronto, \$1,960; John MacDougall Iron Works, Montreal, \$2,281; The Canada Land Co., Ltd., Montreal, No. 1, \$4,615.24; The Canada Land Co., Ltd., Montreal, No. 2, \$4,249.74; Canada Ford Co., Montreal, \$4,825.

Supplying Cast Iron Pipe—Stanley Brock, Ltd., Winnipeg, \$39.25 (6 inch), \$39.25 (4 inch); G. Thompson Pipe Foundry, \$40.00 (6 inch), \$40.00 (4 inch); Francis Hankia & Co., Montreal, \$41.40 (6 inch), \$41.95 (4 inch); H. A. Drury & Co., Ltd., Montreal, \$43 (6 inch), \$44.05 (4 inch); Moose Jaw Machine Works, \$45.77 (6 inch), \$47.31 (4 inch); Whitlock & Marlatt, \$45.50 (6 inch), \$47.50 (4 inch); Chas. Miller & Co., \$45.60 (6 inch), \$45.60 (4 inch); S. D. Wood &

Co., \$18.25 (6 inch), \$21.00 (4 inch); R. Cunningham, \$50.47 (6 inch), \$50.47 (4 inch); Canada Foundry Co., \$42.50 (6 inch), \$42.50 (4 inch); Bissett and Loucks, \$45.00 (6 inch), \$45.60 (4 inch).

Sewer and Water Extensions—Navin Bros., Moose Jaw, \$51,113; L. W. Schruth, Fargo, N.D., \$56,519; C. J. Robinson, Moose Jaw, \$52,774; H. G. McVean, Moose Jaw, \$54,740; Flanagan & Murphy, Moose Jaw, \$58,800; Ransom & Kilkenny, Moose Jaw, \$63,000; C. J. Townsend, Toronto, \$60,000; Mudies Bros., Edmonton, \$66,917.75; City Engineer, \$55,743.

Sewer Pipe—Dominion Sewer Pipe Co., \$12,937.70; Saskatchewan Glass & Supply Co., \$13,832.12; Whitlock & Marlatt, \$13,531.18; Macomb Sewer Pipe Co., \$14,597.24; Hamilton and Toronto Sewer Pipe Co., unit prices; D. F. Lee, \$13,592.17; R. Cunningham, \$14,890.28.

Ottawa, Ont.

Tenders are called until April 27th for construction of the West End Drainage System. N. J. Ker, city engineer. Advertisement in "Tenders and For Sale Department" of this issue.

Perth, Ont.

Tenders will be received up to April 28th by Jno. A. Kerr, town clerk, for construction of various sewers in the town of Perth. Advertisement in "Tenders and For Sale Department" of this issue.

Saskatoon, Sask.

Tenders will be received by the city commissioners up to April 28 for laying of water and sewer mains in the city of Saskatoon. Commissioners: Jas. Clinkskill, W. B. Neil, E. M. Snell. Advertisement in "Tenders and For Sale Department" of this issue.

Toronto, Ont.

Tenders addressed to the chairman, board of control, will be received until June 6th for supply of pumps, vertical electrically driven; motors and other electrical equipment; screens; and cleaning apparatus; venturi meters. G. R. Geary, mayor.

Victoria, B.C.

Under the newly elected council the paving programme for the year will at once be taken up and tenders called for the work to be done on a large number of streets. The creation of a large number of additional parks in various parts of the city; the Sooke Lake scheme, and the report of C. H. Topp, who has made preliminary surveys, will be considered. Arrangements will probably be made for the submission to the ratepayers of by-laws providing loans for the further extension of the sewerage system and the electric lighting plant, and altogether every effort will be made to advance with all speed those large works of improvement which were decided upon

earlier in the year. About 600,000 yards of asphalt pavement will be built, tenders for 200,000 yards of which must be in by April 28th.

AWARDED

Berlin, Ont.

David Christner, Berlin, was awarded the contract for concrete storage tank, \$1,571. H. Tomlinson, engineer in charge.

Calgary, Alta.

The contract for supply of road roller was given to Western Supply and Equipment Co., Ltd., Calgary, \$2,448; that for asphalt plant to Bitulithic & Contracting, Winnipeg, \$6,975. J. T. Childs, city engineer.

London, Ont.

The contracts for gravel, concrete tile, etc., were awarded as follows: Unscreened gravel—Section 1, Mr. Robinson, \$2.60 a cord; section 2, W. J. Ross, \$2.03; section 3, G. Alexander, \$3.40; section 4, G. Alexander, \$3.50; section 5, Mr. Robinson, \$3.50; section 6, G. Alexander, \$3.70; section 7, W. J. Boss, \$3.70; section 8, Mr. Robinson, \$3.40. Concrete tile—8-inch, 16 cents; 10-inch, 18 cents; 12-inch, 20 cents. R. North, 14-inch, 40 cents; 15-inch, 50 cents. W. J. Anthistle, 18-inch, 60 cents; 22-inch, 60 cents; 24-inch, 70 cents. R. North, 26-inch, 90 cents. W. J. Anthistle, 28-inch, 90 cents. R. North, 32-inch, 95 cents. W. J. Anthistle, 26-inch, \$1. R. North, 39-inch, \$1.10. W. J. Anthistle, 43-inch, \$1.40. R. North, 45-inch, \$1.50. Glazed tile—Hayman & Mills, 4-inch, 8½ cents; 6-inch 11½ cents; 8-inch, 18 cents; 10-inch, 27 cents; 12-inch, 35 cents; 15-inch, 47 cents. Junctions—4-inch, 35 cents; 6-inch, 50 cents; 8-inch, 75 cents; 10-inch, \$1.15; 12-inch, \$1.50; 15-inch, \$2.75, and 18-inch, \$2.50. The contract for cement walks was awarded to George Norton for 8½ cents, covering the whole city. Curbs and gutters were awarded to W. J. Anthistle for the whole city at 31 cents for 15-inch curb, 41 cents for 18-inch and 41 cents for 24-inch.

Renfrew, Ont.

Contract for the season's supply of cement was given to Mr. E. J. McGarry. The tender was at \$1.55, in cotton bags, the bags to be returned.

Saskatoon, Sask.

The contract for cement sidewalks aggregating about 500,000 square feet, exclusive of curbing and amounting to over 12 miles, was awarded to Western Pavers, Limited, Winnipeg. The contract price was slightly over \$90,000. The work is in charge of Charles Curtis, Winnipeg.

Vancouver, B.C.

Contracts for concrete sidewalk work in the six wards were as follows: Geo. W. Ledingham was awarded the contract for Wards 1 and 2 at 13 cents per foot, and Wards 3 and 4 at 13½ cents. McGarry & Cavanagh were awarded the contract for Wards 5 and 6 at 14 cents and 15 cents respectively. Boyd & Craig were awarded the contract for grading Broadway from Granville street to Trafalgar road, for \$13,400. The grading and concrete work on Seventh avenue between Bridge and Scotia streets were awarded to R. McLean & Co., for \$19,780. There were eight other tenders for this work with prices ranging from \$19,986 to \$25,900. J. B. Saint was given the contract for the grading of Graveley street, for \$4,987.

Winnipeg, Man.

The contract for the construction of a wood-stave pipeline for the extension of the present feed mains of the water system to the new wells now being drilled to the north and west of the present wells, was let by the city engineer of construction.

Railroads, Bridges and Wharves

Bala, Ont.

The C. P. R. has asked for tenders for the construction of a drain 135 feet long, five feet wide and six feet high, for the diversion of a creek on the Muskoka line. Two miles north of Bala the line is carried across a muskeg by a trestle bridge, the safety of which was threatened by a creek running through the muskeg. The building of this drain will remove this danger.

Bayfield, Ont.

The Ontario West Shore Railway Co. is in negotiation with this municipality in connection with the proposed extension from Goderich here.

Dauphin, Man.

Tenders addressed to J. W. Johnston will be received until May 16th for supply of two 70 ft. bridges with 18 ft. roadway over the Vermillion river here. Specifications, etc., at the office of the above and at the office of the chief engineer, Department of Public Works, Winnipeg.

Fassett, Que.

Tenders are called by Public Works Department, Ottawa, until May 9th for construction of a wharf here. Plans, at this Department, and at the office of J. L. Michaud, District Engineer, Montreal, and on application to local postmaster.

Port Arthur, Ont.

It is stated on good authority that the Canadian Pacific will begin the double tracking of the line between Port Arthur and Fort William as soon as the weather will permit.

Regina, Sask.

The G. T. P. has purchased a strip of land one mile long and 200 yards wide, situated north of Belvedere subdivision, on which property the new shops will be located. The exact location of the station is at the corner of Albert street and 16th avenue.

Renfrew, Ont.

The by-law to raise \$3,200 for construction of the new bridge on Smith's creek will be submitted on May 10th.

Trynor's Cove, N.B.

Tenders are called by Public Works Department, Ottawa, until May 9th for construction of wharf here. Plans, etc., with E. T. P. Shewen, Esq., District Engineer, St. John, N.B.; G. Stead, Esq., District Engineer, Chatham, N.B.; the Postmaster at Pennfield Centre, N.B., and at above Department.

Vancouver, B.C.

Tenders addressed to Mackenzie, Mann & Co., Ltd., will be received until May 12th for construction of the following sections: Hope to Boston Bar; Boston Bar to Lytton; Lytton to Ashcroft; Ashcroft to the crossing of the North Thompson river. Tenders will include clearing, grubbing, grading, bridges, trestles, culverts, masonry and fencing. Plans, etc., at the offices of the above, Room No. 29, 18 Hastings street west.

Virden, Man.

The C. P. R. will spend \$70,000 here during the coming season in building a pipe line to bring water from the Assiniboine for the company's use. The line will be about five miles in length and necessary buildings will also be erected. The company is also arranging to build a steel bridge across the Virden creek.

Woodstock, Ont.

Tenders are called until May 6th for erection of three steel bridges, also for construction of concrete abutments for same. Tenders are also called for same date for construction of two or three bridges. F. J. Ure, county engineer. Advertisement in "Tenders and For Sale Department" of this issue.

AWARDED

Brantford, Ont.

Mr. H. M. Vanderlip, Cainsville, Ont., was given the contract for the construction of three concrete bridges; the Daubigny Creek bridge, \$798; the Lumler bridge, \$565; and Wood bridge, \$685; Mr. George Thompson, Paris, Ont., received that for the Wheeler bridge, \$890.

Fork River, Man.

The contract for the construction of a Howe truss bridge across the Fork river, has been awarded to the Algoma Steel Bridge Company.

Port Arthur, Ont.

Stewart and Hewitson will probably be given the contract by the C. P. R. for the erection of permanent bridges, etc., east of here, amounting to about \$60,000.

The Canadian Northern Coal and Ore Docks Co., Ltd., have let the contract to Barnett & McQueen Co. for the construction of an addition to the coal docks. The addition will have a capacity of 500,000 tons of coal.

Public Buildings, Churches, Schools, etc.

Annapolis Royal, N.S.

Tenders were called until April 15th for erection of church building. Plans, etc., at the Parsonage or at the office of the architect, Leslie R. Fairn, architect, Aylesford.

Brantford, Ont.

A building campaign has been started to raise \$100,000 for a new Y. M. C. A. building.

Calgary, Alta.

The new building to accommodate the city stables, etc., will be erected at once at an estimated cost of \$20,000.

The proposed Trades and Labor Building may be built at a cost of about \$100,000. A joint stock company will be formed.

The new First Baptist Church will be erected at the corner of Thirteenth avenue and Fourth street west at a cost of \$90,000. Architect, D. S. Mellroy.

Cobourg, Ont.

Tenders will be received by Neil F. MacNachtan, county clerk, Cobourg, Ont., to June 1st, for steam heating at Victoria Hall in Cobourg. For further particulars see advertisement in "Tenders and For Sale Department" of this issue.

Edmonton, Alta.

Tenders are requested until April 24th for an addition to the Separate School

Plans may be seen at the office of H. A. Magoon, Credit Foncier Building.

The provincial government have decided upon the erection of a large new land titles office, to cost about \$200,000, at the corner of Howard and May streets. The new building will, it is understood, be much after the type of the new court house building. A preliminary estimate of \$30,000 was made during the last session for the purchase of a site.

Forest, Ont.

Tenders are called until April 22nd for erection of 6-room school here. Plans, etc., at office of W. J. Porte, or at the office of the architect, R. W. Fawcett, Sarnia.

Fort William, Ont.

Plans for the new theatre to be constructed by Messrs. Hamilton and Fregeau, are complete, and work will begin in a few weeks. The theatre will be on the lines of the Walker theatre in Winnipeg and estimated cost is \$85,000.

Montreal, Que.

Plans are being prepared by Mr. P. J. Turner for a proposed new Anglican Church at Montreal West.

Mr. Joseph Perrault, architect, 2106 Park avenue, Montreal, has completed the plans, specifications, etc., of the Postal Station "C," corner St. Catherine and Plessis streets, Montreal. The plans are at Mr. Perrault's office, and at Department of Public Works, Ottawa. Tenders are called until May 1st.

Ottawa, Ont.

Allan Keefer, architect, has prepared plans for a school to be erected by government at the Kootenay Mission, B.C.

Regina, Sask.

Tenders are being called for the Carnegie library here. Specifications call for alternative tenders for an all stone and a brick and stone building, fireproof construction throughout. It has been decided to install cork flooring. Estimated cost, \$45,000.

Stratford, Ont.

At a meeting of the congregation of St. Andrew's Presbyterian Church the following were appointed to report on the question of the erection of a new church: Messrs. Thos. Ballantyne, J. H. Moffat, L. Oman, B. Johnson, B. Williams and J. A. Andrew.

Sudbury, Ont.

Plans are being requested for a skating rink here until May 1st. Advertisement in "Tenders and For Sale Department" of this issue.

St. Boniface, Man.

Under date of last information the contract had not been awarded for the new seminary here. Work will be commenced in May. The building will be of white Tyndall stone and is estimated to cost about \$200,000.

St. John, N.B.

Arrangements are being made for the erection of the new theatre for Keith Theatre Co., New York. H. L. Watkins, general manager of the Keith circuit.

Toronto, Ont.

Ward One Liberal Association will erect a club house. President, Mr. George Strath.

The permit for the Women's Building on the Exhibition grounds has been issued, \$60,000.

Tenders will be called by the Board of Education for the erection of a separate building for manual training and domestic science school at Manning avenue. Superintendent of Buildings, Mr. Bishop.

Negotiations are now in progress towards the disposal of the present site of the Queen street asylum and the securing of a site near the city for a new building which is estimated to cost about \$150,000. Hon. W. J. Hanna, Provincial Secretary.

Vancouver, B.C.

The ratepayers of the municipality of Burnaby voted in favor of the \$76,000 by-law for the purchase of school sites. It is possible that a new municipal hall will be erected this summer.

The architect for the new 7-storey building for the Bible Society to be erected on Howe street is Claude P. Jones. The building will be of steel and concrete construction with stone base and columns, the upper portion being pressed brick with stone trimmings.

Victoria, B.C.

Tenders are called for the erection of a school house at University School, Mount Tolmie. Plans and specifications can be seen at the office of John Wilson, architect, Pemberton Block.

Tenders are called by Department of Public Works until May 1st for the erection of a two-room frame school at North Cowichan. Plans at the office of the government agent, Duncan, and the Department of Public Works. J. E. Griffith, Public Works Engineer.

Windsor, Ont.

Tenders addressed to the secretary, board of education, will be received until May 1st for the heating of Cameron avenue school, either by hot water, steam or hot air blast. Plan of school at office of the above. Plans and specifications of system to be supplied by tenderer.

Winnipeg, Man.

Tenders are called until April 24th for erection of the Central Y. M. C. A. building. J. H. G. Russell, architect, McArthur building.

The congregation of St. Ignatius will erect shortly a large church on the northwest corner of Stafford street and Jesse avenue, Fort Rouge. Rev. Father Coffee, pastor.

The preliminary plans for the new court house were submitted to the Manitoba Bar Association by Provincial Architect Hooper. Estimated cost, \$500,000. Work will commence as soon as plans have been finally revised.

The land for the new building for the Sisters of the Good Shepherd has been purchased in Kildonan. Estimated cost, \$150,000. It is not stated just when work will commence.

The plans of Herbert B. Rugh, Union Bank Building, were accepted for erection of contagious diseases hospital to be erected in Riverview at a cost of \$200,000. There were thirteen competitors, all of Winnipeg. George T. Teefer, Woodman and Carey, George W. Northey, Mathews & Maistre, also received prizes. Meyer J. Strum, of Chicago; John D. Atchison, and A. J. Douglas, M.D., acted as judges.

AWARDED

Brandon, Man.

The contract for the construction of the new central fire hall has been awarded

to A. E. Bullock, \$33,933. The price does not include plumbing, heating or wiring.

The contract for erection of hospital for insane was awarded to John Clark, of McDiarmid & Clark, local contractors, at \$529,000. Six other tenders were received and ranged from somewhat about this amount to \$529,000.

Brockville, Ont.

The Canadian Office and School Furniture Company, of Preston, Ont., has secured the contract of seating the new opera house.

Grand Forks, B.C.

The contract has been awarded by the Provincial government for the erection of the court house here to Mr. Robert Gaw, \$40,000. The work of construction will begin forthwith.

Kamloops, B.C.

The contract for excavation for the new hospital building was awarded to Johnston & Co., of this city.

Moose Jaw, Sask.

The plans of W. Zimmerman were chosen for erection of 8-room school in the east end; for that of the 12-room school the plans of R. G. Bunyard were chosen.

Nelson, B.C.

The contract for the extension of post office has been let to John Burns, Nelson.

Oakville, Ont.

Messrs. Byers & Anglin, contractors, Montreal, have undertaken to construct a preparatory school here for forty pupils. Work will be proceeded with as expeditiously as possible. Messrs. Peden and McLaren, Montreal, are the architects.

Victoria, B.C.

The plans of Loring D. Rixford, of San Francisco, Cal., have been accepted for the 4-storey club house which is to be erected for the Union Club at Humboldt and Gordon streets at a cost of \$150,000.

Welland, Ont.

The contract for the rebuilding and enlargement of the Presbyterian Church was awarded to the Builders' Lumber & Supply Co., \$10,000.

Winnipeg, Man.

The contract for the addition to school here, fireproof construction, was awarded to R. J. Barker, 59 Pearl street, \$84,000. Shepley Construction Company, Winnipeg, \$85,000; John Saul, \$86,945, Winnipeg, also tendered.

Residences

Brockville, Ont.

Tenders addressed to A. Stuart Allaster, architect, will be received until April 19th for erection of residence for I. Wright.

Chilliwack, B.C.

Permits were issued to the Western Home and Improvement Co., Ltd., two dwellings at \$2,700 and two at \$2,300, on Gore avenue; also on Second avenue, \$2,300; First avenue, \$1,400; total, \$6,600.

Fergus, Ont.

Tenders are called until April 22nd for erection of stone house. Plans with

H. Ellis, Fergus, P.O. Separate tenders are asked for.

Montreal, Que.

Tenders will be received up to April 20th for alterations and additions to the residence of Dr. F. G. Henry, 148 Crescent street, Montreal.

Ottawa, Ont.

James Davidson will erect four detached brick houses on Wellington street which will cost about \$24,000.

M. C. Edey, architect, is calling for tenders for a solid brick residence for John McKellar to be erected on McKellar's townsite. It will cost about \$10,000.

Smith's Falls, Ont.

The Methodist Church here have under consideration the erection of a parsonage.

Vancouver, B.C.

Messrs. F. B. & Hugh E. Springer will call for tenders shortly for the erection of about 100 new residences, costing at an average, \$2,000.

Winnipeg, Man.

P. C. Samwell is the architect in charge of the erection of the apartment house for J. E. Wilson.

Tenders addressed to J. H. G. Russell, architect, McArthur Building, were called until April 15th for erection of brick apartment block for Chas. Smith.

Tenders are called until April 22nd for erection of an apartment building for Messrs. W. F. L. and T. G. M. Orris. George T. Teeter, architect, 604 Builders' Exchange.

AWARDED

St. Thomas, Ont.

The contracts for erection of two new houses have been awarded by Architect J. T. Findlay, as follows: masonry, A. E. Ponsford; carpentry, E. Reath; roofing, C. Riddle; plumbing, C. Bull; plastering, J. Stewart.

Business Buildings and Industrial Plants

Chatham, Ont.

The plans for the American Pad & Textile Company's factory have arrived.

Fort Frances, Ont.

The C. N. R., it is reported, have prepared plans whereby they will establish their car shops here to care for the western system, including the line to Duluth.

Fort William, Ont.

Negotiations have been closed whereby the Northern Engineering Supply Co., of this city, J. M. Paton, manager, will have sole rights in Canada for the manufacture of the new Forrest Lumber Loader. Albert Forest, of Duluth, is inventor and patentee. As soon as a suitable site is obtained a factory costing about \$50,000 will be erected and the manufacture of the loader will be started at once. All work will be done in this factory with exception of the castings, which will be made by the Canada Iron Corporation.

The Canadian Northern Railway are having plans prepared for a new passenger station to be erected at western end of Victoria avenue on the main line.

As soon as completed the old station on the "loop" will be abandoned.

Kamloops, B.C.

Architect Parlett has prepared plans for a new 2-storey brick block to be erected on Victoria street for J. F. Smith.

P. Burns, of P. Burns & Co., Calgary, will erect a business building adjoining the Royal Bank building, which is to be erected at the corner of Victoria street and Second avenue.

Lethbridge, Alta.

Messrs. Monarch Bros., contractors, will erect two brick warehouses on property south of the present City Hall at an outlay of about \$20,000. E. E. Carcer, architect.

Tenders were called until April 15th for the purchase and removal of the building occupying the site on which the Massey-Harris Company will erect their 3-storey warehouse. They hope to have the construction started soon after May 1st.

Montreal, Que.

The rumor is being revived that four new storeys will be added to the Jacobs Building, St. Catherine street, this summer.

Alterations are being made by Messrs. Simpson & Peel, contractors, to the St. Regis Hotel, which will provide a new grill room and ladies' reception hall.

Salada Tea Company is arranging to have extensive alterations made to their premises in St. Paul street. Tenders have been advertised for returnable on April 13th. The estimated cost is \$20,000. Messrs. Peden & McLaren are the architects.

Plans are being prepared by Mr. Crighton for alterations to the premises at No. 10 Hanover street, the property of Mr. Charles Charters, which will provide stores on the ground floor and dwelling apartments above. Tenders must be in by May 1.

Stuart's Limited, bakers, are having an extensive addition made to their warehouse and stables on Rivard street. A three-storey structure 70 by 87 feet, of reinforced concrete, will be erected by George W. T. Nicholson, the plans for which have been prepared by Mr. D. J. Crighton.

Mr. George Ethier, contractor, is building a four-storey hotel with 76 ft. frontage by 38 ft. depth at the corner of Berri and St. Louis streets, for Mr. George Moreau. It will be faced with pressed brick and graded as second-class. The cost is estimated at \$18,000. Messrs. Trudel & Gordon are the architects.

The corner of St. Catherine and Peel streets has been purchased by Carrick, Limited, for a syndicate who propose to erect a big hotel on the site. The property has a frontage of 113 feet on St. Catherine street, 170 feet on Peel street, and 113 feet on Dominion square. Messrs. Scroggie have a lease on the property, which expires on April 30, 1912.

Messrs. Brown & Vallance, architects, have the plans nearly completed for the new Herald Office Building, at the corner of Craig and St. Alexander streets. Tenders will be called for this week. The building will be about 80 by 150 feet in area and six storeys in height. It will be of reinforced concrete throughout and modern in every appointment. The estimated cost is about \$150,000.

Ottawa, Ont.

The Geo. H. Macdon Lumber Co. will erect a planing mill near here.

Horwood Taylor and Horwood are preparing plans for an addition to Topley Company's store, Sparks street.

McFarlane & Douglas will erect a solid brick 2-storey addition to their factory on Slater street. The extension will be 141 feet by 66 feet. J. A. Ewart, architect.

A block of stores is being erected for R. H. Millar on the corner of Bank and Rosberry avenue. It will be of solid brick and will have apartments. Alex. Christie is contractor.

Port Arthur, Ont.

It is stated that the Atikokan Iron Company will erect a foundry in connection with the furnace, for the manufacture of pipe and also enlarge their blast furnace. Superintendent, J. Dix Fraser.

It is stated with authority that the International Harvester Company, of Chicago, Ill., and Hamilton, Ont., will erect a large implement warehouse and assembling station. The main building will be 5 storeys in height and will be brick. The site chosen is a 400 foot frontage on the Kaministiquia river near C. P. R. Elevator "D."

Pilot Mound, Man.

The warehouse of the Dow Cereal & Milling Co. was destroyed by fire on the 11th inst. Estimated loss, \$30,000.

Stickney, N.B.

The mill of the Peel Lumber Company was damaged on the 14th inst to the extent of about \$30,000.

St. Remi, Que.

William Clark, Montreal, Que., will shortly have erected at St. Remi, Que., a packing plant and warehouse of considerable dimensions. The plans are being prepared by Messrs. Peden & McLaren, architects, of Montreal, and tenders will be called in a few days.

Sydney, C.B.

The Sydney Post, of Sydney, C.B., is shortly to have a new home. Messrs. Brown & Vallance, Montreal, are preparing the plans for the proprietor, Mr. S. J. McLennan, and tenders will be called for immediately.

Sydney, N.S.

A charter has been granted a company with a capital of \$10,000,000 for a shipbuilding plant on Sydney Harbor. Sir Henry Pellatt, of Toronto, Lieutenant-Governor J. M. Gibson, Messrs. Chas. Ellis, of Clyde Bank, Scotland; Alex. Gracie, of the Fairfield Shipbuilding Co., and A. Cross, of Sydney, are the incorporators. The company will carry on business under the name of the British-Canadian Shipbuilding & Dock Company.

Toronto, Ont.

Tenders are called until May 1st for all works in connection with the construction of a passenger station at Matieson. Architect, J. M. Lyle, Toronto. A. J. McGee, secretary-treasurer. Advertisement in "Tenders and For Sale Department" of this issue.

Tenders were called by Geo. Gouinlock, architect, 1109 Temple Building, until April 15th for the excavation, drain, concrete, brick, masonry and stone-work on portion of which has already been executed) in connection with alterations and additions to buildings for Geo. Lawrence, baker.

Vancouver, B.C.

The Norton Griffiths Steel Company secured the permit to erect a three-storey structure on Seymour street, \$45,000. Niles & Fisher were authorized to build a four-storey block, costing \$30,000 on Cordova street. Lee Yick Company a new building on Canton street, \$16,000.

Victoria, B.C.

Tenders are called by the B. C. Land & Investment Agency, Ltd., for the removal of rubbish from the site of the Five Sisters' Block on Government street.

Dennis Harris, C.E., is authority for the statement that the building to be erected will be of the most improved type.

Walkerton, Ont.

The flour mills of Kent & Co. were destroyed by fire on the 13th inst. Estimated loss, about \$14,000.

Winnipeg, Man.

Tenders were called until April 12th for erection of 2-storey brick block, Portage avenue and Kintyre street, for the Geo. Craig Co., Ltd., R. L. Smith, architect, 509 Builders' Exchange.

Czerwinski Box Company will extend their plant on Logan avenue at an estimated cost of about \$75,000; plans have been prepared by Wm. Finland, Portage avenue for a factory to cost \$50,000 on Chambers street; Copp Sons & Co. will erect a brick building corner of Nena and Henry; The Imperial Oil Co. Logan avenue, will extend their plant, also the Canadian Bag Company.

AWARDED**Lachine, Que.**

Mr. P. J. Turner, F.R.I.B.A., Montreal, has completed the plans for a new branch of the Molsons Bank at Lachine to cost \$15,000. Mr. Louis Beaudry, of Outremont, is the general contractor. Messrs. Selkirk Bros. have the contract for the plumbing and heating. The Lachine Branch Bank will be constructed of pressed brick with Roman stone trimmings, and will be situated at the corner of Notre Dame street and Sixth avenue. Work will be started at once.

Montreal, Que.

McFarlane & Douglas, Ottawa, Ont., have been awarded the contract for the fireproof windows for the elevators being erected by the Montreal Harbor Commission, of which John S. Metcalfe is the general contractor.

The Atlas Construction Co. are the contractors for the new Timmens factory to be erected opposite their factory recently completed on Clark street, Montreal Annex. The new structure, like the other one, will be of reinforced concrete, the reinforcement being of the Mushroom design. The estimated cost is \$54,000. Mr. P. J. Turner is the supervising architect.

Ottawa, Ont.

Holbrook and Sutherland have been awarded the contract for converting the store until recently occupied by J. Hope & Son, together with the one occupied by the Royal Bank, into one bank office for the Royal Bank. W. E. Noffke, architect.

George Crain has been awarded the contract of a commercial building for Kabil Farrah. It will be erected on the corner of York street and Market square. It will be 165 feet long and 54 feet deep.

It will have 10 stores, be two storeys high, and will cost about \$30,000. W. E. Noffke is architect.

Victoria, B.C.

Murray & McKinney have been awarded the contract for the erection of the new B. C. Telephone Company's building on the corner of Blanchard and Johnson streets, \$62,000. Work will begin at once.

The contract for the tearing down of the buildings occupying the site of the new Union Bank building at the corner of Trounce avenue and Government street, has been awarded to Messrs. Dinsdale & Malcolm.

Power Plants, Electricity and Telephones**Hull, Que.**

It is understood that the extension of the Hull Electric Railway to Chelsea will be proceeded with this year. Preparatory to this the Hull Electric Company are building car sheds at Hull Junction which will cost about \$25,000.

La Salle, Man.

At a meeting of the ratepayers of Macdonald municipality for the purpose of discussing the advisability of securing a system of rural electric railroads throughout the country, the following were present: Reeve R. W. Wood, Oak Bluffs; H. Hohimier, La Salle, and H. H. Hinch, Winnipeg.

Ripley, Ont.

Tenders addressed to Angus Martyn, sec.-treas., will be received until May 11th for construction of a telephone system in the Tp. of Huron. Plans, etc., at office of the above.

Smiths' Falls, Ont.

The company which has been formed to construct an electric railway from Ottawa to Smith Falls and Kingston held a meeting and decided to conduct a series of meetings along the proposed route to get capital for continuing the work of organization and surveying. A. and B. Bruce are the engineers.

Toronto, Ont.

Tenders addressed to the Chairman of the Board of Control will be received until April 25th for supply of lightning arresters. Specifications obtained from the Toronto Hydro-Electric System, City Hall.

Winnipeg, Man.

The plans submitted by City Electrician Cambridge for the installation of lights across the new Arlington viaduct were approved and call for alternating ornamental lighting standards on each side of the bridge every 27 feet.

Miscellaneous**Calgary, Alta.**

Recent building permits include: M. Healey, residence, \$3,500, to be built in Mount Royal; Wm. Peacock, residence, \$2,500, Fourteenth avenue; T. G. Whitehair, residence, \$2,500, south side of Eleventh avenue; Dr. Wright, residence, \$6,000, Centre avenue, Crescent Heights; J. Swanson, 1255 Keefer street, \$6,500; Dissette & Fraser, 965 Thirteenth avenue west, \$4,000; W. J. Harrington, 1076 Seventh avenue west, \$2,400; G. Ling, 770 Harris street, \$2,500.

Hamilton, Ont.

Recent buildings include: R. Spicer, brick dwelling on Charlton avenue, for J. Dillabaugh, \$2,500; R. G. Wilson, brick dwelling on Rutherford street, \$2,200; R. G. Wilson, brick dwelling on Balsam avenue, \$6,000; R. G. Wilson, brick dwelling on Beulah avenue, \$2,200; R. G. Wilson, brick dwelling on Undermount avenue, \$3,500; W. H. Northcott, brick dwelling on Mount Royal avenue, \$2,500; W. H. Northcott, brick dwelling on Mount Royal avenue, \$2,500; Stewart McPhie, brick stores and apartment houses on York and Merrick streets, for Herbert Holden, \$11,000; Canadian Westinghouse Co., brick extension to foundry building, 112x208 ft. long, \$25,000; W. A. Petit, eight brick dwellings on Fullerton avenue, \$10,000; H. McCulloch, brick dwelling on Mount Royal avenue, \$3,500.

London, Ont.

Among the permits issued recently are: McClary Manufacturing Company, warehouse on Adelaide street, \$6,000; W. and T. Copp, seven brick houses on Yales street, \$2,500 each; Hon. Adam Beck, addition to factory on Albert st., \$2,000; Ed. Harrison, two storey brick, corner Simcoe and William streets, \$2,500; Scandrett Bros., alterations to 175½ Dundas street, \$3,500; sun room at Victoria Hospital, \$650; Harry Lewis, alterations to 653 Queen's avenue, \$850.

Hamilton, Ont.**MacNutt, Man.**

Tenders will be received until May 1st by the postmaster for moving the town of MacNutt across the railroad track from its present site. About 15 buildings, some stables and outbuildings compose the lot, to be moved during the month of May.

New Westminster, B.C.

Recent building permits include: B. C. Electric Railway Company, \$80,000; Bank of Commerce, Columbia street, \$60,000; Y. M. C. A. building, \$57,000; Kelly, Douglas & Co., Tenth street, \$40,000; Cliff's building, Sixth street, \$32,000; J. B. Wilson's dwelling house, Sixth avenue, \$25,000; Hon. Mrs. Coutts, Marjoribanks buildings, Begbie street, \$19,000; H. A. Eastman, Third avenue, dwelling house, \$12,000; D. J. Stewart, Fourth avenue, residence, \$6,000; G. R. Specks, Third avenue, \$4,500; A. L. Lavery, Agnes street, \$3,000; fire hall, \$2,500; K. J. Macleod, Third avenue, \$2,225.

Ottawa, Ont.

Tenders addressed to A. Johnston, deputy minister of marine and fisheries, will be received until May 1st for construction of two twin-screw gasoline launches for the Fisheries, Patrol service on the Great Lakes.

The Dominion Public Works Department has awarded the following contracts: Iron work for three 260-cubic yard dump scows for Vancouver, B.C., to Wallace Shipyard, Limited, of Vancouver, for \$11,400; Regina, elevator for post office to Otis Fensom Elevator Co., for \$46,380; Richibucto, N.B., wharf extension, approach and dredging, to Thos. O. Murray, of Richibucto, for \$17,000; Ottawa, plaza between Sappers and Dufferin bridges, to John O'Toole and William H. McGillivray, for \$236,000; Battleford, Sask., heating apparatus for public building, to Municipal Light, Heat and Power Company, of Brandon, Man., for \$2,422; St. John, N.B., repairs

to buckets of dredge to W. S. Fielding, to St. John Iron Works and Estate of James Fleming, of St. John, for \$7,497.50 each; Chateauguay, Quebec, wharf, to Eugene Patenaude, of Montreal, for \$7,243.84; Richibucto, Que., north break-water extension, to T. P. Charleson, of Ottawa, for \$20,995.

Renfrew, Ont.

The Renfrew Separate School Board will accept none of the tenders received for construction of new Separate School, all being too high. Plans will be altered and another call made for tenders.

Saskatoon, Sask.

Tenders addressed to Wm. P. Bate, Box 1046, Secretary, School Board, will be received until April 25th for erection, exclusive of plumbing, heating and ventilation of a school building. David Webster, architect, Kempthorne Block.

Toronto, Ont.

Tenders are called by Public Works Department, Ottawa, for dredging until April 24th. R. S. Desrochers, secretary. Advertisement in "Tenders and For Sale Department" of this issue.

Tenders addressed to G. R. Geary, mayor, will be received until April 25th for supply of lumber on account of the property and street cleaning department for the period commencing June 1st, 1911, and ending May 31st, 1912. Specifications, etc., at office of the above.

Vancouver, B.C.

The following building permits have been issued: Beard Home Building Co., frame dwelling, 1906 Eleventh west, \$4,500; T. Edwards, frame store, Pender and Heatley, \$13,000; Gionani Camicea, frame dwelling, 2756 Third west, \$2,400; Jas. McMurray, frame dwelling, 1076 Eleventh east, \$3,500; Ritchie Contractors' Supply Co., Granville street bridge, store, \$4,000; R. A. McKenzie, frame dwelling, 2434 Sixth west, \$3,600; G. L. Wright, frame dwellings (two), 3356-3362 Second west, \$2,800 each; Mrs. A. B. Waldie, frame dwelling, 1715 Twelfth west, \$3,500; Oliver & Wilson, frame dwellings (two), First west, \$3,500 each; John Wakefield, frame dwelling, 550 Broadway, \$6,000; C. A. Lett & Sons, apartment and stores, 2106 Hastings east, \$10,000; W. Macfarland, alteration, 1865 Haro street, \$6,000; Clarke & Sutherland, 801 Thirteenth avenue east, \$2,500; John Morley, 2631 Seventh avenue west, two houses, \$5,000; A. Nicholson, 1933 Seventh avenue west, \$2,500; A. Neville Smith, 2335 Sixth avenue west, \$4,000; G. E. Glass, 2176 Thirteenth avenue west, \$3,000; W. C. Hodgson, 1715 Eleventh avenue west, \$5,600; Vancouver Breweries, 2210 Scotia street, \$3,000; G. A. Stinson, 1265 Twelfth avenue west, \$4,000; N. D. McLaren, 1966 Bismarck street, \$2,000; Mr. H. J. Duncan, six-storey block, 123 Pender street, \$70,000; Storey & Campbell, 7-storey warehouse, Beatty street, on the C. P. R. tracks, \$60,000; R. G. Long, 1204 Fourteenth avenue east, two houses, \$4,600; J. A. Jackson, 1686 Eleventh avenue west, \$3,000; Frank Harris, 2150 Lake-wood drive, \$4,000; Royal Investment Company, 1629 Second avenue east, \$2,700; A. Balderstone, 1589 Sixth avenue west, \$3,000; J. D. Williams, 2037 Third avenue east, \$2,500; J. Darby, 2385 Fifth avenue west, \$3,500; R. J. Hopper, 1125 Fourteenth avenue west, \$4,500; A. Harrison, 1750 William street, \$3,800; Messrs. Maskill and Lee for a five-storey business block at 1161 Granville street,

\$60,000; Bentley & Wear, 3236 Second avenue and 2532 Eighth avenue west, four houses, \$14,500; H. N. Odlin, 1610 Park drive, \$5,500; J. Woodrow, 1705 Twelfth avenue west, \$5,000; Park Board, pavilion in Stanley Park, \$14,000; A. H. Morris, 848 Eleventh avenue east, \$2,500.

Victoria, B.C.

Recent building permits include: Messrs. F. & J. Filer, one storey store building, Hillside avenue, \$4,000; Mr. John Avery, dwelling on Cook street, \$2,700; Mr. Lee Hue, dwelling on Skinner street, \$2,450; Mrs. Margaret Stout, dwelling on Rendell street, \$2,500; E. D. Grierson, Pemberton road, \$12,000, contract has been awarded to A. H. Mitchell.

Winnipeg, Man.

A modern private hospital, three storeys in height, solid brick and reinforced concrete, fireproof throughout, will be built immediately by Dr. Thomas Beath at the corner of River avenue and Rose street, Fort Rouge. The new building will accommodate 60 patients and is thoroughly modern in every detail. He estimates the cost at \$37,000. The building will probably be done by day labor under the supervision of the architect.

Recent building permits include: T. Olsen, dwelling, Home street, \$2,600; A. Black, dwelling, McMillan avenue, \$4,000; James McDonald, dwelling, Agnes street, \$4,000; V. C. Brown, brick dwelling, Kingsway, \$18,000; W. T. Carson, 3 dwellings, Gosvenor avenue, \$15,000; W. H. Alexander, store extension, 395 Portage avenue, \$3,000; W. McIntosh, two dwellings, Home street, \$10,000; Cameron, Stewart & Co., 10 dwellings, Home street, \$50,000; Bandeen & Fraser, dwelling, Home street, \$5,000; E. Watkins, dwelling, Jubilee avenue, \$2,500; Y. M. C. A., branch institute, Selkirk avenue, \$84,000; M. Chess, dwelling, Charles street, \$5,000; C. Rogers, dwelling, Polson avenue, \$2,500; L. Emma, store, Portage avenue, \$4,600; Grose & Walker, three-storey addition to warehouse, Stanley street, \$14,000; A. C. Galbraith, four dwellings, Basswood place, \$10,000; McCrea & MacKenzie, three dwellings, Greenwood Place, \$15,000; B. J. Hawker, dwelling, Beresford avenue, \$3,800; J. C. Campbell, dwelling, Home street, \$6,400; R. E. Minaker, store, Sargent avenue, \$5,000; R. J. Whitla, addition to warehouse, McDermot avenue, \$5,000; J. F. Parker, dwelling, Arlington street, \$4,000; Mrs. A. Miller, dwelling, Evanson, \$3,000; Ed. Noe, four dwellings, Jessie avenue, \$12,000; H. Haldorson, dwelling, Aubrey street, \$4,000; H. Haldorson, dwelling, Simcoe street, \$2,700; A. J. Hedges, dwelling, Burnell street, \$3,000; S. Abramovich, eight dwellings, Rosseer avenue, \$16,000; H. Genser, two dwellings, Lansdowne avenue, \$6,800; W. E. Toshack, dwelling, Polson avenue, \$2,500; A. E. Hyde, dwelling, Polson avenue, \$2,500; W. Black, dwelling, Cobourg avenue, \$2,000; James Lind, dwelling, Burnell street, \$3,500; M. Avren, two dwellings, Lansdowne avenue, \$4,000; M. Dorfman, two dwellings, Aikins street, \$4,000.

New Companies

J. Watterson & Company, Limited, Montreal, Que., capital, \$150,000, incorporated to manufacture and deal in iron, steel, metals, bricks, cement, vitrified wares and clay, etc. Incorporators,

J. Watterson, merchant, Westmount; E. B. Binsted, K.C., Montreal.

The Fort Frances Pulp and Paper Co., Ltd., Toronto, Ont., incorporated, capital, \$50,000. Incorporators, W. Bohn bookkeeper, R. Grosvenor, H. Chisholm, R. Musgrave Coates, all of Toronto.

Modern Gas, Light & Power, Limited, Montreal, incorporated, capital, \$250,000. Incorporators, P. G. Majeau, insurance broker, J. A. Chagnon, accountant; P. Durocher, advocate, Montreal Phoenix Lumber Company, Limited, Winnipeg, Man., incorporated, capital, \$500,000.

The Palace Building Company, Limited, Montreal, incorporated, capital, \$100,000. Incorporators, H. L. O'Donoghue, merchant, Hudson, Que.; C. A. Pariseau, and Omer Lapierre, advocates, A. Brassard, architect, all of Montreal.

Business Notes

The Canadian Iron & Metal Co., Montreal, are stated to have dissolved.

Edward Partington Pulp & Paper Co., Ltd., has increased capital by \$200,000.

Lamoureux & Caletague, painters, Montreal, are stated to have dissolved.

H. Brunet & Cie, bricklayer contractors, Montreal, are stated to have registered.

Larose & Cie., Montreal, sash and door manufacturers, are stated to have dissolved.

Modern Stone Co., Ltd., Winnipeg, Man., has been succeeded, it is stated, by Manitoba Quarries, Ltd.

Williams Quarry Co., Ltd., Williams, Man., has been succeeded, it is stated, by Manitoba Quarries, Ltd.

The contract for the decorations for fourteen rooms and corridors in the Chateau Laurier have been awarded to Bell's galleries, of Montreal, and seven to Tiffany's studios of New York.

The refrigerator contract for the Chateau Laurier, being built by the Grand Trunk at Ottawa, has been awarded, the successful tenderer being the White Enamel Refrigerating Co., who manufacture the famous Bohn Syphon System. The silver contract has been awarded to the Martin Hall & Co., Shrewsbury Works, England.

The B. G. Gazette gives notice of the following companies: The Peavine Lumber Mills, Limited, capital, \$50,000; the Dominion Western Timber Company, Limited, capital, \$600,000; the North Pacific Power Company, Limited, capital, \$50,000; Dominion Construction Company, Limited, capital, \$30,000; the W. A. Corder Engineering and Supply Company, Limited, capital, \$30,000; Contractors Material Company, Limited, capital, \$20,000; R. A. McLaughlin Contracting Company, Ltd., capital, \$10,000.

Contracts for 1,000 miles of wire fencing in Saskatchewan and Alberta were given out by Canadian Pacific Railway Company, and two Winnipeg firms will do the work. The contracts call for maintenance fencing of the main line and branches in the two prairie provinces. This means the repairing, and in many places the replacing of the fences already existing. The Hawke's Bay Wire Fence Company were awarded the contract for 700 miles in Saskatchewan, and the Ideal Fence Company for 270 miles in Alberta.

Tenders and For Sale Department

Tenders for School Building

Tenders will be received by the undersigned, up to Monday, the 1st day of May next (1911), at 5 o'clock p.m., for building a school house of brick with cement trimmings, on Hickman street, West Highlands, Town of Amherst, according to plans and specifications which may be seen at Town Office, Amherst, and at the office of Leslie R. Fairn, architect, Aylesford, N.S., on and after Monday, April 17th, instant. Contractor to do all work and supply all material.

Tenders to be sealed and marked "Tenders for School Building" and must be accompanied with a certified cheque for \$500 payable to the Town of Amherst, which amount will be forfeited to the said Town should the party whose tender is accepted neglect or refuse to execute a satisfactory contract to complete the work.

The Town Council do not bind themselves to accept the lowest or any tender.

By order of Town Council
W. FRED DONKIN,
Town Clerk.

Amherst, N.S., April 8, 1911.

TENDERS FOR COUNTY HOUSE OF REFUGE

Sealed tenders will be received by the undersigned, up to noon of Tuesday, May 2nd, 1911, for the erection of a County House of Industry and Refuge at Cornwall.

Plans and Specifications can be inspected at my office in County Building here, at the store of Mr. J. A. C. Hout, Alexandria, at residence of Mr. C. E. Cameron, Iroquois, or at the office of Mr. A. L. Weeks, architect, Ottawa.

Marked cheque for 5 per cent. of tender, payable to my order, to accompany tender. Cheques will be immediately returned to unsuccessful tenderers after contract awarded.

Dated at Cornwall this 8th day of April, 1911.

ADRIAN I. MACDONELL,

15-16 County Clerk.

CITY OF BRANDON Street Paving

Sealed tenders marked "Tenders for Paving," will be received by the City Clerk, Brandon, Manitoba, until 12 o'clock at noon on Friday, the 28th day of April next, for paving the following streets in the City of Brandon:

Rosser avenue, Twelfth street to Sixth street.
Pacific avenue, Eleventh st. to Eighth st.
Princess avenue, Tenth street to Eighth st.
Eleventh street, Rosser ave. to Pacific ave.
Tenth street, Princess ave. to Pacific ave.
Ninth street, Princess ave. to Pacific ave.
Eighth street, Princess ave. to Pacific ave.

Tenders are invited for Wood Block, Asphalt Block, Sheet Asphalt, Granitoid, Bitulithic and Vitrified Brick, on 5-inch and 6-inch concrete foundations, or other kinds of pavements.

Proprietors of patented pavements are requested to furnish their special specifications.

An accepted bank cheque for 5 per cent. of amount of tender must accompany each bid.

The lowest or any tender not necessarily accepted.

Further particulars can be obtained from City Engineer's Office.

R. E. SPEAKMAN,
City Engineer's Office, City Engineer.

Brandon, March 31, 1911.

14-16

Steam Shovels

We own and have for sale near Buffalo, N.Y., two Vulcan 75-ton 2½-yard steam shovels; late model, with new extra large boilers and in excellent condition; also one 70-ton. These will stand most rigid inspection and we are offering them at unusually low prices. Confer with us.

WILLIS SHAW MACHINERY CO.,

171 La Salle Street,

T.F.

Chicago, Ill.

CITY OF REGINA Saskatchewan, Canada

Tenders for Sewage Pumps and Motor. Switchboard and Apparatus. For Sewage Disposal Works.

Sealed tenders marked "Tenders for Sewage Pumps, Disposal Works," will be received by the City Commissioners, Regina, until 12 o'clock noon, April 30th, 1911, for the supply of One 1,000,000 gallons per 24 hours capacity Pump and Motor. Switchboard and Apparatus.

Full particulars may be had upon application to the Chief Engineer, Trunk Sewer Works.

The lowest or any tender not necessarily accepted.

(Signed) JOHN MARSHALL,

Chief Engineer,
Trunk Sewer Works.

April 6th, 1911.

15-17

Tenders for Dredging

Sealed tenders addressed to the undersigned and endorsed "Tender for Dredging, Toronto, Ontario," will be received until Monday, April 24th, 1911, at 4 p.m., for the work mentioned.

Tenders will not be considered unless made of the forms supplied, and signed with the actual signatures of tenderers.

Combined specification and form of tender can be obtained on application to the Secretary, Department of Public Works, Ottawa. Tenders must include the towing of the plant to and from the work. Only dredges can be employed which are registered in Canada at the time of the filing of tenders. Contractors must be ready to begin work within thirty days after the date they have been notified of the acceptance of their tender.

A cheque equal to five per cent. (5 per cent.) of the amount of the tender and based on the approximate quantities, must accompany the tender. The cheque must be accepted, on a chartered bank, and payable to the order of the Honourable the Minister of Public Works. If the tender be not accepted the cheque will be returned.

The Department does not bind itself to accept the lowest or any tender.

By order,

(Signed) R. C. DESROCHERS,

Secretary.

Department of Public Works,

Ottawa, April 10th, 1911.

Newspapers will not be paid for this advertisement if they insert it without authority from the Department.

16-18

PAVING

City of Fort William, Ont.

Sealed and endorsed tenders, addressed to the Chairman of the Works Committee, will be received at the office of the City Clerk before 5 o'clock p.m., of May 4th, 1911, for the paving with asphalt block, sheet asphalt or bitulithic of—

May street, 46 ft., curb to curb., approximately 5,700 square yards.

Brodie street, 46 ft., curb to curb., approximately 8,400 square yards.

Plans, Specifications and Forms of Tender may be obtained at the office of the City Engineer.

Each tender must be accompanied by a marked cheque for \$1,000.

The lowest or any tender not necessarily accepted.

JOHN WILSON,

City Engineer's Office,

City Engineer.

Fort William, April 1, 1911.

14-16



Department of Railways and Canals, Canada

Ontario—St. Lawrence Canals

Farran's Point Canal

Sealed tenders addressed to the undersigned and endorsed "Tender for Improving Lower Entrance" will be received at this office until 16 o'clock on Friday, April 21.

Plans, specifications and form of contract to be entered into can be seen on and after April 3, at the office of the Chief Engineer of Railways and Canals, Ottawa, and at the office of the Resident Engineer of the Ontario—St. Lawrence Canals, Cornwall, at which places form of tender may be obtained.

Parties tendering will be required to accept the fair wage schedule prepared or to be prepared by the Department of Labor, which schedule will form part of the contract.

Contractors are requested to bear in mind that tenders will not be considered, unless made strictly in accordance with the printed forms, and in the case of firms, unless there are attached the actual signature, the nature of the occupation, and place of residence of each member of the firm.

An accepted bank cheque for the sum of \$9,000 made payable to the order of the Minister of Railways and Canals must accompany each tender, which sum will be forfeited if the party tendering declines entering into contract for the work, at the rates stated in the offer submitted.

The cheque thus sent in will be returned to the respective contractors whose tenders are not accepted.

The cheque of the successful tenderer will be held as security, or part security, for the due fulfilment of the contract to be entered into.

The lowest or any tender not necessarily accepted.

By order,

L. K. JONES, Secretary.

Department of Railways and Canals,

Ottawa, March 30, 1911.

Newspapers inserting this advertisement without authority from the Department will not be paid for it.

15-16

TENDERS For Waterworks Supplies

The Board of Water Commissioners for the City of London, are inviting tenders for Water Works Supplies for the current year. The list includes Brasswork, Lead Pipe, Iron Pipe, Iron Castings, Stop Cock Boxes, Street Hydrants, Valves, and Valve Chambers.

Tenders will be received up till 12 o'clock noon on Thursday, April 27th, 1911.

For information address,

H. J. GLAUBITZ,
General Superintendent.
London, Ont.

16-17

City of Edmonton, Alberta

Sealed tenders marked "Tenders for Trunk Sewer," will be received by the City Commissioners up till 8 p.m., May 2nd, 1911, for the supplying of all materials and the construction, in tunnel of a concrete sewer ten feet six inches (10 ft. 6 in.), in internal diameter and approximately 3,290 feet long.

Plans and specifications and all particulars may be obtained from the City Engineer's office, Edmonton, on deposit of a marked cheque for the sum of \$25.00, which will be held until the return of plans and specifications. Duplicates of which may be seen at the office of the Contract Record, B34 Board of Trade Building, Montreal, Que.

Lowest or any tender not necessarily accepted.

CITY COMMISSIONERS.

A. J. LATORNELL,
City Engineer,
Edmonton, Alta. 14-16

CITY OF MOOSE JAW Saskatchewan Tenders

Sealed tenders will be received by the undersigned City Clerk up to 8.30 p.m. on Monday, April 24th, 1911, for the supply of approximately 400 White Cedar Poles, for use in the Electric Light Department.

Specifications and full particulars may be obtained on application to the undersigned or to J. D. Peters, Electrical Superintendent, Moose Jaw.

Tenders to be at a price f.o.b. Moose Jaw and to be endorsed "Tenders for Electric Light Poles."

The lowest or any tender not necessarily accepted.

W. F. HEAL,
City Clerk.

15-16

Tenders for Sewers

Sealed tenders addressed to the undersigned will be received up to 4 p.m., Friday, April 28, 1911, for the construction complete and supplying of all material necessary of approximately 3,200 lineal feet of Sewers in the Town of Perth. Approximately 3,200 lineal feet of 8-inch pipe and 75 feet of 6-inch pipe. Tenders to state price for excavation or backfilling per cubic yard of earth, hard-pan and rock. The building complete of Catch Basins, Manholes, Lamp Holes, and the laying of and supplying the necessary pipe or Ys.

Tenders must be accompanied by marked cheque for \$400.

The lowest or any tender not necessarily accepted. The Corporation reserves the right to withhold from construction the work on any street whereon the residents decline to install water service.

JNO. A. KERR,
Town Clerk.

OR
JAS. J. HANDS,
Chairman Sewer Committee.

TENDERS for HEATING

Sealed tenders for steam heating of Victoria Hall, in Cobourg, Ont., addressed to the County Clerk, Cobourg, will be received up to noon on Thursday, June 1st next, marked "Tenders for Heating." Plans and specifications can be seen at the office of the County Clerk, Cobourg.

GEORGE GREER,

Chairman of Committee
Cobourg, April 13, 1911. 16-16

Toronto Main Drainage

Low Level Interceptor:

Section No. 5—3,350 lineal feet.
Section No. 6—2,830 lineal feet.
Section No. 7—3,778 lineal feet.
Section No. 8—3,238 lineal feet.

Sealed tenders for the laying of reinforced concrete pipe sewer complete will be received by registered post only, addressed to the Chairman of the Board of Control, Toronto, Ontario, up to noon of May 9th, 1911. The concrete pipe to be laid will be supplied by the City. The diameters are as follows: For Section No. 5, 60 inches; for Section Nos. 6, 7 and 8, 66 inches.

Plans and specifications will be on file at the office of the CONTRACT RECORD, B-34 Board of Trade Building, Montreal, after Monday, April 18. Plans may be seen, and specifications and further information obtained from the Main Drainage Works, City Engineer's Office, Toronto.

G. R. GEARY, Mayor,

15-16 Chairman, Board of Control.

Notice to Contractors West End Drainage System

Sealed tenders addressed to the Chairman of the Board of Control, endorsed "Tender for West End Drainage System," will be received at the City Hall, Ottawa, up to 4 p.m., Thursday, April 27th, 1911, for the construction of the West End Drainage System.

Any tender received after the above stated time will be declared informal.

Specification, plans, profiles, forms of tender and full particulars may be seen on application at the City Engineer's Office, City Hall.

The Corporation does not bind itself to accept the lowest or any tender.

NEWTON J. KER,

City Engineer.
Ottawa, April 11, 1911. 16-16

City of Fort William.

Paving

Sealed and endorsed tenders, addressed to Chairman of the Works Committee, will be received at the City Clerk's Office before 5 o'clock p.m. of Thursday, the 4th day of May, 1911, for paving with asphalt block, sheet asphalt, or bituminous, of:

May street, 46 ft., curb to curb, approximately 5,700 square yards.
Brodie street, 46 ft., curb to curb, approximately 8,400 square yards.

Plans, specifications and forms of tender may be obtained at the office of the City Engineer.

Each tender must be accompanied by a marked cheque for One Thousand Dollars.

The lowest or any tender not necessarily accepted.

JOHN WILSON,
City Engineer.

April 8, 1911. 16-16

Notice to Architects

The Sudbury Rink Company, Limited, requires plans for a skating rink, to be constructed of steel and concrete, on lot 1, size of about 70 feet by 170 feet; walling round about 20 feet by 170 feet; and on inside walling round about 20 feet by 170 feet. Plans may be seen at the office of the City Engineer, Sudbury, Ontario, until May 1st, 1911. A contract price will be paid for, and architect engaged. 16-16

Corporation of the Town of Collingwood

Tenders will be received by the undersigned until 2 o'clock p.m., May 3rd, 1911, for the following:

Approximately 3,765 square yards of Bituminous Pavement on a five-inch concrete foundation.

Approximately 9,594 lin. feet of concrete curb. Approximately 9,594 lin. feet of sixteen inch concrete gutter.

All tenders must be accompanied by an accepted cheque for the sum of Two hundred dollars made payable to the Town Treasurer, same to be forfeited to the Corporation if the party tendering declines entering into the contract for the work, at the rates stated in the offer submitted. All tenders must be sealed and sent by registered mail and marked "Tender for Bituminous Paving." For further information apply to the office of the Town Engineer.

The lowest or any tender not necessarily accepted.

K. S. MACDONELL,
Town Engineer.

Collingwood, Ont.

April 12th, 1911. 16-17



Department of Railways and Canals, Canada

Ontario—St. Lawrence Canals

CORNWALL CANAL

Sealed tenders addressed to the undersigned and endorsed "Tender for Canal Office Enlargement" will be received at this office until 16 o'clock on Friday, April 21.

Plans, specifications and form of contract to be entered into can be seen on and after April 3, at the office of the Chief Engineer of the Department of Railways and Canals, Ottawa, and at the office of the Resident Engineer of the Ontario—St. Lawrence Canals, Cornwall, at which places form of tender may be obtained.

Parties tendering will be required to accept the fair wages schedule prepared or to be prepared by the Department of Labor, which schedule will form part of the contract.

Contractors are requested to bear in mind that tenders will not be considered, unless made strictly in accordance with the printed forms, and in the case of firms, unless there are attached the actual signature, the nature of the occupation, and place of residence of each member of the firm.

An accepted bank cheque for the sum of \$500 made payable to the order of the Minister of Railways and Canals, must accompany each tender, which sum will be forfeited if the party tendering declines entering into contract for the work, at the rates stated in the offer submitted.

The cheque thus sent in will be returned to the respective contractors whose tenders are not accepted.

The cheque of the successful tenderer will be held in escrow, or part remitted, until the fulfilment of the contract to be entered into.

The lowest or any tender not necessarily accepted.

By order,

L. K. JONES, Secretary
Department of Railways and Canals,
Ottawa, March 30, 1911.

Newspapers inserting this advertisement without authority from the Department will not be paid for it. 15-16

CITY OF SASKATOON

Tenders Wanted for
Excavating and Pipelaying

Sealed tenders, addressed to the City Commissioners, Saskatoon, will be received up to 12 o'clock noon on Friday, April 28th, 1911, for all labor necessary for laying about four and one-half miles water mains and sewer mains in the City of Saskatoon, and furnishing certain materials therefor, according to specifications, plans and profiles dated March 1st, 1911.

Plans, Specifications, Instruction to Bidders, General Conditions, and Forms of Tender may be seen at the office of George T. Clark, City Engineer, Saskatoon. Instruction to Bidders, and Forms of Tender will be furnished on application but copies of Plans and Specifications will not be furnished.

The lowest or any tender not necessarily accepted.

JAS. CLINSKILL,
W. B. NEIL, City Commissioners.
E. M. SNELL,
Saskatoon, Sask., April 13, 1911. 16-17

COUNTY OF OXFORD

Bridge Tenders

Sealed tenders addressed to the undersigned will be received up till noon of Saturday, the 8th day of May, for the erection of three steel bridges, one of 140 feet span and one of 55 feet span, and one of 50 feet span. Also for the construction of concrete abutments for the same.

Tenders will also be received at the same time for the construction of two or three concrete bridges of 10 feet or 12 feet span. Further particulars may be obtained from the undersigned. Plans and specifications may be seen at the County Engineer's Office or at the home of J. O. Given, Reeve of Blenheim Township, lot 12, con. 5.

The lowest or any tender not necessarily accepted.

F. J. URE,
County Engineer,
Woodstock, Ont.
16-16

Temiskaming and Northern
Ontario Railway Commission

Sealed tender, addressed to the undersigned, will be received up to 12 o'clock noon, on Wednesday, May 3rd, for all works in connection with the construction of a passenger station at Matheson. Tenders to be marked on envelope "Passenger Station at Matheson."

Plans and specifications may be seen at the office of the Architect, J. M. Lyle, 14 Leader Lane, Toronto, or at the office of the Chief Engineer in North Bay.

Certified cheque on a chartered bank of Canada, payable to the order of the Secretary-Treasurer of the Commission, for 10 per cent. of the amount of the tender, must accompany same.

The lowest or any tender not necessarily accepted.

A. J. McGEE, Sec.-Treas.
25 Toronto Street, Toronto.

Toronto, April 12th, 1911.

Note—Papers inserting this advertisement without authority will not be paid for it. 16-17

Tenders Wanted

Sealed tenders will be received by William Purves, Clerk of East Whitby Township, Columbus, Ont., until Monday, May 1st, at 2 p.m., for the construction of a 35 foot concrete bridge near Oshawa.

For information apply to H. Gifford, Reeve, Cedardale.

BOWMAN & CONNOR,
Engineers,
16-16 36 Toronto Street, Toronto.

Positions Wanted

Advertisements under this heading one cent a word per insertion. Box No ten cents extra

POSITION WANTED—AS Foreman on railway, sewer, or other contract work, by man of wide experience. At liberty to accept favorable terms immediately. Address, Box 260, Cntrct Record, Toronto, Ont. 15-17

Miscellaneous

Advertisements under this heading two cents per word per insertion.

CANADIAN AGENT WANTED—I would like to secure a good wide-awake Canadian representative to represent my line of "Perfect" Brick Tile and Block Machines, Silo Cistern Sill Post and Chimney Moulds, No. 2 and No. 3 Brick Moulds. I intend to have my machines manufactured in Canada at an early date. For full particulars write C. S. Wert, Kendallville, Ind. 15-16

WANTED—Engineer or Contractor to represent our systems of piling and wharf construction in St. John, N.B., and Fort William, Ont., either as agent or contracting licensee. None but firms or individuals in good standing need apply. A good opportunity for the right parties. Apply by letter to The Simplex Concrete Piling & Construction Company, Limited, 2 Manning Annex, Toronto, Ont. 16-16

TO DEALERS IN CANADA—Large American manufacturers of Waterproofing Portland Cement want to secure reliable representatives in Canada. We are offering a dealer's proposition whereby we agree to spend a certain number of dollars per ton for advertising in Canadian journals. Our product now enjoys a large and increasing sale throughout the United States. For particulars write to E. J. MacIntyre, 4059 Perry Street, Chicago, Ill. 15-16

Business Notes

Canada Lime Co., Montreal, Que., are stated to have dissolved.

Gilbert Julien, plumber, Ottawa, has been succeeded by E. Glaude.

Gaudette & Frere, contractors, Montreal, have registered.

O. Hogue & Cie, plumbers and roofers, have registered.

W. J. Leach, builder, Toronto, is stated to have assigned.

McGregor & Black, contractors, Regina, Sask., are stated to have dissolved.

Arnold Electric Co. of Canada, Montreal, Que., are reported to have dissolved.

Robert & Robert, builders' supplies, Montreal, are reported to have dissolved.

International Supply Co., Montreal, builders' supplies, are stated to have assigned.

Olivier Dubois, carriage makers, supplies and lumber, Montreal, have registered.

Heon, Roy & McLeod, contractors, Three Rivers, Que., are stated to have dissolved.

I. Tremblay & Co., plasterer contractors, Montreal—Mrs. Isidore Tremblay, has registered.

Drake & Drake, builders and contractors, Hamilton, are reported to have dissolved.

J. H. Vickerson Electric Company, Montreal, Que., are stated to have dissolved.

Home Electric Company, Kenora, Ont., has been succeeded by W. J. McLaughlin.

Laurie & Lamb, consulting and contracting engineers, Montreal, Albert Laurie, registered.

Raith Agencies, Limited, builders' supplies, Montreal, has been granted a winding-up order.

Hull Woodenware Company, Limited, manufacturers toothpicks, are stated to be in voluntary liquidation.

L. P. Jodoin & Co., cement contractors, St. John, Que., Mrs. Louis Philippe Jodoin, have registered.

Jos. Brunet & Fils, bricklayer contractors, Montreal, Jos. Brunet and Ernest Brunet, have registered.

Berrington, Son & Watney, civil engineers, of Wolverhampton, England, intend opening a branch office in Calgary.

Pratt Specialty Co., hardware and electrical supplies, Montreal, Geo. F. Pratt and M. J. McLaughlin, have registered.

Bastien & Dagenais, sash and door manufacturers, Montreal, Josephat Bastien & Francois Xavier Dagenais, have registered.

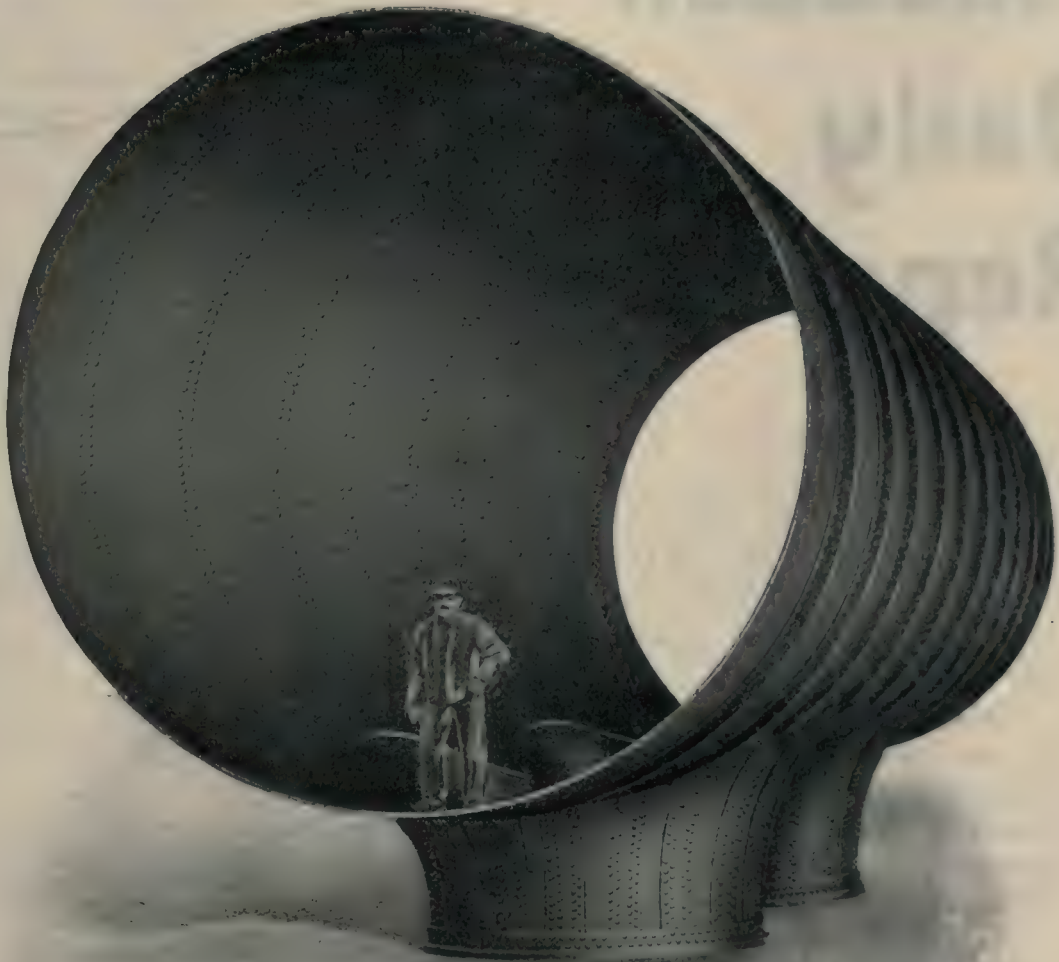
Canada Ford Co. and The Ford Iron Co., Montreal, Que., E. Herman Ford, K. E. Drinkwater, C. A. Stuart, and H. R. Hingston, have registered.

Geo. Anderson & Co., engineers and ironfounders, of Carnoustie, Scotland, and Montreal, have opened a branch at 504 Builders' Exchange, Winnipeg, for the purpose of looking after their western trade.

The Canadian Pacific Railway has ordered 750 steel underframe flat cars from the Canada Car and Foundry Co. The cars are of regular standard design with the exception that for the intermediate floor stringer a 3-inch rolled steel Z bar is used to which the floor is bolted at intervals. In previous cars this bar was generally of wood, to which the floor was nailed.

The contract of Messrs. Vickers' Sons & Maxim with the Canadian government and the Harbor Commissioners of Montreal provides for the construction and operation of a floating drydock with a lifting capacity of 27,000 tons; the establishment of a ship-repairing plant and a mill for the production of steel railway ties in respect of which they receive from the Canadian government subsidy of three per cent., interest on \$3,000,000 for a period of thirty-five years. This is a first-class subsidy, under the graving dock subsidies act passed by the Dominion Parliament. The contract stipulates that the dock is to be placed in a basin at the mouth of Molson's Creek, at the east end of the harbor, and the site of the proposed works will be a piece of land thirty-six acres in extent to be reclaimed from the river shore by the Harbor Commissioners. The floating dock is to be completed and installed by May, 1912, by which time the basin will be ready for its reception.

PENSTOCKS



Side view of Penstock Distributor built for the Ontario Power Co.

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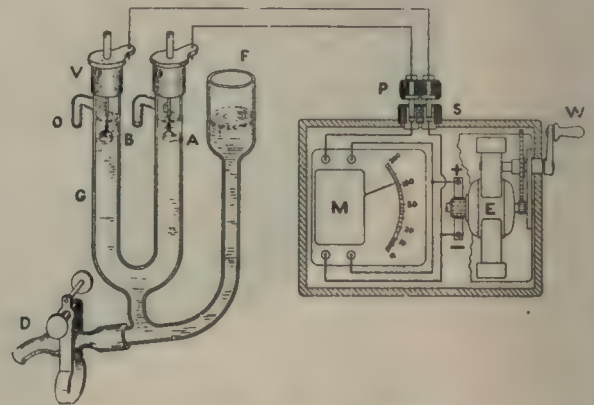
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Toronto - Ontario

Electric Water Tester

The detection and estimation of impurities dissolved in water has hitherto been carried out by chemical tests of more or less complexity and water testing suggests at once a skilled chemist and all the paraphernalia of a chemical laboratory. A new apparatus known as the Dionic Water Tester substitutes a simple electrical measurement of conductivity for the chemical reactions hitherto used for the purpose. The working principle of the apparatus is based upon the fact established by Kohlrausch that the conductivity of pure water containing any electrolytic substance in solution is due almost entirely to the dissolved substance and only to a negligible extent to the water itself. Kohlrausch established the law that, provided a solution is very dilute, the conductivity is proportional to the percentage amount of the substance dissolved in the water. The Dionic Tester is able, by measuring conductivity, to measure with accuracy the percentage amount of any electrolytic substance dissolved in water. It does not discriminate between one kind of substance and another; analysis alone can do that. But in most instances in which water testing is carried out for engineering and kindred purposes, the substance present in the water is well known, having been ascertained once for all by analysis, or being inherent in the source of supply. Such



Dionic Water Tester

tests are not made for purposes of analysis, but to find out how much of a known substance is present in the water.

The complete apparatus is shown in the figure where G is a bent glass tube to contain the water under test, and A and B are the electrodes for passing the electric current through the water. The electrodes are connected by wires to a direct-reading conductivity meter M, and a continuous-current hand-driven dynamo E, so that by turning the handle W of the dynamo, a current traverses the meter and the water in the conductivity tube G. The pointer of the meter is deflected, and comes to rest at some point upon the scale which directly indicates the conductivity of the water in the tube. The test is completed as soon as the pointer has come to rest, that is to say, in two or three seconds. For further particulars address the selling agents, Messrs. Vandeleur & Nichols, Dineen Building, Toronto.

The Edmonton Builders' Exchange is taking a firm stand, and for all the unions (excepting the bricklayers and laborers—which have agreements extending until 1913) there will be nothing but open shop after May 1st. The agreement with the carpenters' union which has still two years to run, will be cancelled on the ground that it has been found unworkable, and further, that it has been violated. In spite of the builders' attitude, however, no serious trouble is anticipated.

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No. 17

The Attitude of the Engineer in the Supervision of Contract Work

We are frequently reminded of the necessity for the careful inspection of concrete work, and we are inclined to endorse all that has been said in this connection. The time will never come when we shall be able to dispense with resident engineers and inspectors. Little enough, however, is done towards bringing the supervising engineer into more harmonious relations with the contractor. Certain it is that a helpful attitude on the part of the supervising engineer will accomplish far more with the contractor than a whole squad of inspectors. The contractor and his staff are quick to detect the willingness of the engineer and his assistants to assist them in the various little ways that offer in the execution of important work. It is within the power of the engineer to interpret specifications on any work in such a way that the contractor may make or lose a good profit, and with no benefit to the construction. A contractor is made of flesh and blood just as is the engineer; he is just as human, and just as susceptible to decent treatment. Moreover, his resentment of harsh treatment and unfair decisions is no more than one might expect from an engineer if the conditions were reversed. The engineer in charge of construction whose decisions are always against the contractor, irrespective of the latter's rights, and whose readings of the specifications are, of intent, one-sided, is not worthy of his profession.

The contractor, having assumed all contingencies, should be treated with a measure of liberality and should always have the benefit of the doubt. More should not be expected of him than is conveyed by a reasonable interpretation of the contract. He should not be expected to shoulder the slightest omission on the part of the engineer, and he should be regarded—like Caesar's wife—as being above suspicion until proven otherwise.

A large percentage of bad results can be charged

directly to the engineer and poor materials. It is the province of the engineer to see that the quality of materials and finished work comply with the plans and specifications. He should decide all questions pertaining to the quality of materials, workmanship and construction, but he should keep clear of the management and direction of the work, and any and all disputes arising between the company and the contractor that do not effect the quality of the work done. For instance; the engineer makes plans for a river pier with pile foundations, concrete base, stone shell and concrete cores, constructed according to printed specifications. Does it make any difference to him whether the contractor makes a double crib and back fill, or drives steel sheet piling, just so long as the finished work is completed according to plans and specifications? Does the engineer presume to dictate to the contractor how he shall manage his work, and then make the contractor responsible for the mistakes of both the first and second parties without just compensation?

Certain companies and engineers—happily they are in the minority—think it smart to keep from contractors certain information, other than plans and specifications, that if known to contractors when bidding on work would materially change the price of construction, resulting later on in delays and loss of time and money. Any company or engineer who knows from past experience that difficulties will be in the way for the successful contractor, and does not acquaint him with same before the tender for the work is made and contract entered into, is dishonest. Sooner or later it is sure to be found out, and the word passed from one contractor to another, with that absolute certainty of paying extra for contingencies in the future. The engineer who takes pains to explain to the contractor, not only the meaning of the plans and specifications, but also all the features of the physical conditions reasonably sure to be met with at the site, uniformly obtains for his clients the lowest safe bid that would be paid for the work. Such conditions guarantee good work, the best feelings and rapid construction.

Contract Bonds—A Correction and a Note

In another column will be found a letter by "Building Contractor," in which our attention is drawn to a misrepresentation of a former letter of this writer published in our issue of April 5. As an illustration of the attitude of the bonding companies, "Building Contractor" in his first letter cited the case of a bridge concern which was bonded for \$100,000, but which upon the collapse of the structure was unable to recover owing to the fact that the company had not been notified. Owing to a typographical error an extract from this letter read as follows: "The case was discussed in all the papers but the company did not pay, they having received timely notification," instead of "they not having received timely notification." Our apologies to "Building Contractor."

Regarding the premium rate for contract bonds, discussed in the concluding paragraph of the letter published in this issue, it would seem necessary to explain that the one-quarter of one per cent. per annum charge is based on the amount of the contract. The amount of the bond itself may be anywhere from 10 to 50 per cent. of the contract, as required. The figures referred to by our correspondent were those of bond liability and premiums, not of contract totals and premiums.

Another Record-Breaking Building Year

First Quarter of 1911 Shows Net Gain of 20 per cent. According to Returns from Twenty-Six Leading Canadian Cities

According to official returns submitted to the Contract Record by twenty-six leading cities of the Dominion, the expenditure on building for the first three months of 1911 shows an increase of twenty per cent. over the corresponding period of 1910, the totals being respectively \$17,139,655 and \$14,340,778. In view of the fact that 1910 was Canada's greatest building year, and that during that year the total expenditure on building was nearly one hundred millions—an increase of 44 per cent. over 1909, the present showing

able perhaps in a measure to the somewhat backward season. Be this as it may, the greatest optimism prevails in the city, and those who are in close touch with trade conditions assert confidently that by the end of 1911 the year will surpass 1910 in building volume.

In view of recent developments at Ottawa a decrease of 39 per cent. for the first three months of 1911 will occasion little surprise. It is hinted in some quarters that there is not so much confidence in the federal capital since the birth of the reciprocity pact,

City	Mar. 1910	Mar. 1911	3 mos. '10	3 mos. '11	Increase % for 3 months.	Decrease %
Vancouver	\$1,806,106	\$2,147,798	\$3,318,212	\$4,607,330	39	
Toronto	1,583,165	2,210,770	3,125,693	3,638,940	16	
Montreal	674,804	1,101,577	1,110,344	2,109,845	90	
Calgary	415,800	1,012,260	692,100	1,641,960	137	
Winnipeg	2,543,150	1,007,400	3,067,050	1,639,600		47
Regina	329,650	545,025	382,490	622,225	63	
Victoria	244,760	279,945	525,505	614,340	17	
Edmonton	264,435	396,825	337,555	519,055	54	
Hamilton	289,390	350,300	346,040	465,000	34	
Ottawa	219,350	134,475	374,200	228,075		39
Fort William	92,585	166,850	162,200	202,175	25	
Lethbridge	124,000	81,500	212,605	140,000		34
North Vancouver		47,700		116,715		
Windsor	27,225	60,250	37,975	113,625	199	
Moose Jaw	58,825	74,100	69,875	87,100	25	
London	139,700	65,638	221,832	85,863		61
Quebec	25,100	48,000	43,300	85,000	96	
Brantford	11,470	43,445	26,670	60,645	127	
Halifax, N.S.	43,800	22,000	88,975	36,600		59
St. John, N.B.	48,250	13,400	94,750	30,200		68
Port Arthur	5,365	14,810	5,365	20,360	279	
Sydney	17,935	12,440	20,910	20,220		3
Kingston	14,850	19,172	20,875	20,102		4
Peterborough	10,327	6,655	17,477	13,210		24
St. Thomas	15,500	9,850	20,200	12,300		39
Stratford	6,310	8,610	18,580	9,170		51
Totals	\$9,011,852	\$9,880,795	\$14,340,778	\$17,139,655		
Total Increase of first quarter of 1911 over corresponding period of 1910, 20 per cent.						

can only be regarded as eminently satisfactory and encouraging. True, a number of cities record decreases, but these are attributable either to abnormal inflation during 1910 or to recent conditions of exceptional occurrence. The developments of the season alone will show whether Winnipeg's decline is attributable to the former cause. During 1910 the western capital expended on building over fifteen million dollars, an increase of no less than 64 per cent. over 1909. Such a record, even for a city like Winnipeg, is difficult to maintain. We would not infer for one moment, however, that the city is falling off in any respect; on the contrary we believe that it has entered upon an entirely new era of prosperity, but we do think that it would be unreasonable to take nothing but a phenomenal increase as evidence of development and progress. Winnipeg's comparatively poor showing is attribut-

but upon such a delicate matter we hesitate to commit ourselves.

The city of Lethbridge has had some trouble with labor and expects to more than retrieve itself later in the season.

With the worst told we turn to the achievements of Vancouver, Montreal, Calgary, Regina, Edmonton, Toronto, and even Hamilton, and find records which amply compensate us for Ottawa and elsewhere. Easily the most significant thing is Vancouver's position at the head of the table, with an outlay of nearly one million dollars more than Toronto, which occupies second place, and two and a half millions in excess of Montreal, which comes third. It is of interest to recall that Vancouver occupied the leading position at the end of the first quarter of 1910, while at the close of that season it took fourth place among Canadian

cities, with an expenditure of over thirteen millions and an increase of 81 per cent. for the twelve months. These figures represent solid facts, which stand as a monument to the enterprise of Vancouver and as a certain forecast of the great future to which that city is destined.

Toronto spent more than twenty-one million dollars on building during 1910, and the increase of 16 per cent. for the first quarter of 1911 is identical with that recorded for the whole of last year. The steady progress made during the last year or so can only be regarded with satisfaction and as an augury of future progress and prosperity; particularly so, having in view the favorable conditions obtaining in the supply and labor markets.

Of the other eastern cities particular mention must be made of Montreal, whose outlay on building during the first quarter of 1911 was nearly double that of the corresponding period of last year.

Calgary, "the City of Certainties," justifies its assumption of this noteworthy title by taking fourth place in the table, with an expenditure of \$1,641,960, and a gain of 137 per cent. The development of Calgary during the last decade has been phenomenal and we believe, that even greater things will be accomplished in that city within the next few years. (In 1901 the population of Calgary was 4,091, and in 1910, 51,000—an increase of 1,253 per cent., since we are dealing in percentages). Calgary's building outlay during 1910 was over five and a half millions. During 1911 it is confidently expected that it will be ten millions.

A final word should be said for Regina, which occupies sixth place in the list of cities, with a gain of 63 per cent.—a most creditable record.

The general optimism prevailing among city engineers, building inspectors and others may be gauged from the reports which follow:

Vancouver, B.C.—S. H. Jarrett, building inspector, writes: "Building conditions were never better, or prospects brighter, than at the present time. The indications are that the percentage of increase for the first three months will be kept up for some time. Everything seems to indicate that Vancouver is going to maintain the position reached in January, of having by far the largest per capita total of any of the large cities on the continent. There is no doubt that this city is now entering upon a most marvellous and rapid development."

Toronto, Ont.

P. L. Fraser, Secretary Builders' Exchange, writes:—"The amount of building permits issued by the City Architect for the first three months of the year is the best criterion of what is really happening in the building industry in Toronto this year. It was thought by many that the building record made last year would not be approached for some time to come, but from present indications and the statistics handed out by the City Hall Building Department, this year's record bids fair to equal, and even surpass, that of last year. There seems to be no let-up in the number of residences that are being erected and the number to date this year exceeds that of last year for the same period. This is the case in every class of building.

"The outlook is really bright for a busy year. At the present time there does not seem to be anything which will have a tendency to hold up operations. No serious labor trouble is anticipated. Any agreements with the labor unions which lapse this year have been renewed.

"The great difficulty of the contractor will be in obtaining building materials. A scarcity is already foreshadowed and indeed this scarcity is now felt in regard to brick. This commodity can only be purchased at an increase over

last year. The price of brick in Toronto is seemingly higher than in other localities, but when the size of the brick and its quality are considered, the market price compares favorably with that of other cities. The prices of other building materials, compared with the prices which obtain in Detroit, which is slightly larger than Toronto, and where building conditions are similar to those here, are nearly on a parity.

"A very optimistic view should be taken by every one identified with the building industry."

Montreal

Office of the Contract Record,

Montreal, April 21, 1911.

The building operations in Montreal which will be proceeded with this summer include the following large operations:

C. P. R., extensions to the Windsor station and Place Viger station and hotel, \$1,500,000; Dominion Express Company, new office building on St. James street, estimated cost \$600,000; the Transportation Building, to be erected on St. Francis Xavier street, between St. James and Notre Dame streets, estimated cost \$1,000,000; Montreal Art Association, new galleries on Sherbrooke street (first section) \$300,000; National Bridge Company's Works at Longue Point, estimated cost \$100,000; Y. M. C. A. headquarters, estimated cost \$325,000; Y. M. C. A. at Westmount, estimated cost \$55,000; St. Stanislas de Kotska parish, church to cost \$142,000, and a presbytery, estimated at \$35,000; Mr. W. H. Creed, apartment house on Cote des Neiges Road, estimated cost \$90,000; Les Artisans Canadiens Francais, head offices at the corner of St. Vitre and St. Denis streets, estimated cost \$70,000; St. James Hotel extension, estimated cost \$70,000; rebuilding front of General Post Office, St. James street, estimated cost, \$300,000; Protestant Board of School Commissioners, extension to Fairmount avenue school, \$120,000; Protestant Board of School Commissioners, new school on Christopher Columbus street, estimated cost \$70,000; Catholic School Commissioners, new school in St. Edward's Parish, cost \$34,000; N. A. Timmens, factory on Clark street, \$64,000; J. U. Cartier, hotel and office building, McGill street, \$50,000; Pierre Brault, factory, rebuilding after fire, cost \$35,000; A. Ramsay & Son Company, Limited, factory, \$16,000; Masson Estate, addition to office of Ross & Macfarland, Beaver Hall Hill, \$10,000; J. C. McLaren Belting Company, new factory, estimated cost \$17,000.

The following table shows the total amount of the value represented by building permits issued during the first three months of 1910 and 1911:

	Jan.	Feb.	March	Total.
1910	\$159,510	\$274,030	\$676,804	\$1,110,344
1911	365,840	642,428	1,101,577	2,109,845

This shows that there was an approximate increase in March permits over January of 201 per cent., and an increase for March, 1911, over March, 1910, of 90 per cent.

A glance over the above list of extensive operations shows that there will be a very heavy business in the building line in Montreal this summer. It should be mentioned that the largest buildings will be constructed principally of steel and reinforced concrete. In most cases the contracts call for the completion of the work within a year, and much of it will be finished by the fall.

In addition to the work under way in Montreal proper, undertakings of considerable importance are under contract in the neighboring municipalities. Maisonneuve, of course, takes the precedence, the figures for the first three months being as follows:

Estimated value of permits for January	\$40,000
Estimated value of permits for February	225,000
Estimated value of permits for March	100,000

This record is much larger than last year's operations.

Among the larger buildings projected for this summer are the following:

United Shoe Machinery Company, factory, \$195,000; die factory for Mr. J. Dupre, \$25,000; Shawinigan Water & Power Company's power house, \$60,000; General Post Office, estimated value, \$60,000; Viauville Catholic School, value \$55,000; residences in connection with above school, \$80,000.

The town of Verdun since the beginning of the year has issued ten permits representing buildings worth \$25,000.

Montreal West, since the beginning of the year has issued eight permits to the value of \$26,000.

The city of Westmount building operations have been held up since last fall as the result of an agitation for the amendment of the building by-law. The points in dispute were settled recently and the by-law as amended came into force on April 5th. It is expected that during the month of April permits for a heavy summer work will be issued under the new regulations. A large number of plans are in the office of the building inspector and much material is already on the ground, so that just as soon as the plans can be made to conform with the present restrictions the permits will be issued and work will go on.

In the town of Outremont, which is of a residential character, similar to Westmount, there will be the usual amount of home construction, but no buildings of large value.

In addition to the buildings under way in Montreal, the Yorkshire Building, which has just been completed, should be mentioned. This is a ten-storey structure, fireproof throughout, and is to be devoted to office purposes. The floor area of each flat being rather smaller than most big office buildings the interior will be specially suitable for persons requiring suites of offices taking in a whole floor.

Work has just been commenced on the demolition of the buildings that at present occupy the site of the new transportation building.

Splendid progress is being made with the Windsor station extension, the stonework of the front elevation being up about one-third of the height and the steelwork practically all in place.

The foundations are in for the Y. M. C. A. headquarters and the superstructure will be rushed ahead now that fine weather has set in.

The excavation work for the new art gallery is under way.

Labor Conditions at Montreal

In labor circles the opinion seems to be general that there will be plenty of men on hand for the work that is in sight this season. Day laborers are now getting from 17 to 20 cents an hour, 20 cents being the scale paid by the city on municipal work. It is considered that this will be as high as the contractors will be able to pay. Masons are getting 45 cents an hour under an agreement which has two years to run, and bricklayers 50 cents an hour, under an agreement which has one more year. Plasterers' wages are not yet settled. They are asking for 54 cents and an eight-hour day, but the demand has not yet been acceded to. Carpenters are working on the open shop system and are receiving on an average 30 cents an hour, the best men getting 35 cents. It is expected that carpenters' wages will be slightly increased in July. Painters are asking for a minimum of 30 cents an hour but the employers do not recognize any minimum wage and propose to pay men what they are worth. Plumbers and electricians are paid on a sliding scale and no serious change is expected.

Calgary, Alta.—Richard Harrison, Building Inspector, writes: "The outlook for the season's work is most promising. Several modern steel structures and reinforced con-

crete office buildings are to be erected, besides banks and government buildings. During the past three months there have been erected 350 residences, ranging in value from \$3,000 to \$20,000 each. If there is no unexpected scarcity of building material this will be a record year." There was record breaking activity last month and the permits for March, 1911, exceed in value those of March, 1910, by nearly \$600,000. The union carpenters have submitted their proposed agreement to the contractors. The clauses of this agreement call for double time on holidays, a 5-cent increase (making the wage 55 cents an hour) and closed shop. The contractors are firmly opposed to the last named proviso and as there are a large number of non-union men in the city, it is probable that open shop will continue. The estimates foreshadow a large increase in the expenditure of the city, and altogether 1911 gives every promise of being a banner year.

Winnipeg, Man.—Building Inspector Rodgers, reporting to the Contract Record, states that the outlook for the season is particularly good and that there is no cause for alarm at the apparent falling off for the first quarter. The explanation is that building is starting later this year than last, and that last year permits were taken out early for several very large buildings which were not started until well on into the summer. Mr. Rodgers still holds to his opinion that the exceptional record of last year when total permits went over fifteen millions, will be beaten before 1911 has passed. Inquiries at the offices of the architects reveal numerous plans for large commercial structures, while there is every indication, already, of there being more activity in residential work than last year. April has been a most active month in Winnipeg building circles and the city undoubtedly will show much better returns than are submitted for March. It is too early as yet to make any predictions in regard to labor. The supply market generally is at normal level.

Regina, Sask.—O. T. Falls, Building Inspector, writes: "Conditions and prospects were never better. Contracts have already been awarded for a number of public buildings and business blocks, and a great deal of new work is under consideration. The Bank of Ottawa has obtained a permit for an office building to cost \$50,000 and plans are being prepared for new buildings for the Imperial Bank and the Bank of Commerce. Smith Bros. & Wilson have the contract for the new Baptist Church, which is to be erected at a cost of \$65,000. The contract for the Methodist College (architects, Brown & Vallance, Montreal) will be awarded in a few days."

Regina, Sask.—R. J. Burdett, Secretary, Board of Trade, writes: "Trade conditions generally are the best ever experienced and from all appearances they will continue so throughout the whole season. 1911 will witness marked development in all lines of industry. The municipal improvements contemplated are extensive. They include the construction of the electric street railway, additional street paving, boulevarding, extension of waterworks and sewerage, disposal works, Broad street subway, etc. Building and civic construction combined will involve an expenditure of \$4,000,000 this season and give employment to 5,000 men. Contractors obtained an early start this year and excavations are in progress all over the city. In some instances foundations are being put in, while in a few cases the structures are slowly rising above the ground. Labor is already becoming scarce and contractors are complaining of their inability to secure enough men for their present requirements."

Victoria, B.C.—W. W. Northcott, Building Inspector, writes: "Building conditions and prospects are good; indeed, they have never looked better in any previous year."—The month of April so far has been distinguished by increased activity in local building circles. Permits for a large num-

ber of business buildings will be issued this month, and with a steady demand for good class dwellings, further improvement may be looked for. Of the public work projected may be mentioned the extension of the Parliament Buildings, for which Mr. Ridgeway Wilson, of this city, is the architect. At an early date the ratepayers will be called upon to vote on a by-law authorizing the raising of the sum of \$290,000 for sewer construction, and in addition \$50,000 for surface drains.

Edmonton, Alta.—The City Building Inspector writes: "The city's prospects are exceedingly good. The present year will undoubtedly record a great increase over previous seasons." Not only the building permits, but also the custom returns, bank clearings, post office, and street railway show gratifying increases for the first quarter of 1911. The continued expansion of trade has rendered necessary greatly increased facilities for handling business. The Ames-Holden, McCready Company are to build on Third street, and the Great West Saddlery Company and Nicholson & Bain on Seventh street. These will all be heavy modern structures rendered necessary by phenomenal increase in volume of business. Work has been commenced on a six-storey building of thoroughly modern fireproof construction on First street, for use as a departmental store. Arrangements have recently been concluded under which P. Burns & Company will at once commence the construction of a modern meat packing plant, representing an ultimate investment approximating a million dollars.

Hamilton, Ont.—John Anderson, Building Inspector, writes: "Prospects are very good and conditions satisfactory in every department of trade. We are looking forward to an excellent building year."

Ottawa, Ont.—The late spring and a shortage in certain lines of building material are given as the chief causes of the dullness in the building trades. Contractors' operations have been hampered recently by a scarcity of brick.

New Westminster, B.C.—Building is active in the Royal City and is expected to approximate \$2,000,000 in value during 1911. Between new buildings, the enormous amount of civic work under way, railway construction in the immediate district, including the British Columbia Electric and Canadian Northern operations, and other enterprises, it is doubtful if there is a busier city in Canada for its size today than New Westminster. Among the projected work may be mentioned the Westminster Trust building on Columbia street, which will cost \$12,000.

Woodstock, Ont.—John Morrison, City Clerk, writes: "The building permits for 1911 look better than for years. Owing to the industrial boom which set in last year a number of extensions to our present factories are projected, while new buildings are in sight. The congregation of Chalmers Church are putting up a new building at a cost of from \$35,000 to \$40,000. Contracts have already been awarded for a number of residences."

Moose Jaw, Sask.—W. F. Heal, City Clerk, writes: "Building operations generally are a month later than last year, but the erection of a large number of buildings this season is definitely assured and prospects are very bright."

London, Ont.—Arthur E. Nutter, City Architect, writes: "Our record this year, although not as good, so far, as that of 1910, shows improvement, and there is every prospect that the amount of building in 1911 will surpass that of previous years. The largest undertakings in hand at present were carried over from last year and the figures, of course, are not credited to this season's work."

Sydney, N.S.—D. McD. Campbell, City Engineer, writes: "Many buildings are projected for 1911, and a record season is looked for. The apparently small activity is attributable to a cold winter and a somewhat backward spring. The

figures for Sydney do not include large additions made by the Dominion Iron & Steel Company, Limited."

Kingston, Ont.—H. B. R. Craig, City Engineer, writes: "Building prospects for the season are fair."

Fort William, Ont.—S. Macnamara, City Building Inspector, writes: "The season is opening up in good shape after a hard, tight winter, and I anticipate a good building year for Fort William."

Lethbridge, Alta.—H. W. Meech, Building Inspector, writes: "The decrease noted here is attributable to a slight disagreement which took place between the Trades and Labor Council and the Builders' Exchange, which greatly retarded building operations, owing to the possibility of a strike. It now looks as if matters will adjust themselves and I have no doubt that we shall have a record year."

St. Thomas, Ont.—J. P. Freek, Building Inspector, writes: "The building total has fallen away owing to a backward spring, but prospects are fairly good for the balance of the year. St. Thomas is very prosperous, with a moderate increase in both building and population from year to year."

Stratford, Ont.—Hugh Durkin, Building Inspector, writes: "Conditions are satisfactory and prospects generally good. It is probable that there will be increased activity in residential work this summer."

Halifax, N.S.—City Engineer Doane writes: "The prospects for the year are not bright. Building operations have fallen off during the last eighteen months and it is unlikely that there will be any marked revival in the near future. Among the new buildings contemplated are an addition to St. Mary's College, a large curling rink, a structure to be erected by the Freemasons, a city market building, a bank building for the Merchants Bank of Canada and an Infants' Home. The Intercolonial Railway propose to erect an 800-foot terminal freight shed and terminal piers with the necessary buildings. It is also reported that the C.P.R. will erect a large hotel in Halifax, this year, but so far it is rumor only."

Chilliwack, B.C.—A number of substantial business blocks will be erected here this season, which promises to exceed all former years in building activity. The Merchants Bank, Bank of Montreal and the Bank of Commerce have plans for new buildings and a new city hall is also among the projects. Municipal work will be heavy and will probably include a complete sewerage system.

North Vancouver, B.C.—Thos. Shepherd, City Clerk, writes: "Great activity prevails in building circles, and municipal development is proceeding apace. The Bank of British North America and the Royal Bank will shortly commence the erection of permanent buildings, while the city has extensive work in hand, including miles of sewers and permanent water mains. A building inspector has just been appointed by the council, and a by-law to establish fire limits is now being considered by that body. I regret that we have no statistics for 1910."

Saskatoon, Sask.—The city is expending over a million dollars this season on municipal improvements which include the installation of a filtration plant (to cost \$35,000) and a new intercepting sewer (to cost \$300,000). The two subways to be constructed at 19th and 23rd streets will represent an expenditure of \$93,000, while the new light and power station will cost \$50,000. An active season is assured building and contracting interests.

Five sub-contractors who have been doing railway work in the United States, have been brought to Edmonton by Jas. O'Connor, to take contracts on the main line west of the Canadian Northern Railway west of the McLeod river.

Methods of Sewer Construction at Regina

Description of the Manufacture of the Meriwether Reinforced Concrete Pipe—Remarks Relative to Tamping and Waterproofing of Concrete

By W. R. Harris*

The city of Regina is situated on the Wascana Creek, and has a population of 23,000. It has grown very rapidly, so rapidly, indeed, that in constructing a modern sewerage system it was necessary to build on a larger scale than is usually done.

One novel feature of this system is that it is paid for mainly by revenue derived from land owned by the city that was granted to it at the time it was chartered. About one-half million dollars will be spent for the construction of the complete sewerage system.

Wascana Creek is now polluted by the Regina sewage and the prevalence of typhoid fever may be accounted for by the fact that many dairymen water their cows from this stream. The operation of the proposed sewer system will eliminate this trouble.

The work now under construction is known as the Seventh Avenue sewer, consisting of 10,761 feet 30-in. sanitary sewer, and 2,369 feet 66-in. and 8,392 feet 72-in. storm water sewer. At Campbell street the 72-in. storm sewer makes an abrupt turn, emptying into Wascana Creek, a distance of 3,240 feet above the sewage disposal plant now being constructed. At this turn a junction is formed between the 30-in. sanitary sewer and a 48-in. main running 3,248 feet to the sewage disposal plant. The proposed sewer is known as the Wascana Valley Trunk Sewer and joins the 48-in. main above referred to by passing the 45-in. Valley sewer under the 72-in. storm water sewer.

This is accomplished by a very ingenious type of construction, designed by Mr. John Marshall, a member of our society.

The Seventh avenue trunk sewer is being constructed with concrete pipe manufactured by the Lock Joint Pipe Company, under the Meriwether patents. This pipe is cast in sections in steel molds, and is reinforced with the triangular wire mesh sold by the American Steel and Wire Company. The joints are of the bell and spigot type, but do not project beyond the outside of pipe, and the pipe, when jointed, appears as a monolithic tube of uniform thickness. When the pipes are joined the metal in the spigot end overlaps the metal in the bell end and the mortar in the joint seals and locks the pipe.

Sealing is usually done by troweling mortar in the invert of the joint space up as far as the spring line of the arch, then after placing a spring steel sealing form, a thin mortar or grout is run into the remaining arch joint space by pouring through a hole, knocked in the bell at the top of the pipe. This hole is not broken in the bell until the pipe is placed in final position in the trench.

Now, speaking of the question of manufacture of this pipe, which will, probably, appeal to you, as contractors and engineers, more than other details, I will say that the design of the pipe is such that it can be varied, so far as reinforcement is concerned, to meet the requirements of any special job by increasing or decreasing the size of the reinforcement.

At the beginning of this work it was found that

the aggregates had never been inspected or analyzed. We cast a few pipes, and noticing that the color was bad, we went into the question of the proportion of the aggregates and found that from one pit we got a poor sand, containing 25 per cent. of small gravel and 75 per cent. of sand, including a large percentage of silt. We secured from another part of the country a cleaner sand, but the proportion of the sand was greater than it should be.

I will give you the results of the tests made: The Lumsden sand, which we decided to use finally, contained 50 per cent. of fine sand and 50 per cent. of gravel. This sand, after screening, contained 36 to 38 per cent. of voids, and the gravel 38 to 40 per cent. of voids, while the bank sand and gravel had 29 to 30 per cent. of voids. By using one part of Lumsden sand and two parts of Lumsden gravel we reduced the voids to 26.8 per cent., and we determined to screen sufficient gravel to obtain the proper aggregate, which was used with the residue, thereby increasing the gravel in the aggregate.

Another matter that gave us trouble is that the Canadian cement bag is much smaller than the American bag. An American contractor would consider that the sack contained approximately 9-10 of a cubic foot of cement, where as it holds only 75-100 of a cubic foot, with the average a little higher on a series of tests.

It was after we made these tests that the city had other tests made, and as a result immediately issued orders for all work in town to stop until the matter could be looked into further. After that every contractor had to screen his sand to get better work. The sidewalk and building construction had been very poor, probably due to the fact that the contractors had not gone into the question of proper mixtures and proper materials. They may have been perfectly honest in their intentions to give a good job, but seldom gave it. It is in such things as this that our society can be of assistance to our members by letting them know that such things should be examined and looked into, and by recommending ways and means to avoid these troubles. No contractor wants to do bad work, and no one wants to have his money held up owing to faults resulting from the use of poorly graded materials or improper mixtures of concrete.

This is getting away from the subject I began with, but it is to let you all know the troubles that we have had there.

Now, to return to pipe construction. We use ordinarily a 1-2-4 mixture of concrete, and after the concrete is made very wet, i.e., "sloppy," it is placed in molds and churned, and cut by means of a hoe with a straight shank, the blade being curved to fit the circular forms. In that way we get a finished surface against the forms. After the concrete is placed in the molds the spigot end is made. The pipe is then allowed to stand in the mold 24 hours, and the casing stripped the following morning without removing or disturbing the pipe in any way. After three days we raise the pipe with a derrick and a lifting ring which

* Before the American Society of Engineering-Contractors



72" and 48" Pipe Manufacturing Plant



72" Junction Pipe



Winter Delivery of 72" Pipe Loading on Sled



Laying 48" Sanitary Main to Disposal Plant in Zero Weather

we use. Each pipe is then set on its bilge, and allowed to remain thus for several days. The pipes are delivered at the place of manufacture, or at yards located along the line of the trench. At other times we have made the pipe alongside of the trench. In other words, the pipe is always delivered to the contractor on his work. The joints can be made immediately, and back-filling can be done at once, which is the plan adopted on the Regina contract.

At the beginning, sewer construction, i.e., the excavation of the trenches, was delayed, owing to the fact that the city was unable to get its steam shovel as soon as desired. The time of the arrival was so late in the season that the monolithic work or pouring of joints could not have been done. The pipe was laid with the thermometer down to six degrees below zero. Snow fell on October 30, and when I left Canada, November 30, 1910, it was ten degrees below zero.



Lifting 72" Pipe from Base

Work was stopped on the day I left because of the breakdown of the steam shovel, and was not resumed until the spring of 1911.

Discussion

Mr. Lockwood: How long was the pipe?

Mr. Harris: The total length of pipe, including the bell, is 4 feet 3 inches, but each section of pipe laid gives a net length of 4 feet.

Mr. Lockwood: Where do you place your reinforcement.

Mr. Harris: On this particular job it was placed within the inner third, viz., 1 inch on 30-in. pipe, and $1\frac{3}{4}$ inch on the 48-in. pipe from the inner surface. The 30-in. and 48-in. pipes have one ring of American Steel and Wire Reinforcement style 34, and the 66-in. and 72-in. pipes have 2 rings of the same style of mesh, the inner ring being placed 2 inches from the interior surface and $1\frac{1}{2}$ inch from the outer surface.

Mr. Lockwood: How do you hold the reinforcement in place?

Mr. Harris: By means of an annular ring in the bell casting. We also have vertical spacing strips that hold the reinforcement the proper distance from the form. These strips are pulled as the concreting progresses, and when this reaches the top the strips are out altogether. The top ring is made so that it keeps the reinforcement in place until the concrete is set. After the section of pipe are assem-

bled the reinforcement is securely locked by mortar in the joint.

Mr. Lockwood: What strength do you aim to get in your pipe

Mr. Harris: The Lock Joint Pipe is reinforced for external pressure only, at the present time, and with a 1-2-4 mixture sufficient density is secured to prevent percolation of sewage through the walls or joints of the pipe. I made hydraulic tests of a 36-in. pipe with a four-inch wall. I tested one pipe, and with a pressure of 7 pounds forced water through the ordinary concrete mixture of 1-2-4, although the percolation was slight. I grouted that pipe on the inside and the pressure increased to 14 pounds before percolation ensued. I used a waterproof compound mixed with the cement, but was not able to get over 14 pounds pressure without leakage through the concrete wall of the pipe. I used another compound mixed with the concrete and broke the pipe before I could force the water through

the concrete. The pressure obtained was 32 pounds with a 36-in. pipe, in which the reinforcement was placed to resist external pressure, and not internal pressure, as I did not expect to secure such good results that a pressure of 32 pounds could not produce leakage.

Mr. Lockwood: What depth of trench did you figure for?

Mr. Harris: The maximum depth of the trench is 30 feet at Regina.

Mr. Lockwood: Do you waterproof all this pipe?

Mr. Harris: It is not necessary.

Mr. Lockwood: Don't you have a male and a female joint?

Mr. Harris: Yes; there is a male and a female joint, so made that it forms a dove-tailed recess, and the concrete, even though there was no adhesion, would not fall out owing to the dovetail overlap.

Mr. Hanson: Mr. Harris, do you have those pipes braced?

Mr. Harris: For the first few days, because the concrete is green and under the age of three or four days it is not advisable to have the green walls unsupported. We have perpendicular and horizontal braces in the pipes.

Mr. Hanson: Do you handle them when they are three days old?

Mr. Harris: They are moved at that time, before we take them to the yard, but we would prefer to have them three weeks old before we deliver them to the trench.

Mr. Wemlinger: Can the joints be made from the inside?

Mr. Harris: They can be made from the inside or in the manner described before, by knocking a hole in the upper part of the bell four or five inches in size, and the joints made by filling the invert with ordinary mortar, using a trowel and then pouring grout through bell opening at the top.

Mr. Hauer: Can you describe how you deliver and lay the pipe

Mr. Harris: Fortunately, most of the pipe was delivered after the first snowfall, October 30, and we used sleds for that purpose. We made some bob sleds. The large pipes were rolled on to a bob sled. A rope was then fastened to the sled, which was drawn by a horse. The pipe was distributed along the trench, and all the contractor had to do was to pass his derrick hook through the pipe, lift it over the trench, lower it down and put it in position.

at the lap by means of Sargent belt clamps, which are similar to the ring placed in a hog's nose. These clamps are then clinched with pliers, one being used on nearly every strand of wire. We set up the reinforcement on a mandrel and secure each strand at the lap, for the reason that we can thus assemble the wire mesh quicker than where it is set up on the base of the form before it is wired together.

Mr. Wemlinger: How large, approximately, is the saving as compared to monolithic construction?

Mr. Harris: I cannot say positively. Our experience with different contractors has proven that sometimes one contractor will figure lower on our pipe, whereas another contractor will figure much lower on the monolithic.

Ordinarily, the lock-joint pipe can be manufactured for less cost and placed in the trench for less money than monolithic, due to the fact that most monolithic pipe is heavier construction. Again, from the contractor's standpoint, there is rapidity of construction with the former as com-



Moving 72" Pipe to Side of Base with Movable A-Frame Derrick

Mr. King: What do you use to prevent the freezing of your concrete?

Mr. Harris: We use wooden flumes set alongside the pipe, and one flume over the pipe, making a V-shaped covering. We place in each pipe one or two gasoline lamps or torches, according to the expected temperature overnight, and between each two pipes we place another torch. We provide an opening so that there will be a circulation of air around the pipe, and had we placed the torch into one, the air would go round; but placing them between the two we were able to heat the air which went into the pipe as well as that which came out.

Mr. Hauer: How far apart were the forms?

Mr. Harris: At first three feet; later in the season we placed them six feet apart. It was then we used the additional lamp. The forms were spaced sufficiently so that the lamps could be set between them while we were still assembling the other forms. The method of doing the work is as follows: To begin with, one row of pipes, made the previous day, is stripped of the forms, then as these forms are stripped they are assembled in another row. The reinforcement is now placed in a slot in each inside form, and sand is placed in that slot to prevent concrete flowing into it; then the outside casing is placed in position, after which the concreting is the next and last step of the day's work.

Mr. King: How much lap in the reinforcement do you allow?

Mr. Harris: Six inches. The reinforcement is fastened

pared with the monolithic construction, which must be allowed to set before the trench can be back-filled.

There are few weather conditions that prevent the laying of the reinforced pipe.

Mr. Wemlinger: With your pipe the cost should be nearly constant for the same diameter of pipe.

Mr. Harris: The labor cost is practically constant in man-hours, but not so in dollars and cents; due to labor rates and the over head expense. Furthermore, it is never constant because of varying freight rates that influence the general expense. However, the man-hour cost per yard of concrete would be considerably less on the lock-joint pipe than on monolithic construction, because the concrete mixer can be placed closer to the pipes, unless it is placed above the trench and carried along with the work where the concrete is monolithic.

Mr. Wemlinger: Do you generally use a mixer?

Mr. Harris: Yes; where the yardage of the combined job will justify.

Mr. Wemlinger: Do you agree to furnish the contractor pipe to lay in his trench?

Mr. Harris: We agree to furnish it delivered to the trench.

Mr. Wemlinger: He has nothing whatever to do with the manufacture of the pipe?

Mr. Harris: No. We supply the sand, cement and the material. He buys this pipe as any other pipe, except that the breakage of clay pipe is usually at the risk of the con-

tractor, as it is delivered f.o.b. cars. But not so with us.

Mr. Wegmann: Do you have a great percentage of breakage?

Mr. Harris: No, sir; practically no breakage. We occasionally have a few bad pipes at the beginning of a job, where the materials are not what they should be. Sometimes there is too much sand. Originally the concrete specified was 1 to 4 or 1 to 5, and there was not sufficient cement to fill the voids, and we could not get a good concrete.

Mr. Lockwood: It was too weak?

Mr. Harris: Yes, sir.

Mr. Wemlinger: What is your limit as to the size of stone?

Mr. Harris: Ordinarily three-quarters or one inch.

Mr. Wemlinger: Do you use gravel?

Mr. Harris: Either gravel or crushed stone. For instance, on a pipe having a 7-in. wall, i.e., a 6-ft. pipe, we could use a lagrer aggregate. There may be pipe ranging from 24 in. to 96 in., and we specify a one-inch aggregate.

Mr. Lockwood: Do you find any difference?

Mr. Harris: We get as good concrete with one as with the other.

Mr. Wemlinger: You have a standard of thickness for each diameter, I suppose, Mr. Harris

Mr. Harris: Yes, sir. The dimensions of each diameter of pipe are fixed as a standard. If it were not so the cost of plant would have to be included in every job.

Mr. Wemlinger: How many forms do you use?

Mr. Harris: In Regina we had forms to turn out 100 feet per day, 100 feet of 30-in. and 80 feet of 48-in. forms. Ordinarily, a large job would be figured on the basis of 100 feet or more per day. If the contractor has to rush his work the size of the plant must be increased accordingly.

We use wheelbarrows, shovels and standard tools, such casing strippers; we have also an A-frame derrick, with a chain, blocks and trolleys of sufficient size to handle the pipes.

Mr. Hauer: Is the hoisting done by hand power?

Mr. Harris: Yes.

Mr. Wemlinger: Do you make specials?

Mr. Harris: Yes, sir; we make slants or "T" inlets.

Mr. Wemlinger: Do you make bands?

Mr. Harris: We make no bands, as they are not necessary in making our joints. We have used for our intakes, pipe as large as 84 inches in diameter without bands. Pipe now being made at Perth Amboy for a subaqueous intake is in 20-ft. sections. It is to be laid in cradles on piles, and a diver connects the sections by means of cast iron flanges set in the concrete pipe and bolted together by a diver.

Mr. Hauer: Did you ever try tamping concrete with a round bar? My experience is that you can do more with a round bar, working in a slanting or rounded form, as you have with your pipe, than you could with a straight bar.

Mr. Harris: I have tried using a slash bar, having a face on it of about one inch.

Mr. Hauer: That is too large.

Mr. Harris: We are using hoes with straight and long shanks and the blades curved to suit the form.

Mr. Hauer: I have used a one-half inch or five-eighths inch bar with a right angle bend four or five inches long, and found that this cuts the concrete and you do not have the suction with the bar that you have with the side of the hoe.

Mr. Harris: We never used such a tool.

Mr. Hauer: I think you would find it of advantage. A number of contractors find it better than the hoe.

Mr. Harris: You mean simply a bar, with the ends turned off at an angle of 90 degrees?

Mr. Hauer: Yes; it is very light, and the workman will do more work with it.

Mr. Wemlinger: Does that catch in the reinforcement?

Mr. Hauer: It would in some types of reinforcement, but not in the wire mesh of which Mr. Harris speaks. I have put up 3-in. walls with reinforcing in it, very successfully with those bars, and then I have used them on 3-ft. and 4-ft. thick walls, and especially on the face, and I got splendid results.

Mr. Harris: Do you find that these bars eliminate the air-holes?

Tamping with Round Bars

Mr. Hauer: Yes, sir. When you use a spade or a hoe you open up a large gap which permits the air to enter and stay in the cement, which does serious harm; while with a bar, the right-angle piece is always below the surface, and when it is drawn no air can collect.

In building small walls I had three or four men tamping with heavy tamps—about two by four. I then took off one or two men and gave them round bars, and they did more work than the others. It is like handling a heavy ram. The workman picks it up and then he lets it fall, and before he picks it up again he looks around awhile; with the round bar, on the other hand, being light, he will look around while he is working with it.

About seven years ago I found a large contracting firm making a specialty of reinforcing concrete, using these bars, and I did not begin to use them immediately. Although I used such a bar on one job, I paid no special attention to its work. Then I tried the old way again and made comparison of the two, and the more I have used the bar the more convinced I am that it is an economical thing to give you good concrete.

Mr. Lockwood: I do not tamp. I use a very wet concrete.

Mr. Hauer: If the wall is 6 in. or more in thickness you can; but take 3 or a 4-in. wall, even though you may take concrete so wet that it will run and pour it in that space, there will be air-holes in it.

Mr. Lockwood: It is a question of head or height and not thickness.

Mr. Hauer: You cannot throw concrete from any considerable height into these narrow forms.

Mr. Lockwood: I thought it could not be done, but I learned that it could.

Mr. Hauer: I find the concrete when very wet flushes from side to side, and dropping in 14 ft. slushed the boards. That was the trouble with a reinforced tank that I built. We bid \$1,800 or \$2,000 for this little reservoir and allowed \$200 for waterproofing; instead of that it cost us \$2,000 to waterproof it. The first four feet of concrete was so poor that it looked like a sieve. After trying several waterproofing mixtures or compounds without satisfactory results, we built a 3-in. brick lining, leaving 2 in. of space between the brick and the concrete, which was filled with grout, and we had no further trouble with the waterproofing. It leaked very little and whatever leakage took place must have come through the bottom itself.

Mr. Lockwood: Any waterproofing I have tried needs to be put on as quick as you can strip your forms. I usually take five pounds of potassium alum—not ammonia alum—one pound of concentrated lye; mix that with a gallon of water; then take one pound and a half of this solution and mix it with ten pounds of cement, and water to make it like whitewash. This is then put on after adding enough sand to make a three-to-one mixture, and rub it until it lathers. If it don't lather, it won't do the business. I put this lather on a wall 3,800 feet long with 30 feet of water back of it.

Mr. Hauer: What about waterproofing pipe of this style, and especially pipe having to sustain internal pressure?

Mr. Harris: I think we could safely guarantee to make a pipe that will sustain 20 pounds pressure, but I do not think at the present time we could guarantee service for higher pressure. I believe that later we shall be able to make pipes

that will resist a higher head. We can make our concrete as strong as we want by using heavier reinforcement; but we want to fill the pores of the concrete with something that will close them and not injure the concrete. By grouting the pipe I was able to go up to 20 pounds pressure.

I did not mention the waterproofing process where I got 30 pounds pressure, as I am not sure the final results will be altogether right. In other words, I am not sure what effect the process has on the strength of the concrete. That is the main point. If we are using waterproofing that will cause the concrete to lose strength in course of time, we of course do not want it.

Mr. Hauer: Do you think this pipe could be used for water supply?

Mr. Harris: It could be for main conduits, but not for house service connection.

There is another thing to consider in a pipe joint; i.e., the effect of placing the new mortar or joint compound against old concrete. If the shrinkage is only 1-1,000th of an inch, water will find its way through the crack at certain pressures. We do not know at the present time how tight we can make our joint. We are experimenting to make them water tight against high pressures.

Effect of Oil on Concrete

Mr. Simth: I understand that accidentally a barrel of oil burst in the cement storehouse of the Agricultural Department, and it was found that when mixed with the cement it made a splendid waterproof concrete. Since then they have experimented with it, with the result that they have used oil instead of water with the concrete there.

Mr. Harris: What was the nature of the oil?

Mr. Smith: I do not know. I gathered these facts from an official report which did not give this information.

Mr. Harris: The Louisville Cottonseed Oil Company was considering the use of concrete for tanks to hold cottonseed oil. They made test pieces and found that the concrete disintegrated when immersed in the oil. Why this happened in this case but not with the other oils I do not know.

Mr. Hauer: They are building some tanks on the Pacific coast, very large ones, taking a month or more to empty them.

Mr. Harris: I do not know what there is in cottonseed oil that should break down concrete any more than linseed or machine oils would. I have yet to find an engine room floor where the oil will disintegrate the concrete.

Mr. Hauer: In excessive quantities oil is supposed to be detrimental. It is certainly excessive in these tanks out west.

Mr. Smith: But the concrete from which these tanks are made is mixed with water instead of oil. It merely holds the oil.

Mr. Harris: I know of an experience a cement company had about cement not setting. The contractor complained that the cement was poor, and the cement people took samples, but could not find out what the trouble was. They were on the job one morning and found that the contractor was greasing the inside of his mixers to prevent the cement sticking.

Mr. Wemlinger: What was the oil used?

Mr. Harris: Linseed. There was some mineral oil in it.

Mr. Lockwood: I use North Carolina tar and Rosendale cement as a mixture, and as far as I know it is absolutely water-tight. I use that on sewer pipe joints.

Mr. Smith: If you mix that tar with any other cement wouldn't it make water-tight joints?

Mr. Lockwood: If you mix it with Portland cement you cannot get the same results.

Mr. Hauer: Do you mix sand with it

Mr. Lockwood: No; just the Rosendale cement and tar. This North Carolina tar is peculiar. You must take a

shovel and dig it out of the barrel. It does not get brittle.

Mr. Lockwood: What size mesh do you use?

Mr. Harris: We use a 4-in. mesh. The cross wires are spaced on 2 and 4-in. centres, and the longitudinal strands spaced on 4-in. centres.

Mr. Hanson: Do you have any trouble with the specifications? I remember a job on which I was working where the inspector rejected all pipe with airholes. Is that customary, Mr. Harris?

Mr. Harris: No, sir; that is not customary. We have found specifications that require tests under which monolithic work could not be constructed. We are willing to guarantee the same quality and strength as on any form of concrete construction, but we are not in favor of making concrete pipes to stand tests more severe than required for monolithic structure. One engineer stated to me that "I would have allowed your pipe in the specifications, but I have fixed them so that you cannot bid." (Laughter.)

Mr. Lockwood: Why did you settle on 4 feet as the length of your pipe?

Mr. Harris: We have some larger pipe, made in Havana, that is only 3 feet long. That is used in deep trenches. We can make the 4-foot section almost as quickly as we can make the 3-foot section, and the contractor can lay it as quickly.

Mr. Lockwood: How about an 8-foot section?

Mr. Harris: A 4-foot section is about the maximum height which a man can make conveniently standing on the ground. If we went over that height we would have to construct runways, which would run up the manufacturing cost. All of our molds are now made to be filled by hand.

Foreign Labor Organizing

Mr. John A. Flett, general organizer of the American Federation of Labor, has begun the systematic organization of Italians, Hungarian, Polish and other foreign labor in Canada. A meeting for taking the initial action in this movement was held in Montreal on April 16 when several hundred workmen signed a petition asking for a charter. Further meetings for completing the organization will follow, and the organizers expect to meet with entire success. There are said to be about 1,200 Italian workmen in the Montreal colony alone. Mr. Flett stated that Italians had not been getting fair wages in the past but had been taken advantage of by labor agents in all branches of work. They would now have regular officers and a scale of wages corresponding with the different departments of work in which they were engaged. Considerable interest exists on the labor market, and before any forecast can be made it will remain to be seen what scale of wages will be adopted.

At Fort William the C. P. R. has built a bridge over the Kaministiquia river. It is a Strauss-Bascule, double track, double deck bridge, the ground level being for railway purposes and the upper deck for vehicular traffic. The movable span is 186 feet in length and the approaches measure about 70 feet of construction work at each end. The contractors for the steel work were the Canada Foundry Company, of Toronto, and the substructure was built by A. C. Stewart, of Winnipeg. At McKellar the C. P. R. has erected a double track railway bridge with highway space on one side on the same level. This bridge is of the Scherzer type of Bascule bridge. The movable span is 100 feet long. The masonry work of this bridge was constructed by A. C. Stewart, of Winnipeg, and the steel work by the Canada Foundry Company, Toronto.

Sprinkler Tank Supports*

The last of a very interesting series of technical papers read before the Architects' Association of Quebec, at Montreal, was on the subject: "Notes on sprinkler tank supports." This paper was prepared and read by Mr. Marcel Beullac, C.E., B.Sc., special lecturer on structural engineering at McGill University.

Mr. Beullac introduced his subject by remarking that, curious as it might seem, the curtailment of the title of his paper by dropping the first two words in the announcement had considerably enlarged its scope. He, however, would confine himself to the original topic.

The lecturer eliminated sprinkler towers built separate from buildings and carrying sprinkler tanks only, which were engineering structures generally, outside the field of architecture.

The construction of a sprinkler tank involved the problem of keeping the water from freezing and he described the different methods for doing this, one being to house the tanks and another to heat the water either by introducing steam coils inside the tank at the bottom, or by means of a steam jet below the surface of the water.

Taking up the subject of the loads that would have to rest on the supports Mr. Beullac mentioned three points for consideration:

- (1) The dead load of the tank and support.
- (2) The live load of the water in the tank.
- (3) Wind pressure.

An important item to be reckoned with was the amount of moisture that would be absorbed by different kinds of wood that might be employed in the construction of tanks. He showed that the increase in weight of wet woods over dry woods was from 20 to 40 per cent.

In designing supports for sprinkler tanks it was necessary to consider the real and not the nominal capacity of the tank. On account of the wind-load being considered, the snow-load was usually neglected.

Mr. Beullac then explained how the load bore on the joists in relation to the dead load, water and wind. Photographs showed the effects of these on joists and supports, one effect being a tilting or slanting, either on steel or wood, and the other the crippling of steel supports.

Speaking of bracing, Mr. Beullac declared it to be his opinion that angle-sway braces were safer than rods with turnbuckles.

Mr. Beullac showed drawings of batter towers. These were supported by inclined posts strengthened by struts and sway braces. He did not see that these had many advantages over the vertical tower. There was little danger, he said, of both tanks and supports tipping as a result of wind pressure when a tank was full. If the tank were empty when struck by a strong wind it might tip. It had occasionally been found that tanks supposed to be full of water were quite empty, this condition of affairs being due to the fact that the indicator got caught at a point where it showed the tank to be full so that it failed to go down with the water, the true condition of affairs only being found through casual inspection. This showed the necessity for frequent and careful inspection. The wind pressure on a tank house was greater than that on the tank itself owing to the shape and greater bulk of the tank house. Tank houses are sometimes braced against the floor of the tank. Several photographs were shown to illustrate the different styles of tanks, tank houses, supports, and foundations to be found in Montreal.

Speaking of tanks constructed on old buildings, Mr. Beullac declared that at best they were simply a make-shift and he expressed the hope that the committee now engaged in forming a new building by-law for the city of Montreal would see to it that the construction of sprinkler tank sup-

ports be regulated and that in future no sprinkler tank supports be placed on buildings not designed for this purpose and that sprinkler tank supports on old buildings be carried by new structures built from the ground up.

The fact that sprinkler tanks would be with us for a while yet—probably until a high pressure system for fire protection is installed—made it absolutely necessary that the supports should be constructed with a view to perfect safety; and tanks could be made safe. Tanks to be seen on buildings, speaking from the artistic viewpoint, were positive eye-sores. He was pleased to say that some tanks had been enclosed by towers which completely hid the tanks and at the same time added architectural value to the buildings. The Lyman and Birks buildings were examples in point. In the Birks building provision was made for a fireproof stairway to be used as a fire escape in connection with the walls supporting the sprinkler tanks.

An Interesting Discussion

At the conclusion of the paper a vote of thanks was moved by Mr. A. C. Hutchison and seconded by Mr. Arthur Amos, after which a discussion took place, when many opinions and suggestions were advanced.

To make sprinkler tanks safe it was asserted a little more money would have to be spent by proprietors and less leniency must be shown by architects, but the path of safety should be insisted upon, and in the end it would pay. The serious accidents that had occurred in Montreal had been traced to insufficient supports and defective walls. Some walls that appeared to be well built, so far as the outward indications went, were found, on being pierced, to be hollow, due to skimping on the part of irresponsible workmen or negligent contractors who were in a hurry to get through with their job at a profit, their tender having been too low to enable them to do good work.

A point not touched in the paper was brought out during the discussion, and referred to the question of vibration. An instance was given of a seven-storey building where the vibration affected shelving on the top storey to the extent of a quarter of an inch. This was most noticeable in the front of the building, but there was a sprinkler tank on the rear of the building which was constantly being affected to some extent by the vibration. It was contended that no large tanks should be erected on old walls, for no architect living could tell on sight what the inside of a wall was like. Tank supports should be constructed by conscientious and capable contractors. The calculations were complicated and should not be left partly to the guess work and partly to the bad arithmetic of junior clerks, draughtsmen, or contractors.

According to one speaker there are few really safe sprinkler tanks in Montreal. Three-legged tank supports were almost always unsafe. Among the causes contributing to accidents were mentioned the bursting of staves and hoops, the giving way of joists, the buckling and corroding of steelwork, and the miscalculation regarding certain forces which under special circumstances should be taken into account.

As an alternative to the sprinkler system one speaker mentioned a double water pressure connection from the street which it was stated would secure equally favorable insurance rates. Still another suggestion was the installation of a water pressure tank in the basement.

"Tankophobia" was the name suggested for the agitation in favor of the sprinkler system and the many questions growing out of it. There were many other problems of equal importance being dealt with every day by architects in connection with plans calling for weight-carrying and stress-resisting walls and other supports. The practice some people were indulging in, of adding third and fourth and fifth, and even more storeys, to buildings originally

*Specially contributed by our Montreal Representative.

intended to be two storeys in height, was equally dangerous. This was particularly the case when different architects and different contractors were employed in carrying up the additional storeys. It was feared that some day Montreal would be shocked by a heavy casualty list resulting from

the collapse of such a structure. The only safe fire-escape for industrial establishments in the opinion of one speaker was the independent fireproof stairway.

Mr. J. Rawson Gardiner, president of the Architects' Association, presided.

The Manufacture and Testing of Fire Brick

Composition of Fire Clay—Practical Notes on Mixing, Preparation, Moulding, Drying and Burning—General and Specific Tests

By A. V. Bleininger

With regard to the manufacture of fire brick we might consider this subject briefly from the standpoint of the mixing, preparation, molding, drying and burning.

The ideal fire clay would be a pure clay possessing sufficient, but not excessive plasticity, good working and drying qualities, low burning shrinkage and, of course, maximum refractoriness after burning. However, such a combination of qualities is difficult to find. The fire clays which are available are frequently clays of practically no plasticity and which cannot be worked alone. They show, of course, no drying shrinkage, but are often highly refractory since they correspond closely to the composition of the pure clay substance. Hence, while they are valuable on this account they are troublesome on account of their lack of working qualities and their high burning shrinkage. These clays are known as flint clays. They vary in composition and qualities from locality to locality, and, hence, the term flint clay does not necessarily mean a high grade material. These clays, when mined, are quite hard, of dense conchoidal fracture, but after long storing become softer and show a slight increase in their working qualities. If ground very fine in a tube mill, especially in a wet condition, these clays could be made to develop sufficient plasticity to be made into bricks by the slop process.

Again, the fire clays may be clays of the so-called "set" type, which, though like flint clays in being nonplastic at first, are readily made plastic by ordinary fine grinding. The writer has seen such clays from Alabama, which could be manufactured into high-grade products since they have practically the composition of kaolin, and, hence, are exceedingly refractory.

The fire clays most frequently found are of the plastic type, but of inferior refractoriness, approaching more or less the No. 2 fibre clays in composition.

From what has been said it is quite evident that it is difficult to find a clay which in itself could constitute a good fire brick body. In most cases, therefore, we are compelled to produce a body consisting of flintclay and bond clay, mixed together in about the ratio of 6:1 for high grade products. In some cases the burning shrinkage of the flint clay is so high that part of it must be calcined or replaced by crushed old fire brick, called grog. As regards mixing the fire clay it might be said that it is of primary importance to study the formation and quality of every part of the clay deposit so that there is not the slightest doubt as to what part is of inferior or superior refractoriness. If a certain vein or streak is of low value it should be clearly recognized and rejected. On the other hand, if the low grade material is but small in quantity and cannot be plainly recognized it might be possible to render it more harmless by causing it to be mixed uniformly with the entire output of the clay mine so that the average content of the injurious clay is very low. This would mean, of course, a good-sized stock shed, which, by the way, would be an excellent investment for almost every fire brick plant.

As to the proportioning of the flint and plastic clays it might be said that this should be done by proper mechanical devices so that the desired amounts of the two clays are introduced at all times, thus resulting in a more uniform mixture. It usually is most desirable to mix the ground flint and bond clays.

Preparation of the Clay

The customary preparation of the clay mixture consists in dry pan grinding, screening and tempering in the wet pan. Where the bond clay is of good quality this treatment is amply sufficient, but where the quality of the product suffers by the use of an inferior plastic clay a different treatment might greatly improve the resultant quality of the brick. Owing to the fact that the breaking down of a fire brick is due to its least refractory constituent it is easily seen that the quality of the product may be improved by grinding the plastic clay with some of the flint clay to an intimate mixture which passes quite a fine mesh, say the 20 mesh screen. To illustrate, if a brick could be improved by grinding, say 20 per cent. of the flint with the 15 per cent. plastic to this fineness and using as the bond these 35 per cent. of mixture. The writer has succeeded in improving by this treatment a fire brick which otherwise would have been of low quality. There are now many grinding machines on the market which could do this kind of fine grinding very cheaply and efficiently, and this suggestion might prove of considerable value to plants now struggling with the annoying bond clay problem.

Most of our fire brick are molded by the soft mud process, either by hand or machinery, and are frequently repressed. For most work this kind of brick is probably the best, though for certain purposes such as gas benches, etc., where the brick are subjected to the effects of high temperature and pressure the dry press process is to be preferred.

The drying offers, as a rule, no difficulty, however, and need not be considered in this connection. As regards the burning it might be said that the temperature should be carried as high as possible.

It is a well known fact that the burning shrinkage of a clay does not reach its limit with the first burning, but that some additional shrinkage takes place on re-burning, though in decreasing amounts. Although we are not able to burn fire brick so that no further shrinkage whatever takes place on heating, yet we should endeavor to carry the burning as far as possible. Underburnt fire brick are very undesirable for many purposes and the burning temperature should in no case be below cone 12. The idea that soft burned fire brick are as good as the harder burned is erroneous.

As to the testing of fire brick the subject might be considered under the heads of general and special tests. The former involve the questions of refractoriness, chemical analysis and load carrying ability. The latter depend upon the use to which the brick are to be subjected, involving the action of slag or glass, abrasion by ore; action of caustic lime at a red heat or any or other numerous factors.

Summarizing again the general tests for No. 1 fire brick it might be said that the brick should not soften below cone 32, should be as low in fluxes as possible, not over 0.20 RO expressed in chemical equivalents and should be able to carry a load of 50 lbs. per square inch at 1,350 degs. C., as practiced in the test used by the Bureau of Standards.

There are as yet no general requirements establishing clearly what properties constitute a No. 1 fire brick and how it differs from the No. 2 material, and the writer would suggest to the manufacturers of fire brick that it might be well to co-operate in setting down certain definitions along these lines, though naturally it is impossible to cover every case of the use of fire brick. This suggestion is made with the idea of benefiting primarily the manufacturer who, in many cases, is not receiving the equivalent of the value of his products and of putting a premium on quality. High grade brick should be paid for according to their quality.

This question is an important one as may be seen from the current articles in the metallurgical journals, in which the question of refractories is constantly brought up. If any specifications are to be drawn up as is being demanded by the metallurgical engineers, let the movement start from the side of the manufacturers in order to avoid the danger of unjust demands on the part of the users which would work harm to the fire brick industry.

Railway Companies' Marathon to the Coast

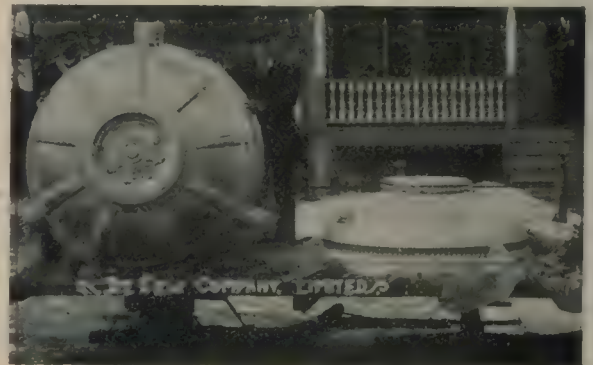
The Grand Trunk Pacific and the Canadian Northern are each striving to make the first connection with tidewater on the Pacific. Two years ago the Grand Trunk Pacific and the Canadian Northern were battling for primary location of route through Yellowhead Pass in the Rockies. The Grand Trunk Pacific won out, but the year following the Canadian Northern beat the Grand Trunk to it for a location or route down the North Thompson river into Vancouver. With the Canadian Northern building its line to Vancouver via the North Thompson, and the Grand Trunk Pacific heading for its terminals at Prince Rupert via Fort George, both railways are plunged into a keen race for the first completed grade through to the Pacific. West of Edmonton, which is the base of this race, the Grand Trunk Pacific has 200 miles of grade completed, while the Canadian Northern has only 40. From the Pacific end, the Grand Trunk Pacific has 150 miles of grade completed to the Canadian Northern's 70. For the past two years the Canadian Northern has not been doing much grading on its main line west of Edmonton. With the Grand Trunk Pacific rails laid within a few miles of its proposed route, almost parallel for the whole distance west of the mountains, and with the advantage of being able to ship in supplies and outfits by rail right to the very doors of the construction camps, the Canadian Northern will concentrate its greatest construction efforts of the undertaking of rushing its main line through. The Canadian Northern will also undertake to complete, ready for the steel, exclusive of the bridges, 400 miles of main line grade every year until its line is completed to the Pacific coast. The Grand Trunk Pacific is building its lines in 100 mile stretches, while the Canadian Northern is building its in 200 mile stretches, building 200 miles from each end of the line. With the completion of the 200 miles contract west of Edmonton, the line will reach the Athabasca river in the mountains, while the 200 mile contract out of Vancouver will carry the line to Kamloops. With the completion of the 400 miles next year, this will bring the two ends of the line within about 300 miles of each other, and in the next year, which will be 1914, the whole line should be finished whereby the east should be connected with the west by the Canadian Northern Railway.

Indirect Illumination in the West

Though the first installation is not yet a year old, indirect lighting has already secured a firm hold in the west. R. G. Dunn and Company were the first to secure an installation and others followed in rapid succession until at present there are over 250 installations in Winnipeg and many farther west. The system has taken hold strongly with architects and owners so that many of the new buildings now under construction have specified either indirect lighting throughout or with direct lighting only where it is desired for the decorative effect.

It is significant that the G. T. P. have specified this system for the whole of their western offices and depots wherever electrical energy is available. They have awarded the contract for all of their work to the DeCew Company, Limited, and many of the installations have already been completed.

The two large Methodist churches just completed have also put in the indirect lighting system, and efficiency tests have shown that it is most economical. Of these Young Church is probably most worthy of mention. The total installation is 7,740 watts, the greater part of which is carried in four large special fixtures, built according to a design accepted by the architect and church board. These are



Indirect Lighting Fixtures for the Young Methodist Church, Winnipeg.

5 ft. 4 in., outside diameter, and weigh 275 pounds each. Each fixture carries 15 tungsten lamps of 100 watts each, giving a candle-power of 1200. A smaller fixture in the organ loft carries 600 watts and under the galleries there are ten others carrying a total of 1140 watts. The main fixtures are carried on heavy bronze chains and are a material addition to the general design of the interior. While the source of light being hidden gives the impression that it is not adequate, it is found by experience that it is much more effective than a direct system using the same amount of current, in that it casts no shadows and is most perfectly diffused.

One of the advantages of the indirect system is that fixtures of any desired design may be readily built. The fixture is first modeled in clay, then a mould is made and the finished product is made from a special composition which may be poured the same as plaster of Paris, except that it is capable of taking a better finish. Any desired finish may be given in iron, bronze or gold to suit the scheme of decoration. Completed, the fixture weighs less than the old style of brass fixture of equal candle power.

In addition to the manufacture of these fixtures the DeCew Company has also started a department of plaster modelling and is prepared to undertake work of all kinds in this department. In the past, architects have to a large extent neglected plaster for interior decoration, chiefly because it was necessary for them to send out of the city for it.

East and West -- Montreal and Vancouver

Activity in General Building and Municipal Work—Noteworthy Prospects—Steel Plant for Vancouver—The Labor Situation at Montreal

Correspondence of the CONTRACT RECORD.

Vancouver, B.C., April 19, 1911.

If it were not for the uncertain state of the weather here building operations would now be in full swing. Vancouver has no special building season so far as temperature goes, but the downfall of rain every other day or so during the winter and spring causes temporary breaks in outside work, which, however, are not sufficiently serious to affect the trade materially, as may be gathered by Vancouver's position at the head of the list of twenty-six leading cities of the Dominion, for the first quarter of 1911. Vancouver's progress just now is one continuous record of improvement. Of the February total of \$4,051,958 for twenty-three Canadian cities Vancouver's share was \$1,047,730—more than one-fourth.

Large financial concerns are buying up available property or land upon which is located old rickety buildings, and modern office buildings, stores and apartment houses are being erected rapidly. Eastward from Cambie street to Main street there are very few building sites not covered by substantial structures.

Excavations are in progress on five splendid building sites between Main street westward on Carroll—the dividing street line of the east and west ends of the city. Large stores and offices are planned.

Messrs. Allan Bros., of Pender street, have purchased a site at the corner of Main street and Seventh avenue, where they will erect a large business block, tenders for which will be called almost immediately.

A seven storey steel-concrete building will be erected at the corner of Broadway and Main street by Mr. Lee. Excavations have been completed but the work has been delayed for steel which will arrive from England via the Horn. A great deal of building is going on in this district which is one of the busiest parts of the city, inasmuch as the car lines at the junction of Main street and Broadway reach all suburban points.

Le Mesurier & Company have purchased a site on Richards street, near Georgia street, upon which they will erect a large business block. Messrs. Springer Bros. will erect 100 dwellings, mostly of the bungalow type, ranging in cost from \$1,400 to \$2,800. These houses will help somewhat to meet the large demand for such structures all over the city. An apartment house to cost \$18,000 will be erected by R. Y. Blackhall at 1137 Burrard street, and a residence costing \$12,500 by Mr. Hector Stewart on Triumph street.

Among the noteworthy projects under consideration may be mentioned the proposed steel works, which will probably cost \$1,000,000. Mr. W. Owen, the steel expert, has returned from England and is selecting sites for the erection of the new plant. He told our representative that he was unable as yet to go into details but said that all the capital required for the undertaking had been secured; and further, that deals have practically been closed for the purchase of iron areas in the province.

A trainload of electric generating machinery arrived on March 31 from the east for the Western Canada Power Company. Contracts were awarded recently for the construction of a \$200,000 power house and \$100,000 receiving station, and for the erection of the first of the big steel towers for the power transmission line. The location of the works is at the Stave river falls, near Ruskin, B.C., 35

miles northeast from Vancouver. Over 500 men were put to work in various capacities, the wages paid being more than \$40,000 a month, exclusive of supplies. The next three months will be marked by increased activity as the \$3,000,000 plant approaches completion. This company will supply light and power for this city.

To date \$4,260,451.85 has been passed for local improvement work, and eighteen months' work is in sight. The city's portion is \$1,462,560, and the property owners' \$2,797,891.85. These figures are given out by City Controller Baldwin.

Vancouver and North Vancouver jointly will spend \$27,150 improving and widening the Capilano (pipe line) road. This picturesque highway will have a uniform width of 66 feet for about seven miles.

North Vancouver

Along the North Vancouver waterfront, on Burrard Inlet, wharves and warehouses are gradually making their appearance. Whilst progress in this line of building does not seem so prominent as the construction of residences and blocks through the residential and business sections of the city, yet it is most commendable that waterfront industries are creeping into existence at the rate they are, considering that there is no railway communication outside the city. This latter lack of a public utility is expected to be but short-lived, for negotiations are so far advanced for the building of a joint traffic and railway bridge at the Second Narrows that it can be said with assurance that it is only a matter of months until active operations will be commenced.

A Clear Horizon at Montreal

Office of the Contract Record,

Montreal, April 24, 1911.

The number of permits issued by the City Building Inspector for the month of April up to the 19th was 224. Most of these were for new work. The estimated value of new buildings was \$721,960, and of alterations, \$68,305, a total of \$790,265.

As the result of numerous conferences between the labor leaders and building employers, the difficulties that appeared to be looking up at the beginning of the season have been smoothed over, so that at the present time no labor troubles are anticipated. The plasterers have signed a new agreement for a scale of 42½ cents an hour, to take effect after July 1st. The present wage is 40 cents. After November 1st the eight-hour day will come into effect, and on January 1, 1912, effect will be given to the union scale of 45 cents an hour. A committee of arbitration representing both employers and employees has been organized to settle any difficulties that may arise in this branch of labor.

It is declared on behalf of the employing carpenters that they will not acknowledge the union scale. First-class carpenters may get this wage, but contractors will not sign any agreement recognizing this as a fixed rate of remuneration. Just what the outcome will be cannot be definitely stated, but no trouble is anticipated.

It is stated that the city of Winnipeg is about to advertise for a manager for the new municipal power plant at Point du Bois, now nearing completion.

Canadian Contractors and their Work

Two of the Best Known in the Western Field: Peter Lyall, Jr., and J. D. McArthur—How They Achieved Their Success

Peter Lyall, Jr.—Montreal, Winnipeg and Regina—three Canadian cities, each with a world-wide reputation—have offices of the firm of Peter Lyall & Sons. This is the growth of a single concern in thirty-five years, a firm of contractors which has undertaken and carried through some of the largest work in the country. Peter Lyall, Sr., born in Caithness in 1842, came to Canada a young man, imbued with a determination to succeed. It is needless to follow



Peter Lyall, Jr., Winnipeg, Man.

the various steps which finally brought him into prominence, but in 1875 the firm which bears his name was organized. Together with his three sons, all trained in various branches of the building trade, he has carried the firm half way across the continent.

The senior member of the firm is not so well known in Winnipeg as his son, Peter, Jr., who for several years past has been in charge of the work in the west. Among their notable achievements may be mentioned the C. P. R. depot and Union depot, at Winnipeg, and the new parliament buildings of the province of Saskatchewan at Regina.

The first contract secured in the west was the C. P. R. depot, then one of the largest pieces of work attempted in Winnipeg. The difficulties which had to be overcome were tremendous. For instance, the railway company desired that native stone should be used and at the same time there were no cutting yards big enough to undertake the work, nor was it possible to secure a large enough gang of hand-cutters to deliver it within the specified time. The contractors put in a mechanical cutting plant with diamond saws, gangs, and planers. The hand-cutters went on strike as a protest against the introduction of machinery, but the strike was broken by the importing of a couple of carloads of cutters from Quebec. A steel erecting gang went on strike and a gang of foreign laborers were broken in to do the work. But the finished contract was turned over on time. And so it has always been with other works undertaken: a Lyall contract is a fact, not a proposition.

The branching out of this company into various fields

has, to a certain extent, been forced upon them. Before they entered the field, the greater part of the large dimension cut-stone was imported, with the result that but little of it was used. East of Winnipeg there is a good deposit of limestone, but the owners did not have sufficient capital to handle it. Peter Lyall, Sr., furnished the capital and the firm to-day are operating it. At the quarry they have installed one of the largest cutting plants in Canada, with every modern facility. The stone for the Parliament Buildings at Regina was furnished from there, as well as that for the Winnipeg Union Depot.

Peter Lyall, Jr., is now just in his prime—a keen sportsman and an all-round favorite. He is surrounded by a staff of loyal, competent men, and the firm is in a position to undertake work of any magnitude. The western branch is prosperous; in fact it is whispered that it will be but a short time before the western end of the business surpasses the eastern in importance.

J. D. McArthur.—After 31 years in the Canadian west, to have arrived at the head of one's profession, is a feat to boast of; and if at the same time one can point to great works accomplished, that in itself provides a sufficient monument.

Builders are what is wanted in Canada, and it is worthy of note that Canada itself has provided some of the most notable of the men who have striven to bring Canada to the fore.

Probably no part of Canada has furnished more noted contractors, men who have accomplished great things and left their mark on the transportation systems of our country—than Glengarry. J. D. McArthur, railroad builder and



J. D. McArthur, Winnipeg, Man.

lumberman, is one of these. Born on a farm in Glengarry, Ont., on June 25, 1854, he was one of those young men who first received the call of the west, where he arrived at the age of twenty-five years. Equipped with perfect health, indomitable energy and a public school education, it was

but a short time before he found his way into railroad work, then one of the biggest problems of this new land. His first work was with a "flying gang" on the C. P. R., where his duties consisted of being ever ready for a rush order to any part of the system where there was trouble, wreck, breakdown or land-slide.

At that time but little capital was required if one wished to get into construction work, and a very short time found J. D. in charge of a piece of new work. As the main line was carried west he was always ahead of the steel, finishing up with a piece of heavy rock work on the eastern slope of the Rockies. Then there were many branch lines to be built and these served to keep his outfit busy, year after year. There was one piece of work, put through a few years ago, which gave him a record among railway builders. A section of 500 miles of a C. N. R. line called for a rush order; Mr. McArthur received the contract and in nine months the grade was ready for steel.

Immediately following this came the contract for section "F" of the Transcontinental railway, a piece of road which cost \$13,000,000 to build, and which is one of the finest sections of roadbed in Canada—if not on the continent. It was a monumental task to put that line through within a specified time, but it was done, and done properly, and to-day the greater part of it rides like a piece of old roadbed, though for miles it runs through muskeg country, which is considered one of the greatest obstacles of the railroad builder.

It must not be imagined for a moment that these thirty-one years were periods of constant sunshine. They were not. In fact there were times when a confirmed optimist would have had trouble in finding a ray of sunshine; and it was only those with pluck and endurance, who at the same time commanded the respect of their backers, who pulled through. Like many other contractors whose work was on prairie sections, Mr. McArthur carried a heavy outfit of teams, and during dry years oats and hay were almost prohibitive, so that idle teams would eat their heads off during the winter. To keep them busy he went into the lumber business, where spring freshets, snowless winters and a hung-up log drive sometimes spelled a bad season.

But that time is now past, and were it not for his restless energy Mr. McArthur could retire very comfortably from active work—something, by the way, which he does not propose to do. A year ago he invested a portion of his money in the construction of the largest and most commanding office building in Winnipeg, and he has also entered largely into the lumber business in British Columbia. Land and other interests take up the balance of his attention.

Personal Mention

Mr. J. G. Rossman, of New York, has been appointed manager of the new civic power plant, Winnipeg.

Mr. J. P. Napier, of Victoria, B.C., has been appointed assistant engineer in the department of public works for British Columbia.

Mr. Geo. D. Mackie, of the John Galt Engineering Company, Winnipeg, was in Ponoka, Alta., recently, taking levels preparatory to street grading.

Mr. J. N. Stone, manager of the Dominion Bank at Windsor, Ont., has been appointed secretary-treasurer of the Bishop Construction Company, Montreal and Toronto.

Messrs. Hayden & Slean, of Calgary, Alta., were the successful contractors for the erection of the Swiss village, which the C. P. R. is establishing in the Rockies.

Mr. Peter Lyall, Jr., Winnipeg, is identified with an English syndicate which proposes to erect a 14-storey build-

ing on Main street, Winnipeg. Plans for the structure have been recommended to the city council for acceptance.

At Edmonton, Alta., last week, Mr. Lionel Gibbs delivered an address on Civic Planning before the St. George's Society. Mr. Gibbs advised the city to prepare for the time when it would have a population of 500,000.

Mr. Charles Macdonald, who was recently appointed to fill the vacancy on the Quebec Bridge Commission caused by the resignation of Mr. FitzMaurice, was born at Gananoque, Ont., on January 26, 1837. He received his early education at the old Kingston Grammar School and later at the Polytechnic Institute at Troy, N.Y., from which he graduated as a civil engineer in 1857.

His professional career commenced under the late Mr. Samuel Keefer, C.E., on the survey of the Grand Trunk Railway. Later he took up residence in New York, joining the Union Bridge Company, of which he became head. As an engineer he devoted himself chiefly to the design and construction of railway bridges, of which may be mentioned



Mr. Charles Macdonald of Gananoque, Ont.

the bridge across the Hudson river at Poughkeepsie, N.Y., and the Hawkesbury river bridge, New South Wales, Australia. This latter bridge is remarkable on account of the depth of the foundations.

In 1894 the degree of LL.D. was conferred upon Mr. Macdonald by Queen's University. He is commodore of the Gananoque Yacht Club and is interested in all kinds of sport.

Mr. John G. Glassco, formerly with the Dominion Power & Transmission Company, at Hamilton, Ont., has been appointed Electrical Superintendent of the Winnipeg municipal electric station at Point du Bois. For the past two years Mr. Glassco has been with the construction staff of Smith, Kerry & Chace, of Winnipeg and Toronto.

Mr. F. C. Gamble, formerly Chief Public Works Engineer and Inspector of Railways for the Government of British Columbia, has been appointed Deputy Minister of Railways of that province. Mr. Gamble is succeeded as Public Works Engineer by his former assistant, Mr. J. E. Griffith.

Mr. R. J. Lecky, of Regina, who, up to the present time, has been manager in that city for Peter Lyall & Sons, was the successful tenderer for the Methodist College in

Regina, for which Messrs. Brown & Vallance, Montreal, are the architects. The contract price is \$268,780, which sum is for the erection of the first section, only, of the college buildings. Mr. Lecky has had charge of the Parliament Buildings contract at Regina, involving an expenditure of one and a half million dollars.

Mr. F. H. Peters has been appointed Commissioner of Irrigation, vice Mr. John Stewart resigned. Mr. Peters will be called upon to supervise many important projects in western Canada, including the extensive work now being carried on by the Canadian Pacific Railway.

Mr. N. J. Ker, city engineer of Ottawa, returned last week to the Federal Capital after spending four days in Preston, Berlin, Galt and Toronto. Incidentally, Mr. Ker spent part of the time with City Engineer Rust, of Toronto, who was also taking a short holiday. During his trip Mr. Ker inspected the bacteria beds, septic tanks and sewage disposal system in Berlin.

Canadian City Engineers

Allan Waters, Nanaimo, B. C.

Mr. Allan Waters, City Engineer of Nanaimo, B.C., was born in the county of Essex, England, in 1868, and was educated at the Collegiate School, Tunbridge Wells, Kent. On leaving school was articled to Mr. S. W. Haughton,



City Engineer Waters, of Nanaimo, B. C.

M.S.A., architect and surveyor. Upon the completion of his articles he entered the office of a London architect and district surveyor. Later, in architectural offices in Derby and Manchester, he obtained extended experience on the erection of large business blocks and ecclesiastical buildings. Mr. Waters left the Midlands for South Wales upon his appointment as assistant surveyor to the Barry and Codoxton local boards, afterwards entering the offices of the Metropolitan Board of Works of London (now defunct) where he was engaged chiefly on main sewer extensions.

In 1893 Mr. Waters received an appointment on the staff of the Director of Works of the Admiralty, being appointed to the Devonport Naval Yard under E. Colson, Esq.,

C.B., an eminent dock and harbor engineer who designed the large Alexandra dock at Malta and the Dover harbor, among a number of other noteworthy works. During this period Mr. Waters was engaged on plans for new shipbuilding slips, machinery shops, extensive additions to the Naval Engineering College and dock construction work. In 1896 he received from the Admiralty the appointment of Officer-in-Charge-of-Works at the Halifax, N.S., Naval Yard, where his work consisted chiefly in the extension of wharves and miscellaneous construction and maintenance. The duties at Halifax also included an annual inspection of Admiralty properties in Newfoundland and down the coasts of Nova Scotia and New Brunswick. The Commander-in-Chief on this station was Admiral Lord Fisher.

Mr. Waters returned to England in 1899. After a short period at the Admiralty head office in London he was sent out to the Island of Ascension on the west coast of Africa, immediately before the outbreak of the Boer war, as engineer-in-charge of various works of fortification, water supply and new buildings. Upon the completion of this construction he returned to England and received a gratuity as a recognition of his able services.

Upon the termination of the Boer war, Mr. Waters left the Admiralty and went to the northern Transvaal to join three brothers who had served through the campaign. There he obtained further valuable experience. Among his various commissions were the preparation of reports on irrigation schemes promoted by the mining companies of the Rand and several important works of building construction. Later, he accepted an engagement with Mr. D. Leitch, engineer of the Johannesburg municipality and formerly an Assistant Director of Works at the Admiralty. After a short period in the sewerage department of the Johannesburg engineering department Mr. Waters was placed in charge of the construction of tramway and general traffic subways under the railways.

In 1906 Mr. Waters left the Transvaal for Australia. Obtaining an appointment with the Ferro-Concrete Company, of Australia, he went to Auckland, N.Z., where the company had extensive contracts from the Harbor Board for the reconstruction of the whole of the large wharves and docks, in reinforced concrete. The Ferro-Concrete Company also built for the Auckland city council a ferro-concrete bridge with the longest single span arch in existence, the span being 300 feet with a rise of 87 feet and the total length of the bridge being 950 feet. The general system of reinforcing employed by the company is the Hennebique with plain bars.

Upon the completion of the above contracts Mr. Waters accepted a position with the city engineer of Auckland. In this capacity he designed and supervised the construction of a reinforced concrete service reservoir of three million gallons capacity, also street improvement works entailing heavy reinforced concrete retaining walls. Two of the outer walls of the reservoir were constructed on the street lines in the city.

Mr. Waters' varied experience of the world and of the engineering profession prompted him to turn to the possibilities of the Canadian field, and in 1909 he left New Zealand for British Columbia. After a short period in the Provincial Lands Department of Victoria he was appointed engineer to the city of Nanaimo. During Mr. Waters' regime extensive municipal improvements have been undertaken. A sewerage scheme has been designed and is now well in hand, nine miles of concrete sidewalks have been laid, and the water supply has been considerably extended, the work including a concrete dam impounding 14,000,000 gallons of water.

Constructional News and Notes

News of a noteworthy western building project comes from Edmonton, Alta., where the G. T. P. have decided to erect a modern hotel at a cost of something like \$750,000.

Tenders closed last week for the installation of a mechanical filtration plant at Saskatoon, Sask. It is hoped to have the plant in operation by December 1st next.

A Welland dispatch records the completion of the new bridge which the Michigan Central Railway have erected over the Welland Canal at a cost of \$200,000.

Seventeen million dollars will be spent by the Grand Trunk Pacific during 1911 in constructing new lines and erecting station buildings throughout the west. There will be 619 miles of work undertaken on the branch lines and completed during the present season.

Mr. J. K. Cornwall, M.L.A., the pioneer of the north-land, has obtained permission to pave part of an Edmonton street with asphalt, which he will freight up Athabasca river from Fort McMurray, and pack in by Indians. The experiment is to demonstrate the asphalt resources of the north, which Mr. Cornwall says will supply all Canada's needs.

An investigation by the fire department of Montreal, of the fire escapes in factories there, revealed a startling condition of affairs. In many cases the equipment was either totally inadequate or hopelessly antiquated. In one factory, where a large number of girls was employed, the only access to the solitary fire escape was a barred window, which took ten minutes to open.

It is reported that the new Montreal jail under construction at Bordeaux is expected to be ready for occupation next February. The institution is hexagonal in design, but only four wings are being completed at the present time. They will have a capacity of 600 prisoners. Mr. Pauze, the contractor, will receive orders next week to proceed with the erection of the guard wall, and it is expected that two more wings will be built as speedily as possible.

Strikes and rumors of strikes are in the air at Vancouver, B.C. A number of carpenters are on strike for a wage of \$4.50 a day. They have been receiving \$4 a day and the Builders' Association offers \$4.25. The unions as usual are busy making tall threats. The employers declare that unless their terms are accepted they will declare open shop, and import men from the United States and the Old Country.

Alterations are nearly completed for the new Freeman hotel, formerly the Carsley department store, facing on St. James and Notre Dame streets, Montreal. This building now contains about 150 rooms in the upper storeys besides dining rooms, sitting rooms, and the usual accommodation provided in a house of public entertainment. The alterations have been made under the supervision of Messrs. Finley & Spence, architects. Mr. C. E. Deakin is the contractor.

A somewhat curious action is being brought against the Canadian Northern Railway by the widow of a workman named Brouillette, who is suing to recover \$8,000 damages for the loss of her husband. Brouillette was employed upon bridge work at Quebec and was killed by a fall alleged by the plaintiff to have resulted directly from strain induced by over work. The evidence showed that the man had worked continuously for 27 hours. It is claimed that the company is responsible for his death for allowing this.

The fire and light committee of Toronto will recommend a graded schedule of rates which builders will pay for the inspection and supervision of their operations. Inspection of property over \$1,000 and not more than \$2,000 will cost \$2.00; over \$2,000 and not more than \$3,000, \$2.75; over \$3,000 and not more than \$5,000, \$5.00; over \$5,000 and

not more than \$10,000, \$8.75; over \$10,000 and not more than \$25,00, \$15.75; over \$25,000 and not more than \$50,000, \$25.75; over \$50,000 and not more than \$100,000, \$45.75.

Thos. Kelly & Sons, of Winnipeg, it is rumored, are the successful contractors for the dormitory building of the new Agricultural College at St. Vital, Man. At the time of writing no definite award has been made owing to the absence of the Provincial Architect, Mr. Samuel Hooper. The plans for the proposed building provide for a total of 500 rooms.

The proposed extension of the Royal Alexandra Hotel at Winnipeg, by the addition of from two to four storeys, is delayed owing to a division of opinion as to the ability of the foundations to carry the extra strain. A number of architects and experts were called in to examine the footings, but their reports varied considerably. It is possible that the question will be referred to the president of the road, Sir Thomas Shaughnessy.

Among the visitors to Montreal last week were Mr. J. S. Irvin (Ottawa), of the Canada Cement Company, and Mr. J. H. Plummer, president of the Dominion Steel Corporation.

The carpenters of Calgary, Alta., are asking for an increase from 50 to 55 cents an hour, with 65 cents for foremen, after July 1st. The plasterers and hod carriers are also out for a raise. The former want 75 cents an hour and the latter 50 cents, instead of the present rate of 68 and 45½ cents respectively. The stone-cutters have obtained a wage of 65 cents an hour and the plumbers 57½ cents.

The British Columbia Mental Hospital, a view of which is shown herewith is said to be one of the finest of its kind in existence. It is situated at Mount Coquitlam, New Westminster district. The hospital will consist of seven buildings in all, which will total in cost to \$1,000,000. During the year 1911, \$400,000 will be spent upon the buildings, farm and grounds. The work on the foundation for the main building has been completed. It is expected that it will be ready for occupancy in the spring of 1912.

A cement syndicate, headed by Mr. Allan Haines, of Spokane, has been formed at Edmonton, Alta. An excellent property has been secured a few miles west of Edson, on the G. T. P. The company, it is stated, will install a plant with a capacity of 1,000 barrels and will deliver cement in the city at \$3 a barrel. Mr. F. J. Klossoski, an expert engineer from the other side, has been engaged to report on the project.

Contract Bonds

Editor, Contract Record:

In your issue of the 5th inst. I am made to say that the bonding company received timely notice of the collapse of the bridge and refused to pay up. What I did state was just the reverse, the company claimed that notice of default had not been served upon them in the allotted time, as prescribed by the policy, and refused payment accordingly. The government legal department confirmed this, although the news of the disaster was telegraphed all over the world as soon as it occurred. My point was that a corporation is liable to take advantage of any legal technicality—being another case of "insurance that does not insure."

Under the heading "Contract Bonds" you say that a Toronto office wrote bonds covering \$3,766,717.26 for a premium consideration of \$47,115.95. This at once dispels the quarter of one per cent. delusion. According to my reckoning this amounts to about one and a quarter per cent., which would make a serious cut into a builder's profits.

Yours truly,
"Building Contractor."

Trade Notes and Business Notices

Architects and builders will be interested in the decision of the Yale and Towne Manufacturing Company, of New York, to establish a Canadian plant at St. Catharines, Ont. A site has been secured and the erection of the buildings will be commenced immediately. It is hoped to have the new plant in operation early in 1912. The business of the Canadian plant will be conducted by a subsidiary company, "Canadian Yale & Towne, Limited." Meantime, Canadian requirements will be catered to from the general offices at 9 Murray street, New York. The company's plant is at Stamford, Conn. "Yale" products, made in Canada by Canadian labor, should appeal to the trade more strongly than ever.

Escher Wyss & Company

On account of the steadily increasing development of their business in Canada, the Escher Wyss Company decided to open a Canadian office and to make Toronto its Canadian headquarters. This firm is world-known as a pioneer in the field of hydraulic engineering and has gained its reputation in this country by its various installations at Niagara Falls, where large water turbines have been supplied for the Canadian Niagara Power Company, the Shawinigan Water Power Company, Montreal, and also for the Niagara Falls Power Company, etc.

The Escher Wyss Company was founded as early as 1807, and started the manufacturing of water turbines in the year 1840, in the time of the Jonval and Giffard turbines. Hence the make of the above firm has become world-known and at the present moment its name is connected with important water power plants all over the world.

Since 1890, the demand for turbines of the Escher Wyss Company's make has increased rapidly, and at the moment of writing the firm possesses the record of having supplied 5,000 turbines representing a total output of not less than 2,000,000 horse power and of having on order by March, 1911, water turbines representing an output of 400,000 horse power. Of the most important plants on order may be mentioned:

Two 13,000 h.p. turbines for the Western Canada Power Company, Vancouver.

Six 10,000 h.p. turbines for Messrs. S. Pearson & Son's successors, Mexico.

Six 12,000 h.p. turbines for the Kinugawa Hydro-Electric Supply Company, Tokyo, Japan.

Four 4,600 h.p. turbines for the Sao Paulo Power Co.

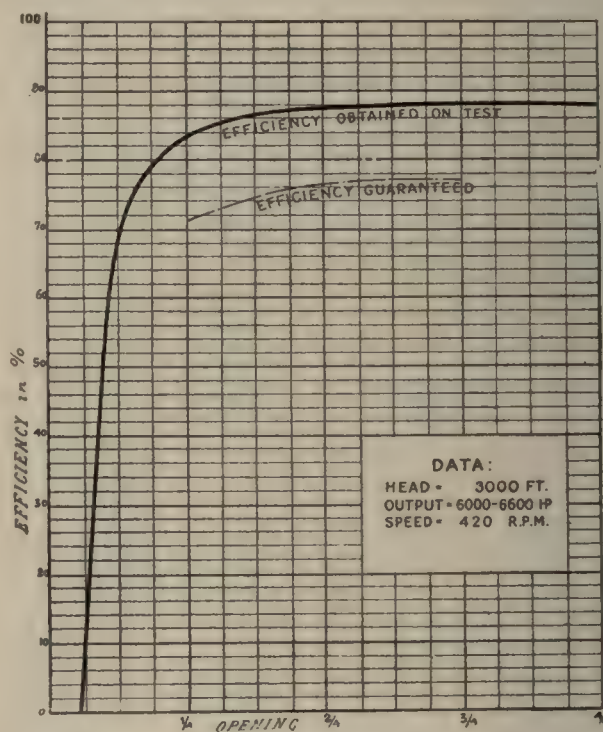
Four 5,000 h.p. turbines for the German Swiss Water Power Company, Bales, etc.

In 1905 the vast works in Zurich, Switzerland, were enlarged to about twice the previous size and are now fitted with entirely new and up-to-date machinery—equipment which enables the company to comply with any desire of its customers so far as first-class design and prompt delivery are concerned. The figure stated above—400,000 horse power on order will give the reader some idea of the efficiency of this renowned Swiss concern.

Apart from the general design and construction of high and low pressure turbines, the Escher Wyss Company is well known, especially in Canadian engineering circles, for its exquisite design of turbine governor which has lately been improved considerably and which is now able to solve the most complicated governing problems. The company has supplied approximately an equal number of high pressure turbines or impulse wheels (the pressure ranging from 150 to 3,100 feet) and of Francis turbines, the pressure ranging from 1 to 650 feet. As the company considered the design of the Francis turbine practically to have reached per-

fection, the daring problems connected with the exploitation of the highest heads have received the company's closest attention. Two years ago the Escher Wyss Company got an order for the whole of the hydro-mechanical portion of the Adamello power plant, Northern Italy, where a head of about 3,100 feet has been utilized, the total capacity of the plant being 20,000 h.p. Apart from the pipe line, which had to be designed with the minutest care, the construction of the turbine was thoroughly entered into and no cost saved in order to turn out a first-class piece of workmanship. This plant was started during January last and proved entirely satisfactory. The efficiency obtained on official test reached a height never approached before, which may be gathered from the accompanying diagram, 88 per cent., this figure remaining practically constant for $\frac{4}{4}$, $\frac{3}{4}$ and $\frac{2}{4}$ load.

Each turbine has an output of 6,600 h.p., is of the impulse wheel type, and has been fitted with automatically act-



ing deflection the nozzle of the Escher Wyss & Company's special patent design. The high efficiency obtained is due to the careful design in general and to the construction of the buckets and nozzles in particular. A complete description of this plant will appear in a later issue.

The Canadian office, in Toronto, is supposed to deal with business in Canada, United States and eventually Mexico—where lately vast water power plants have been put in use. The manager of the Canadian office is Mr. Thv. Heyerdahl, chief engineer of the company, who arrived from London, Eng., quite recently, having had charge of the London office of the above concern for the last two years.

Engineers, architects and builders will find much of practical interest and value in the Blue Book of the Pittsburgh Steel Products Company, which has been prepared with a view to assisting the design of concrete structures in accordance with sound theory and the best practice, and without laborious mathematical computations. All tables have been prepared using formulae recommended by "A Joint Committee on Concrete," of the American Society of Civil Engineers, American Society for Testing Materials, American Railway Engineering and Maintenance of Way

(Continued on page 62)

Contracts Department

News of Special Interest to Contractors, Engineers, Manufacturers and Dealers in Building Supplies.

Information for insertion in these columns is invited from Architects, Contractors, Engineers, etc.

Waterworks, Sewerage and Roadways

Brandon, Man.

In the matter of street paving the following prices were decided on for crushed stone to contractors: for Nos. 2 and 3 stone, \$2.25 a yard; for No. 1, \$4 a yard, in so far as the city can supply this material. The basis of the paving is to be properly screened gravel.

Edmonton, Alta.

The time for receiving tenders for construction of trunk sewer has been extended until May 15th. A. J. Latornell, city engineer. Advertisement in "Tenders and For Sale Department" of this issue.

Estevan, Sask.

It is now definitely decided that a plant for the manufacture of sewer pipe will be established here soon, and the promoters of the enterprise are figuring on having the main building completed by November. The company building the plant is composed of eastern capitalists, and the estimated cost is about \$150,000. F. L. Tennent, is in charge.

Kingston, Ont.

The city of Kingston are about to call for tenders for the laying of about 10,000 square yards of permanent pavement. H. B. R. Craig, city engineer.

Moncton, N.B.

Tenders addressed to J. S. Magee, city clerk, will be received until May 1st for construction of concrete walks here. Plans, etc., at office of the city engineer or office of the above.

Montreal, Que.

Tenders addressed to the Board of Commissioners, will be received until May 1st for supply of the following machinery: 6 concrete mixers, side loaders, capacity 1-2 cu. yd., to be operated by steam or electric motor; 6 concrete mixers, side loaders, capacity 3-4 cu. yd., to be operated by steam or electric motor; 1 five-ton asphalt steam roller; 24 hand concrete carts; 12 concrete spreaders; 30 asphalt waggons, under dump; 1 portable asphalt machine; 1 or more portable crushers, with screen and bins, to be operated by steam or electricity, direct current. L. N. Senecal, secretary.

New Westminster, B.C.

The Burnaby ratepayers endorsed the three by-laws calling for an expenditure of \$850,000. The largest was \$50,000 for roads, and the balance of \$350,000 for a water system. The by-law asking for the permission of the people to conclude an agreement with the city of Vancouver to supply the municipality with 250 in. of water at an annual cost of \$7,000 was also endorsed.

Messrs. Cleveland & Cameron, a firm of engineers, were appointed to supervise the construction of the water sys-

tem for Burnaby. They will be required to prepare a geographical survey and take all levels necessary to construct the system. This is to be handed to the council within a month. They will supervise the work while the system is being constructed.

North Battleford, Sask.

The ratepayers voted to issue \$38,000 bonds for waterworks and sewer extensions from plans of Chipman & Power, of Toronto, Ont. S. Cookson, secretary-treasurer.

Quebec, Que.

The city will expend \$350,000 on street improvements. W. Ballairge, city engineer.

Saskatoon, Sask.

The commissioner's report on the tenders for the intercepting sewer were as follows: labor, McGougan, of Port Arthur, \$127,000; reinforced concrete sewer pipe, The Lock Joint Pipe Company, of New York, \$137,000; cast iron pipe, the Gartshore Thompson Pipe Company, Hamilton, \$13,481.

Simcoe, Ont.

Tenders are called until May 15th for construction of five miles of concrete sidewalks and crossings. J. W. Sanders, town clerk. Advertisement in "Tenders and For Sale Department" of this issue.

Smith's Falls, Ont.

Tenders for brass goods, lead pipe and fittings necessary for house services for season of 1911 addressed to J. A. Lewis, town clerk, will be received until May 1st. Information with Town Engineer.

Stettler, Alta.

The council contemplate grading and improving streets and sidewalks.

South Vancouver, B.C.

The municipal council decided that they would call for tenders to take a topographical survey of South Vancouver and have a contour made of the municipality preparatory to the construction of the local section of the big comprehensive sewer system which is now being discussed between the city and the municipalities interested. The council will specify in the contract that the work has to be completed within three months after the first of May.

Stratford, Ont.

In the report on Romeo Creek drainage scheme the following is the approximate cost: concrete culvert, 2,300 cubic yards at \$7, \$16,100; backfilling, \$2,000; 10 manholes at \$50, \$500; 12,972 ft. of tile, excavation, laying, etc., 60c., \$7,732.20; 40 catch basins at \$12, \$480; preparing plans, assessment, etc., \$1,000; extras, \$1,000; total, \$28,863.20. City Engineer, M. Ferguson.

Vancouver, B.C.

City Engineer Clement reported that the cost of a rock crushing plant on

the reserve opposite Burnet would be about \$33,500. This estimate would provide for an equipment capable of turning out 350 cubic yards daily and covered not only the cost of the crushing machinery but all the necessary conveyors, motors, compressors, drills, bunkers, cart hoists, air receivers, etc.

Victoria, B.C.

The extensions to the sewer system to cover the section at present without drainage will call for an expenditure of about \$290,000; drain extensions, about \$50,000.

The Columbia Bitulithic Company offered to lay the surface coat on Seventh avenue from Bridge to Scotia at \$1.77 per square yard, guaranteeing the work for five years (accepted). Superintendent Scott stated that the price was based on the estimate furnished the engineer last year, \$1.55 per yard being then quoted for paying material in the wagons at the company's plant. The extra 22 cents per yard was said to cover the hauling, spreading and rolling of the coat. The engineer was directed to call for tenders for bitulithic paving on Twelfth avenue.

Tenders addressed to Wm. W. Northcott, purchasing agent, will be received until April 28th for the following: 350 4-inch double gate valves; 100 6-inch double gate valves; 10 12-inch double gate valves; 15 tons best blue pig lead.

Waterloo, Ont.

New tenders for the construction of cement walks for 1911 will be called. Specifications for such were submitted by Engineer Moogk. S. Kumpf, town clerk.

Toronto, Ont.

Tenders are called until June 6th for main drainage works by the city. G. R. Geary, chairman, board of control. Advertisement in "Tenders and For Sale Department" of this issue.

Welland, Ont.

The following report on various kinds of pavement was issued by Engineer Black: vitrified brick, \$26,000; creosoted wood block, \$30,500; asphalt block, \$20,000; sheet asphalt, \$22,300; bitulithic, \$21,500; westrumite, \$19,000.

Winnipeg, Man.

The approximations for local improvements for 1911 are as follows: asphalt pavements, \$600,000; macadam pavements, \$10,000; block pavements, \$20,000; granolithic sidewalks, \$75,000; plank sidewalks, 45,000; sewers, \$200,000; water mains, \$279,000; streets and lanes, \$50,000; boulevards, \$10,000; sanitary improvements, \$1,000; total \$1,340,000. Last year the total amount expended in local improvements was \$1,386,111.24. The total amount to be expended upon pavements this year is \$826,041. Asphalt macadam is to be used in place of the regular asphalt on residential streets. It

costs only about half as much to lay and is as good a pavement for a residential street as any other. This asphalt macadam pavement has only been used for the last few years. The committee does not intend to lay any block pavement at all. Engineer of Construction Astley and Street Commissioner Tallman will start work on the streets at once.

Woodstock, Ont.

Tenders addressed to W. G. Henderson, clerk, will be received until May 8th for construction of the Elliott drain improvement in the Tp. of Blandford. Plans, etc., at office of F. J. Ure, or at the clerk's office, Bright. Tenders are also called for running the stone crusher for said township.

AWARDED

Galt, Ont.

The following were the successful tenderers for supply of cement, castings, lumber, sand and gravel: Ontario Portland Cement Company, Brantford, \$1.55 per bbl.; J. J. Stevens Co. (castings), Galt, \$2.35 per 100 lbs.; W. I. Reid Co. (lumber), Galt; Dickson & Henderson (sand), Galt, 95c. per load; sand and gravel, 90c. per load.

Halifax, N.S.

Tenders for supply of stone were as follows: stone, for breaking, Samuel Walker, 2½ cents per bushel at Poor Association shed and 4 cents at crusher; J. D. McLellan, 2½c. at shed; Newton Harvey, 2½c. at shed; 3½ cents at crusher. Mr. Harvey's was recommended for acceptance.

Moose Jaw, Sask.

The Sewer and Water Committee recommended that the tenders of the Dominion Sewer Pipe Co., for \$12,937.70, the National Iron Works for 6-inch and 4-inch pipe at \$39.25 per ton, and Navin Bros., for \$51,113, be accepted. It was further recommended that the city engineer call for tenders for storm sewer extensions.

Simcoe, Ont.

Contract for road roller was awarded to Messrs. Cameron & Son for a 10-ton Watrous double engine road roller, \$2,750. W. C. McCall, town clerk.

Winnipeg, Man.

The city awarded contracts as follows: supply of c.i. water pipe, the Canada Iron Corporation, Ltd., Montreal, \$34.75 per ton; laying 18 in. water pipe line from well No. 7, Engineer of Construction, 40c. per lin. ft.; step-down transformer and equipment for Wells 7 and 8, the Canadian Westinghouse Co., Ltd., \$6,400; manhole frames and covers for conduit system, Winnipeg Foundry Co., about \$2,906; supply of 25,000 bbls. of cement, W. F. Lee, Winnipeg, 74 1/3c. per net 100 lbs., including sacks.

Railroads, Bridges and Wharves

Arden, Man.

Tenders addressed to M. E. Boughton, secretary-treasurer, Lansdowne, will be received until May 9th for erection of steel truss bridge. The municipality provides the stone and sand, contractor to provide cement and all other material. The bridge is 30 feet span with a clear width of 18 feet. Tenders may be for either part of the work or in block. Plans, etc., at office of the above

at Arden or at the Department of Public Works, Winnipeg.

Chatham, Ont.

Tenders addressed to H. Smith, commissioner, box 265, will be received until April 29th for construction of the steel and concrete bridge over Little Bear Creek Drain, Con. 14. Plans, etc., at office of John Welsh, Tp. Clerk, 94 Grand avenue, and with above.

Edmonton, Alta.

Plans for the east end bridge with the modifications required by the Dominion government engineer, have been completed by the city engineer, and tenders for concrete work will be called. Tenders for steel superstructure will not be advertised, the engineer being authorized to confer with the bridge building concerns of importance in Canada and in the United States.

Fort William, Ont.

The Inland Navigation Co., Ltd., who recently purchased about 1,200 feet frontage on the Kaministiquia river, will erect thereon a dock and large transfer shed.

The Northern Navigation Company will construct a dock and passenger terminal on the Kaministiquia river near the new Union station of the C. P. R. and G. T. P. Railwa.

It is stated on good authority that the G. T. P. Ry. will construct about 20 miles of new track in their terminals on Mission Island and will construct one, and perhaps two, steel docks and sheds on the Mission river.

Guelph, Ont.

The city council decided to construct a bridge over Heffernan street at an estimated cost of \$7,500.

Lethbridge, Alta.

Tenders addressed to N. E. Brooks, division engineer, C. P. R., Calgary, will be received until April 31st for construction of concrete work and timber approaches in connection with overhead bridge. Plans, etc., at office of above; at Asst. Chief Engineer's Office, Winnipeg; City Engineer's Office, Lethbridge.

New Ireland, Que.

Tenders are called by the Corporation of South Ireland and South Halifax for construction of iron bridge on the site of the Chaine bridge. Plans, etc., with Dr. L. J. A. Sirois, sec.-treas., St. Ferdinand d'Halifax.

New Westminster, B.C.

The Lulu Island bridge by-law for \$30,000, carried.

Point Sapin, N.B.

Tenders addressed to R. C. Desrochers, Secretary, Public Works Department, will be received until May 9th for construction of a breakwater here. Plans at above department, at the office of district engineer, St. John, N.B., and on application to the local postmaster.

St. John, N.B.

The C. P. R. is calling for tenders for the removal of the buildings on Mill street to enable them to proceed with the erection of new terminal buildings. They must be out of the way by May 31st.

Toronto, Ont.

Tenders addressed to G. R. Geary, chairman, board of control, will be received until May 23rd for construction

of dock in Ashbridge Bay. Specifications upon application to Department of Railway, Bridges and Docks, City Engineer's office. Advertisement in "Tenders and For Sale Department" of this issue.

Vancouver, B.C.

The C. P. R., it is understood, will replace thirteen wooden bridges between Vancouver and North Bend with steel and concrete structures, and will put up thirty new bridges along the same stretch of line.

Walkerton, Ont.

Tenders are called until May 16th for erection of Warren Truss steel bridge at Dunblane. James Warren, engineer. Advertisement in "Tenders and For Sale Department" of this issue.

Welland, Ont.

Tenders addressed to Donald Dell, reeve, will be received until April 29th for construction of two concrete piers at Geo. Heximer bridge over Lyons Creek, Willoughby Tp.

AWARDED

Niagara Falls, Ont.

The contract for constructing five steel-concrete bridges has been awarded to Rutherford & Patten, of St. Catharines, Ont. J. H. Jackson, Superintendent Queen Victoria Park Committee.

Ottawa, Ont.

It is reported that the Canadian Northern Railway has awarded the contract for the section of the Toronto-Ottawa line from Sydenham to the terminus, to Mullarkey & Company, Carleton Place.

Owen Sound, Ont.

The contract for the erection of bridges, on at Tenth street, cement arch construction, \$16,475; the other, wooden structure, \$1,765, was given to Messrs. Green & Clark. Town Engineer, R. Macdowall.

Public Buildings, Churches, Schools, etc.

Belleville, Ont.

The new school will be erected on the St. Agnes school property as soon as possible. W. P. Hudson, chairman, board of education.

Caughnawaga, Que.

Tenders addressed to J. O. McLean, assistant deputy secretary, Department of Indian Affairs, will be received until May 8th for erection of 2-storey brick veneer school house and 1-storey frame school house on the Reserve.

Charlottetown, P.E.I.

Tenders addressed to Murdock Macleod, secretary, building committee, 233 Richmond street, will be received until May 15th for erection of a brick and stone church and school for Zion Presbyterian congregation. Specifications at office of C. B. Chappell, architect.

Edmonton, Alta.

Tenders addressed to John Stocks, deputy minister of public works, will be received until May 15th for the plumbing, heating and ventilation required in connection with the Parliament Buildings here. Plans, etc., at the Engineer's Office, New Parliament Buildings, Edmonton, or at the office of the

consulting architect, Wm. Fingland, Enderton Block, Portage avenue, Winnipeg.

Fenelon Falls, Ont.

Mr. Taylor, Barrie, is the architect in charge of the erection of new Methodist church here, 52 x 78 feet; cost, about \$10,000.

Fort William, Ont.

A campaign to raise \$100,000 for Y. M. C. A. purposes has been started.

Plans for the proposed Greco Orthodox Church have been approved. Peter Pascas and Geo. Prikaska are interested.

Galt, Ont.

It has been decided to inaugurate a campaign to raise at least \$50,000 to build a Y. M. C. A. building. J. W. Hopkins, Prov. Field Secretary.

Guelph, Ont.

It is generally understood that the Winter Fair board have under consideration the erection of a new exhibition building which will entail considerable outlay.

The property committee, composed of Messrs. H. G. Cockburn, D. D. Christie, Col. J. Davidson, A. Stewart and Dr. J. Lindsay, were authorized to arrange at once regarding plans for the new Y. M. C. A. building, for which the required amount has been raised.

Grenfell, Sask.

The Presbyterians here are considering the erection of a new church. Plans are being prepared.

Kamloops, B.C.

Tenders addressed to F. E. Simpson, secretary, hospital committee, will be received until May 6th for the erection of the new brick hospital building (plumbing and heating contracts segregated). Plans, etc., at office of the architect, S. B. Birds, 308 Loo Building, Vancouver, or on application to the secretary.

Kerwood, Ont.

Tenders are called until May 9th for erection of new school at S. S. No. 7 Adelaide. Plans with J. H. Richardson, secretary-treasurer, Box 5, Kerwood.

Kingston, Ont.

W. Ellis is preparing plans for a new 8-room school. Tenders will be called next month. Estimated cost, \$30,000. Materials, brick on limestone foundation.

W. Newlands, architect, has about completed plans for a \$40,000 addition to the local post office. Tenders will be called for in the next week or so. The addition will be of stone to match the present building.

Lytton, B.C.

Tenders are invited until May 11th for erection of a timber-framed school house here by Public Works Department, Victoria.

London, Ont.

Tenders are being called until May 9th for erection of a new school at S.S. No. 7 Adelaide. J. H. Richardson, secretary, Box 5.

Macleod, Alta.

It is more than probable that the new post office will be erected this year. Estimated cost, \$10,000.

Medicine Hat, Alta.

Competitive plans for the erection of a 10-room, 2-storey brick school building with stone facings, are requested until April 25th by E. J. Fewings, secretary-treasurer.

Moncton, N.B.

The site on High street has been recommended by the fire committee for the new fire hall. It is likely that a St. John architect will draw plans. Chairman Bourque.

Montreal, Que.

The Protestant Board of Education will enlarge the Fairmount school by the addition of 15 class rooms, gymnasium, etc. S. J. Binmore, treasurer.

Permit has been issued for the erection of a new church for the parish of St. Elizabeth du Portugal in St. Henry Ward, at a cost of \$56,000. Architects, Messrs. McDuff & Lemieux.

The Catholic School Commissioners of Villeray have taken out a permit for the erection of a school on Labelle st., the estimated cost of which is \$47,000. Mr. Z. Trudel is the architect, and Mr. Zenon Corbeau the general manager.

A new Catholic Normal School is to be erected at the corner of Sherbrooke street and Atwater avenue for the congregation of Notre Dame at a cost of \$150,000. Messrs. Marchand & Haskell are the architects. The general contractors are Messrs. Marineau & Proulx.

New Westminster, B.C.

The by-law to raise \$95,000 for school purposes carried. That for the high school was defeated.

Nelson, B.C.

The directors of the Kootenay Lake General Hospital Association have decided to erect a new building, at a cost of approximately \$60,000.

Ottawa, Ont.

A move is on foot to form a company to erect a large auditorium for musical events.

It is proposed to erect a new club house for the O. A. A. C. on Queen street. C. Ross, president.

Hugh Carson has purchased the Grand Opera House and expects to convert it into a commercial building.

The Westminster Presbyterian congregation appointed a committee to get plans for the new church to be erected at the corner of McLaren & Lyon sts. Ambrose Duffy, treasurer, board of managers.

Port Hope, Ont.

The public buildings under consideration are new or remodelled public school (central bldg.); Carnegie public library, \$10,000; fireproof hospital.

Tenders addressed to J. A. Ewart, architect, 193 Sparks street, will be received until April 28th for addition to the laundry building, for the Carleton General Hospital.

Prince Albert, Sask.

Tenders are called until May 8th for construction of a 4-room school house with basement. H. W. Halpin, secretary, Prince Albert, East School District.

Quebec, Que.

A company incorporated as The Frontenac Athletic and Land Company,

and capitalized at \$145,000, have under consideration the erection of a large hockey rink on the Q. A. A. grounds. Senator Choquette, president, Quebec Hockey Club; others interested are N. Lavoie, general manager Banque Nationale, and W. J. Ray, H. E. Price, and J. G. Scott.

Regina, Sask.

Tenders addressed to J. R. C. Honeyman, secretary, public library board, will be received until April 29th for erection of library building. Plans, etc., at office of the architects, Storey & Van Egmond.

Saskatoon, Sask.

A by-law for \$185,000 for erection of new hospital will be submitted to the ratepayers.

The plans for the new school to be built on the Alexandra school grounds are complete and tenders for erection will be asked. Architect Webster; estimated cost, \$54,000.

Shawville, Que.

Tenders addressed to the school commissioners, will be received until May 10th for construction, with supply of materials of a new Academy building to be completed before December 31st. Tenders received either separately or collectively for all, one or more of the following trades: masonry and brick work; carpentry; painting; roofing. W. K. Ireland, secretary-treasurer.

South Vancouver, B.C.

The Mountain View Methodist Congregation will call for tenders for their new church. Brick, as well as wood, has been specified. Architect Horel has drawn plans for both.

Stettler, Alta.

This municipality have under consideration the erection of additional municipal buildings. D. Mitchell, secretary-treasurer.

Stratford, Ont.

J. S. Russell, architect, has been engaged to prepare a preliminary sketch for the new St. Andrew's Church. Noted in last issue.

Sydney, N.S.

The plans of the new building for the Y. M. C. A. are on view. They show a building either of reinforced concrete or brick. A new and larger site will be purchased. Secretary, Mr. Thorburn.

Thamesville, Ont.

The town hall here was destroyed by fire on the 23rd inst. The fire apparatus was also burned. Total loss, about \$20,000.

Toronto, Ont.

The Musical Protective Association will build a home for its members on University avenue, at a cost of \$15,000.

The congregation of the African Methodist Episcopal Church has secured a building site on University avenue. Pastor, Rev. T. H. Henderson.

The Board of Trade have directed the attention of the Dominion Government to the inadequate accommodation of the Dominion government buildings here. W. J. Gage, president.

Tenders for erection of fire hall on Balmoral avenue, will be received until May 9th for masonry, carpentry, galvanized iron and roofing, etc. Advertise-

ment in "Tenders and For Sale Department" of this issue.

The Public Library Board have decided to request the city council to provide the sum of \$75,000 for library purposes. Of this, \$65,000 is required for the purchase of a site and the cost of a building, equipment, etc., for a new branch library to be built in the vicinity of Bloor street and Dovercourt road. Chairman, N. B. Gash, K.C.

The congregation of Holy Trinity Church will erect a parish house on north side of Trinity Square to cost about \$10,000. The congregation of St. Anne have decided to erect a new Sunday school building at a cost of \$45,000; St. Barnabas congregation, cor. of Givens and Halton streets, will erect an extension to cost \$10,000; Rev. L. B. Vaughan, rector; St. John's, West Toronto, will have plans prepared for a new parish house and Sunday school; a building site was presented to St. Olave's Church, Swansea, and a committee appointed to consider ways and means for the erection of the new building.

Vancouver, B.C.

The Women's Club have secured a suitable site for their new building. Mrs. J. H. MacGill, president.

The Vancouver Rowing Club will call for tenders for a new club house. Harris, Sawers & Woodward, committee; architect, Kiggie.

The by-law to raise \$150,000 for the immediate erection of city hall and office building, etc., will not be submitted for at least six months. Noted in issue of April 5th.

The congregation of St. James have purchased their building site on Pender street. Construction on the building will start this spring. The structure will be probably of stone. Rector, Rev. H. G. Flennes-Clinton.

Alexander & Brown are preparing plans for the erection of new church for the congregation of St. James' Church on the southeast corner of Pender street and Carl avenue. Estimated cost, \$150,000. Rev. H. G. F. Clinton, rector.

Tenders are called by Public Works Department, Victoria, until May 4th for erection of Janitor's Lodge, Normal School. Plans, etc., at the office of William F. Gardiner, architect, Vancouver, B.C., and the department of public works, Victoria.

Excavation will be completed shortly for the 12-room additions to the King Edward and Britannia High schools; and the school to be erected at the corner of Sixth avenue and Bayswater st. It is expected that tenders for erection of same will be called in a few days.

Victoria, B.C.

Tenders for erection of St. John's Anglican Church will be called probably early in June. Estimated cost, \$80,000. W. Ridgway Wilson, architect, Pemberton Block.

Webb, Sask.

The public school here was destroyed by fire recently. Estimated loss, \$6,000.

Welland, Ont.

A committee consisting of H. F. Stoddard, Dr. Howell, D. Ross and others have been asked to report on the proposition to erect an industrial and technical school here.

Winkler, Man.

Tenders addressed to B. Loewen, chairman, school board of Winkler S. D., will be received until May 15th for erection of 4-roomed brick school house, the contractor supplying no material; tenders are also called until May 15th for the following material for a 4-room school house: brick, cement and lime; coarse and fine gravel; lumber, metallic ceiling, hot water heating system.

Winnipeg, Man.

Plans for erection of the new Westminster church are complete and call for a church which will cost over \$200,000.

Harry J. Rill, 54 Buhl Block, Detroit, Mich., is the architect for the Ignatius R. C. Church; cost, \$150,000; tenders will soon be called. Noted in last issue.

Preliminary plans for erection of All Saints Church have been prepared which call for an expenditure of about \$50,000. No immediate action will be taken.

Plans, etc., for a new building for the municipality of Assiniboia have been prepared by Hooper & Hooper. Dimensions, 49 x 40; material, stone and brick; two storeys.

Tenders addressed to Western Trunk Lands Building and Development Corporation, Limited, were called until April 23rd for the construction of a moving picture theatre at Transcona. Plans, etc., at the office of the Transcona Theatre Company, 537 Main street, Winnipeg.

AWARDED

Blairmore, Alta.

Fray & Sinclair have commenced the erection of the new opera house. Cost, \$50,000.

Morwood, Ont.

Gilbert Emard, of Embrun, has been awarded the contract for the continuation school at Morwood. C. P. Meredith, Ottawa, architect.

Vancouver, B.C.

The contract for erection of 12-room addition to the Lord Nelson school has been awarded to D. Matheson, \$73,300.

Residences

Athens, Ont.

Tenders addressed to R. B. Patterson, secretary of building committee, will be received until May 1st. Plans, etc., at the store of Karley & Purcell.

Hamilton, Ont.

Munro & Meade, architects, have prepared plans for the new residence to be erected for E. Phin, Welland, at a cost of \$30,000.

Montreal, Que.

Permit has been taken out by Messrs. W. Robb and D. R. Brown for a new three-storey residence at 718 Pine avenue west at an estimated cost of \$50,000. Messrs. Brown & Vallance are the architects; contractors, Bonnell Bros.

Messrs. R. P. & H. A. Adams have taken out a building permit for a four-storey house of solid brick at the corner of Prince Arthur street and Oxenden avenue. Estimated cost, \$79,000. Mr. H. A. Adams is the architect; Messrs. Byers & Anglin, contractors.

Messrs. Saxe & Archibald have in

hand the plans of a \$12,000 house for Mr. R. E. Thorne, to be constructed on Cote des Neiges road. The same firm is preparing plans for extensive alterations to the residence of Mr. Edward Hanson at Ste. Agathe des Monts.

Ottawa, Ont.

W. E. Noffke is calling for tenders for the alterations to W. H. A. Fraser's residence, Nepean street.

M. Drazin is erecting stores and apartments on Rideau street. Jas. Ewart, architect, is calling for tenders.

Port Arthur, Ont.

Messrs. Hunt & Reed have begun the construction of fifteen modern houses on Court. Total estimated cost, \$70,000.

Porcupine, Ont.

W. R. Graham, Cobalt, has prepared plans for 2,000 bungalows for the Philadelphia Mining Company.

Toronto, Ont.

A large three-storey apartment house is to be erected on Bathurst street by the Dundas Building Company. Work will commence about May 1st.

Bond & Smith are the architects for the apartment house on Prince Arthur avenue to be erected for C. H. Wilson \$12,000. Contracts have been let.

Permits have been issued to J. T. and H. Hutson, apartment house, Avenue road and Cumberland street, \$80,000; N. Butler, apartment house, Harvard avenue, \$20,000.

The property at 21 Isabella street has been purchased by Mr. Fleury, of Montgomery, Fleury and Montgomery, barristers. It is stated that an apartment house will be erected. J. A. Thompson barrister, is also interested.

Winnipeg, Man.

Tenders addressed to Hooper & Hooper, architects, 303 McIntyre block will be received until April 29th for erection of a stone and frame residence for E. G. Parker.

AWARDED

Ottawa, Ont.

The following contracts have been awarded for the residence of E. C. Russell on Buenavista road, Rockcliffe, C. J. Meredith, architect; A. Garvock, masonry; Larkin & Adams, carpenters; Ritch & Nunn, painters; Blyth & Holloway plumbers; James McLaughlin, plasterer and J. Saunders, electrician.

Winnipeg, Man.

E. E. Wire, Kennedy building, has received the contract for the first installment of a number of small dwelling houses to be erected here by W. J. Henry, Esq., a capitalist in the O. Country. The houses will be erected in accordance with the new health act, Manitoba under the personal supervision of the architect, William Bruce.

Business Buildings and Industrial Plants

Belleville, Ont.

The city council have decided Church street as the site for the C.N. R. station.

Calgary, Alta.

Hodgson, Bates & Butler have prepared plans for the large addition

Pryce Jones Ltd. store. Cost, about \$150,000.

The Alberta Pressed Brick Company propose erecting a factory here to be completed by July 1st. Local labor will be employed. Plans call for a capacity output of 40,000 bricks per day. J. Fetter, Jr., consulting engineer, of the Steger-Farrier-Silica Brick Company, Bonham, Texas, has selected a site.

Hodgson, Bates & Butler, architects, have prepared plans for the alterations to be made to the Bank of Montreal, \$25,000. Permits were issued to A. McBride & Co. for wholesale warehouse on Tenth avenue, \$40,000; also to M. Fraser, East Calgary, for 3-storey store and apartment house, \$23,000.

Edmonton, Alta.

Permit was given to Cushing Bros. for their warehouse, \$24,000.

Tenders are called until April 29th for erection of 3-storey building for J. A. Lockerbie. H. A. Magoon, architect.

The Imperial Oil Company will erect their central tank plant on Twenty-first street. Estimated cost of the building, about \$25,000; total cost, \$60,000. J. A. Boyd is interested.

Plans are being prepared for the 3-storey brick and stone building to be erected for William Sugarman. It is also stated that Jackson Bros., jewellers, will erect a 3-storey block this year.

Tenders will be called for erection of a strictly up-to-date fireproof office building for Drs. J. D. Maclean and W. N. Condell on Jasper avenue. The building will be 51 x 150 feet, 6-storeys, with provision for four more storeys to be added. The intention is to have it completed by 1st of December. J. E. Wize, architect, 534 Jasper avenue west.

Fraser Mills, B.C.

The Canadian Western Lumber Company, Fraser Mills, B.C., are contemplating the erection of further additions to their plant this year. These are to include another planing mill, box factory, sash and door factory and a wood-working factory.

Hamilton, Ont.

The Lyons Tailoring Company will erect a modern 4-storey building on their present site on James street.

Hull, Que.

The council have granted permission to N. St. Denis for the erection of a \$24,000 abattoir here.

Kippewa, Ont.

The following buildings were destroyed by fire on the 23rd inst.: C. P. R. station, the large store of Shannon and Fraser, and John Lumsden's store and hotel. Total loss, \$50,000.

Kingston, Ont.

The Canadian Bank of Commerce are about to erect a new bank on the corner of King and Brock streets. Plans have been prepared by Darling & Pearson, architects, Toronto. Tenders will be called early next month. Power & Sons, local architects.

Lacombe, Alta.

Tenders addressed to N. E. Brooks, division engineer, C. P. R., Calgary, will be received until May 1st for construction of a combination brick and frame station. Plans, etc., at Assistant Chief Engineer's office, Winnipeg, and at office of above.

Lethbridge, Alta.

The Great West Saddlery Company have under consideration the location of a branch here. R. J. Hutchings, Calgary, representative.

Matheson, Ont.

Tenders addressed to A. J. McGee, secretary-treasurer, T. & N. O. Ry. Commission, 25 Toronto street, Toronto, will be received until May 3rd for construction of a passenger station here. Plans, etc., at office of the architect, J. M. Lyle, 14 Leader Lane, or at the office of the chief engineer, North Bay.

Medicine Hat, Alta.

A by-law was carried granting a free site to the Alberta Linseed Oil and Paint Company, which will invest \$180,000 in plant and buildings. By-laws will be voted upon early in May granting concessions to a foundry and machine shop, a glass works and a nail factory.

Montreal, Que.

Tenders are called until April 29th by Messrs. Brown & Vallance for erection of the new Herald building.

Permits were issued for warehouse in St. Henry, \$25,000, and for an hotel on Mount Royal avenue, \$32,000.

Nelson, B.C.

Tenders for the excavation for the new jam factory to be built at the corner of Vernon and Kootenay streets for J. A. McDonald, are being called. Plans being prepared by A. Carrie, architect, call for a 2-storey building, 100 x 50 feet.

Ottawa, Ont.

The Gibson property, Bank street, has been sold to W. H. Lester, contractor. It is understood that Mr. Lester will erect a row of stores in the near future.

Pain Court, Ont.

Tenders addressed to T. H. Taylor Co., Ltd., Chatham, Ont., will be received until April 26th for construction of a grain elevator of crib work construction, metal clad and metal roofed with a concrete foundation. This elevator will be placed at the terminus of the C. W. & L. E. Railway. Plans, etc., at office of the above.

Port Arthur, Ont.

It is stated that a match factory will be located here. J. O. Hourigan, manager, Marks-Clavel-Dobie Company, is interested.

Work on the construction of the plant for the Port Arthur Wagon Works Co. will start at the beginning of May. Capitalization of company, \$750,000. Mr. Fox, secretary-treasurer.

Port Hope, Ont.

The Standard Ideal Co. are planning extensions to plant No. 1.

Preston, Ont.

The Canadian Buffalo Sled Co. will erect a new 2-storey factory on the property adjoining Clare Bros. foundry. Mr. Mickler is preparing plans.

Prince Albert, Sask.

The Royal Bank of Canada have purchased the corner of Tenth street and First avenue west.

Quebec, Que.

The improvements to the plans of the new union station will increase the cost of the structure from three-quarters of

a million to a million and a half. The station building is now to be 350 feet long, and it is expected that construction will be commenced early in the summer.

Tenders are called for erection of Quebec Bank here. Messrs. Brown & Vallance, architects, Montreal.

Renfrew, Ont.

A. Moon, of Bowmanville, and J. A. Kincald, of Eganville, are mentioned in connection with a new hotel here.

Regina, Sask.

Tenders were called until April 17th for removal of buildings, etc., for the Canadian Bank of Commerce.

Tenders are called until April 27th for erection of bank building for the Imperial Bank of Canada. Storey & Van Egmond, architects.

Sarnia, Ont.

A site for the new sash and door factory has been found. A. H. Diver, Trenton, is interested.

Saskatoon, Sask.

Mr. B. Ward, representing Minneapolis interests, has purchased a building site near here for a factory to make flax binder twine.

Plans are under way for a 4-storey business block to be erected on the southeast corner of 22nd street and 2nd avenue for Mr. H. Weston. The materials are brick with a stone or terra cotta front.

St. Catharines, Ont.

The Yale & Towne Mfg. Co., Stamford, Conn., manufacturers of Yale locks, will locate their Canadian branch here. A suitable site has been secured; work on building will commence. A Canadian Company has been incorporated. Estimated total cost, \$50,000.

St. Remi, Que.

We are informed that the tenders for the factory and warehouse to be erected for W. Clark will probably be called for April 29th or possibly a week later. Messrs. Peden & McFarlane, architects, Montreal.

Strathcona, Alta.

The Commercial Hotel Company have purchased the property on the eastern side of the hotel, thus providing a splendidly located site of three lots for the 3-storey brick hotel for which excavation will be made this year. Estimated cost, about \$60,000.

Toronto, Ont.

Conduits, Limited, will build an 80 x 150 ft. addition to their factory on Don Esplanade; Bond & Smith, architects.

The "Saturday Night" Publishing Co. will erect on the corner of Richmond and Sheppard an 8-storey building. H. Gagnier, president.

Brigdens, Limited, will erect a 5-storey engraving plant at 4 Richmond street west. The dimensions will be 80 x 109 feet; cost, about \$50,000. Fireproof construction. Architects, Bond & Smith.

The R. S. Williams & Sons will erect a business building at 145 Yonge street. Messrs. Chapman & McGiffin, architects. The Boston Lunch, Limited, it is stated, will erect a 6-storey building this summer.

Windsor, Ont.

A. L. Iron will erect a large block here this year with a frontage of 100 feet on

Ouelette avenue. Negotiations have been opened. Committees of the city and county councils will confer regarding the offer to lease part of the building for county offices.

The Imperial Garage Company will build a garage on Osborne Place to cost about \$25,000, of reinforced concrete with single span roof.

Winnipeg, Man.

The Anthes Foundry Company, Toronto, has purchased a building site for their new plant; Wortman & Ward, manufacturers of pumps and farm tools, will extend their plant.

The plans for the new government telephone exchange building have been approved. Plans call for a 4-storey building, 50 x 130 feet; cost, \$75,000. Provincial architect, S. Hooper.

It is stated that when the large flour mill operated in Pilot Mound until destroyed by fire, is re-built, that Winnipeg is the probable location. Nicholson & Bain, Bannatyne East, commission agents, are interested.

The plans for the new G. T. P. hotel here have been approved by head office. The detailed plans are now under way; when completed, construction will commence shortly. Messrs. Ross & McFarlane, Montreal, architects.

AWARDED

Calgary, Alta.

The contract for part of the erection of business block for Judge Travis has been let to J. A. Brocklebank, \$100,000, exclusive of plumbing, heating and wiring.

Carleton Place, Ont.

Speagle & Smith, Westport, were given the contract for erection of church here, \$4,470. The other tenders ranged from \$3,300 to \$5,000. J. W. H. Watts, 45 Central Chambers, Ottawa, architect.

Durham, Ont.

Mr. W. A. Mahoney, architect, Guelph, has had his plans accepted for the erection of a new \$10,000 Carnegie Library here.

Guelph, Ont.

The contracts for the four new buildings at the Homewood Sanitarium have been let to Secord & Son, Brantford, \$175,000.

Little Manitou Lake, Sask.

The contract for erection of sanatorium has been awarded to Brown Construction Company, Builders' Exchange, Winnipeg, \$28,800.

Ottawa, Ont.

The general contract for erection of business building on York street for K. Farrah has been given to George Crain, \$30,000. W. E. Noffke, architect.

Owen Sound, Ont.

The contract for erection of new Bell Telephone building here will probably be awarded to Pounder Bros., Stratford. The tenders for reinforced concrete work, of which there is a large amount, were high.

Outremont, Que.

The contract for erection of fire and police station here was awarded to T. Lessard, \$11,410; carpentry, Jackson Co., \$7,675; roofing, R. Limards Co., \$680; electric lighting, J. C. Duff, \$125; plumbing, Tremblay & Francoeur, \$1,346.60;

plastering, G. Bowen, \$630; total, \$21,866.60. J. Kruse, secretary-treasurer.

Preston, Ont.

Messrs. Wiraching Bros. have the contract for erection of 3-storey addition to the Crown Furniture Company' plant. Messrs. Moss & McGillivray, managers.

Regina, Sask.

The contract for erection of the first section of the buildings for the Methodist College here was awarded to Robert J. Lecky, \$268,780. At the present time Mr. Lecky is manager here for Peter Lyall & Sons.

Saskatoon, Sask.

The contract for construction of a new departmental store building has been awarded to A. A. Godwin, \$150,000, exclusive of the structural steel work, which has been awarded separately at a cost of \$30,000.

South Vancouver, B.C.

The contract for clearing the Tweedy school site of nearly four acres was let to Messrs. Halliwell & Sons, \$475 per acre.

Stratford, Ont.

The contract for ventilation of the House of Refuge has been awarded to McDonald & Henry.

Victoria, B.C.

Plans for a 4-storey building to be erected on the north side of Fort street have been prepared for Mr. P. R. Brown by Mr. Thomas Hooper. The contract has been let to Messrs. Ferris & Barff. Estimated cost, \$50,000.

Winnipeg, Man.

Carter-Halls-Aldinger Company have been awarded the contract for the building of an upholstery shop, 100 feet by 40 feet, and also for a transfer table in the shops of the C. P. R. in Winnipeg.

Power Plants, Electricity and Telephones

Lethbridge, Alta.

The tenders of the Westinghouse Co. for supplies for electric light extension in the arc system was recommended by superintendent Reid for acceptance.

London, Ont.

The report of Superintendent Glau-bitz on the added necessary expenditure for the distribution of Niagara power was as follows: Sub-station equipment, \$8,600; meters, \$10,180; meter inspection, \$2,000; 2,300 volt bent line, \$4,559; primaries, \$500; secondaries, \$4,390; lighting system, \$2,500; transformers, \$3,900; power services, \$150; power meters, \$1,550; series street lighting, \$6,800; underground system, \$5,150; painting poles, \$3,250; draughting room, \$400; testing apparatus, \$500; motor generator, \$10,000; power solicitors, etc., \$4,000; lamp renewals, \$2,000; total, \$70,429.

Magog, Que.

An electric light and power plant will be constructed here at about \$100,000. Engineers, Pringle & Sons, Montreal.

New Westminster, B.C.

The electric light and water extensions by-law has been carried.

Ottawa, Ont.

In view of the fact that paving operations will be commenced on Sparks

street in the course of about ten days, it seems well to go ahead with the underground conduit system at the same time, for which the city engineer has prepared plans. Engineer Duckworth, G. N. W., Toronto, will come here to confer with the city engineer, the local telephone and Ottawa Electric companies and others interested in the laying of the conduits. Providing an amicable arrangement can be arrived at all the poles on Sparks street will be removed and telegraph, telephone, Ottawa Electric Municipal electric and other wires will pass through the conduits under the sidewalks. In order to do away with the poles supporting the trolley wires the city engineer has planned to have the sustaining wires attached to the buildings on either side of the street. This is a new way and as yet untried in any other City. Mayor Hopewell; City Engineer, N. J. Ker.

Peachland, B.C.

Tenders will be received until May 1st for \$3,000, 5 per cent., 20 years, electric light system and \$1,000, 5 per cent., 20 years, local improvements. H. McDougall, clerk.

Penetanguishene, Ont.

The ratepayers will vote on May 1st on the question of the agreement between the municipality and the Penetanguishene and Midland Electric Street Railway, Light and Power Company, Limited, for the purchase of the latter, etc., and to provide for further extensions. W. H. Hewson, town clerk.

Port Arthur, Ont.

Tenders are called until April 29th for supply and delivery of the following: 20,040 feet standard steel rails, (80-lb.); 674 pairs angle bars with 6-in. centres; 105 pairs angle bars with 6-in. 5-in. 6-in. centres; 26,000 5½ x 9-16 spikes; 3,300 4½ x ¾ bolts. Delivery on or before May 25th, 1911. Tenders to quote price f.o.b. point of delivery. J. McTeigue, City Clerk.

Prince Albert, Sask.

Tenders addressed to the City Commissioners are called until May 31st for supply of electrical machinery. A. Holmes, C. O. Davidson and F. A. Creighton, city commissioners. Advertisement in "Tenders and For Sale Department" of this issue.

The City Commissioners have accepted the following quotations for electrical supply material for year: cross-arms, to the Cameron Lumber Co.; cedar poles, two 2-car lots, Lindsley Bros.; copper wire, Eugene Phillips Electrical Works; also accepted quotation of Vandeleur & Nicholls for one 15 h.p. induction motor to be used for driving new elevating machinery in connection with present rock-crushing equipment. R. Wright, city electrician.

Portage la Prairie, Man.

The power committee appointed W. E. Skinner, Electrical engineer, of Winnipeg, to give an estimate of the cost of a transmission line from Winnipeg to this city; also the cost of replacing the plant of the Central Electric Company and the cost of a transformer station at this city.

Saskatoon, Sask.

The city engineer has been authorized to secure information on the cost of installing, operating and maintaining a street railway here as a municipal enter-

prise. Prof. Greig was instructed to report on the relative methods of producing power for the city's use.

Stettler, Alta.

The council contemplate the installation of an electric light plant costing \$17,000. D. Mitchell, secretary-treasurer.

Swift Current, Sask.

Tenders addressed to O. G. Manwaring, secretary, Prairieville Rural Telephone Co., Box 371, will be received until April 28th for construction per pole mile of about 11 miles of rural telephone line out of this town. The provincial government supply the poles free, delivered and placed.

Toronto, Ont.

Tenders addressed to G. R. Geary, chairman, Board of Control, will be received until April 25th for supply of rubber insulated wire.

The time for receiving tenders for electric waggons is extended until May 23rd; that for testing transformer until May 9th. G. R. Geary, mayor.

Vancouver, B.C.

Notice has been given of the application of the Howe Sound Power Company, Ltd., for water rights for power purposes on Furry Creek, a stream which flows into Howe Sound. The amount of water applied for is forty cubic feet per second, and in connection with the application for the water record the company has also filed a request to store water in the lakes at the head of the creek by the construction of dams. The Howe Sound Power Company, the details noted in their application show, that the plans in mind are extensive. The water record asked for is equivalent to 1440 miner's inches and the point at which the supply is to be taken has an elevation of 1,000 feet. The water is to be taken from both the north and south forks of the creek. The application for the right to store water in connection with the power plant covers the construction of dams at the outlets of the two lakes forming the sources of Furry Creek. These are located at an elevation of 2,500 feet and now have an area of eighty-two acres. The plans propose dams thirty feet in height, which will increase the area of the lakes to 122 acres.

Victoria, B.C.

For the purpose of carrying out the extensive additions to the city's street lighting system the following apparatus and plant will be purchased: Thirty-five thousand feet of three-inch fibre conduit, at \$7.50 per hundred feet; \$50,000 feet of one inch galvanized steel conduit, at \$8.40 per hundred feet. Tenders will be called for a supply of 150 cedar poles, 5,000 pounds of copper line wire; 1,000 pounds of flexible arc cable; 1,000 glass insulators; 150 magnetite arc lamps and cut outs; 4.50 light transformers, and 1-10 circuit arc switchboard.

Winnipeg, Man.

Tenders are called until May 15th for supply of six 500 k.w. stepdown transformers for sub-station No. 1. M. Peterson, secretary, board of control. Advertisement in "Tenders and For Sale Department" of this issue.

AWARDED

Kingston, Ont.

The acceptance of the Canadian General Electric Company's tender for a

better lighting system for the city was recommended to the council.

Moose Jaw, Sask.

The contract for the power house and car sheds for the Moose Jaw Electric Railway Company has been let to Navin Bros. The buildings will cover a space of 250 x 63 feet.

Vancouver, B.C.

An additional 10,500 horse power is being added to the generating plant of the British Columbia Electric Railway at Lake Buntzen, and contracts for the installation of the generator, water wheel and pipe line have been let as follows: The Canadian General Electric Company received the contract for the generator; McDougall & Co. the contract for a Dobie water wheel. McDonald & Godson, a local firm of contractors, were given the contract for laying the large pipe connecting the power house with the dam at the lake. The installation of the mammoth wheel will make the fourth of its kind at Lake Buntzen, which along with three 3,000-horse power generators are already generating power for the company's systems on the mainland. Work on the latest addition will be completed in October.

Victoria, B.C.

Messrs. Hutchinson Bros. will be awarded the contract for the installation of the electrical system for the cluster lights on Fort street, \$1,400. This price does not include the iron standards.

Miscellaneous

Fort William, Ont.

An unusually large body of iron pyrites has been discovered at Lake Manitou, near Fort William, by an old prospector and miner from Cobalt. The lode measures 76 feet wide in the massive form. This is the second rich discovery in the district during the spring. Several hundred men are now prospecting New Ontario for gold, silver, pyrites and iron ore.

Ottawa, Ont.

The contract for the construction of the Plaza Laurier here has been awarded by the Government to McGillivray and O'Toole, of Ottawa, \$235,000.

Tenders addressed to L. K. Jones, secretary, Department of Railways and Canals, will be received until May 5th for improving Lower Extreme to Lock No. 24. Rapide Plat Canal. Advertisement in "Tenders and For Sale Department" of this issue.

The following building permits have been issued recently: Ottawa Car Co., lumber shed, Slater street, \$4,500; R. E. McKinstry, dwelling, Oakland avenue, J. H. Ashfield, owner, \$4,000; James Davidson, apartments, Wellington street, A. Tracy, architect, \$24,000; Jos. Landreville, storeroom and dwelling, Sparks street, \$6,000; Alex. Betcherman and D. Merskey, dwelling, Clarence street, \$5,000; P. Villeneuve, dwelling, Laurier avenue west, W. A. Charlebois, builder, \$3,500; A. K. MacDonald, dwelling, Archibald street, \$2,500; A. Charpentier, dwellings, \$9,000; S. Coplan and O. Petegorsky, dwelling, Clarence street, \$5,000; Edward Pranke, dwelling, Havelock street, A. W. Clarke, builder, \$2,800; Wm. H. Campbell, dwelling, Spadina avenue, \$3,000; Mrs. A. Hickey, dwelling, W. J. O'Connor, builder, \$3,000; H.

Miller, store and dwelling, Bank street, W. H. George, architect, Alex. Christie, builder, \$11,000; Frank Bessenotte, apartments, Park avenue, George Roy, builder, \$4,225; Frank Bossie, dwelling, Laurier avenue west, \$5,000; J. Hope & Son, alterations, Sparks street, W. E. Noffke, architect, Holbrook & Sutherland builders, \$5,000; F. Diamend, dwelling Lyon street, \$9,000; Bethany church, Bethany street, J. A. Ewart, architect, \$18,000; A. G. Marshall, warehouse, Catharines street, \$3,000; Wm. Gardner, dwelling, Heney street, \$4,000; David Cuthbertson, dwelling, Clemow avenue, \$6,000; Wolf Shengman, dwelling, Besserer street, \$4,500; J. D. Wilson, shop, Bank street, \$2,500; Mrs. William Robertson, dwelling, Monkland avenue, Alex. Robertson, builder, \$3,500; William Moore, dwelling, Springfield road, C. P. Meredith, architect, James Moore, builder, \$2,800; Fred Hunt, dwelling, LeBreton street, \$3,000; A. K. McLean, dwelling, Drive-way, W. E. Noffke, architect, Albert Tabbe and E. D. Spence, Builders, \$6,000.

Toronto, Ont.

Recent building permits include: H. Franks & Son, 3 att. 2-storey brick dwellings, cor. Paton and Campbell, \$5,600; D. B. Cockburn, 1 pr. semi-det. 2-storey brick dwellings, 24-26 Borden street, \$7,000; A. F. Ayisworth, 2½-storey brick dwelling, Whitney avenue, \$10,000; J. Curry, 2-storey brick addition to apartments, northwest cor. Church and Charles streets, \$12,000; F. A. Bowden, 5 att. 2-storey brick dwellings, 649 Logan avenue, \$8,000; F. Markham, 1 pr. semi-det. 2½-storey brick dwellings, Balmoral avenue, \$5,000; A. Elliott, 1 pr. brick dwellings, 613 Avenue road, \$5,000; Crummay & Whalen, 3 att. 3-storey brick dwellings, 61-63-65 Armstrong avenue, \$6,000; F. G. McBrien, 3 pr. semi-det. 2½-storey brick dwellings, Symington avenue, \$10,800; Dickson & Turnerm, 3 det. 2-storey and attic brick dwellings, Tyndall avenue, \$11,000; W. J. Peppiatt, 3 att. 2½-storey brick veneer front roughcast dwellings, 15-17-19 Salisbury avenue, \$5,100; R. H. Bullen, 3-storey brick apartments, 38 Maitland street, \$35,000; W. J. Craig, 2-storey and attic brick dwelling, Heath and Russell Hill road, \$12,600; Edward Eyre, 1 pr. semi-det. 2-storey and attic brick dwellings, Balmoral, \$8,000; C. J. Lakey, 1 pr. semi-det. 2-storey brick dwellings, Lansdowne, \$5,000; St. Helen's Parish, 2½-storey brick rectory, north side Dundas street, \$20,000; F. Waite, 4 pr. semi-det. 2½-storey brick dwellings, College, \$16,000; J. Lancaster & Sons, 5 att. 2-storey and attic brick dwellings, Victor, \$5,000; John Poucher, 3 pr. semi-det. 2-storey brick dwellings, Coady avenue, \$13,800; L. M. Sinclair, 2½-storey brick dwelling, Warren road, \$6,500; C. R. Peterkin, Jr., 2 det. 2½-storey brick dwellings, St. Johns road, \$5,400; N. Johnson, 1 pr. semi-det. 2½-storey brick dwellings, Medland street, \$4,500; E. F. Williams, 3 att. 2-storey and attic brick dwellings, Baker avenue, \$5,600; F. S. Sneath, 1 pr. semi-det. 2½-storey brick dwellings, Crawford street, \$4,600; Woodcock & Lock, 1 pr. semi-det. 2-storey brick dwellings, 508-510 Clinton street, \$4,500; G. W. Verall, 3-storey concrete brick and brick veneer storage warehouse, on Esplanade, \$45,000; A. E. Cornelius, 3-storey brick store and dwelling, 377 Roncesvalles avenue, \$5,500; F. G. McBrien, 1 pr. semi-det. 2-

(Continued on page 60)

Tenders and For Sale Department

Tenders for School Building

Tenders will be received by the undersigned, up to Monday, the 1st day of May next (1911), at 5 o'clock p.m., for building a school house of brick with cement trimmings, on Hickman street, West Highlands, Town of Amherst, according to plans and specifications which may be seen at Town Office, Amherst, and at the office of Leslie R. Fairn, architect, Aylesford, N.S., on and after Monday, April 17th, instant. Contractor to do all work and supply all material.

Tenders to be sealed and marked "Tenders for School Building" and must be accompanied with a certified cheque for \$500 payable to the Town of Amherst, which amount will be forfeited to the said Town should the party whose tender is accepted neglect or refuse to execute a satisfactory contract to complete the work. The Town Council do not bind themselves to accept the lowest or any tender.

By order of Town Council

W. FRED DONKIN,

Town Clerk.

Amherst, N.S., April 8, 1911.

15-17



Department of Railways and Canals

Ontario—St. Lawrence Canals

Rapide Flat Canal

Sealed tenders addressed to the undersigned and endorsed "Tender for Improving Lower Extreme to Lock No. 24," will be received at this office until 16 o'clock on Friday, May 5th.

Plans, Specifications, and Form of Contract to be entered into can be seen on and after Monday, April 17, at the office of the Chief Engineer of the Department of Railways and Canals, Ottawa, and at the office of the Resident Engineer of the Ontario—St. Lawrence canals, Cornwall, at which places forms of tender may be obtained.

Parties tendering will be required to accept the fair wage schedule prepared or to be prepared by the Department of Labor, which schedule will form part of the contract.

Contractors are requested to bear in mind that tenders will not be considered, unless made strictly in accordance with the printed forms, and in the case of firms, unless there are attached the actual signature, the nature of the occupation, and place of residence of each member of the firm.

An accepted bank cheque for the sum of \$9,000 made payable to the order of the Minister of Railways and Canals must accompany each tender, which sum will be forfeited if the party tendering declines entering into contract for the work, at the rates stated in the offer submitted.

The cheque thus sent in will be returned to the respective contractors whose tenders are not accepted.

The cheque of the successful tenderer will be held as security, or part security, for the due fulfilment of the contract to be entered into.

The lowest or any tender not necessarily accepted.

By order,

L. K. JONES, Secretary.

Department of Railways and Canals,
Ottawa, April 14th, 1911.

Newspapers inserting this advertisement without authority from the Department will not be paid for it.

17-18

Steam Shovels

We own and have for sale near Buffalo, N.Y., two Vulcan 75-ton 2½-yard steam shovels; late model, with new extra large boilers and in excellent condition; also one 70-ton. These will stand most rigid inspection and we are offering them at unusually low prices. Confer with us.

WILLIS SHAW MACHINERY CO.,

171 La Salle Street,

T.F.

Chicago, Ill.

TENDERS

For Waterworks Supplies

The Board of Water Commissioners for the City of London, are inviting tenders for Water Works Supplies for the current year. The list includes Brasswork, Lead Pipe, Iron Pipe, Iron Castings, Stop Cock Boxes, Street Hydrants, Valves, and Valve Chambers.

Tenders will be received up till 12 o'clock noon on Thursday, April 27th, 1911.

For information address,

H. J. GLAUBITZ,

General Superintendent.

16-17

London, Ont.



Department of Railways and Canals

Ontario—St. Lawrence Canals

CORNWALL CANAL

Sealed tenders addressed to the undersigned and endorsed "Tender for Dredging Rapide Flat Canal," will be received at this office until 10 o'clock on Friday, May 5th.

Plans, Specifications, and Form of Contract to be entered into can be seen on and after Monday, April 17, at the office of the Chief Engineer of the Department of Railways and Canals, Ottawa, and at the office of the Resident Engineer of the Ontario—St. Lawrence canals, Cornwall, at which place form of tender may be obtained.

Parties tendering will be required to accept the fair wages schedule prepared or to be prepared by the Department of Labor, which schedule will form part of the contract.

Contractors are requested to bear in mind that tenders will not be considered, unless made strictly in accordance with the printed forms, and in the case of firms, unless there are attached the actual signature, the nature of the occupation, and place of residence of each member of the firm.

An accepted bank cheque for the sum of \$750 made payable to the order of the Minister of Railways and Canals must accompany each tender, which sum will be forfeited if the party tendering declines entering into contract for the work, at the rates stated in the offer submitted.

The cheque thus sent in will be returned to the respective contractors whose tenders are not accepted.

The cheque of the successful tenderer will be held as security, or part security, for the due fulfilment of the contract to be entered into.

The lowest or any tender not necessarily accepted.

By order,

L. K. JONES, Secretary.

Department of Railways and Canals,
Ottawa, April 14th, 1911.

Newspapers inserting this advertisement without authority from the Department will not be paid for it.

17-18

City Hall, Toronto, April, 1911.

17-17

G. R. GEARY, Mayor,

Chairman Board of Control.

TENDERS WANTED CITY OF SASKATOON City of Prince Albert, Sask.

Sealed tenders will be received until **Monday, May 8th, noon**, by J. W. Sanders, Town Clerk, Port Hope, for the construction of reinforced concrete girder bridge, superstructure 130 feet long on present piers, and for filling approaches. Plans and specifications may be seen at the Clerk's office, or at the office of the Engineers.

BOWMAN & CONNOR,

17-18 36 Toronto St., Toronto, Ont.

Machinery For Sale

Concrete Plant

Concrete mixer, capacity 60 yards daily.

Concrete mixer, capacity 80 yards daily, with boiler and Lidgerwood hoister complete.

Cube concrete mixer, capacity 90 yards daily, with engine complete.

McKelvey mixer, capacity 75 yards daily, with engine complete.

Footie electric continuous mixer.

About 2,000 feet double track and ties complete, and

Four turntables,

Ten side dump cars,

Three concrete hoisting dump buckets,

Two stone or coal hoisting dump buckets.

NEUCHÂTEL ASPHALTE CO., LTD.,

17-17 265 Broadway, New York, N.Y.

PORT HOPE

Tenders

For Concrete Sidewalks, etc.

The Corporation of Port Hope invite Tenders for the construction of five lineal miles, or thereabouts, of Concrete Sidewalks and Crossings, with the necessary works connected therewith, in accordance with detail and specifications prepared therefore, copies of which, with forms of tender, may be obtained on application to the undersigned. A marked cheque equal to five per cent. of the gross amount of the contract to be furnished with each tender, and the lowest tender not necessarily accepted. Tenders will be received to noon, 15th May, 1911.

J. W. SANDERS,

Town Clerk.

Dated 19th April, 1911.

17-19

CITY OF TORONTO

Tenders

For Construction of Ash-bridge Bay Docks

Tenders will be received by registered post only, addressed to the Chairman of the Board of Control, City Hall, Toronto, Canada, up to noon on Tuesday, 23rd May, 1911, for the construction of dock in Ashbridge Bay.

Envelopes containing tender must be plainly marked on the outside as to contents.

Specifications and forms of tender may be obtained upon application to the Department of Railways, Bridges and Docks, City Engineer's Office, Toronto.

The lowest or any tender not necessarily accepted.

G. R. GEARY, Mayor,

Chairman, Board of Control.

City Hall, Toronto,

April 12th, 1911.

17-19

Tenders Wanted for
Excavating and Pipelaying

Sealed tenders, addressed to the City Commissioners, Saskatoon, will be received up to 12 o'clock noon on Friday, April 30th, 1911, for all labor necessary for laying about four and one-half miles water mains and sewer mains in the City of Saskatoon, and furnishing certain materials therefor, according to specifications, plans and profiles dated March 1st, 1911.

Plans, Specifications, Instruction to Bidders, General Conditions, and Forms of Tender may be seen at the office of George T. Clark, City Engineer, Saskatoon. Instruction to Bidders, and Forms of Tender will be furnished on application but copies of Plans and Specifications will not be furnished.

The lowest or any tender not necessarily accepted.

JAS. CLINSKILL,

W. B. NEILL,

City Commissioners.

E. M. SNEILL,

Saskatoon, Sask., April 13, 1911.

16-17

EXTENSION OF TIME

City of Edmonton, Alberta

Sealed tenders marked "Tenders for Trunk Sewer," will be received by the City Commissioners up till 3 p.m., May 15th, 1911, for the supplying of all materials and the construction, in tunnel of a concrete sewer ten feet six inches (10 ft. 6 in.), in internal diameter and approximately 3,290 feet long.

Plans and specifications and all particulars may be obtained from the City Engineer's office, Edmonton, on deposit of a marked cheque for the sum of \$25.00, which will be held until the return of plans and specifications. Duplicates of which may be seen at the office of the Contract Record, B34 Board of Trade Building, Montreal, Que.

Lowest or any tender not necessarily accepted.

CITY COMMISSIONERS.

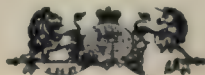
A. J. LATORNE,

City Engineer,

Edmonton, Alta.

14-16

Previously advertised for May 2nd, 1911.

CITY OF REGINA
Saskatchewan, Canada

Tenders for Sewage Pumps and Motor, Switchboard and Apparatus. For Sewage Disposal Works.

Sealed tenders marked "Tenders for Sewage Pumps, Disposal Works," will be received by the City Commissioners, Regina, until 12 o'clock noon, April 30th, 1911, for the supply of One 1,000,000 gallons per 24 hours capacity Pump and Motor, Switchboard and Apparatus.

Full particulars may be had upon application to the Chief Engineer, Trunk Sewer Works.

The lowest or any tender not necessarily accepted.

(Signed) JOHN MARSHALL,

Chief Engineer,

Trunk Sewer Works.

April 6th, 1911.

15-17

City of Winnipeg Electrical
Distribution System

Tenders

For 500 K. W. Transformers

Sealed tenders, on prescribed forms, and marked on the envelope, "Tenders for Transformers," will be received at the office of the undersigned up to 11 a.m., on Monday, May 15th, 1911, for the manufacture, delivery and installation of six (6) 500 k.w. Step-down Transformers for Substation No. 4. Copy of specifications and form of tender, together with conditions governing tenders, as prescribed by law, may be obtained at the office of Messrs. Smith, Kerr & Co., Public Engineers, Carnegie Library Building, Winnipeg. The city reserves the right to reject any or all tenders or to accept any bid which appears advantageous to the City of Winnipeg.

M. PETERSON,

Secretary.

Board of Control Office,

Winnipeg, April 28th, 1911.

17-17

Tenders for Steel Bridge

Tenders will be received by the undersigned up to 4 p.m., on Tuesday, May 16th, 1911, for the erection of a Warren Truss Steel Bridge, over Snake Creek at Dunblane, 5 miles north of Paisley. Span 60 ft., centre to centre of bearings, 14 ft. roadway, concrete floor.

Plans and specifications may be seen at my office, Walkerton. Tenders will be opened on Wednesday, May 17th, at 2 p.m., at Queen's Hotel, Port Elgin.

Also tenders received for the erection of two concrete abutments for said bridge.

The lowest or any tender not necessarily accepted.

JAMES WARREN,
Engineer.

Walkerton, April 22, 1911.

17-18

Corporation of the Town of Collingwood

Tenders will be received by the undersigned until 2 o'clock p.m., May 3rd, 1911, for the following:

Approximately 11,266 square yards of Bituminous Pavement on a five-inch concrete foundation.

Approximately 9,504 lin. feet of concrete curb.

Approximately 9,504 lin. feet of sixteen inch concrete gutter.

All tenders must be accompanied by an accepted cheque for the sum of Two hundred dollars made payable to the Town Treasurer, same to be forfeited to the Corporation if the party tendering declines entering into the contract for the work, at the rates stated in the offer submitted. All tenders must be sealed and sent by registered mail and marked "Tender for Bituminous Paving." For further information apply to the office of the Town Engineer.

The lowest or any tender not necessarily accepted.

K. S. MACDONELL,
Town Engineer.

Collingwood, Ont.
April 12th, 1911.

16-17



Notice to Contractors

MAIN DRAINAGE WORKS

Pumps, vertical electrically driven.
Motors and other electrical equipment.
Screens and cleaning apparatus.
Venturi Meters.

Sealed tenders addressed to the Chairman of the Board of Control, City Hall, will be received by registered post only, up to noon of June 6th, 1911, for the supply of the above equipment.

Envelopes containing tenders must be plainly marked on the outside as to contents.

Specifications and forms of tender may be obtained at the office of the City Engineer, Toronto.

The tenderers shall submit with their tender the names of two personal sureties (approved of by the City Treasurer) not members of the City Council, or Officers of the Corporation of the City of Toronto, or, in lieu of said sureties, the bond of a Guarantee Company, approved as aforesaid.

The usual conditions relating to tendering as prescribed by city by-law must be strictly complied with, or the tenders will not be entertained.

The lowest or any tender not necessarily accepted.

G. R. GEARY, Mayor,

Chairman, Board of Control.

17-17

Miscellaneous

Advertisements under this heading two cents per word per insertion.

Large European concern manufacturing water turbines, centrifugal pumps and steam turbines, wants to be represented in Winnipeg and Vancouver by well-known qualified and experienced firm. Box 265, Contract Record, Toronto, Ont.

Miscellaneous

(Continued from page 57)

storey brick dwellings, cor. Royce and Osler avenue, \$4,600; P. H. Stewart, 1 pr. semi-det. 2-storey and attic brick dwellings, Lansdowne avenue, \$4,800; H. J. Rea, 2-storey and attic brick dwelling, St. Andrews Gardens, \$4,500; Robinson & Shelley, 2 pr. semi-det. 2-storey roughcast dwellings, brick fronts, east side Greenwood, near Gerrard, \$4,800.

Vancouver, B.C.

The following contracts for improvements will be carried out by C. P. R.: The complete fire protection system for the False Creek freight yards, involving among other things the installation of a pipe line for the full length of the freight sheds with hydrants at convenient points, will be put in by Mr. J. H. Vickers of this city. The contracts for the erection of the new ten-stall addition to the round house, and the pattern house in the False Creek yard have been given to the Canadian Dart Company, of Vancouver. Campbell & Wilkie, of this city, will construct the new freight sheds at Harrison Mills, Walhachin and Savonas as well as the boiler house for the large and new oil tanks now being erected near the C. P. R. wharves here. Mr. A. D. McQuarrie, of Vancouver, will build the new Abbotsford station; the addition to the depot building at New Westminster will be put up by Mr. C. Tossell, of this city, while the freight shed at Merritt is to be constructed by Mr. John Boch, of Merritt.

Windsor, Ont.

Windsor is considering a proposition to spend \$17,000 in overhauling its fire fighting system. The plan is to purchase two pieces of motor-driven apparatus, including a combination truck and fire engine, as a first step toward converting the entire department into an automobile force.

AWARDED

Collingwood, Ont.

The following contracts for school were awarded: J. S. Woolum, Collingwood, for mason work, carpenter work, plastering, painting and graining, \$20,741; Wm. Parrott, for plumbing, heating and roofing, \$6,618; total, \$27,359. John Wilson, architect.

London, Ont.

The contracts for pit gravel were awarded as follows: Section 1, R. Hutchinson, \$2.40; 2, W. J. Boss, \$3; 3, R. Hutchinson, \$3.20; 4, Geo. Alexander, \$3.50; 5, R. Robinson, \$3.20; 6, G. Alexander, \$3.40; 7, R. Hutchinson, \$2.80; 8, J. Quick, \$3.24. Mr. J. Flood was awarded the contract for hauling broken stone at 35 cents a load. Mr. W. J. Boss was given the contract for supplying broken stone at \$1.70 a load.

Business Notes

A. & R. Billet, contractors, Montreal, Que., have registered.

The Hull Woodenware Co., Ltd., Hull, Que., assets to be sold by tender.

J. Barrette & Cie., plumbers, Montreal, Que., are stated to have dissolved.

Therriault & Malette, plumbers, Montreal, Que., are stated to have dissolved.

Simoneau & Bastien, waterworks, Racine, Que., have registered.

Heon, Roy & McLeod, contractors, Three Rivers, Que., have registered.

Naylor, Son & Co., Essex, Ont., Ont., electric light plant sold to Essex Light & Power Co., Ltd.

David Steven, saw mill proprietor, Chesley, Ont., is stated to have assigned to Matthew A. Halliday.

M. Germain & Co., plumbers, St. Roumald, Que., are stated to have assigned.

Morden Pump & Machine Works, Morden, Man., are stated to have dissolved.

H. E. Brunet & Cie., bricklayer contractors, Montreal, Que., have filed consent of assignment.

Lincoln Saw Mills Co., Ltd., sawmill proprietors, Langley Prairie, B.C., are stated to have assigned.

Similkameen Co., Ltd., sawmill proprietors, Princeton, B.C., is stated to have sold out to W. C. McDougall.

The Laing-Ritchie Co., of Essex, Ltd., Essex, Ont. Planing mill and lumber business taken over by the Naylor Lumber Company.

A report has been prepared at the City Hall showing that there are at present 91,160 houses in Montreal as compared with 64,500 in 1906, or an increase of nearly 30,000 new residences in five years.

The power plant of the Sherbrooke Railway & Power Company has been completed and is in operation. At a meeting of the directors held in Montreal a few days ago it was stated that the company's railway line would be started at once and it is hoped to have it running by the first of July.

Mr. J. C. Wallace, of the Western Dry Dock and Shipbuilding Company, Port Arthur, stated on the 20th that work would be started at once on the construction of the largest boiler works in the Dominion of Canada. The produce of the factory would be steam boilers of all kinds, stationary, marine, and locomotive, stationary engines, pumps, and other lines of machinery. No estimate has been furnished yet as to the approximate cost of this plant.

The C. P. R. has placed an order at the Angus shops for six new sleeping cars of a distinctly new type. These are for the Imperial Limited, each car will have seven state rooms together with all modern conveniences, placed in the most approved form. Each drawing room will accommodate five persons and be finished in different styles of decoration. Every compartment will be furnished with individual electric lights and the dusting will be done by an adaptation of the vacuum cleaner system.

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Side view of Penstock Distributor built for the Ontario Power Co.

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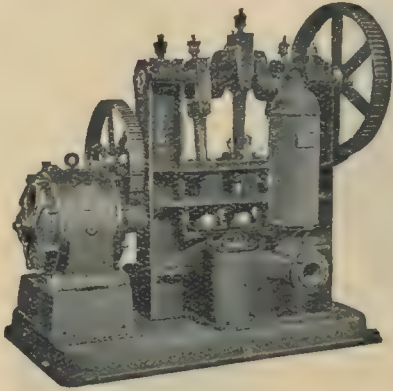
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(Continued from page 50.)

Association, and Association of American Portland Cement Manufacturers. The Blue Book presents data especially applicable to Pittsburg Standardized Reinforcement and other information useful in general design. The Pittsburg Standardized Reinforcement offers an efficient system of design requiring practically no drafting details, and the Blue Book reduces the amount of mathematical computations to a minimum.

The publishers of the "Cement Era," Chicago, have issued their fifth annual Directory of Portland Cement Manufacturers. In the compilation of this directory every care has been taken to make it accurate, complete and up-to-date. It contains a complete list of manufacturers of cement, gypsum and lime, as well as machinery and supply firms. The lists given should be most useful in the conduct of all businesses relating to the cement and allied industries.

C. P. R. Programme for 1911

The programme of the Canadian Pacific Railway in western Canada for 1911 includes the construction of 380 miles of new branch lines and the building of 100 miles of double track. The most easterly portion will be that between Fort William and Port Arthur. In Manitoba the work will be continued to Brandon. In Saskatchewan double track will be built both east and west from Moose Jaw. East of Moose Jaw congestion is caused, owing to trains from the Soo line running on the main line at Pasqua, 7 miles from Moose Jaw, but this difficulty will be overcome by the construction of the double track between the two points. The same congestion would occur in future years west of Moose Jaw through the construction of the new branch line to the southwest. To avoid this, and to provide better facilities, the company will this year double-track the line for a distance of 16 miles west of Moose Jaw.

The addition of 40 miles to existing sidings will be made to make room for the longer trains drawn by mogul engines, and the Winnipeg shops of the company will be enlarged to provide facilities for the handling of locomotives and cars.

The Manitoba and Northwestern line running through Yorkton will in future years be the main road from Winnipeg to Edmonton. The steel on this line is light, but this summer heavy 85-pound steel will be laid for 158 miles, and much ballasting, etc., will be done, making the roadbed capable of carrying the heaviest trains at the highest speed.

Rock-crushing plants will be built in British Columbia, and hundreds of miles of roadbed will be ballasted to protect it against the effects of heavy rains.

The Canadian Pacific Railway propose to extend Granville street through the existing depot in Vancouver city, and construct a jetty to accommodate three Pacific steamers; also extensive improvements will be made on False Creek and Burrard Inlet. The company will also establish the gravity system for the distribution of cars at the Fort William terminals, in place of the poling yard, and will replace existing steel bridges with heavier ones, capable of carrying the largest locomotives. New railway yards are to be established at Medicine Hat, Moose Jaw and Regina.

The new lines for the western Provinces will be from Moose Jaw, southwest, 35 miles; Estevan to Forward, 35 miles; Weyburn extension, 20 miles; from Swift Current, southeast, 45 miles; Swift Current, northwest, 35 miles; Wilkie, south on the east side of Tramping Lake, 25 miles; Wilkie, northwest through the Cut Knife country, 32 miles; the Lacombe branch eastward, 60 miles; from Golden, south (Kootenay Central), 20 miles; and Carmangay to Aledrsyde (southern Alberta), 27 miles.

Contract Record

ESTABLISHED 1858

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Improved Specifications

The need for some consideration of the above subject is emphasized by a recent investigation of the Department of Public Works in a large American city. The expenditure involved ran into several millions and the investigation disclosed the fact that the specifications for the various works were faulty, that certain contractors had been favored; and that the work had been conducted in a loose and extravagant manner. Undoubtedly the first item is of primary importance of the objections made in the investigation cited could be sustained pretty generally in specifications for our own municipal work. Ambiguity of clauses in specifications is the base of the contracting business and undoubtedly much improvement might be made in this direction. Indefiniteness of this kind tends to limit real competition and throw the work to one or two bidders, for the simple reason that one or two only will probably have done considerable work for the city before and have some idea as to the manner in which such clauses will be construed by the engineer. Their competitors are obliged to protect themselves by bidding high enough to cover all contingencies. Under such conditions the city must be the loser.

One of the indefinite clauses referred to is the unqualified statement that the material or work must be "satisfactory to the engineer." Another class of indefinite requirements comprises those calling for lump bids on construction of indefinite amount or nature, as of foundations carried down to solid rock, where no borings have been made to indicate what such depths may be, or leaving indefinite the location of certain work.

Perhaps in the majority of cases such as these last the engineer is not primarily to blame, being frequently required to prepare plans and advertise the work before he has had sufficient time to thoroughly investigate the conditions existing, to make proper borings, etc., or perhaps without being allowed to spend the money necessary for such investigations. It is no

uncommon occurrence to have the city council, or other body of officials not familiar with the amount of work involved, direct the engineering department to prepare plans and estimates and report the same within say two weeks, when the thorough consideration which the subject should receive would occupy at least four or five months; and, having received such hastily prepared plans, to direct the engineer to receive bids on the same after a brief period of advertising. We have several times called attention to the desirability of deciding on the next year's work in the fall, thus giving the engineering department the winter in which to work up the plans. The too common practice is to make no decision until spring, when the department is already busy with outside field work which has been necessarily deferred until the construction season opened; and then, since that season is already on, urging the engineer to hurry the plans so that the work may be completed before winter closes in.

City councils and municipal engineers would do well to give some consideration to these matters and to cultivate forethought. The engineer should make it perfectly plain that it is essential for him to have sufficient time to make a thorough investigation of projected work and to prepare not only general, but also detailed plans so complete and final in every respect that there will be no necessity for extensive changes in the future. Then, having decided upon what is to be done he should specify it, clearly and simply, in terms that contain no suspicion of ambiguity.

Estimating On New Work

In the spring and early summer a contractor is called upon to make estimates on much new work. To a great extent there is no more important subject connected with contracting than the making of estimates.

If the estimate made in bidding is wrong, especially if it is too small, the contractor cannot make a profit on the work. As he is in business primarily to make a profit, this shows the consideration that should be given estimates of cost. Many contractors still use what may be termed the "guessing system" of estimating costs of prices. That is, they make a guess at the probable cost of new work, based either on records of prices or costs of similar work they have done or else from prices that they remember. In

Reciprocity With U. S.?

The Financial News, of London, England, says that up to the present time no less than \$2,100,000,000 of British capital has been invested in Canada. In 1910, 81½ per cent. of the total Canadian issues were taken up by the Old Country.

other words, the process is entirely a mental one. This method was a very common one some years ago, but to-day, with prices running low, the class of labor that can be obtained being indifferent, and with margins of profits small, it is certainly not a safe method, and it is small wonder that losses are sustained under such circumstances.

To-day each item in an estimate should be made up separately and upon an analytical basis. If the cost of concrete is being estimated, the first consideration should be the cost of the materials, cement, sand and the aggregate, then the cost of forms should be

considered. At times the cost of water for mixing must be listed. A difficult item to estimate is the cost of mixing and placing. This must include preparatory work and that of cleaning up and all extra work that may arise. Then the cost of plant must be estimated and this should include the expense of placing the plant on the job. Last of all is the general expense and this varies much according to the size of the job and character of the work.

If each class of work is made up in this manner in unit contracts, no detail is likely to be overlooked. When lump sum bids are to be submitted, a schedule of all work should be made and then each item can be worked up as suggested, and a total thus obtained.

It is a good idea to have a book in which all such estimates are recorded, so that quick reference can be made to them. This is not only necessary in making up other bids, but allows of the estimates being

from an advertising point of view it would be of great value, especially if it were made to throw light upon constructional methods and the varying effects obtainable in shades and colorings.

Many people have little or no conception of the real possibilities in color effect in brick work and we are confident that it would be to the advantage of our larger firms to invest in a sample room of the kind shown. We venture to think that the displays that could be made by our own Canadian industries would be worth while.

Uncle Sam is not bound by the laws that affect owners of less consequence, according to a ruling in the federal court in Minneapolis recently. Suit was brought on behalf of the government against a bonding company which had bonded a contractor, the latter failing before completing the work. The bonding



Display of Front and Ornamental Brick in the Office of a Leading Manufacturing Firm of New York City

used if the work is secured, during the life of the job, to learn how the actual cost varies from the estimated. —The Contractor.

Is a Brick Display Worth While?

The question seems superfluous after a glance at the illustration, which is reproduced from a photograph of a display of Messrs. Fredenburg & Lounsbury, of New York City. We have always been willing to give clay products their due and on more than one occasion we have called attention to what we considered the lack of progressiveness on the part of clay workers in not informing their customers sufficiently as to the great adaptability of clay products and their possibilities in commercial and structural lines. A display of the kind shown herewith would accomplish much as an educational medium, while

company set up that the government should have presented its claim within one year, but attorneys for the government argued that Uncle Sam was not bound by such regulation, and the court ruled that the contention was correct.

A St. Louis architectural firm has brought suit against a client for damages for alleged libel. The libel is claimed to have consisted in the defendant's making endorsements upon a draft which the plaintiffs drew upon the defendant, which endorsement is declared to have been alleging that plaintiffs made false accounts. While it would be considerable of a question as to the extent of the damage which could be sustained upon the circulation of libellous statements upon a draft, the defendant does not seem to have exercised much judgment in expressing his opinions in that way.

A "Find" in An English Brickyard

An interesting discovery has just recently been made at Mr. F. D. Veasey's brickyard at Goodmanchester, Eng., when the fossilized remains of an Ichthyosaurus were found 15 ft. in the clay and 35 ft. from the top surface of the earth. The discovery was made whilst ordinary digging operations were in progress. The first portion of the reptile found was the ribs, and on digging further the backbone was disclosed, and all the parts of the skeleton were removed. The vertebrae are, of course, like those of a fish, and each is about 13 in. in circumference and 2 in. thick, whilst the segment weighs on the average about 2 lb. Quite eighteen pieces of the backbone were recovered, and there was one section of the tail. There are a great number of ribs, but unfortunately these are broken into small pieces. Two large fragments were also found, like two of the vertebrae joined, but it is hardly possible to say what they are. A professor from the Sedgwick Museum, Cambridge, has paid a visit to the spot, and places the life of the reptile at something like six million years ago. If the Ichthyosaurus were seen complete it would be about 9 ft. 4 in. in length (a small one). Many are continually unearthed in the Oxford clay at Fletton, but the one discovered at the brickyards has not as yet been put together. Chamber's Encyclopaedia says:

"The Ichthyosaurus is a remarkable genus of reptiles which inhabited the sea during the deposition of the Mesozoic strata. Like the modern Cetacea, their structure was modified to suit their aquatic life. The body was shaped like that of a fish, the limbs were developed into paddles, and the tail, long and lizard-like, was furnished, it is believed, with a fleshy fin, as in the dolphin, except that its position was vertical. The head was large and produced into a long and pointed snout, resembling that of the crocodile, except that the orbit was much larger, and had the nostril placed close to it, as in the whale, and not near the end of the snout. The jaws were furnished with a large series of powerful conical teeth, lodged close together in a continuous groove, in which the divisions for sockets, which exist in the crocodile, were indicated by the vertical ridges on the maxillary bone. The teeth were hollow at the root, sheathing the young teeth, which gradually absorbed the base of the older ones, and, as they grew, pressed them forward until they finally displaced them. The long and slender jaws were strengthened to resist any sudden shock by being formed of many thin bony plates, which produced light and elastic as well as strong jaws. The most remarkable feature in the head was the eye, which was not only very large—in some specimens measuring 13 inches in diameter—but was especially fitted to accommodate itself for vision in air or water as well as for speedily altering the focal distance while pursuing its prey."

Building Bridge Piers with Little Clearance

The two passenger tracks of the main line of the Erie Railroad cross the westbound passenger track and the freight track of its Newark Branch on a two-span skew plate girder bridge with a concrete centre pier and two abutments 91, 170 and 201 feet long, respectively, that although of ordinary construction, were difficult to build on account of the narrow clearance with constant traffic on the surface tracks. The abutments, about 16 ft. high above the ground, are 5½ ft. thick under the coping and 10 ft. 9 in. thick at the base, 5 ft. below the surface of the ground, and 2 ft. below water level. The centre pier is 5 ft. wide under coping and 7 ft. wide at the base and is pro-

vided with one, and the abutments with two, tongue and groove vertical expansion joints. The coping, 18 in. thick, is made monolithic with the rest of the concrete.

Construction was commenced by digging the foundation pit 5 ft. deep, which as the excavation progressed was sheeted with 2-in. square-edge sheet piles driven with mauls. Water was kept down by pumping, and foundation piles 60 to 75 ft. long were driven in the pit, 2 ft. 7 in. to 3 ft. 6 in. apart on centres, and cut off below ground water level. The piles were driven through deep soft mud by a No. 2 Vulcan steam hammer to a refusal of less than 6 in. under the last ten blows and until their points presumably entered a clay and gravel stratum.

Sand, gravel and cement were stored as much as possible in the cars on which they were delivered and were wheeled by hand to the Ransome concrete mixing machine, which delivered to Stuebner 1-yd. bottom dump steel baskets carried on flat cars on a 24-in. gauge industrial track to the forms, into which they were dumped by a stiffleg derrick. The derrick had a 35-ft. boom, was mounted on wheels and was operated by a double-drum Lambert hoisting engine.

The forms were made in lengths of about 50 ft., corresponding to the distance between expansion joints, and were built of 10 x 2-in. horizontal square-edge planks with 3 x 4-in. outside vertical pieces 3 ft. apart on centres. On account of the train clearance of only 4 ft., outside braces for the forms were inadmissible and they were secured entirely by interior bracing of horizontal transverse permanent wires and removable filler pieces. Half a dozen loops of vertical pieces at distances about 3 ft. apart vertically. Usually they were passed through holes bored in the planks and they were twisted inside the forms to create sufficient tension and bring the forms to close bearing on the spacers. The vertical pieces were in short lengths overlapping each other and when necessary were sawed off to allow the boards in the lower part of the form to be removed and used for the upper portions before the completion of the pier.

To prevent movement of the structure when placing fill the abutments and centre pier where overlapping were praced apart at the foundation by concrete struts, 3 ft. square, reinforced with old rails, spaced 20 ft. apart, and supported on piles. The portions of the abutments not opposite the centre pier were buttressed similarly with concrete on piles, the struts being 3 ft. square at the abutment, 3 x 9 ft. at the end and 20 ft. long.

After the forms were stripped the surface of the concrete was washed with cement and rubbed with ordinary bricks, which gave as good satisfaction as the carborundum bricks first used, although it was the contractor's experience that after a year or two weathering the appearance of the concrete is as good without rubbing as when rubbed. The principal quantities include 1,410 cu. yd. of excavation, 500 piles and 2,486 yd. of 1:3:5 monolithic concrete made with Atlas Portland cement. The work was executed in three months by a force which consisted, on an average, of about forty-five men.

The work was designed and constructed under the direction of the engineering department of the Erie Railroad, Francis Lee Stuart, then chief engineer, and Mr. C. K. Conrad, assistant engineer. The contract was awarded to the Phoenix Construction Company, New York.—Engineering Record.

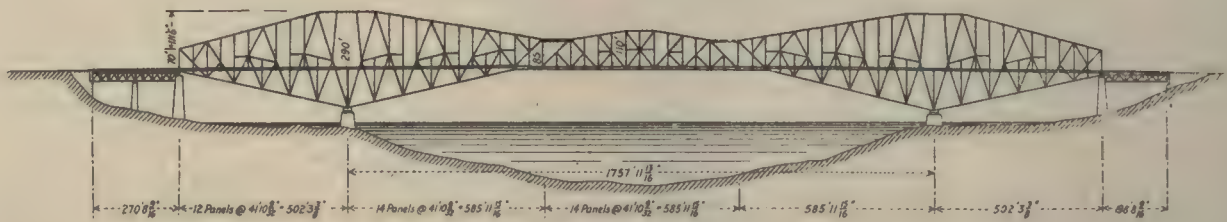


FIG. 1. OFFICIAL DESIGN V. BOARD OF ENGINEERS.

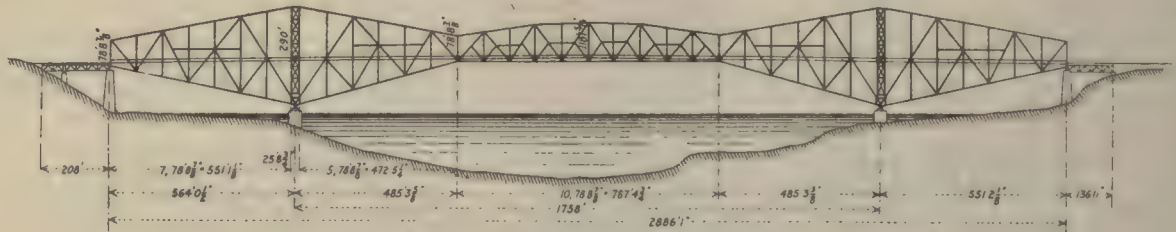


FIG. 2. DESIGN OF MASCHINENFABRIK AUGSBURG-NUERNBERG



FIG. 3. SUSPENSION DESIGN (LINDENTHAL) OF PENNSYLVANIA STEEL CO.



FIG. 4. DESIGN M-N OF THE ST. LAWRENCE BRIDGE CO.

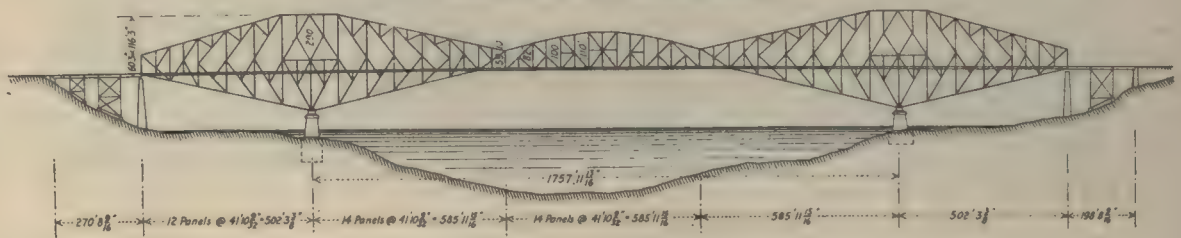


FIG. 5. DESIGN A-B-X OF THE ST. LAWRENCE BRIDGE CO.

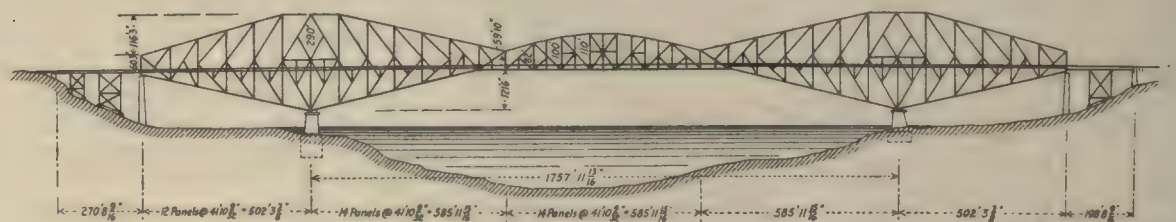


FIG. 6. DESIGN C-Y OF THE ST. LAWRENCE BRIDGE CO.

OUTLINE DIAGRAMS OF SIX COMPETING DESIGNS FOR THE NEW QUEBEC BRIDGE
OVER THE ST. LAWRENCE RIVER.

Designs Submitted for the Quebec Bridge

Together with the Accepted Design of the St. Lawrence Bridge Company, of Montreal—Interesting Features of the Various Plans

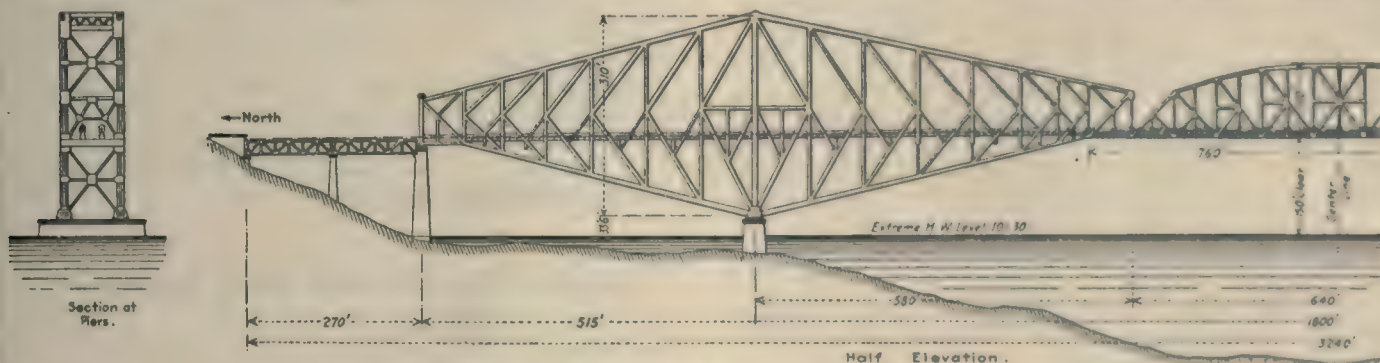
The diagrams of the accepted design upon which the contract for the reconstruction of the Quebec bridge was awarded to the St. Lawrence Bridge Company, of Montreal, and also six of the competing designs are reproduced herewith from an official drawing.

The St. Lawrence Bridge Company, as is now well known, is a combination of the Dominion Bridge Company, Montreal, and the Canadian Bridge Company, Walkerville. The contract price is about \$8,650,000; this sum and the contract price for the substructure make a total of about \$12,000,000. It is expected the bridge will be finished by 1915. In addition to the St. Lawrence Bridge Company, three other firms tendered on this work, namely, the Maschinenfabrik Augsburg-Nürnberg Aktien Gesellschaft, of Gustavsburg, Germany; British Empire Bridge Company, of Montreal, and the Pennsylvania Steel Com-

The British Empire Bridge Company submitted six tenders on the Board's design only. It proposed two schemes of erection in connection with the floating in of the suspended span; one floating the span in on high falsework, the other by floating in a light temporary span to be used as staging upon which the suspended span is erected.

The Pennsylvania Steel Company submitted ten tenders on the Board's design and one tender on an eyebar suspension span designed by Mr. Gustav Lindenthal, fig. 3. This company submitted prices on two schemes of erection of the suspended span. In one scheme the suspended span is floated in on high falsework, while in the other the entire span is lifted directly from the pontoons by a special lifting device designed and patented by the company.

The St. Lawrence Bridge Company submitted a tender on each of the Board's designs and, in addition,



pany, of Steelton, Pa. Tenders were based on the plans and specifications prepared by the Board of Engineers in charge of the work, but contractors were granted the privilege of preparing plans of their own, if they should so desire, and submitting tenders thereon. Three of the above firms availed themselves of this privilege; the St. Lawrence Bridge Company, in fact, submitted seven different plans with tenders, in addition to tendering on the Board's plans.

The official plan was for a cantilever bridge with anchor arms and cantilever arms of the same length, and the erection to be by cantilevering out the suspended span. Five modifications of this design were also prepared by the Board, a tender on any of the six propositions being considered a tender on the Board's design. Two of these schemes were based on erecting the suspended span by cantilevering out, while the remaining four were based on erecting the suspended span at an adjacent site and floating it into position.

The Maschinenfabrik Augsburg-Nürnberg Aktien Gesellschaft tendered on three of the designs of the Board. It also submitted a tender on a design of its own, fig. 2. The principal features of this design are the large panels, the small number of members in the web system and the length of the suspended span. The material proposed was a chrome nickel steel. Built up riveted members were to be used for tension members throughout.

seven tenders on designs of its own. In general elevation and outline the designs submitted by this firm conform to that of the Board's design. Two of these designs are of the single intersection Warren type, fig. 4, the remaining five being variations of the single intersection K web system type, figs. 5 and 6. The variations in these different tenders were due mainly to variation in the details of the members, as well as the proportion of nickel and carbon steel used in the construction.

The design approved by the majority of the Board, as well as the additional experts appointed by the government, was one submitted by the successful contractors, it being the opinion of the engineers that this design contained several features, particularly in respect to erection, that rendered it preferable to the designs prepared by the Board.

The design fig. 7, is to have the K web system in the cantilever and anchor arms, the suspended span being a modified Pratt. All members in the anchor arm and those immediately over the main pier, as well as the floor system, are carbon steel, the cantilever arms and suspended span being of nickel steel. The top chords are composed of built-up riveted members extending over one full truss panel or two floor panels.

The suspended span is 640 ft. long, 110 ft. deep at the centre and 70 ft. at each end. The cantilever arms are 580 ft. long, 70 ft. deep at the end and 310 ft. high over the main post. The anchor arms are 515

ft. long, as at present designed. The trusses are 88 ft. apart and there is a clear headroom of 150 ft. above extreme high water. The total length is about 3,228 ft.

The bridge will be designed to accommodate two railway tracks and two sidewalks for foot passengers, the government having decided that no accommodation will be provided for highway traffic. The train load allowed for on each track will be equivalent to two E60 engines followed by a train load of 5,000 lbs. per lineal foot of track.

The length of span has been slightly increased over that originally proposed by the Board, being now fixed at 1,800 ft., being the same as the original span. This increase was brought about by a rearrangement in the manner of sinking the caissons, thus allowing the centre line of the new bridge to remain coincident with that of the old bridge. The old main piers will not be used, but will be taken down to lower water level, the stone being reused in the new piers.

Inspection of Bridges Should Influence Design

The influence of current bridge inspection on bridge design should be greater than it is, according to the following discussion by Prof. H. S. Jacoby, of Cornell University, at the recent annual meeting of the American Railway Engineering Association:

"In connection with steel bridges, there is hardly any material available in published form relating to the lessons taught by the observations of bridges under traffic conditions. All over the country bridge inspectors are making their rounds, looking at the details of bridges and making records of conditions discovered and recommendations as to repairs required. After the repairs are made the incident is closed for that structure, and so the matter goes on year after year. There must be some important lessons taught by the extensive experience of these inspectors which should influence design much more largely than it apparently does.

"One reason is that the maintenance department is entirely separate from the bridge department, in which the designs of new structures are developed. There are doubtless also other influences at work. Designers and draughtsmen have but little opportunity to become familiar with these matters by direct observation. It seems that the railway does not get the full benefit of the experience of the maintenance department, thus leading to the continued construction of some faulty details because the designers do not learn (except incidentally) of the actual behavior of bridges previously designed by them.

"For example, certain designs of brackets on end floor beams perform their duty in an excellent manner under heavy modern live loads, and under adverse conditions of adjacent track, while others show marked defects. Yet the defective designs are built over and over again on the roads in which the maintenance-of-way department has discovered their weakness.

"This condition is not confined to steel bridges. I am convinced that some railways are losing at least two or three years of service in their Howe trusses because of the lesser relative efficiency of the splices in the lower chords. This is an indication that there are details in timber framing which are not receiving sufficient study by designers, although similar timber structures have been used for many years. This is probably true because the conditions under which fail-

ure occurs are not brought to the attention of designers."

An Expeditious Piece of Work

Rapid reconstruction of a burned trestle was accomplished on the Duluth, South Shore & Atlantic Railway by systematic organization of a gang of about 30 men, the time required being 32 hours for 518 feet of trestle 28 feet high. The original structure was of piles, but in rebuilding, framed bents were used, the burnt piles being cut off for sills. Details of the organization and procedure were furnished by Mr. William Noon, superintendent of bridges of the road, to the "Railway and Engineering Review." Four men ahead cleared around the burnt piles to enable a second gang of three to cut them off at proper level and dowel the sills in place. As fast as this was done the heights of bents were found with a pole and cross-bar, sights being taken from the end of the bridge. Three men did this work and framed posts. Four men carried timbers to the bent men, and six packed and raised the bents. Each was raised by a block and tackle attached to the top of the previous bent. The bents were framed in each case with the post bottoms resting on a 2 x 4-in. piece spiked horizontally to the side of the sill near the top, so that in raising the bent the bottoms of the posts rose over the edge of the sill to their bearings on top. As the bents rose, a deck gang of four placed stringers and ties and laid down rails loosely. Four other men supplied them with timbers, pushing out at each truckload enough stringers for one panel. Two men followed the deck crew, doweling and line-spiking.

Driving Piles Through Hard Stratum

Driving piles through a hard stratum overlying softer material may be accomplished without damage to the pile by first breaking a hole through the hard material before final driving is started. A method of doing this is suggested by Mr. F. E. Schall, bridge engineer, Lehigh Valley Railroad, in discussing the recommendation that the hard stratum be removed, as made by the committee on wooden bridges and trestles of the American Railway Engineering Association. This method was adopted in a case where 55-ft. piles had to be driven through a hard embankment under track with a pile-driver having leads of only 40 feet. A 12-in. wrought-iron, double-strength pipe, 25 feet long, was fitted with a steel point and cap and was driven 20 feet into the embankment. It was then withdrawn, the pile dropped into the hole and driven to the proper depth.

The Trent Valley Canal is now open from Orillia to the Trent River, a distance of about 160 miles. The canal was begun before Confederation and has involved an expenditure, up to 1911, of \$7,873,501. The route utilizes nearly twenty lakes and numerous rivers, and when completed will form an inland waterway from the Bay of Quinte to Georgian Bay and the Great Lakes. The section from Rice Lake to Lake Ontario, 71 miles, is under contract, at an estimated cost of \$6,759,000. It is the most expensive section of the whole canal, and follows the general course of the Trent river. On this section there are to be eighteen locks, with a total fall of 369 feet.



1.—Canadian Light and Power Company's Development.—Cofferdam Ready to Launch

The St. Lawrence River Crossing of the Canadian Light and Power Company's Transmission Lines

A power development of the magnitude of that in which the Canadian Light & Power Company is now engaged always presents new features of interest to the engineer. One of these in this undertaking was the spanning of the St. Lawrence River. This is particularly noteworthy because of the width of the river and the lateness of the season during which the work was carried on.

The high tension lines of the company are to extend from the power house at St. Timothee, Que., to Montreal, in all a distance of 26 miles. These lines, consisting of eight cables, are to be carried on steel towers, the economical height and spacing of which was figured to be 52 ft. and 500 ft. respectively.

While these heights and intervals of towers could be followed throughout the greater part of the distance, the St. Lawrence River, with its depth of water and rapid current, necessitated a special treatment. After an exhaustive study had been made and numerous soundings taken, the company's engineers decided to effect this by erecting on the shore of the river steel towers approximately 130 ft. in height, and building at the centre of the river two concrete piers extending about 15 ft. above the mean water level, and on these a tower 150 ft. in height. The point at which the cables were to be carried across the river was located almost 700 ft. below the present C. P. R. Lachine bridge. At this spot the river is about 3,400 ft. wide. As the soundings had located a shoal in the river only about 200 ft. away from the centre, and as the water at this point was only about 12 ft. deep, it was decided to erect the river piers at this point. This meant that the span of the cables from the Caughnawaga side of the river would be 1,600 ft., while that from the river tower to the Highlands shore would approximate 1,800 ft. These the writer believes to be the longest spans in Canada.

The contract for the above work was not given out until about September 1st, 1910. It was awarded to the Foundation Company, Limited, Montreal, P.Q., who were also engaged in installing the foundations for the double tracking of the C. P. R. bridge, just

above this work. These contractors, appreciating the lateness of the season and the danger of remaining out on the river any longer than was necessary, started work at once. They quickly assembled additional plant and while waiting for the timber for the cofferdam commenced operations by installing the shore piers on the Highlands side of the river. As it was impossible sooner to obtain the large quantities of timber required for the cofferdams in the river, work on the first one was not commenced until September 15th. Work was immediately started on cofferdam No. 1, and this was launched on October 4th. To economize time, this had been built with the sheeting out to its site, anchored in position, weighted and sunk. The false bottom was then removed and the sheeting driven. After the inside of the cofferdam had



2.—Cofferdams in position and excavation in progress.

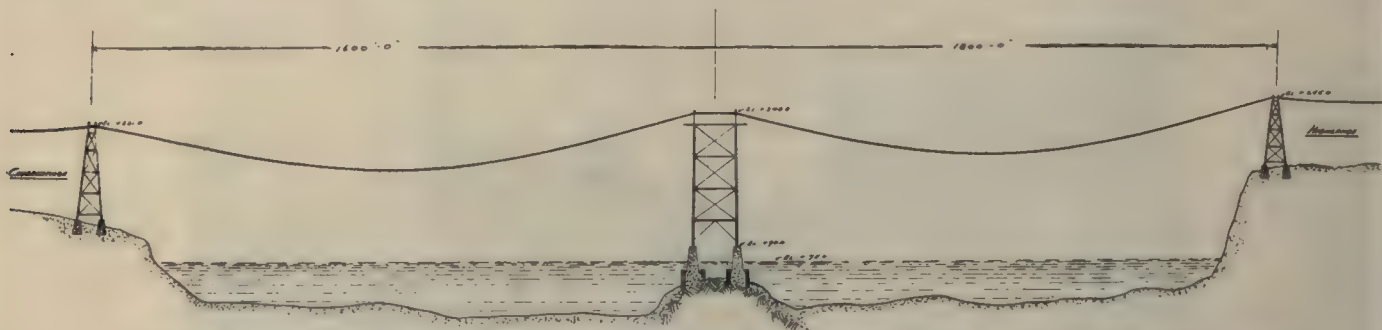
been examined by divers, excavation was started. This excavation was done by means of a one-yard orange peel bucket, operated by a derrick barge, moored alongside. This bucket was augmented by divers cleaning out at points difficult to reach with the bucket.

The contractors, basing their plans upon the records of the soundings which had been given them, expected to find rock at a distance of from 5 ft. to 6 ft. below the bed of the river. Excavation, however, showed that these borings had all stopped on large boulders. Further tests showed that rock could not be located at a further depth of 20 feet.

As the lateness of the season precluded any radical change, the engineers for the company decided to

build the piers on this boulder foundation, leaving pockets in the piers through which pneumatic caissons could be sunk to bed rock the following season. This was made necessary by reason of the fact that

The broken stone and sand used in the concrete and the rip-rap were delivered to the site of the piers in barges handled by a tug used in connection with the work. The lumber, cement, fuel, etc., were ferried



4.—Canadian Light and Power Company's Development—Sketch showing the exceptionally long spans

the boulder formation does not extend down to rock but overlies sand and gravel.

While the river work in connection with cofferdam No. 1 had been proceeding, the framing of cofferdam No. 2 had been carried on. This was launched on October 24th, towed to its position, weighted, sunk and excavated.

As the excavation was completed in each cofferdam, about 4 ft. of concrete was deposited under water all over the bottom. The cofferdams were then

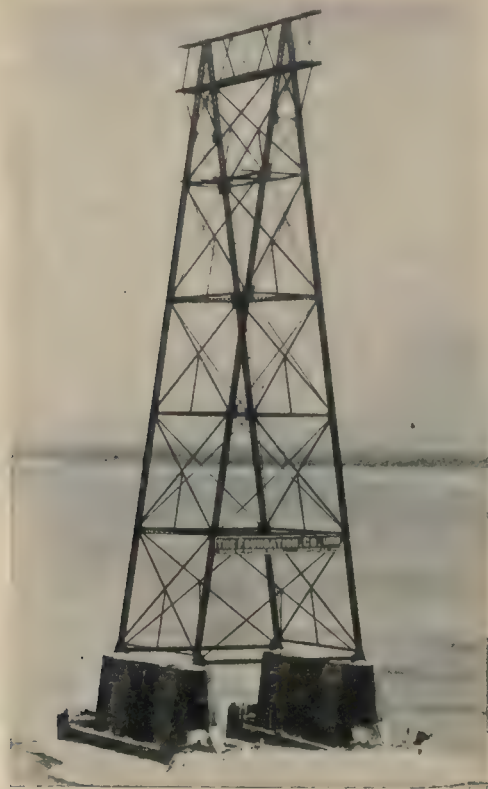
to the piers from the shore on a scow, operated by a hoisting engine, which propelled same by picking up anchor lines from buoys stationed at convenient points.

The work was done by the Foundation Company, Limited, Bank of Ottawa Building, Montreal. J. D. Evans was resident engineer for the Canadian Light & Power Company.

Engineering and Architecture*

The separation of the engineer from the architect was the topic of Luzerne S. Cowles, '97, of Boston, who noted how in European countries the harmonious and artistic development of civic centres during modern times has proved an enormous benefit to them. In ancient times the architect acted as his own engineer; there was little haste in completing a project; and artistic treatment requiring much time and labor was made possible. The ultimate aim of securing the best results was then possible, because time and labor were less important than they are to-day. In the United States there has been, until recently, the tendency to keep the engineer and the architect apart, and the result has been very much in the way of inartistic utilitarian building. Municipalities have been grave offenders in this respect. Consequent on the increase in wealth and population of the cities of the United States, there is at the present time from public and press alike the demand for rational and civic improvement along harmonious lines. The engineer, inartistic as he may be, comes now to the aid of the architect, who will submit to him questions where engineering judgment is desired, while on the other hand the engineer must acknowledge that the architect has the advantage of improving the appearance of constructions, especially of metal. This co-operation was the dominant note of the latter portion of Mr. Cowles' paper, who showed that while private individuals assumed the right to erect almost any kind of building they wished, the public service corporations are realizing the importance of erecting structures good not only from the engineering, but the architectural standpoint. "The training of architects in close proximity to engineers should be encouraged," said Mr. Cowles; "the architect's work embraces the designing of buildings whose form depends on engineering theory and experience." This proximity need not affect the architect's artistic tendencies, but it cannot help training his mind to better work."

* Extract from paper presented before the Congress of Technology.



5.—Completed Piers, with Steel Tower

pumped out and the forms erected. These were framed so as to give the conventional type of nose to each pier, these noses being protected with an armor of old rails embedded in the concrete. Both piers were brought up to grade by November 30th. As a precautionary measure about 1,000 tons of rip-rap were placed at the upstream ends of the piers,

Road Construction in British Columbia

Progressive Policy of the Western Province—Standard Principles Exemplified in Numerous Highways—Extensive Improvements Planned this Season

Road-building generally in British Columbia, owing to the inexorable physical character of the country, presents more complicated engineering problems than does the work of highway construction virtually anywhere else in Canada. And yet it is to the greater glory of provincial enterprise that the main trunk thoroughfares on Vancouver Island and in and about the older settled portions of the lower Mainland enjoy a far-reaching reputation for well-studied gradients, sound construction, excellent surface and workmanlike maintenance. The credit belongs largely in the first instance to the Royal Engineers, who in the earliest colonial days laid the foundation of the British Columbia Good Roads system, and in doing so set a high standard in science construction which has served as an object lesson and stimulus to successive generations.

Roads in this province usually originate in trails, these in the process of evolution incident to settlement and development becoming rural thoroughfares and ultimately trunk highways. At the close of the last fiscal year there was in existence and use in all parts of British Columbia approximately 15,500 miles of public road, this estimate including improved pack trails. To estimate the value of this road system is quite impossible, conditions varying greatly as to construction costs, and no dependable statistics having been systematically kept with respect to road work until during the past few years. The expenditure upon British Columbia roads to date may, however, safely be placed at nothing less than twenty-five million dollars, a considerable portion of which estimate is represented by the cost of the historic Cariboo road from New Westminster and from Yale, the head of navigation on the Fraser River, into the mines that made British Columbia famous.

This wonderful highway, following for a considerable distance the tumultuous waters of the Fraser, through its canyon and clinging almost impossibly to the sheer walls of rock, although it is now falling into ruin in many places where it has been abandoned since the advent of the railway, nevertheless constitutes an enduring monument to the engineering efficiency of British Columbia's earliest pioneers which impresses all who have opportunity of studying its location line and construction.

Not only does the problem of road-making and maintenance offer exceptional difficulties in this Pacific province by reason of the generally mountainous character of the country, and its heavy forestation, but in so far as the lower Mainland and Vancouver Island are concerned, these being the districts containing the greater mileage, deterioration is naturally more rapid than in the other provinces of Canada.

Road-building commands attention commensurate with its importance as a factor in colonization and in public economy generally. During the present fiscal year, beginning on April 1 and ending on March 31 next, a governmental road expenditure of \$4,500,000 is contemplated and authorized; while in order to keep pace with the march of development it is roughly estimated that something like twenty million dollars

will be invested in public roads by the British Columbia authorities during the period of 1910-13 inclusive.

Road construction methods have very greatly changed during recent years, the old-time practice of making the first object of road-building the distribution of funds to the district residents having been long since abandoned for principles of a strictly business character. In this connection the modern policy has been to introduce road-making machinery wherever possible. Graders, traction engines, wagons, road rollers, and logging engines, with rock crushers, are generally employed, with a more generous use of powder than ever before and the application of the machinery of the logging camps to a large extent where heavy clearing is necessitated.

In its road-making plant in all parts of the province the government at present possesses an asset roughly representing in value \$100,000 while of the appropriation of this year of \$4,500,000 for roads and bridges, the largest estimate for any year in the history of the country, it may conservatively be said that a gain or saving in results of at least \$1,500,000 will be secured through the use of road-making machinery and modern scientific methods at a cost of another \$100,000 as against the practice of the old pick and shovel days.

Extensive Improvements Contemplated

Referring to the road-building programme for the present fiscal year, it may be said that colonization construction will be chiefly along the upper reaches of the Cariboo road to Quesnel and Barkerville and to Fort George and thence to Fort Fraser and on to Hazelton, from which point the trunk road will probably be eventually extended yet further north. In the southerly districts, repairs and improvements generally will be undertaken to put in the best possible order the existing trunk and branch road systems of the Okanagan, the Spence's Bridge and Princeton and the Kamloops and Princeton roads, the highways of the Boundary district, and the roads with which the large Ymir district is being well supplied. From the Kamloops centre there are already many excellent radiating thoroughfares to the Okanagan, to Salmon Arm, and into the Nicola country, while a new road that will be of great importance as a colonization factor is now being pushed up the valley of the North Thompson River.

In the Chilliwack and Delta districts road improvements on a large scale are contemplated in the very near future, in connection with which it is the intention of the government to establish a large rock crushing plant at Veddar mountain, on the line of the British Columbia Electric Railway, the crushed rock to be distributed to the various district centres by the electric transportation system, and from these centres taken by the provincial authorities for road work or delivered to the municipalities for similar use within their corporation boundaries.

The roads of British Columbia are allowed a general right-of-way width of 66 feet, while the roadbed proper has a standard graded width of 24 feet, exclusive of ditches, the crowning of the road being

never greater than one inch in 12. Macadam roads are by reason of British Columbia's natural conditions the standard of construction system, little or no corduroy being in evidence and oiled roads not yet having made their appearance, although it is hoped to initiate experiments this summer with the latter or else with tarvia or tar-macadam.

The Department of Public Works is also laying in conjunction with Point Grey municipality and the C. P. R., in the district of Richmond over four miles of bitulithic pavement, from Granville street in Vancouver, at the southern boundary of that city, to Eburne. The first oiled road in British Columbia will also be in the immediate locality of Vancouver city, the intention being to oil the Marine Drive from the Vancouver city boundary at Alma street round by the shore towards the open Gulf, to connect with the McGee road. This drive at the present time offers the finest example in macadam road construction to be found in British Columbia, or anywhere else so far as known. The intention is to oil it for the avoidance of dust from Alma street for about three miles, to where it leaves the beach. The method is to sweep the road clear of dust with wire brooms and then apply the oil to half the road at a time, it being very important that the road should not be traveled over at least three or four days after being oiled.

On Vancouver Island the roads generally are in excellent condition with the exception of a short section connecting Big Qualicum with Union wharf, which is now receiving attention. The improvement of the main Victoria-Campbell River road and the opening of road communication with Strathcona Park are also on the official programme, as well as the location of possible new roads from Nootka Sound and from Alberno via Great Central lake to furnish alternative avenues of entry to the Butte Lake and Strathcona Park country. Of colonization roads on Vancouver Island, the most important now in hand are those to serve the Clayoquot-Ucuelet district and the San Josef Valley, in both of which localities a large amount of colonization settlement has latterly taken place.

Tensile Tests of Large Concrete Specimens

Some time ago tensile tests were made at Cornell University on concrete specimens measuring 6 x 6 x 18 inches in order to learn the behavior of large specimens in tension and determine values for the tensile strength of concrete. These tests were described by Prof. A. P. Mills, assistant professor of civil engineering, in a recent issue of the Cornell Civil Engineer.

The specimens tested were of three different mixtures. The first was a 1:2:4 mixture containing limestone crushed to pass a 1½-inch ring. The second a 1:2:4 mixture containing cobbles, mostly sandstone, crushed to pass a 2½-inch ring. The third was a 1:2½:5 mixture using crushed sandstone similar to that of the second mixture. Nazareth Portland cement was used exclusively.

Special attention was given to the design of the grips, since earlier tests of large specimens have indicated a tendency to crush or shear off in the jaws before actual failure in tension occurs. The device adopted was designed with a view to eliminating the danger of failure under complex stress instead of under direct tensile stress.

Each grip consists of a solid cast-steel envelope having the form of a hollow truncated pyramid of square section. The sides of this envelope were machined

inside and out to a slope of 1 in 10, the smallest interior diameter being 7 inches, the largest 8 inches, and the length of the envelope 5 inches. Wedges were made of hard maple and, in order to permit them to slide with little friction upon the envelope, they were shod on the outside and ends with steel, machined smooth. The use of four wedges permitted the specimen to be gripped alike on all four sides; ⅝-inch steel bolts placed at the corners connect the envelope to a cross-shaped bearing-plate of cast steel which transmitted the stress to a 1½-inch steel bar which was in turn gripped by the jaws of the testing machine. The connection of this steel bar to the bearing-plate was a spherical bearing, so that there was no possibility of the stress being applied in any manner except along the central axis of the apparatus and specimen. Care was taken in every case to drive wedges in to an equal degree of pressure before applying the load.

The results attained by this device, it is stated, were very satisfactory in every way. The majority of the specimens broke well away from the grips at some point within the 3 to 4-inch space between the grips. In no case, even when failure occurred close to the grips, was there the least indication of any crushing between the wedge grips. The break was always perfectly clean, there being absolutely no loose particles, and the fracture was usually in a plane practically at right angles to the direction of application of the load.

In many instances, in the tests of the sandstone concrete, stones were split in two in the plane of the fracture instead of breaking the bond with the mortar; this was particularly true in the case of the red sandstone.

The 1:2:4 limestone concrete in six tests shows an average tensile strength of 278 lbs. per square inch, the highest being 308 lbs. per square inch and the lowest 253 lbs. per square inch.

The 1:2:4 sandstone concrete in nine tests shows an average tensile strength of 150 lbs. per square inch, the highest being 178 lbs. per square inch and the lowest 128 lbs. per square inch.

The 1:2½:5 sandstone concrete in nine tests shows an average tensile strength of 129 lbs. per square inch, the highest being 179 lbs. per square inch and the lowest being 97 lbs. per square inch.

Compression tests were also made of these mixtures and from the data thus obtained certain comparisons have been made. The tensile strength is in the neighborhood of 10 per cent. of the compressive strength, being 11.1 per cent. for the 1:2:4 limestone concrete, 9.3 per cent. for the 1:2:4 sandstone concrete and 8.8 per cent. for the 1:2½:5 sandstone concrete. Comparing the sandstone concrete with the limestone concrete, while the 1:2:4 sandstone concrete has 64.6 per cent. of the strength of the limestone concrete of the same mix in compression, it has only 54 per cent. of the strength of the limestone concrete in tension. The second-class sandstone concrete has 58.8 per cent. of the strength of the first-class limestone concrete in compression, but only 46.4 per cent. of the strength of the limestone concrete in tension.

Preliminary plans have been prepared for a magnificent new hotel to be erected ultimately in Winnipeg by the G. T. P. This new hostelry will be situated on Broadway, near the Manitoba Club and the new Union Station. In round figures it is estimated that it will cost a million dollars. The name selected for it is "The Selkirk." Messrs. Ross & McFarlane, of Montreal, are the architects.

Comparative Cost of Residence Building

Figures Submitted Under Uniform Conditions Upon Various Materials—Relative Economy of Brick Construction—Prices of Materials and Other Details

At the recent annual meeting of the American Building Brick Association, the secretary, Mr. J. P. Fiske, reported an extensive investigation which had been undertaken with a view to determining the relative cost of a small house built of brick, frame and other types of construction. Mr. Fiske procured plans and specifications of a small, modern 8-room house of good design and ascertained by actual bids from a number of reliable contractors, the differences in the cost of construction. Each contractor was fully advised of the object of the investigation and all entered into the spirit of the investigation and agreed to figure out the cost honestly and fairly to the best of their ability.

Bids were obtained upon the following types of exterior wall construction, the other details being common to all types.

Description of Various Types of Outer Wall Construction

- Type 1.—Frame covered with boards and finished with clapboards over building paper; inside surface furred, lathed and plastered.
- Type 2.—Frame covered with boards and finished with shingles over building paper; inside surface furred, lathed and plastered.
- Type 3.—A 10-inch brick wall, i.e., two 4-inch walls tied together with metal ties and separated by a 2-inch air space; inside surface plastered directly on the brickwork. Face brick to cost \$17.50 per M.; inside brick, \$9 per M.
- Type 4.—A 12-inch solid brick wall; inside surface furred, lathed and plastered. Face brick to cost \$17.50 per M.; inside brick, \$9 per M.
- Type 5.—Eight-inch hollow terra cotta blocks, stuccoed on the outside and plastered directly on the inside.
- Type 6.—Six-inch hollow terra cotta blocks, finished with a 4-inch brick veneer on the outside and plastered directly on the inside. Face brick to cost \$17.50 per M.
- Type 7.—Frame covered with boards and building paper, furred and covered with stucco on Clinton wire cloth; inside surface furred, lathed and plastered.
- Type 8.—Frame covered with boards (building paper omitted), and finished with a 4-inch brick veneer on the outside; inside surface furred, lathed and plastered. Face brick to cost \$17.50 per M.
- Type 9.—Frame finished on the outside with a 4-inch brick veneer tied directly to the studding (boarding omitted); inside surface furred, lathed and plastered. Face brick to cost \$17.50 per M.

A separate drawing showing the details of each type of outer wall construction was prepared, and each was accompanied by a set of complete specifications for the entire house.

Everything about the house, except the outer wall construction was identical in all nine types, and may be briefly covered by the following tables:

Details Common to All Types

- A.—Foundations—Local stone.
 B.—Cellar floor—Finished with 2-inch concrete of Portland cement.
 C.—Chimney—Faced with brick costing \$17.50 per M.
 D.—Fireplaces—Faced with brick costing \$17.50 per M.
 E.—Plastering—First-class "two-coat" work.
 F.—Exterior finish—Cypress.
 G.—Blinds—White pine.
 H.—Screens—Copper bronze on white pine frames.
 I.—Window frames—Hard pine.
 J.—Floors—Double floors throughout, with paper be-

tween, except in unfinished attic; Georgia pine upper floors; main hall on first floor of oak.

K.—Inside finish—North Carolina pine.

L.—Doors—Washington cedar.

M.—Hardwood—Bronze finish of ordinary type, costing \$60 for the job.

N.—Wood mantels—\$45 each.

O.—Conductors—Copper.

P.—Flashing—Tin.

Q.—Electric fixtures—Costing \$80.

R.—Hot water heating—Costing \$250 complete.

S.—Wiring—Costing \$68.

T.—Plumbing—Costing \$370.

U.—Painting—Exterior and interior; clapboard house, \$225; other houses, \$130.

V.—Glazing—Double thick German glass.

Note.—Shades, kitchen range and tile work not included.

The following bids were submitted by the contractors, each of whom stood ready to enter into a contract for the house in question at the figures given:

COMPARATIVE BIDS.

Type No.	1	2	3	4	5	6	7	8	9
Description	Clapboard	Shingle	10-inch Brick Wall Hollow	12-inch Brick Wall Solid	Stucco on Hollow Block	Brick Veneer on Hollow Block	Stucco on Frame	Brick Veneer on Boarding	Brick Veneer on Studding
Bid No. 1	\$6,732.00		\$7,572.00		\$7,416.00	\$7,777.00	\$6,852.00	\$7,130.00	\$7,600.00
Bid No. 2	6,235.76	\$6,370.40	6,736.43	\$7,105.00	6,401.21	6,702.81	6,410.00	6,746.20	6,664.00
Bid No. 3	6,662.00	6,786.00	7,118.00	7,418.00	7,199.00	7,236.00	6,842.50	7,076.00	6,897.00
Bid No. 4	6,790.00		7,496.00	7,811.00	7,202.00	7,648.00	7,006.00	7,306.00	7,426.00
Bid No. 5	7,450.00	7,450.00	7,940.00	8,240.00	7,681.00	7,996.00	7,666.00	7,790.00	7,710.00
Average of Bids	6,759.95	6,868.80	7,322.48	7,641.00	7,187.65	7,483.16	6,952.00	7,226.44	7,151.90

A comparison of these five bids, with reference to the excess cost of the various types as compared with the clapboard house, was also shown:

COMPARATIVE BIDS.

PERCENTAGE EXCESS COST OF EACH TYPE OVER CLAPBOARDS.

Type No.	1	2	3	4	5	6	7	8	9
Description	Clapboard	Shingle	10-inch Brick Wall Hollow	12-inch Brick Wall Solid	Stucco on Hollow Block	Brick Veneer on Hollow Block	Stucco on Frame	Brick Veneer on Boarding	Brick Veneer on Studding
Bid No. 1	.0		12.5		10.2	15.3	1.9	5.9	5.2
Bid No. 2	.0	2.1	8.0	13.9	4.1	8.4	2.8	6.2	6.9
Bid No. 3	.0	1.4	6.4	10.8	7.3	8.2	2.3	4.2	3.0
Bid No. 4	.0		12.0	16.6	7.7	14.3	4.6	12.0	10.9
Bid No. 5	.0	.0	6.6	10.6	2.7	7.2	2.7	4.6	3.5
Average of Bids	.0	1.6	9.1	13.0	6.3	10.7	2.9	6.9	5.8

In presenting the bids Mr. Fiske said: "As might be expected, a considerable variation appears among the figures submitted by the different contractors. No two contractors, even of equal skill and experience, will figure exactly the same cost on a given set of plans and specifications. Elements of chance must be considered, such as fluctuations in the market price of material and labor, weather conditions, and unexpected difficulties in construction. Moreover, each man's figure will be influenced to some extent by the measure of his desire to secure the contract in question; in fact, it is doubtful if the same contractor would bid exactly the same on different occasions,

even for precisely the same structure. Moreover, if these variations are encountered in obtaining the cost of a given building in a given place, still wider differences will arise in obtaining bids for different localities where the price of material and conditions of labor are different. For this reason a certain amount of discrepancy between different authorities must be accepted as inevitable, and must not be allowed to throw suspicion on the figures."

In order to arrive at some definite figure which would fairly and equitably set forth the difference in cost of these various types of construction, the general average of all five bids was taken, in addition to the two most favorable bidders as shown in the tables below:

COMPARATIVE BIDS.

AVERAGE FIGURES.

TYPE	Description	Average Bid	Excess Over Clapboards	Percentage Excess Over Clapboards
No. 1	Clapboard	\$6,759.95		
No. 2	Shingle	6,868.80	\$108.85	1.6
No. 3	10-inch Brick Wall—Hollow	7,372.48	612.53	9.1
No. 4	12-inch Brick Wall—Solid	7,641.00	881.05	13.0
No. 5	Stucco on Hollow Block	7,187.65	427.70	6.3
No. 6	Brick Veneer on Hollow Block	7,483.16	723.21	10.7
No. 7	Stucco on Frame	6,952.90	192.95	2.9
No. 8	Brick Veneer on Boarding	7,226.44	466.49	6.9
No. 9	Brick Veneer on Studding	7,153.98	394.03	5.8

COMPARATIVE BIDS.

AVERAGE OF THE TWO MOST FAVORABLE BIDS.

TYPE No.	1	2	3	4	5	6	7	8	9
Description	Clapboard	Shingle	10-inch Brick Wall Hollow	12-inch Brick Wall Solid	Stucco on Hollow Block	Brick Veneer on Hollow Block	Stucco on Frame	Brick Veneer on Boarding	Brick Veneer on Studding
No. 3	\$6,692.00	\$6,786.00	\$7,118.00	\$7,418.00	\$7,179.00	\$7,238.00	\$6,847.50	\$6,970.00	\$6,895.00
No. 5	7,450.00	7,450.00	7,940.00	8,240.00	7,650.00	7,990.00	7,650.00	7,790.00	7,710.00
Average	7,071.00	7,118.00	7,529.00	7,829.00	7,414.50	7,614.00	7,248.75	7,380.00	7,302.50
Excess Over Clap'ds		47.00	458.00	758.00	343.50	543.00	177.75	309.00	231.50
Per cent Excess Over Clap'ds		.7%	6.5%	10.7%	4.9%	7.7%	2.5%	4.4%	3.3%

Mr. Fiske in speaking of the two most favorable bids says:

"The two concerns referred to in the last table were very well prepared to make an accurate comparison on this particular kind of building. Mr. Joslin, of the McDonald & Joslin Company, has made a thorough study of estimating different types of small house construction for years. Their figures, like all the others, were prepared absolutely independently, and while they vary considerably in the totals, their percentage difference between the different types is in remarkably close agreement."

In making up his figures, Mr. Joslin used the following:

PRICE OF MATERIALS

Lime.....	\$1.00 per bbl., 200 lbs.
Portland Cement	\$1.60 per bbl.
Spruce Framing	\$26.00 per M. ft. B.M.
North Carolina Pine	1c. per inch per ft.
Georgia Matched Pine (1st quality) ..	\$75.00 per M. ft. B.M.
Shingles	\$4.75 per M.
Clapboards	\$55.00 per M.
Hemlock Boarding	\$22 per M. ft. B. M.
6-inch Hollow Blocks	10½c. per sq. ft.
8-inch Hollow Blocks	14c. per sq. ft.
Face Brick	\$17.50 per M.
Common Brick	\$9.00 per M.

Allowance for Furring, Lathing, and

Plastering	5c. per sq. ft.
Wages of Bricklayers	60c. per hour.
Wages of Carpenters	50c. per hour.

The cost of lumber displaced by brick on Types 3, 4, 5 and 6, would be as follows:

Frame and Studding, 2,300 ft. B.M., at \$26 per M...	\$59.80
Square Edge Boards, 2,500 ft. B.M., at \$22 per M...	55.00
Spruce Clapboards, requiring for manufacture 600 ft. of stock, B.M.	93.50

Total, 5,400 ft. B.M. \$208.30

These figures may be used in comparison with prices of similar materials and labor in other markets, and by adjusting the differences they could be made applicable in all sections of the country.

Cutting Off Steel Sheet Piling with an Oxy-Acetylene Flame

The data given refer specifically to work observed by the writer where 12-in. U. S. short piling had to be cut off in obstructed spaces. Incidentally other data of similar nature compiled from various sources are given. A brief account of the apparatus used and the general method of operating it will be given first.

The apparatus made by the National Pneumatic Company for cutting steel consists of a torch which has a tip containing two pairs of small holes for the oxy-acetylene heating flame and a fifth hole in the centre which supplies the oxygen to the metal after it is heated. The presence of oxygen in contact with the heated steel oxidizes or burns it up rapidly. The oxygen used with the acetylene flame is merely to increase the temperature of the flame. This flame has a temperature of about 6300 deg. F. The two gases are supplied in the ratio of about 1.3 parts oxygen to 1 part of acetylene.

In operation, the torch is moved along the cutting line and the metal is heated white hot, then the main oxygen valve is opened and a small stream of oxygen at 50 lbs. pressure is blown upon the hot surface. The oxygen unites rapidly with this steel at this temperature forming oxide of iron which runs molten from the cut. It requires 0.38 oz. of oxygen per ounce of iron to form the oxidized iron. The tanks of oxygen are supplied with 100 cubic feet of oxygen at atmospheric pressure, but when compressed into the tank the pressure is run up to 300 lbs. Each tank, therefore, contains about 143 ozs. of oxygen or enough to oxidize 376.3 cu. ins. of metal, provided no oxygen is wasted. This amount wasted depends to a large extent upon the care taken by the operator and also upon the accessibility of the cut.

Cast iron cannot be cut by this method, apparently because of the high percentage of carbon contained. The rate at which steel can be cut has been found, under shop conditions, to be about as follows:

- ½-in. steel at the rate of 15 ins. per minute.
- ¾ to 1¼-in. steel at the rate of 1 ft. per minute.
- 2-in. steel at the rate of 6 ins. per minute.
- 6-in. steel at the rate of 1 ft. in 3½ minutes.

In cutting the steel it is always desirable to have a cut running clear through the material as it is difficult to cut a channel out of which the molten metal cannot run freely. This condition existed at the La-Salle street tunnel, Chicago. It was decided to leave the 12-in. 35-lb. U. S. steel piling in place to protect the adjoining property. The piles had to be cut off below the strict level, and it was impossible to get at



The St. John's Technical High School at Winnipeg now under construction—Contractor, John Saul.

the piles from both sides. The difficulty lay in having a bank of dirt against the opposite side thus preventing the flame and force of the oxygen from blowing the metal through to the other side. It was always running back and covering the surface which should have been exposed freely to the flame. On this work about 35 piles were cut per 9-hour day, using two outfits and five to six tanks of oxygen. The amount of oxygen used was five or six times that necessary to oxidize the steel cut out.

In this work the two cutting outfits were each handled by one man. Two laborers were used to pull out the short sections of pile after they were cut loose.

An example of great saving by the use of this apparatus was that of the wrecking of Pier 14 on the North River, New York, after its destruction by fire on July 9, 1910. The pier extended about 700 feet into the stream and carried a steel structure 50 feet wide by 700 feet long, containing some 2,000 tons of steel. A Philadelphia firm contracted to wreck it in 30 days, or forfeit \$300 a day for each day in excess of that time. It had been estimated that 35 men would be required for the work in the usual way, but it was found that by using the oxy-acetylene apparatus the force could be reduced to 18 men, and the work was completed in 23 working days.

In sinking caissons for the foundations of the Boston Store, Chicago, the cutting name was employed to clear the way of the old steel grillage foundations encountered. Here the method saved a good many hundreds of dollars as it would have been practically impossible to get in with hacksaws.

The method was also employed by the Geo. W. Jackson Company in cutting away members from the elevated railway structure, where changes were being made. The oxy-acetylene flame not only cut about one-third faster than is possible to cut by hand, but in this case the hand process would have been the slow process of cutting a large number of rivets.

Figuring the labor at 30 cents per hour, the oxygen used at 2½ cents per cubic foot, and the acetylene at 1 cent per cubic foot, it is estimated that the cost for ordinary work is 9 cents per square inch.

The outfits for cutting are supplied with different sized tips to suit the class of work, and a trial will soon

show the best tip to use. The outfits cost from \$650 for the small size to \$800 for the largest size.—Engineering-Contracting.

Important School Contracts at Winnipeg

At Winnipeg, work is being resumed on the St. John's Technical High School, the contract for which was awarded last summer to Mr. John Saul, of Winnipeg. The erection of the fine new building illustrated herewith marks an epoch in the educational history of the western capital. When completed, the school will be 220 by 180 feet and three storeys high, exclusive of basement. It will provide accommodation for more than 1,000 students and will be replete with laboratories, work shops, class rooms, gymnasium, assembly hall, and all the other desiderata of a well designed, well equipped building of this class. At the present time, we are informed, the first storey of brick work has been completed above the basement, all of which was surfaced with cut stone. In addition to this the wooden forms have been erected for the second floor of concrete work so that everything is in readiness for prosecuting the work expeditiously this season. The contract price for this building was \$299,750. For a similar building which is being erected on the Academy Road, Harrow and Kingsway site in the southern portion of the city, by J. H. Tremblay & Company, Limited, the contract price was \$299,849.

A new insulating lining brick, designed for use where absolute freedom from dampness is necessary, is so waterproofed and burned that 45 per cent. of the volume is confined air. Its specific gravity is only 0.90, although its ultimate strength in compression is claimed to be 750 lb. per square inch. The bricks float in water and are claimed to be moisture-proof.

A reinforced concrete trestle has been built at Marseilles, Ill., to carry a sidewalk above the grade of the road which it follows. The walk is supported by 9 x 9-in. vertical reinforced concrete posts forming bents, 12 feet on centers, which carry slabs 5 feet wide and 5½ inches thick. There is an expansion joint at every fourth slab.

Compensation of Contractors*

The contractor is the one who is to produce the final result, whether good or bad. It is conceded that a contractor must have the necessary knowledge, ability and facilities, and common business honesty before a proper result can be expected. It is an old saying "You cannot get blood out of a turnip," and every contractor has his personal limitations. Granting, however, that the contractor selected has everything necessary to produce the desired result, the contract requirements will seldom, if ever, be carried out in all cases unless the contractor can earn at least the cost to him of the work. It would seem to many that every honest and capable contractor should be able to earn rightly, the cost of the work, even if he might fail to earn a profit because of delays or failure to economically manage the particular work.

The most important and primary thing for a contractor to know is what assurance the contract provides that he will get out of the work at least as much money as he may be compelled to put into it, plus a possible sum as compensation for his services and knowledge used for the work.

Leaving out of consideration any question of possible profit, contracts may be divided into two groups; first, those in which the contractor is not assured of ever receiving as much money as he may spend on the work and are hereafter referred to as "unsecured-cost" contracts; second, those contracts which assure him at least his cost even if his profit is made uncertain, they are hereafter referred to as "secured-cost" contracts.

The usual forms of contracts can be divided as follows:

- Unsecured-cost Contracts,
 - lump-sum;
 - unit price, with schedule of quantities.
- Secured-cost Contracts,
 - cost, plus a percentage;
 - cost, plus a percentage,—where the general contractor takes estimates for sub-branches of work, and then makes lump-sum contracts, with the architect's approval;
 - cost, plus a percentage, with guaranteed limit;
 - cost, plus a fixed sum;
 - cost, plus a fixed sum, with a bonus if cost is less than a fixed sum, and a penalty if it exceeds such sum.

The writer has coined the terms "unsecured-cost" and "secured-cost" contracts because he desires to represent a class of contracts rather than a particular and specialized form, and he has found that, owing to a wide divergence of opinion, the previous use of terms "lump-sum," "percentage," "cost-plus," etc., have been interpreted as being used in too limited a sense.

There are, undoubtedly, special conditions where some one of the various systems given above will be superior to the others, and no one system can be found that will be the best for all classes and conditions of contracting work. The writer is, however, advocating a principle which must underly all contracts, and is not primarily championing the exclusive use of any one special contract.

As the work is purely a business proposition with a contractor, it is evident that, if the cost is not assured by a "secured-cost" contract, the contractor is

very vitally interested in anything which may tend to affect the cost of the work, but, if the cost is assured, it is immaterial to a contractor what the contract may require or what changes, modifications, alterations, delays, etc., the owner or his professional adviser may demand.

It likewise follows that under the "secured-cost" contracts the accuracy of the specifications and drawings become of minor importance to a contractor, and the owner, or his professional adviser, can modify or correct them at their pleasure without seriously affecting the rights of the contractor. Under "unsecured-cost" contracts, however, exceptional care should be given to make specifications and drawings complete, clear and accurate, because, if this is not done, how in the name of reason can a contractor be expected to make an accurate "lump-sum" estimate, or why in fairness should he be expected to calmly accept changes or corrections which may possibly, if not actually, affect his prospective profit?

It certainly should be evident that if, for any reason, the specifications and drawings cannot be made complete, clear, and accurate, the work should be executed under a "secured-cost" contract, and that only in such cases where it is not only possible but where specifications and drawings have actually been made complete, clear, and accurate should any fair-minded man ask a contractor to accept an "unsecured-cost" contract.

Use of Rock Asphalt

Rock asphalt slabs, laid upon a concrete base 4 to 5 inches thick and surfaced with a thin coating of pure rock asphalt, heated and spread with a wooden float, have recently been put down on Thomas street between Broadway and Church street, New York city. The rock asphalt is mined in Switzerland and after being ground to a powder and heated it is placed in molds and subjected to 3,000 lb. per square inch pressure. The slabs formed by this process are 10 inches square and 1¾ inches thick. In laying pavement a ¼-in. cushion of cement and sand, mixed dry, is placed to support the slabs and level up any inequalities in the concrete base. When the slabs are laid and levelled the entire surface is sprinkled with water which penetrates the joints and enables the cement underneath to set up. The last stage in the construction consists in applying a ¼-in. surfacing coat of hot rock asphalt which is dusted with dry cement. The pavement thus formed, which was put down for the property owners along Thomas street by the Neuchatel Asphalte Company, of New York, is said to afford a sure foothold for horses and to be particularly adapted to streets carrying heavy traffic when a great deal of backing and turning on trucks is necessary. The pavement is laid under a 10-year guarantee. Portions of the thin surface coating are replaced from time to time at they wear out.

The British engineering papers are reporting the following performance in metal cutting: One man employed by the Knowles Oxygen Company, Limited, cut through 42 girders, 15 x 5 in. section, in 4¾ hours, with a consumption of less than 200 ft. of oxygen and 300 ft. of hydrogen. Reckoning labor at 1 shilling per hour the cost figured out 6 pence per cut.

A Toronto man is so much impressed with the versatility of City Engineer Rust that he wrote to him last week asking his advice upon a dentist's bill, in which he claimed to have been over-charged.

*Extract from report of "Special Committee on Uniform Specifications" of the American Society of Engineering-Contractors.

Trade Looking Up at Ottawa

Architects and Contractors Assured of an Active Season — Labor and the Supply Market

Ottawa, April 29, 1911.

Ottawa has again suffered this spring from a shortage of clay brick supply. The different brick plants in the vicinity of the city made brick as fast as possible last year but were only able to catch up with their orders when the season was at an end. Accordingly, there was little or no brick carried over the winter and therefore none to begin spring operations. Last year the early demand was supplied by importing brick from the surrounding towns but they in turn were nearly all drained and this could not be repeated this year. Accordingly there has been a marked scarcity, this having been somewhat lessened, however, by the lateness of the building season. The Peerless Brick & Tile Company has brick for the first of May. This has been made possible this year by indoor methods of manufacture and artificial drying. This company is also making fireproofing this year. They made a little last summer but this season they will go into it extensively. Practically all the fireproofing used in this city in the past has been imported.

There has been much greater activity in the building operations during the past week than before. Tenders have been called for the new apartment house of J. A. Seybold, for which Horwood, Taylor and Horwood are the architects. This building will cost around \$90,000. It will be of brick and of slow-burning construction. It will be a most modern building, replete with all the latest improvements. Donald Fraser is also building a large apartment house on O'Connor street on which the contractors are figuring this week. Tenders are also being called for the new theatre to extend from Sparks to Queen street, of which C. P. Meredith is the architect. Besides these there are a large number of expensive residences now in the architects' hands.

The commencement on the large commercial building to be erected on Elgin street, on the site of the First Congregational Church, has been somewhat delayed on account of difficulties in the transfer of ownership to Mr. Gordon Stewart. These, however, are only temporary and it is expected that the work will soon be under way.

The bricklayers and masons begin working 8-hour days after May 1st, with wages at 52 cents an hour. This has led to some complications with regard to builders' laborers. They, with the exception of those who work with carpenters, will only be able to work eight hours, also, and they are asking for an increase from the usual 25 cents an hour. Two meetings between the builders and the laborers have been held and no agreement reached. However, it is practically certain that it will be settled amicably.

The teamsters are still getting \$4.50 a day for team and man, nine-hour day. However, the city is paying \$5 and it is expected that the buildings will have to pay more, but not as high as the city. The ordinary laborers, that is, those mixing concrete, and excavating, will be paid from \$1.75 to \$2 a day. This is a slight advance.

There is every probability that the work of construction of the electric railway from Morrisburg to Ottawa will be begun this summer. All the surveys are completed and the organization of the company will be completed very soon, the necessary capital having been secured.

There is a general move to have the tunnel question decided within a few weeks. It is holding back railway and industrial operations. The C. P. R. officials state that they are ready to begin the construction of the tunnel this summer if the question is decided. It is estimated that the work will take two years and cost \$1,500,000.

Erection of churches will be an important part of the

building operations in Ottawa this year. Besides the Bethany Presbyterian and First Congregational, there are the new Roman Catholic Church in the Glebe, the Westminster on a site yet to be decided upon but for which several options have been taken, and the large additions to Notre Dame Church in Hull. V. Ladouceur, of Ottawa, has been awarded the contract for erecting the towers for Notre Dame Church and Trudel & Adams will install the fire escapes.

New Apartment House at Montreal

Mr. W. H. Creed is building two fireproof apartment houses that contain some unique features. The largest will be on the Cote des Niegues Road. It will have a frontage of 135 feet and a depth of 175 feet. The structure will be five storeys high in the front and four in the rear. It will be of reinforced concrete and steel, faced with pressed brick and Indiana limestone. It will contain 33 suites of rooms and will be ready for occupation in May, 1912. The property, including land, will cost \$200,000. Mr. Creed is putting in a vacuum cleaner plant that will be connected with every suite in the building. He is also arranging for all refuse to be conveyed to an incinerator in the basement. The heat so derived will help provide hot water for domestic purposes throughout the house. The name of the house will be "The Gloucester." The architect is Mr. Joseph Perreault. Mr. Creed is also building a smaller apartment house in the city with the same vacuum and incinerator features, to be known as the "Shaftsbury." This will contain 32 suites and will cost, with the land, \$70,000. This will be ready for occupation in July.

Great Plant for Port Arthur

Mr. J. C. Wallace, of the American Ship-Building Company, of Cleveland, Ohio, who is interested in the Western Dry Dock and Ship-Building Company, of Port Arthur, announced recently in the latter that the Western Dry Dock and Ship-Building Company would immediately start work on the erection of an additional plant to manufacture stationary, marine, and locomotive boilers, engines, pumps, etc. He also stated that it was the intention of the company to make these works the largest in Canada. The company will build docks. A large amount of machinery will be required. The contract for the buildings as far as known has not been given out, but excavation for the foundation has been started.

The city council of Calgary have calculated the cost of their recently completed city hall, over which there is considerable dispute on the part of the architect and contractor in regard to its completion. The actual outlay was \$300,000, twice as much as at first intended.

Following recent investigations in New York, Controller Hocken, of Toronto, estimates the cost of a tube railway for the Queen City at \$800,000 a mile. He considers the present a most opportune time for obtaining tenders from American contractors inasmuch as the railways on the other side are curtailing their construction programme this season.

The North Lanark Marble & Granite Quarries will exhibit two large pillars of their beautiful Verde antique marble at the coronation festival in London this summer. Samples of the firm's product are shown each year at the Canadian National Exhibition, Toronto, and Lanark marble is universally admired in Canada. The quarries which produce this marble are situated in Darling township, Ontario. The company's office is at St. Catharines, Ont.

Canadian Contractors and Their Work

The Individual and Collective Part Played in the Development of Montreal by the Members of the Laurin & Leitch Firm

Mr. W. C. Leitch was born in Cornwall Ont., about forty-two years ago, and is of Scotch parentage. For a number of years he was with Messrs. Moffatt, Hodgkins & Clarke, waterworks builders, of Syracuse, N.Y. He came to Montreal as general foreman for the Montreal Water & Power Company and later was superintendent for that company. In 1903 he became associated with Mr. James Laurin in general contracting work under the name of Laurin & Leitch.

James Laurin

Mr. James Laurin was born in Montreal in 1863 and educated at the Commercial Academy and the Ecole Polytechnique, graduating from the latter as an engineer in 1884.

cluding the construction of waterworks systems and other municipal projects. Among the works entrusted to them may be mentioned sewerage, paving and macadamizing for the city of Montreal. They put down most of the permanent sidewalks in Ste. Cunegonde and built most of the sewers in St. Louis, Ste. Cunegonde, Maisonneuve, Lachine and Valleyfield. Upon the death of Mr. Benoit Bastien, the firm of Bastien & Valiquette was dissolved, Mr. Valiquette retiring altogether from business in 1905.

In 1906 Mr. T. Bastien joined the firm of Laurin & Leitch, since when the firm has carried on very extensive operations in municipal and other contracting. Mr. Bastien has interested himself in municipal affairs in Montreal



Mr. W. C. Leitch



Mr. James Laurin



Mr. Treffe Bastien

He then became employed on railway construction work in New York State. Returning to Quebec he worked for H. J. Beemer, a railway contractor who built several railway lines in this province, including the Montreal & Western line, now the Labelle branch of the C. P. R. Mr. Laurin next entered the employ of Mr. J. E. Vanier, engineer and architect, and was head clerk in his office for about twenty years, leaving it in 1903 when he joined Mr. Leitch in the firm of Laurin & Leitch.

T. Bastien

Mr. T. Bastien was born in Montreal fifty-four years ago and was educated in the St. Laurent College. His father was the late ex-Alderman Benoit Bastien, who was a prominent resident of St. Vincent de Paul in the county of Laval and represented that county for some years in the local legislature.

Mr. Bastien commenced business as a building contractor when about twenty years of age. In 1889 he associated himself with Mr. Alphonse Valiquette, carrying on business in municipal contracting in Montreal and suburbs. A few years later Mr. B. Bastien joined the firm, which had successfully carried out a number of extensive contracts, in-

for many years. In February, 1904, he was elected to represent St. James' Ward for a two-year period and after being out of the council for a term was re-elected a year ago to represent the newly-annexed Ward of Ahuntsic. Mr. Bastien is very conversant with financial matters and his extensive experience in business affairs makes him a very capable and useful alderman.

Since 1903 the firm of Laurin & Leitch have undertaken contracts to a total value of over \$5,000,000. Their enterprises include the construction of a sewer system, permanent sidewalks and permanent street paving for the town of St. Louis, now Laurier Ward; municipal works for the city of Montreal; a new pipe line, reservoir, pumping plant, and other extensive improvements for the Montreal Water & Power Company; water supply systems for the Singer Sewing Machine Company of St. Johns, Que.; and for the Canada Car & Foundry Company, Limited, of Montreal.

The Winnipeg City Planning Association will probably send delegates to the convention of the National Town Planning Association, which is to be held in Philadelphia, May 15-17. Mr. W. Pearson is chairman and Mr. N. T. MacMillan, vice-chairman of the Winnipeg Association.

Progress News of Construction

The contractors for the Hudson's Bay Company's proposed new building in Calgary, the Carter-Halls-Aldinger Company, of Winnipeg, have been offered a bonus of \$50,000 for the completion of the building by October 1st.

The contractors for the Calgary street railway had to let off about 125 men last week for lack of steel, according to Superintendent McCauley. Contracts for the steel were let last November. Delivery was to be made by April 25. Gorman, Clancey & Grindley, local agents, who had part of the contract, had their steel delivered a month ahead of time.

Good progress is being made by the Randolph Macdonald Company, Limited, Toronto, on the contract for the Hastings lock dam and dredging, on the Trent Canal. The past month witnessed the completion of the lock and approach walls. Mr. Arthur Stephen, C.E., is in full charge of the work. The company expect to complete, this season, the Rosedale section of the Trent Canal and dredging at Cornwall, Ont.

MacArthur, Perks & Company, Limited (G. W. Volckman, vice-president and general manager, Ottawa), have commenced the construction of extensive docks at Havana, Cuba. The work is being supervised by Mr. Aldridge Durrant. Features of interest in this work will be the reinforced concrete pile work for the substructure and reinforced concrete dock shed and warehouses for the superstructure. This work is the first section of the Port of Havana Dock Company's new docks. It consists of two concrete piers, about 650 feet long, extending out into the harbor. The complete scheme will involve two more similar piers, all of which will accommodate the largest vessels.

Good progress is being made on the new ship canal at the works of the Port Credit Brick Company, Port Credit, Ont. The canal will be about 16 feet deep and 100 feet wide and will permit of the passage of lake freighters to the company's shipping docks. Upon the completion of the canal the greater part of the company's shipping will be done by water. During the last few years the Port Credit Company has pursued a continuous plan of improvement and the plant is now considered one of the most complete and up-to-date on the continent. The present improvements will make the shipping facilities second to none.

The Parsons Construction & Engineering Company, Limited, Regina, Sask., are proceeding expeditiously with operations on the overhead bridge at Calgary, Alta., and also with the construction of the Kerr Block, Regina. Mr. W. R. W. Parsons, Mem. Can. Soc. C.E., is superintending the work. Good progress has been made on both contracts during the past month. On the former, five abutments and bridge seats were completed, also concrete footings for 60 timber bents for approaches. On the Kerr Block the excavation (50 by 100 ft.), was completed, also the footings and foundations to ground level. Steel is erected for the first floor and all materials are on the ground.

Toronto's public works, under way and projected, involve a sum of no less than \$26,513,603. The largest items are the hydro-electric system, \$2,750,000; railway viaduct, \$9,000,000; trunk sewer, \$2,400,000; general hospital, \$2,600,000; street widening and extensions, \$1,322,852; storm sewers, \$824,400; filtration plant, \$600,000; school buildings, \$503,000, and new wing for the Parliament Buildings, \$500,000. The indications are that 1911 in Toronto will be the busiest season ever experienced in any Canadian city.

At a recent meeting of the Manitoba Good Roads Association at Winnipeg, a special committee was appointed to

interview the provincial government with a view to obtaining further assistance in road construction and maintenance. An interesting address on Oiled Roads was delivered before the association by Mr. Victor C. Parker, who gave the cost per mile as \$1,425.60, this to include grading, facing, harrowing and rolling, and afterwards treating with oil. The annual cost of maintenance was estimated at \$186 a mile.

Preliminary Work for the Dry Dock at Montreal

No time will be lost in the installation of the proposed dry dock at Montreal. It will be situated at Molson's Creek, some three or four miles below the present harbor. All the summer dredging and other work in this connection will be proceeded with as rapidly as the latest engineering facilities will admit of. A large basin 50 feet in depth will be dredged out along with the necessary approach to the river channel. Quay walls will be constructed and some twenty acres or reclaimed land will be filled in. It is expected that everything will be in readiness for the reception of the 27,500 ton floating dry dock by May of next year. In addition to this a large shipbuilding and ship-repairing plant will be constructed, capable of making all ordinary repairs to both ocean-going and inland vessels. Engine and boiler shops and foundries will be established. Several new features will be adopted in the construction of this dry dock



Montreal Harbour Improvement.

so as to make it adaptable to the Canadian climate. These features are the outcome of deliberations between Mr. F. W. Cowie, Chief Engineer of the Montreal Harbor Commission, and the builders. One special feature will be the provision of a suitable heating system which will prevent the big plant from being frozen up during the winter season. It is understood that this plant will be of the highest type of design and construction that can be produced.

The dry dock will be built on the other side of the Atlantic by Messrs. Vickers, Sons & Maxim. The company will receive a subsidy from the Canadian government of three per cent. interest on \$3,000,000 for a period of thirty-five years. This is a first-class subsidy under the Graving Dock Subsidies Act.

The Lock Joint Pipe Company, New York, which has extensive contract at Toronto, Hamilton, Regina and Saskatoon, is in the market for second-hand locomotive boilers on wheels.

The ratepayers of Saskatoon, Sask., will vote upon a by-law authorizing the expenditure of \$185,000 for the construction of a fireproof unit hospital, equipped with a central heating plant.

Personal Mention

C. A. Biggar, C.E., of Ottawa, returned home recently after a visit to Great Britain and the Continent.

Mr. A. F. Stewart, chief engineer for the C. N. R., has returned to headquarters at Toronto after spending a vacation in the Adirondacks.

David Wilson, of the firm of Mitchell & Wilson, building contractors, Gananoque, Ont., died of blood poisoning on April 14, following a recent injury to his hand.

At Halifax, N.S., on April 20th, Mr. C. D. Howe, of Dalhousie University, addressed a meeting of the Nova Scotia Society of Engineers upon the subject of Reinforced Concrete.

City Engineer Thompson, of Seattle, Wash., has been invited to confer with City Engineer Davis, of Prince Rupert, in regard to the installation of waterworks and sewers. The estimated cost of the projected work is \$600,000.

Messrs. E. M. Nesbitt and Thos. H. Miller, formerly members of the Edinger Nesbitt Construction Company, Limited, Edmonton, Alta., have formed a partnership as general contractors and have opened offices in the Archibald Building at Edmonton.

Mr. Daniel E. Moran has resigned as vice-president of the Foundation Company, New York, to enter private practice as consulting engineer at 55 Liberty street, New York, giving special attention to foundations. He will continue to act as consulting engineer for the Foundation Company.

A notable visitor at Vancouver recently was Mr. John Coates, formerly of Ottawa, and now inspecting engineer in England for the Australian government. Mr. Coates is president of John Coates & Company, Limited, contractors for gas works. It is stated that the company is thinking of establishing a branch in Vancouver.

Applications closed recently for the post of city engineer of London, Ont. Among the applicants were M. W. Wilber, resident engineer, New York State Highway Commission, and S. S. Dawson, an English engineer now at Alexandria, in Egypt. The post, which is worth \$3,000 a year, will probably go to the Acting City Engineer, Mr. Wright, who has been assistant for some years and who has deputized with much satisfaction.

Of the twenty-nine candidates who wrote in the final examination for the British Columbia land surveyors, the following passed, and are entitled to commissions: Messrs. B. C. Affleck, J. C. Agnew, A. W. Ashton, R. P. Bishop, H. N. Clague, F. J. P. Cond, J. R. Graham, R. W. Haggen, J. Heathcott, M. W. Hewett, H. Idsardi, G. J. Jackson, J. L. King, G. H. McCallum, W. Meyerstein, J. F. Nicoll, W. H. Powell, F. Reynolds, R. G. Russell, K. C. C. Taylor and D. O. Wing.

Mr. Fred L. Fellowes, who recently resigned the position of City Engineer of Westmount, left on April 24th to take up a similar position in Vancouver, B.C. He was given a most cordial send-off from Westmount as he boarded the Imperial Limited train at 10.30 in the evening. Mr. Fellowes was presented with a souvenir in the form of a well-stocked travelling bag, the gift of a few intimate friends. The best wishes of a large circle of friends and acquaintances go with him to Vancouver.

Prior to his association with the B. C. Department of Public Works, which began about thirty years ago, Mr. Gamble, the newly appointed Deputy Minister of Railways for British Columbia, served in the location and construction of Canadian railways. His last connection in this field was as assistant engineer on several contracts of the Canadian Pacific Railway. In 1881 he became assistant to the

government agent in the Department of Public Works of British Columbia, and was thereafter resident engineer and agent of the department, having charge of all harbor and river improvements and the erection of public buildings, and later engineer in charge of all public works.

Canadian City Engineers

M. E. Brian, Windsor, Ont.

The present city engineer of Windsor, Ont., was born in that city on October 11th, 1882. He received his early education in his home town and in 1900 was articled to Messrs. Newman Bros., civil engineers. After serving an apprenticeship for three years with this firm he entered the School of Practical Science, from which he graduated in



City Engineer Brian, of Windsor, Ont

1906, taking the degree of B.Sc. in 1907. His early professional experience was obtained as assistant city engineer of Windsor and also in the office of J. J. Newman, where he had a good insight into drainage work and general practice. He qualified as an Ontario land surveyor in 1906 and became an associate member of the Canadian Society of Civil Engineers in 1909. He was appointed to his present position on January 1st, 1909.

A syndicate said to possess a large amount of capital has purchased a tract of land just to the east of the city of Montreal, near Dominion Park, belonging to what is known as the Baylis property, and covering an area of 387 acres, for a price said to be nearly \$1,000,000. Sir Thomas Shaughnessy is said to be allied with a number of English and Scotch capitalists in this deal, and it is further stated that their intention is to build almost a hundred houses, as residences for mechanics and artisans. They will also encourage manufacturing establishments of various kinds. The property, which has a frontage of 960 feet on the River St. Lawrence, runs back a distance of about three miles. The new syndicate purchased this large tract from the Lyall Realities Company, Limited. The House of Brown, Limited, are agents for the Lyall Realities, Limited.

Canadian Railroad Development

A. and W. D. Wheaton have moved their outfit from Amherst, N.S., to Smith Falls, Ont., to do some double track work at the latter place.

Tobin & Larson have been awarded the contract for building 14 miles of railroad from Beaver Creek to Pincher Creek, Alberta. This is the first railroad into the district, but it is said that three other lines are to be built later.

The following contracts were awarded at Calgary for improvements to Alberta Division of the Canadian Pacific: Red Deer roundhouse, Dominion Equipment & Supply Company, Winnipeg; five standard No. 5 stations at Tompkins, Suffield, Burdett, Bow Island and Redcliffe, J. E. Lussler, Medicine Hat; six stall engine house addition at Red Deer, Carter, Halls, Aldinger Company, Winnipeg; No. 1 Bunkhouse, Red Deer and Calgary, G. M. Eaton, Strathcona; extension to Medicine Hat depot, brick and stone, G. E. Lussier, Medicine Hat.

The Canadian Northern Railway is planning for a busy season, and already has engineering parties in the field running lines and laying out work ready for the graders; the contractors are also busy organizing their forces to commence work as soon as the weather permits. Among the firms which have already secured large contracts are the Northern Construction Company, Union Construction Company, McMillan Bros. & Kenny, and M. McCrimmon. It is understood that further contracts will be awarded in the course of a few days. It is expected that between 300 and 400 miles of new grade will be completed this year on the main line, and between 400 and 500 miles on various branch lines, in addition to which a large amount of work will be done on existing lines, ballasting and relaying with heavier steel.

The Railway Committee of the House of Commons has favorably reported the bill extending the time for the construction of the Quebec & New Brunswick Railway Company, which proposes to build a line of railway from Levis to St. John. It was agreed that the capitalization of the company be increased from \$900,000 to \$2,000,000.

G. T. R. Operations at Toronto

The Grand Trunk Railway has placed two steam shovels at work on its \$2,000,000 improvements in the west end of Toronto extending to Mimico. Plans for the proposed subways at Indian road and Howard Avenue have been submitted to the city engineer and are awaiting the approval of the city before commencing their construction. These are to be of solid concrete and have ornamental parapet fences. The structures are designed to present a handsome appearance. One of the steam shovels is working at the Exhibition grounds and the other resumed operations at Dowling avenue, where it ceased work last autumn. Four tracks will be laid from Bathurst street to Mimico, instead of the two tracks formerly in use. A cut which will be 30 feet deep at Dufferin street will be made in front of the Exhibition grounds and the tracks depressed. A retaining wall will be constructed between the tracks and Dufferin Park. The city will leave the tracks at the park at the present level. Workmen have started to remove the old buildings along the northern wall of the Fair grounds and will place at this point additional tracks in accordance with the plans approved by the Railway Commission. The Grand Trunk will start the depression of its tracks on the eastern limit of the Exhibition grounds, and these will not come up till Sunnyside is reached. At that point the viaduct will be begun. The company will have a grade of four-tenths of one per cent. from Bathurst street to Mimico. The revised plans for the bridge over the Humber river provide for two abutments from a central pier, each 100 feet long. Beneath

are no impediments and the structure will be 18 feet above the water. It will have a modern solid ballast floor, so that no water can drop through. The width is to be 55 feet. The cost will be \$250,000 to \$300,000. The bridge over the Mimico river will consist of one span about 100 feet in length. It will be of the same style as the Humber river bridge, except that it will have open flooring. In all subways will be erected over fourteen crossings, and four overhead bridges will be constructed. The bridges are to be at Dufferin street and Dunn, Jamieson and Dowling avenues.

Survey Work for the Hudson Bay Road

An engineering corps of 17 men who had been engaged in the surveys for the Hudson Bay railroad, reached Winnipeg last week. This party, under the charge of F. P. Moffatt, left Winnipeg last May for Split Lake via Nelson river and Manitou rapids and commenced work at the portage between Landing lake and Winter Camp lake. About twenty miles from this point the lines part, one going to Churchill, the other going to Fort Nelson. The party continued on the line of survey from this point toward Churchill for a distance of 70 miles and spent Christmas at Split lake. On December 26 the party with 15 dog teams commenced the journey south toward civilization again and during their trip to Thicket Portage they encountered the coldest weather ever experienced by any of the old-timers of the party, the mercury staying at from 46 to 56 below zero for a period of three weeks. The line was then located south from this point for about 60 miles to Crooked river and the party left this place for Le Pas March 24 and arrived there March 31. From this place they caught the first glimpse of civilization after being away almost one year. The men enjoyed splendid health during the entire trip. About two weeks before Christmas the party came across the survivors of the ship Jeanie, which was wrecked in Hudson Bay last fall and whose crew later arrived in Winnipeg. The winter was very mild and open with the exception of a very cold snap about the beginning of the year. One of the inconveniences which was experienced by the party was the incessant rainfall which commenced about the middle of June and continued until September.

The Canadian Pacific counts on an outlay of \$5,000,000 in Calgary this year, the chief enterprises being the buildings and dams for the \$3,000,000 hotel. The Canadian Northern, which is laying its tracks and preparing for the city station, freight sheds and shops, estimates an expenditure of \$1,500,000 in Calgary the coming summer. The Grand Trunk Pacific will have reached Calgary, it is expected, by September. W. A. Lowry, superintendent of the company's town sites, makes the announcement that before the end of the year the G. T. P. will have nine branch lines radiating from Calgary.

W. H. Martin & Company, Toronto, contractors and planing mill operators, are reported to have assigned with assets and liabilities about even at \$50,000.

Trade Notices and Business Notes

Contractors and others will be interested in the Finger Ring Level, manufactured by the Kokomo Level Company, of Kokomo, Ind. This useful instrument should appeal strongly to bricklayers, cement block layers and concrete workers. It is worn on the hand while at work and enables its possessor to level up his work instantly and accurately as he lays it. A single lance at the level ring on the finger is sufficient and no loss of time is occasioned, as is the case in the adjustment of an ordinary level. This

(Continued on page 64)

Contracts Department

News of Special Interest to Contractors, Engineers, Manufacturers and Dealers in Building Supplies.

Information for insertion in these columns is invited from Architects, Contractors, Engineers, etc.

Waterworks, Sewerage and Roadways

Battleford, Sask.

Wm. Kitson has been engaged as resident engineer to make plans for and superintend the installation of an up-to-date system of waterworks and sewerage disposal plant. As the law now prohibits the discharge of sewerage into rivers it will be necessary to make considerable alterations in the original scheme of drainage prepared by Messrs. Galt & Smith and to devise

Deseronto, Ont.

Tenders are called until June 4th for the sale or exchange of equipment for municipal pumping plant. L. E. Allen, consulting engineer, Belleville. Advertisement in "Tenders and For Sale Department" of this issue.

Fort William, Ont.

Tenders for supply of sand and gravel required for the year 1911 will be received at the office of the city clerk until May 11th. John Wilson, city engineer.

Tenders are also called for same date for supply of 10,000 bbls. of cement.

Tenders addressed to the Chairman of the Utilities Committee will be received until May 11th for supply of the following waterworks material: 500 service boxes; 200 extra caps; 300 extra screws; 28,000 lbs. of $\frac{1}{2}$ in. and 1 in. lead pipe. John Wilson, city engineer.

Fairville, N.B.

The municipality of St. John are calling for tenders for the furnishing of vitrified salt glazed sewer pipe for this village. All tenders must be addressed to J. King Kelley, the County Secretary, 108 Prince William street, and will be received until May 12th. G. G. Murdoch, engineer.

Hull, Que.

The Hull city council will call for new tenders for the Britannia street sewers.

Kamsack, Sask.

It has been decided to take active steps to instal a water and sewerage system.

Lachine, Que.

Tenders were called until May 3rd for supply of drain pipes; construction of brick sewer. H. Robert, secretary-treasurer.

Moose Jaw, Sask.

The board of works have recommended that tenders for sidewalks be submitted to council not later than May 29th. W. F. Heal, city clerk.

The sewer and water committee have recommended that the city engineer be instructed to purchase six American water meters and also write for competitive prices for a horizontal turbine pump.

Melville, Sask.

The by-law for storm water sewer, \$5,000; waterworks, \$63,000, was carried.

North Bay, Ont.

The ratepayers will vote on May 29th to provide for raising \$100,000 for extension of waterworks system and for purchase of electric pump and completing reservoir.

North Toronto, Ont.

Tenders addressed to Frank Howe, chairman of works committee, Eglinton, will be received until May 15th for construction and supply of material for main sanitary pipe sewers; construction of manholes, etc. T. Aird Murray, consulting engineer, 303 Lumsden Building; A. I. Brown, mayor. Advertisement in "Tenders and For Sale Department" of this issue.

Niagara-on-the-Lake, Ont.

This municipality have under consideration the installation of a waterworks system. Total cost about \$21,500.

OKotoks, Alta.

Tenders addressed to Secretary-Treasurer, will be received until May 22nd for construction of cement walks here.

Ottawa, Ont.

The new Sparks street pavement, which it was expected to have put down as the first work this year, will not be started till after exhibition week in September. It is then proposed to put day and night gangs to work so that it will be completed before the winter.

Owen Sound, Ont.

Tenders addressed to J. K. Leslie, chairman, Board of Works, will be received until May 5th for construction and supply of tile sewer pipe for a distance of about 2,600 feet. Plans, etc., at office of the town engineer, R. McDowall, C.E.

Port Arthur, Ont.

A by-law will be submitted to the ratepayers on the 29th of May to authorize the extension of the intake pipe for 2,000 feet beyond the new breakwater. The city engineer was authorized to make surveys of Hazelwood lake as a possible source of water supply. These improvements and the building of another stand pipe will cost about \$100,000.

Ridgetown, Ont.

The by-law to spend about \$35,000 on the waterworks system carried. The water supply comes from artesian wells. F. W. Farncombe, London, C.E., drew the plans.

Renfrew, Ont.

On May 10th three by-laws will be submitted to the voters for approval—\$3,000 for sewerage, \$25,000 for local improvements and \$3,200 for bridge construction. A. T. Lawson, clerk-treasurer.

Scotstown, Que.

This municipality will install waterworks and sewer systems. L. A. Dufresne, Sherbrooke, engineer in charge.

South Vancouver, B.C.

This municipality will call for tenders for 42 miles of 4-in. and 8 miles of 6-in. steel pipe. Besides this, tenders will be shortly invited for supply of 45,000 feet of half-inch and 20,000 feet of $\frac{3}{4}$ -inch galvanized iron pipe; for 4,400 brass cocks, 300 fire hydrants, as well as special castings and pig lead. Superintendent Mullett.

Saskatoon, Sask.

In view of the fact that the intercepting sewer will not likely be ready until next summer City Engineer Clark has recommended that the work on the disposal plant might be well left over until next year. It is expected, however, that the plans for this work will all be completed by the fall of this year, and the tenders advertised for the work early in the spring.

Scott, Sask.

The ratepayers will vote on May 8th on the following: \$20,000, waterworks; \$15,000, sewers; \$5,000, street improvements.

St. Mary's, Ont.

Mr. B. F. Brooke, sanitary engineer, of Toronto, is at work making a survey for the proposed sewage system.

St. Lambert, Que.

Tenders addressed to J. R. Beatty, sec.-treas., St. Lambert, Montreal, will be received until May 8th for following: Contract No. 1, approximately, vitrified salt glazed sewer pipe, 3,500 lin. ft. 24 in., 3,100 lin. ft. 18 in., 7,000 lin. ft. 15 in., 7,500 lin. ft. 12 in., 3,000 lin. ft. 9 in., 2,400 lin. ft. 6 in., 56,000 lin. ft. 4 in. farm tile, 110 9 in. running traps vitrified, 110 9 in. square junctions, 60 increasers, 30 18 in. quarter bends, 30 15 in. quarter bends, 30 12 quarter bends. Contract No. 2, approximately 3,000 lin. ft. 48 in. eww shaped concrete sewer pipe, 1,000 lin. ft. 30 in. egg shaped concrete sewer pipe, 20 concrete monhole sections. Plans, etc., at office of J. R. Beatty, sec.-treas., St. Lambert.

Tavistock, Ont.

The village council has adopted the plans of F. W. Farncombe, C.E., London, for the installation of waterworks here which call for an expenditure of about \$23,000. Fire protection will be included. The pumps run in connection with the electric plant will have a capacity of 1,000,000 gals. per day with a pressure of 120 lbs. in the mains.

Vancouver, B.C.

The following by-laws will be submitted to the ratepayers on June 10th: Sewer extension throughout the city, \$750,000; water extensions in D. L. 301, \$115,000; street improvements in D. L.

301, \$60,000; water extensions in Hastings townsite, \$75,000; opening and rough grading of streets, Hastings \$75,000; rocking, grading and planking streets (general), \$100,000; waterworks extension on Seymour creek, \$100,000; Clark drive street-end widening, \$35,000.

Welland, Ont.

A by-law to spend \$75,000 for the erection of a new pump house and additions to the Welland waterworks was carried.

The expenditure on the new pumping station will be as follows: Water wheel and pump, \$15,000; 16-inch flexible pipe crossing river, \$2,000; 16-inch main from pump house to Young street, \$5,400; building (say) \$10,000; excavating, concrete work, crane, gates, valves, etc., \$31,600; Engineering expenses, \$3,000; contingencies, \$8,000; total, \$75,000.

Winnipeg, Man.

As the result of a meeting held recently between the Good Roads Commissioner and the reeves and councillors of the municipalities of St. Vital and St. Norbert, it is likely that work will be commenced almost immediately on the new asphalt pavement from the city limits past the new agricultural college. The only thing that now remains to be done is the preparation of the necessary by-laws to be submitted to the rate-payers of these respective municipalities for authority to raise the amount required for this purpose. The cost of the new roadway is estimated at \$175,000.

AWARDED

Moose Jaw, Sask.

The contract for main drainage works has been awarded to Messrs. Manders Bros., Edmonton. Geo. A. Archibald, Winnipeg, tendered at \$129,500; Flanagan & Murphy, Winnipeg, \$134,585; Nairn Brothers, Moose Jaw, \$143,713; Moose Jaw Construction Company, \$149,641; Simplex Concrete Piling & Construction Co., Ltd., Regina, \$139,000 on percentage.

Ottawa, Ont.

The following tenders have been received for the west end drainage scheme—Union Construction Company, \$165,475, not including rock excavation. For rock excavation, estimated at 31,000 cubic yards, \$2.50 per cubic yard or \$77,500, making a total of \$243,775. The tender of Thomas McLaughlin was totalled \$209,438, being divided; \$62,188 without rock and \$4.75 a cubic yard for rock, making \$147,350. The board of control has recommended that Mr. McLaughlin's tender be accepted.

Quebec, Que.

The tenders for the supplies required by the department for the ensuing year were as follows: Clay pipes, tenders were received from the Standard Drain Pipe Co., C. A. Parent and Bosse & Banks, the Standard Co. (accepted); lead pipes and pig lead, tenders were received from the Mechanics' Supply Co., C. A. Parent and Bosse & Banks. The contracts for pig lead was awarded to the Mechanics' Supply Co. and for lead pipe to C. A. Parent; Messrs. Terreau & Racine were awarded the contract for iron castings. For brass work, the tender of the Mechanics' Supply Co. was accepted, while Bosse & Banks secured the contract for cement.

Only one tender for bricks, that of Paradis & Letourneau, was received and

that firm was awarded the contract at \$8.50 delivered at the Palais and \$9.00 in other parts of the city.

St. John, N.B.

Pollock & Nice secured the contracts except in one instance, for sewer and water excavations, and in this case it was decided that the city should do the work by days' work. There were fifteen tenders for supplying cast iron pipe and the cheques enclosed to cover five per cent. of the cost amounted in the aggregate to over \$5,000. The tender of W. H. Thorn & Co. appeared to be the lowest and was recommended to the council for acceptance. The matter of installing a pump at the Lancaster reservoir was allowed to stand over until the next meeting. The tenders were as follows: For excavation in Mill and Dock streets—Pollock & Nice, rock, \$8; earth, \$2.25. Excavation in Lancaster street—Pollock & Nice, rock, \$3; earth, 85c. Pond street excavation—Pollock & Nice, rock, \$3; earth, 95c. Clarendon street excavation—Isaac Duffy, rock, \$4.45; earth, 68c. Pollock & Nice, rock, \$4.25; earth, 70c. Tobias & George, rock, \$4.50; earth, \$1.25. Nelson street excavation—Isaac Duffy, rock, \$6; earth, 98c. Pollock & Nice, rock, \$3.50; earth, 80c. Tobias & George, rock, \$3.95; earth, 95c. St. John street west excavation—Isaac Duffy, rock, \$4.35; earth, 74c. Pollock & Nice, rock, \$4.25; earth, 65c. Tobias & George, rock, \$4.75; earth, \$1.

For cast iron pipe:—MacFarlane Strang & Co.—12 inch, \$28.75; 10 inch, \$29.10; 8 inch, \$29.85; 6 inch, \$30.45; 4 inch, \$31.30. Robert MacLaren & Co., (Glasgow)—12 inch, \$29.10; 10 inch, \$29.60; 8 inch, \$30; 6 inch, \$30; 4 inch, \$30.40. N. S. Cast Iron Pipe & F. Co. (Phila.)—12 inch, \$29.75; 10 inch, \$29.75; 8 inch, \$29.75; 6 inch, \$30.75; 4 inch, \$32.75. R. B. Wood (Philadelphia), (f.o.b. on cars, ex duty)—12 inch, \$18.50; 10 inch, \$18.50; 8 inch, \$18.50; 6 inch, \$18.50; 4 inch, \$18.50. T. McAvity & Sons, Ltd.—12 inch, \$29.35; 10 inch, \$29.95; 8 inch, \$29.95; 6 inch, \$30.35; 4 inch, \$31. Vroom & Arnold—12 inch, \$28.15; 10 inch, \$28.15; 8 inch, \$29.15; 6 inch, \$30.15; 4 inch, \$31.15. D. C. Mitchell & Co. (Glasgow)—12 inch, £6.10; 10 inch, £6.11; 8 inch, £6.12; 6 inch, £6.15; 4 inch, £6.17. B. S. H. Thompson & Co. (Montreal)—12 inch, \$30.30; 10 inch, \$30.30; 8 inch, \$31.20; 6 inch, \$31.20; 4 inch, \$31.45. W. H. Thorne & Co.—12 inch, \$27; 10 inch, \$28.65; 8 inch, \$28.65; 6 inch, \$29; 4 inch, \$29. Watson, Jack & Co. (Montreal)—12 inch, \$29.10; 10 inch, \$29.50; 8 inch, \$30.25; 6 inch, \$30.85; 4 inch, \$31.75. Staveley Coal & Iron Co.—12 inch, \$29.30; 10 inch, \$29.65; 8 inch, \$30; 6 inch, \$30.55; 4 inch, \$31.15.

Winnipeg, Man.

The contract for wooden stave conduit for extension of water pipe line was given to J. W. Astley, engineer of construction, at \$7.40 per lin. ft. (4,200 ft.), \$31,080. M. Peterson, secretary, Board of Control.

Railroads, Bridges and Wharves

Arran, Ont.

Tenders are called by Reeve Arran until May 27th for erection of two concrete abutments and one span Baltimore truss, etc., over the Sauble river. James Warren, D.L.S., Walkerton. Advertisement in "Tenders and For Sale Department" of this issue.

Dartmouth, N.S.

The Public Works Department, Ottawa, is having a survey made of the harbor with a view to building a public wharf here. H. A. Russell, C.E., is in charge.

Edmonton, Alta.

It is reported that tenders for the steel for the east end bridge will be called by City Commissioners at once. The date set for receiving them is May 29th. A. J. Latonnell, city engineer.

Halifax, N.S.

Tenders addressed to Hon. C. P. Chisholm, commissioner of Public Works, Halifax, will be received until May 10th for construction of an earth and stone embankment about 2,000 feet long and containing about 45,000 cubic yards. Plans, etc., at local post office or at the office of the provincial engineer, R. McColl, Halifax.

Grandigüe, N.B.

Tenders addressed to R. C. Desrochers, secretary, will be received until May 22nd for construction of public wharf here. Plans, etc., at this department and at the office of the district engineers, Chatham and St. John, and on application to local postmaster.

Hamilton, Ont.

The C. P. R. has filed its detail plans of the route of its Guelph Junction and Hamilton railway with the Dominion Railway Commission. The route of the railway swings in a southerly direction after leaving Waterdown, and crosses the G. T. R. tracks near there. As the track accommodation from the Desjardins Canal bridge to the junction cut is well occupied with the present traffic, a new track will have to be laid. The railway will be begun from the Guelph end in a few days. Vice-president, Mr. McNichol.

Hartney, Man.

Tenders addressed to T. B. Woodhull, secretary-treasurer, will be received until May 22nd for construction of pile bridge with wooden superstructure across the Souris river. Plans, etc., at office of the above.

Huntsville, Ont.

The government wharf will be extended another 200 feet this summer.

Komoka, Ont.

Tenders are called until May 13th for reinforced concrete floor and concrete abutments for a bridge near Komoka. Plans upon application from A. Smith, Komoka; F. W. Farncomb, C.E., 64 Bank of Toronto Chambers, London.

Montreal, Que.

J. N. Greenshields, K.C., states that a syndicate has been formed in London for the construction of a railway from the Saguenay River to Cape Charles Bay, on the east coast of Labrador, a point 650 miles from Quebec. Montreal, which will connect with the Quebec and Saginaw line, which M. J. O'Brien will build during the next eighteen months to Murray Bay, 90 miles from the Ancient Capital.

It is officially announced that the Grand Trunk Railway Company propose to spend between nine and ten million dollars on the improvement of its terminal facilities here. The plans for this scheme embrace the elevation of the tracks between Bonaventure Station and

Turcot Yards, and from St. Henry to the Point St. Charles Yards. The work as contemplated also includes the erection of new freight and passenger terminals at Bonaventure. The plans for this new station are as yet tentative, as they are to a certain extent bound up with the scheme for the elevation of the tracks. When this scheme has been approved by the city authorities and the Railway Commission the plans for the station will be decided upon immediately.

Nelson, B.C.

At a public meeting at Kalso the amount required to purchase the Kalso and Slocan railway was subscribed and a definite plan formed for reorganization of the line. A new equipment will be purchased, new ore bins and car slips built, and a powerful tug and car barge purchased for service on Kootenay Lake.

Pain Court, Ont.

Tenders addressed to T. B. Carron, commissioner, will be received until May 6th for the following work in connection with the Hind Drain in the Tp. of Dover East and West; construction of four steel highway bridges over said drain. Plans, etc., at office of the Tp. Clerk.

Port Hope, Ont.

Plans and specifications for the new electric light bridge were received. The bridge will be constructed of reinforced concrete; there are three different styles as to the protection on the sides. Tenders for these will be received until the 8th of May.

Prince Albert, Sask.

Tenders addressed to R. C. Desrochers, secretary, Department of Public Works, will be received until May 22nd work on the south side of North Saskatchewan river here. Plans obtained at this department and at the offices of the district engineers, at Edmonton, Alta., Calgary, Alta., and on application to the local postmaster.

Revelstoke, B.C.

The C. P. R. will extend their yards here this summer.

Smith's Falls, Ont.

Engineers have been instructed to begin at once on the location of the C.P.R. line from Glentay, sixteen miles west of Smith's Falls, to Toronto, and it is expected that this railroad will be in operation in about two years.

St. John, N.B.

The C. P. R. and the Street Railway may unite with the provincial government in the erection of bridge on the site of the present suspension bridge, which would be used for railway and general traffic purposes.

Toronto, Ont.

It is announced that the Canadian Northern Ry. has placed orders with the Dominion Steel Corporation and the Soo Company for 105,000 tons of rails. The tonnage represented in these orders alone will lay approximately 975 miles. At recent quotations on rails the amount of the two contracts represents an expenditure of \$3,250,000. Of this the Sydney company received a contract for 60,000 tons. The order calls for delivery of at least 15,000 tons per month, and all before the close of navigation.

Victoria Harbor, Ont.

Steel will be laid on the new railway from Victoria Harbor to Bethany, near Peterboro, this year, and before the snow flies it is expected that wheat will be hauled from that harbor.

Victoria, B.C.

The city engineer has prepared the necessary plans and estimates for sea wall to be erected at Ross Bay, which will call for the expenditure of about \$121,000. Should the work be decided upon a by-law to raise the necessary amount will be submitted to the ratepayers. The wall will be 3,700 feet in length and will be of concrete, the top of the wall to be seven feet above high water mark.

Winnipeg, Man.

See "Business Buildings Awarded." The Midland Railway has notified tenants on the property which will be required for construction purposes to vacate before June 1st. The agreement concerning entrance has not yet been drafted in its final state. Ald. W. Midwinter, chairman railway committee. L. C. Gilman, assistant to the president, G. N. R.

AWARDED

London, Ont.

The contract for the new C. P. R. roundhouse has been awarded to John Hayman & Son. Approximate cost, \$75,000. In addition there is an office building for which tenders have not yet been awarded.

Public Buildings, Churches, Schools, etc.

Abaujagne, N.B.

Tenders addressed to Rev. H. D. Cormier, parish priest, will be received until May 6th for remodelling and enlarging the Roman Catholic Church. Plans, etc., at house of the above or at the office of the architect, R. A. Frechet, Moncton.

Barrie, Ont.

Tenders will be called about June 1st for erection of addition and alterations to cost about \$40,000 to school here. Stewart & Witton, architects, Hamilton.

Brandon, Man.

This municipality will erect a town hall and fire hall combined. A large government building to be used as custom, land and post office will also be erected. J. Q. Brandon furnished the information.

Calgary, Alta.

City Engineer Child has submitted plans for a new 73 x 130 storehouse to cost about \$50,000.

A special committee of the board of trade have pronounced on the inadequacy of the post office and customs office here.

Cranbrook, B.C.

Tenders addressed to J. D. McLean, assistant deputy and secretary, Department of Indian Affairs, Ottawa, will be received until May 29th for erection of industrial school at St. Eugene Mission, 5 miles from here. Plans, etc., at the office of the Inspectors of Indian Agencies at Victoria, Vancouver; at the offi-

ces of Dominion Lands at MacLeod, Calgary, and Lethbridge; and at the local post office.

Edmonton, Alta.

The Health Department will call for tenders for erection of Nurses' Home, \$5,000.

Tenders are being called by the Edmonton Exhibition Association for erection of the new \$100,000 stock pavilion on the Exhibition grounds.

Galt, Ont.

Tenders are called until May 13th for purchase of \$25,000 worth of debentures for cost of additions, etc., to the hospital here. A. M. Edwards, chairman finance committee.

Quelph, Ont.

The plan of Architect Wm. Tanner, Jr., of this city, has been chosen by the Provincial Board of Health for the Infectious Hospital. Tenders will be called for erection of building to cost \$15,000. Ald. McLean is interested.

Gretna, Man.

Tenders addressed to E. D. Tuttle, architect, 701 McArthur Building, Winnipeg, will be received until May 12th for erection of a brick school here.

Glance Bay, N.S.

The public school building at New Aberdeen was destroyed by fire on the 24th ulto. Estimated loss, \$10,000.

Hamilton, Ont.

The Barton Street Baptist congregation, it is stated, have acquired the corner of Cannon street and Sherman.

Tenders addressed to W. R. Webb, 65 York street, president I.O.O.F., will be received until May 11th for erection of I.O.O.F. Temple. Plans, etc., at office of the architects, Stewart & Witton; A. Fraser, secretary-treasurer.

Tenders addressed to R. C. Desrochers, secretary, Department of Public Works, will be received until May 15th for hot water boilers, setting, etc., for public building here. Plans, etc., on application to A. Barnard, caretaker, and at the above department.

Hull, Que.

The public school commissioners have decided to erect a large kindergarten school here this summer at the back of Notre Dame College.

Montreal, Que.

Mr. Geo. A. Ross has designed the new M. A. A. club house to be erected in Westmount.

Toronto, Ont.

Mr. Geo. A. Ross, architect, Montreal, has prepared plans for the \$300,000 hockey arena to be erected on the site of the old Mutual Street Rink here. Among those interested are R. Reford, W. I. Gear, Montreal, and Sir H. M. Pellatt, Geo. A. Beardmore and Amelius Jarvis, Toronto.

Uxbridge, Ont.

Tenders addressed to R. C. Desrochers, Secretary, Department of Public Works, will be received until May 22, for erection of public building here. Plans, etc., at this department, and on application to Clerk of Works, station F., Yonge street, Toronto, Ont., and at the local post office.

Moose Jaw, Sask.

A by-law to carry out petition of ratepayers for a public library will be submitted shortly.

Tenders are called until May 22nd for construction of incinerator plant here. J. M. Wilson, city engineer; W. F. Heal, city clerk. Advertisement in "Tenders and For Sale Department" of this issue.

Montreal, Que.

The Protestant Board of School Commissioners will purchase a site for a new school in Outremont. Dr. Barclay, chairman.

The site for the new school for blind comprises $8\frac{3}{4}$ acres on Sherbrooke in Notre Dame de Grace. Plans are being prepared for the building, which will probably be in the form of cottage homes. Estimated cost of construction, \$60,000. Hon. treasurer, P. E. Layton.

Nelson, B.C.

The building site for the new post office to be erected here at a cost of \$75,000, has been cleared.

It is reported that tenders for the new \$100,000 Court House to be erected here this summer are required to be in by May 23rd, and the contract awarded by June.

New Westminster, B.C.

The Isolation Hospital here was destroyed by fire on the 22nd ulto.

Ottawa, Ont.

Tenders addressed to Crawford Ross, secretary-treasurer, P. S. Board, will be received until May 16th for erection of addition to Mutchmor street school. Plans at office of W. B. Garvock, superintendent of buildings, Creighton street school.

Owen Sound, Ont.

The property on Eighth street west has been purchased as a building site for the new Carnegie Library. Miss V. Scott, librarian.

Renfrew, Ont.

Mr. J. D. McNichol, architect, has prepared plans for the proposed gymnasium in connection with the Collegiate Institute, to cost about \$40,000.

South Vancouver, B.C.

Tenders will be called on May 8th for the addition of two wings to Cedar Cottage schools at an estimated cost of \$40,000. Write Mr. Clement for further information.

Stratford, Ont.

Architect Thos. Hepburn has been authorized to prepare plans, etc., for a new arrangement of steam heating, ventilating, etc., to cost \$2,300 for the Separate school.

St. John, N.B.

The Natural History Society building will be remodelled. W. McIntosh, curator.

Strathcona, Alta.

The ratepayers will vote on May 10th on a by-law to authorize the borrowing of \$50,000 to provide for erection of hospital.

Summerland, B.C.

A grant of 24 lots as a building site for the new hospital has been granted by the Summerland Development Company, provided the hospital cost not less than \$10,000. A by-law will probably be

submitted to the ratepayers. President Hospital Board, Mr. Robinson.

Toronto, Ont.

The Toronto Jewish Young Men's Association will raise \$35,000 for erection of a club building.

The city's new registry office will be situated on the corner of University avenue and Anderson street.

The congregation of Ossington Avenue Baptist Church will enlarge their church at once. Pastor, Rev. M. C. McLean.

The Canadian Institute are contemplating the erection of a suitable building in the near future. President, J. B. Tyrell.

The congregation of St. Anne's are considering the erection of a parish house at a cost of about \$40,000. Rector, Rev. L. E. Skey.

The Board of Control of Toronto have recommended to council an issue of \$75,000 debentures for the establishment of public library branch at Bloor street and Dovercourt road.

The Ontario Government has purchased a new site for a residence for the Lieutenant-Governor on Douglas avenue and Roxborough East. The site comprises nearly 14 acres.

The Women's Christian Temperance Union have had plans prepared for a building to be used as a restaurant on the Exhibition grounds. Dr. Orr, chairman, Exhibition Committee.

The house and property of Mr. F. Nicholls, 13 Homewood Place, was purchased recently by Toronto physicians, whose purpose is to remodel and enlarge the building for a hospital, at a cost of about \$125,000.

It is stated that tenders will be called shortly for construction of the new Stanley Barracks, near Long Branch, on the site secured by the Militia Department, Ottawa. Plans are about completed. Work is expected to start this summer and to continue for two or three years. More land has to be purchased. Sir F. Borden, Minister of Militia.

Tignish, P.E.I.

Tenders are called by Public Works Department, Ottawa, until May 17th for erection of public building here. R. C. Desrochers, secretary.

Winnipeg, Man.

The Granite Club will probably erect a new building to cost about \$100,000 next winter. Tenders for sale of present quarters have been called.

Permits were granted to Dr. Thos. Beath for fireproof hospital on River avenue, \$37,000; public bath, \$45,000; Bruce & Bostorm, contractors; architect, Wm. Bruce.

Tenders addressed to F. D. Tuttle, architect, 701 McArthur Buidlin, will be received until May 5th for erection of brick school building. J. Turner, sec-treas., S. D. No. 1,440.

Tenders will be called about the middle of June for erection of Isolation Hospital. The building will be fireproof and cost about \$200,000. Equipment for heating, ventilation, laundry, bath and service fixtures will be required. H. B. Rugh, architect, 927 Union Bank Building.

Tenders for erection of concrete stone church and presbytery for St. Ignatius

Parish were to be called about May 1st. Equipment costing about \$50,000 will be required for basement. For further information address Jno. Chaffee, 476 McMillan avenue, Winnipeg. Noted in last issue.

AWARDED**Calgary, Alta.**

The contract for construction of new city market was awarded to Boyle & Thomas, \$38,400, which does not include the heating and plumbing of the original tender, of \$41,000. Tenders will be called separately for these.

Outremont, Que.

The following contracts were awarded for construction of a fire and police station to be erected on St. Just avenue; masonry, Theo. Lessard, \$11,410; carpentry, Jackson Company, \$7,675; roofing, Richardson Limard Company, \$610; electric lighting, J. C. Duff, \$125; plumbing, Tumblay & Frainocur, \$1,346.

Regina, Sask.

The contract for erection of Methodist church here has been awarded to R. J. Lecky, \$268,780.

Saskatoon, Sask.

The contract for erection of school on Alexandra street was awarded to Bigelow Bros., \$49,300. Other tenders were as follows: Shannon Bros. & Cassidy, \$56,000; Wright Construction Co., \$53,352; T. E. Farley, \$52,643; A. A. Godwin, \$50,000. The contract was exclusive of heating and ventilation.

Vancouver, B.C.

The contract for erection of the two new fire halls on Fernwood and Cedar Hill roads was awarded to R. Lang at \$5,175 and \$5,150 respectively. Parfitt Bros. tendered at \$5,703 and \$5,745.

The contract for the new school at 12th avenue and Victoria street, Mount Pleasant, has been awarded to Messrs. Baynes & Horie, \$58,740, the lowest. They will at once commence work of constructing the new building. The tenders for the Lord Nelson School were all found to be excessive; referred back to the architect for alterations.

Residences**Calgary, Alta.**

Tenders addressed to F. J. Lawson, architect, Norman Block, will be received until May 6th for erection of one apartment house on Sixth avenue west. Plans, etc., at office of the above.

Montreal, Que.

The Mountain View Apartment House in the Annex was destroyed by fire on the 28th ulto. F. X. Clavette, owner. Estimated loss, \$125,000.

Saskatoon, Sask.

St. James' congregation have decided to build a parsonage this year. Estimated cost, \$3,000. Dean Tucker.

Winnipeg, Man.

A permit was granted to James Enright, Jarvis avenue, for apartment block, \$36,500.

Permit has been issued to J. T. Bergman for apartment block, \$72,700. P. C. Samwell, architect.

AWARDED**Brockville, Ont.**

The following contracts for erection of vestry addition to First Church were

awarded. Fox & Farr (masons), Brockville, \$1,600; Paisley & Horton (carpenters), Brockville, \$2,000; Lindsay & Fitzpatrick (painting), Brockville, \$300; Geo. Ross (plumbing), \$345; A. G. Dobbie (electric), Brockville, \$168.50; Geo. Barclay (plaster), Brockville, \$235. A. S. Allaster, architect.

Prince Albert, Sask.

A. P. Anderson has the contract for the building of Judge Forbes' new residence and Turner & Summers the contract for painting. A. G. Creighton, architect.

Ottawa, Ont.

The following contracts have been awarded in the construction of the stores and apartment house for Donald Fraser: George Crain, brick and stone; W. Charlebois, carpentering; P. Ackroyd, electrical work; Murphy and Morrow, plastering; J. R. McLennan, plumbing; and P. Stewart, painting. Horwood, Taylor & Horwood, architect.

Business Buildings and Industrial Plants

Amherst, N.S.

The plant of the Canadian Car Foundry Company was damaged by fire to the extent of about \$200,000 on the 27th ulto.

Dauphin, Man.

The C. N. R. will shortly let the contract for a modern coal chute to replace the one recently burned. The government elevator commission will erect an elevator with a capacity for 30,000 bushels, at Ste. Rose du Lac.

Edmonton, Alta.

The by-law to grant a fixed assessment and free water to the G. T. P. for twenty years if they build an hotel here, carried.

J. F. Cairns, of this city, has just completed negotiations whereby he will erect a large new 4-storey store on the corner of Second avenue and Twenty-third street, 100 x 140 feet. Brown and Vallance, architects, Montreal, have the plans in hand and excavation work will start shortly. Total cost, \$400,000.

Elora, Ont.

It is decided to place a by-law before the people to loan the Elora Furniture Company \$10,000 to erect a two-storey addition to their present factory.

Fort William, Ont.

A new industry to produce cheap and efficient sewer pipe and paving block is reported here. Messrs. Dowler, Gowanlock, are interested.

Galt, Ont.

Hall & Utting will build a 2-storey addition, 60 x 40 feet, to their cabinet and planing mill, of reinforced concrete.

Huntsville, Ont.

G. F. Purdon contemplates the erection of a large addition to his hotel.

Lethbridge, Alta.

Tenders are invited for excavation and concrete basement for a proposed business building. Plans may be seen and particulars obtained from Alberta Loan and Investment Company, 416 Dufferin street, Calgary.

R. J. Hutchings, of the Great West Saddlery Company, announces that the

company will build a factory and wholesale house in this city. The company has an option on a site. The new stock and plant will cost \$250,000.

Moose Jaw, Sask.

The G. T. P. station, it is stated, will be situated not far from the C. P. R. station.

Beaubier Bros., of Brandon and Saskatoon, have purchased the corner of High street and Eighth avenue as a building site for the 5-storey hotel which they intend to erect at once.

North Vancouver, B.C.

McDougall-Jenkins Engineers, Limited, have purchased the plant, including foundry equipment, patterns, etc., of the Albion Iron Works. They will erect another shop extending from the present building a distance of 250 feet and costing about \$150,000.

Ottawa, Ont.

F. W. Burns will erect a commercial building on the corner of Bronson and Somerset streets. W. E. Noffke, architect.

Hiram Robinson has decided to erect a four-storey building on Queen street instead of two storeys, first proposed. The building has about 100 feet frontage and will cost about \$50,000. James Ma-ther, architect; Holbrook and Sutherland, general contractors.

Peterborough, Ont.

Messrs. G. W. Green, W. C. Ackerman, Geo. Gyllespie, president, Board of Trade, and others, were appointed on the committee to report on the proposition of the Jules Motor Company regarding their location here.

Parry Sound, Ont.

The box factory of the Parry Sound Lumber Company was destroyed by fire on the 26th ulto.

Prince Albert, Sask.

A. G. Creighton, architect, is preparing plans for the 3-storey block to be built for Mayor Holmes. Estimated cost, \$25,000. Contract for excavation has been let to Jas. Anderson.

Port Arthur, Ont.

Plans and specifications are being prepared for a 2-storey market building to be erected here. Estimated cost, \$12,000. Material, cement. The suggestion has been made that a cold storage plant be included.

Specifications are being prepared for a large cement warehouse to be built on the C. P. R. track for the Riley-Ramsay Co., wholesale grocers. It is understood that work will be started early in the summer. As far as can be learned the estimated value for the building is not yet known, but it will be four or five storeys high, 80 feet wide, and about 150 feet deep.

Portage la Prairie, Man.

The National Grain Stooker Company, Limited, will erect their factory here. Plans, etc., will be called for at once and the factory built as soon as possible. Directors, I. Riley, M.P.P., Stonewall, and R. E. Bruce, LL.B., of Grandview. Mr. Boerman, local representative.

Regina, Sask.

The Alask Bedding Company are negotiating for rental of Wright Bros.

warehouse pending the erection of their own. J. H. Parkhill, western manager; A. H. McIntosh, resident traveller.

Saskatoon, Sask.

A permit has been issued to the Ash-down Hardware Company, Winnipeg, for their 6-storey warehouse here, \$150,000; also to the Dominion Bank for an office building on Second avenue, \$35,000.

It is understood that a company to be known as the Saskatoon Cordage and Flax Fibre Company will locate here. Benjamin Ward, representative. Dr. Elliot is said to be interested.

Thetford Mines, Que.

Work on the excavation for the Bank of Montreal's new office building has been started.

Vancouver, B.C.

The ratepayers will vote on May 10th on the following by-laws: erection of isolation hospital and clearing site, \$30,000; construction of jail on Admiralty reserve and purchasing sub-station in city, \$30,000.

Woodstock, Ont.

The cheese factory of J. H. Williams was destroyed by fire on the 27th ulto. Loss, about \$4,000.

Westport, Ont.

The Westport Manufacturing and Plating Company's plant was destroyed by fire recently.

Windsor, Ont.

The Foresters' Block was damaged to the extent of about \$17,000 on the 25th ulto.

Winnipeg, Man.

Tenders addressed to D. W. McCuaig, chairman, Government Elevator Commission, 579 Garry street, will be received until May 6th for remodelling the government elevators at the following points, Minitonas, Dauphin, Grandview, Miami, Oakville, St. Claude, Swan Lake, Valley River, Miniota.

Yorkton, Sask.

The manager of the Hudson Bay Co. announces the probable construction of a large department store here. Commissioner Burbidge.

AWARDED

Calgary, Alta.

The contract for the erection of the new C. P. R. Land and Irrigation building was awarded to McDiarmid Bros., of Winnipeg. The contract calls for the termination of the building by October 1st next.

Galt, Ont.

The Down Draft Furnace Company has awarded the contract for an addition to the nickel-plating department to Thomas & Hancock.

Ottawa, Ont.

The following contracts have been awarded in the Blackburn building: McFarlane and Douglas, ventilation and copper work; M. M. O'Connell, heating and plumbing; W. J. Carson, painting and glazing; Talkins Tile and Mosaic Company, Montreal, marble and tile work. W. E. Noffke, architect.

Prince Albert, Sask.

The contracts for the Manville-Angus block were awarded to Bonas Bros, masonry; T. E. Baker, carpentry; Manville

Hardware Co., tinsmithing, heating and plumbing; Turner & Summers, painting, and W. Davy, the electric lighting. The lowest tender was accepted in each case. Total cost, \$50,000. Work will be started as soon as possible.

Regina, Sask.

The contract for erection of the wholesale warehouse for the Great West Saddlery Company has been given to Wilson & Wilson, of Regina. Dimensions, 75 x 50, full sized basement.

St. John, N.B.

The contract for the mason work in connection with the enlargement of building for T. McAvity & Sons has been given to A. R. C. Clark; carpentry, Edward Bates.

Toronto, Ont.

The contract for erection of C.P.R. freight shed 300 x 30 x 40 here, has been awarded to Geo. Martin, Smith's Falls.

A. B. Ormsby, Limited, has been given the following contracts: steel shutters and fireproof doors for the Mason & Risch Building, Yonge street; galvanized iron, roofing and windows on Lionel Rawlinson's warehouse; galvanized iron, copper and felt roofing work on Home Bank, Broadview and Elliott street.

Vancouver, B.C.

The contract for construction of fireproof freight sheds, 250 feet long, for the C. P. R., has been awarded to R. G. Wilson & Co.

Marriott & Fellows have been awarded the contract for erection of the new fireproof building for the Arts and Crafts. Estimated cost of building, \$70,000.

Victoria, B.C.

Mr. J. L. Skene, contractor, has been awarded the contract for the erection of the new British Columbia Telephone block. It is expected that the new premises will be ready by the first of September. The building will be of concrete construction and fireproof, costing about \$60,000.

Welland, Ont.

The Welland Machine & Foundries, Limited, have been awarded the contract to supply 150 tons of gray iron castings for the construction of the Page-Hersey works.

The Bishop Construction Company, Limited, Toronto and Montreal, have been awarded the contract for extensive addition to the plant of the Canadian Billings & Spencer Company, Limited, here.

Winnipeg, Man.

The contract for the new warehouse of the Ontario Wind, Engine & Pump Company has been let to Alex. Jamieson, Winnipeg. Amount of permit, \$50,000. G. M. Miller & Co., Toronto, architects.

The contract for completion of coach shops and buildings for the National Transcontinental Railway, estimated to cost about \$2,500,000, has been awarded, it is stated, to Haney, Quinlan & Robertson. Completion within two years.

Power Plants, Electricity and Telephones

Chatham, Ont.

The Chatham, Wallaceburg & Lake Erie Railway may extend the road to Blenheim and Sarnia this summer.

Edmonton, Alta.

On May 16, the ratepayers will vote on the agreement between the International Heating and Lighting Company, of Cleveland, Ohio, and the city, for a non-exclusive twenty-five year franchise for the manufacture and distribution of gas.

Superintendent Ormsby, Electric Light Department, has submitted a plan of lighting similar to those in use in eastern cities. All of the wiring in connection with the installation of cluster Tungsten lamps will be underground. He also proposed to install a new system of arc lights, each being of 1,300 candle power, as well as fifty additional arc lamps of the type now in use. The entire scheme would call for the installation of approximately 125 new arc lights as well as eight-five ornamental iron poles, which the superintendent will recommend the city to purchase will cost approximately \$85 each, while the total cost of the venture will be in the vicinity of \$10,000.

Fort William, Ont.

Tenders addressed to the Chairman of the Utilities Committee, care of City Clerk, will be received until May 4th for the following: 50 tons 60 lb. T rail, A.S.C.E. section, drilling $2\frac{1}{2}$ -in. x 5-in.; 90 pair angle bars for 60 lb. T rail, A.S.C.E.; 50 kegs railroad spikes $5\frac{1}{2}$ in. x 9-16 in.; 3,000 lock-nut washers for $\frac{3}{4}$ -in. bolts; 400 track bolts and nuts, 4 in. x $\frac{3}{4}$ -in. A. L. Farquharson, construction superintendent.

Guelph, Ont.

Tenders are called until May 11th for construction of about 4,900 feet of street railway track. J. J. Hackney, manager, Guelph Radial Railway. Advertisement in "Tenders and For Sale Department" of this issue.

Hamilton, Ont.

A Toronto syndicate, represented by Engineer Somerville, is preparing to make a proposition to the city to build an electric line to Galt, Hespeler and other western towns. Inquiries have been made as to what powers the city has to compel the Cataract Railways to give other railways running rights over their lines into the city.

Knowlton, Que.

A committee was appointed to report on the cost of installing a municipal power plant.

London, Ont.

The London Street Railway Company will put on night shifts to hurry the construction work on Richmond and Dundas streets.

Melville, Sask.

The by-law for electric light, \$23,000, was carried.

Moose Jaw, Sask.

Tenders are called until May 9th for construction of a rural telephone line; tenders for labor and material to be made separately. Information, etc., on application to Geo. Wilcox, sec-treas., Moose Jaw-Enterprise Rural Telephone Co., 92½ Manitoba street east.

Niagara Falls, Ont.

Recommendations for the purchase of the necessary transformers for the new Bell Telephone plant were submitted to council.

Prince Rupert, B.C.

A proposition to supply Prince Rupert with gas for lighting and cooking pur-

poses, electric power for industries and street cars was outlined to the city council recently by Raymond Brutinell, representing the Thompson Light and Power Company. The company proposes to spend \$3,000,000 on the enterprise and briefly the proposition is to supply gas at \$1.25 to \$1.75 per thousand feet; electric power up to 50,000 horse power at \$30 per h.p. year, with a reduction after 5,000 horse power is taken; to build a line for street cars and run them when the city has 15,000 people. Under the agreement the gas plant will be installed here, and electric power will be transmitted from a point forty-two miles up the Skeena river and the company will give the city from 3 to 10 per cent. of the gross earnings of the street cars.

Renfrew, Ont.

This municipality will spend about \$117,000 in the construction of the power plant inclusive of site; work probably will be done by day labor. Engineer in charge, J. R. Stewart, Renfrew. W. E. Smallfield, chairman, waterworks committee.

Scott, Sask.

A by-law to expend \$9,000 on electric light system will be voted upon on May 8th.

Sandwich, Ont.

A franchise has been granted R. Stuart to run a line of poles and wires across town to carry electric power developed from a plant to be constructed in Sandwich.

St. John, N.B.

A meeting of the Eel River Light, Heat & Power Company, Limited, was held recently. John G. Murchie was elected president; H. A. Connell, vice-president and general manager, and R. G. Lee, secretary-treasurer. The directors authorized Mr. Connell to proceed with the work of survey immediately. The plant is expected to be in operation before the close of the year.

Toronto, Ont.

Tenders addressed to G. R. Geary, Chairman, Board of Control, will be received until May 9th for supply of glass cylinders and aluminum reflectors. Specifications obtained from Toronto Hydro-Electric System, City Hall.

Tenders addressed to G. R. Geary, Chairman, Board of Control, will be received until May 23rd for supply of steel crossing towers. Specifications obtained from the Toronto Hydro-Electric System, City Hall, Toronto. Advertisement in "Tenders and For Sale Department" of this issue.

Victoria, B.C.

See "Business Buildings Awarded."

Welland, Ont.

The Niagara Falls, Welland & Lake Erie Railway Company, Hendrick H. Leach & Co., contractors for the construction of the street railway system in this town, have commenced work. The Ontario Power Company will furnish the power.

AWARDED

Magog, Que.

The contract for construction of hydro-electric plant here has been awarded to the Bishop Construction Co., Ltd., of Montreal. T. Pringle & Son, consulting engineers, Montreal.

(Continued on page 60)

Tenders and For Sale Department

Tenders for Steel Bridge

Tenders will be received by the undersigned up to 4 p.m., on Tuesday, May 16th, 1911, for the erection of a Warren Truss Steel Bridge, over Snake Creek at Dunblane, 5 miles north of Paisley. Span 60 ft., centre to centre of bearings, 14 ft. roadway, concrete floor.

Plans and specifications may be seen at my office, Walkerton. Tenders will be opened on Wednesday, May 17th, at 2 p.m., at Queen's Hotel, Port Elgin. Also tenders received for the erection of two concrete abutments for said bridge.

The lowest or any tender not necessarily accepted.

JAMES WARREN,
Engineer.

Walkerton, April 22, 1911.

17-18



Department of Railways and Canals

Ontario—St. Lawrence Canals

Rapide Flat Canal

Sealed tenders addressed to the undersigned and endorsed "Tender for Improving Lower Extreme to Lock No. 24," will be received at this office until 16 o'clock on Friday, May 5th.

Plans, Specifications, and Form of Contract to be entered into can be seen on and after Monday, April 17, at the office of the Chief Engineer of the Department of Railways and Canals, Ottawa, and at the office of the Resident Engineer of the Ontario—St. Lawrence canals, Cornwall, at which places forms of tender may be obtained.

Parties tendering will be required to accept the fair wage schedule prepared or to be prepared by the Department of Labor, which schedule will form part of the contract.

Contractors are requested to bear in mind that tenders will not be considered, unless made strictly in accordance with the printed forms, and in the case of firms, unless there are attached the actual signature, the nature of the occupation, and place of residence of each member of the firm.

An accepted bank cheque for the sum of \$9,000 made payable to the order of the Minister of Railways and Canals must accompany each tender, which sum will be forfeited if the party tendering declines entering into contract for the work, at the rates stated in the offer submitted.

The cheque thus sent in will be returned to the respective contractors whose tenders are not accepted.

The cheque of the successful tenderer will be held as security, or part security, for the due fulfilment of the contract to be entered into.

The lowest or any tender not necessarily accepted.

By order,
L. K. JONES, Secretary.

Department of Railways and Canals,
Ottawa, April 14th, 1911.

Newspapers inserting this advertisement without authority from the Department will not be paid for it.

17-18

Bucket Crane

FOR SALE—One full circle, self-propelling, modern 10 to 15-ton capacity Browning size No. 1 Locomotive Crane, standard gauge, 4-wheel truck, 38 ft. steel boom, 8 x 10 engines, equipped to handle Clam or Orange Peel. Will furnish with or without bucket. Attractive price, fine condition, quick delivery. Inspection here.

WILLIS SHAW MACHINERY CO.

39 So. LaSalle Street, Chicago.

PORT HOPE

Tenders

For Concrete Sidewalks, etc.

The Corporation of Port Hope invite Tenders for the construction of five lineal miles, or thereabouts, of Concrete Sidewalks and Crossings, with the necessary works connected therewith, in accordance with detail and specifications prepared therefore, copies of which, with forms of tender, may be obtained on application to the undersigned. A marked cheque equal to five per cent. of the gross amount of the contract to be furnished with each tender, and the lowest tender not necessarily accepted. Tenders will be received to noon, 15th May, 1911.

J. W. SANDERS,

Town Clerk.

Dated 19th April, 1911.

17-19



Tenders

For Steel Crossing Towers

Tenders will be received by registered post only, addressed to the Chairman of the Board of Control, City Hall, Toronto, up to noon of Tuesday, May 23, 1911, for steel crossing towers.

Envelopes containing tenders must be plainly marked on the outside as to contents.

Specifications may be seen and forms of tender obtained from the Toronto Hydro-Electric System, City Hall, Toronto.

Tenderers shall submit with their tender the names of two personal sureties (approved by the City Treasurer) not members of the City Council or officers of the Corporation of the City of Toronto, or, in lieu of said sureties, the bond of a guarantee company approved as aforesaid.

The lowest or any tender not necessarily prescribed by city-by-law must be strictly complied with or the tenders will not be entertained.

The lowest or any tender not necessarily accepted.

G. R. GEARY, Mayor,
Chairman, Board of Control.

City Hall, Toronto,

April 26, 1911.

3-3

CITY OF MOOSE JAW Saskatchewan

Incinerator Plant

Sealed proposals endorsed "Incinerator Plant" will be received by the City of Moose Jaw addressed to the undersigned City Clerk until 8.30 o'clock p.m., on Monday, 22nd May, 1911.

The proposals received may cover alternative designs and methods but in any case the plant shall be capable of handling 25 tons per day.

The price bid shall include the supply of all materials for and the complete construction of the plant, same to be turned over to the Corporation in satisfactory working order.

Satisfactory guarantees shall accompany each tender.

The lowest or any tender not necessarily accepted.

J. M. WILSON, City Engineer.
Moose Jaw, April 24th, 1911.

W. F. HEAL, City Clerk.
18-20.



Department of Railways and Canals

Ontario—St. Lawrence Canals

CORNWALL CANAL

Sealed tenders addressed to the undersigned and endorsed "Tender for Dredging Rapide Flat Canal," will be received at this office until 16 o'clock on Friday, May 5th.

Plans, Specifications, and Form of Contract to be entered into can be seen on and after Monday, April 17, at the office of the Chief Engineer of the Department of Railways and Canals, Ottawa, and at the office of the Resident Engineer of the Ontario—St. Lawrence canals, Cornwall, at which place form of tender may be obtained.

Parties tendering will be required to accept the fair wages schedule prepared or to be prepared by the Department of Labor, which schedule will form part of the contract.

Contractors are requested to bear in mind that tenders will not be considered, unless made strictly in accordance with the printed forms, and in the case of firms, unless there are attached the actual signature, the nature of the occupation, and place of residence of each member of the firm.

An accepted bank cheque for the sum of \$750 made payable to the order of the Minister of Railways and Canals must accompany each tender, which sum will be forfeited if the party tendering declines entering into contract for the work, at the rates stated in the offer submitted.

The cheque thus sent in will be returned to the respective contractors whose tenders are not accepted.

The cheque of the successful tenderer will be held as security, or part security, for the due fulfilment of the contract to be entered into.

The lowest or any tender not necessarily accepted.

By order,
L. K. JONES, Secretary.

Department of Railways and Canals,
Ottawa, April 14th, 1911.

Newspapers inserting this advertisement without authority from the Department will not be paid for it.

17-18

TENDERS WANTED

Sealed tenders will be received until Monday, May 8th, noon, by J. W. Sanders, Town Clerk, Port Hope, for the construction of reinforced concrete girder bridge, superstructure 130 feet long on present piers, and for filling approaches. Plans and specifications may be seen at the Clerk's office, or at the office of the Engineers.

BOWMAN & CONNOR,

17-18 86 Toronto St., Toronto, Ont.

PIPE LAYING

Tenders will be received until May 25th next for excavation and pipe laying for Harriston Waterworks. For all information apply to the Engineers.

BOWMAN & CONNOR,

18-18 Berlin, Ont.

CITY OF TORONTO

Tenders

For Construction of Ash-bridge Bay Docks

Tenders will be received by registered post only, addressed to the Chairman of the Board of Control, City Hall, Toronto, Canada, up to noon on Tuesday, 23rd May, 1911, for the construction of dock in Ashbridge Bay.

Envelopes containing tender must be plainly marked on the outside as to contents.

Specifications and forms of tender may be obtained upon application to the Department of Railways, Bridges and Docks, City Engineer's Office, Toronto.

The lowest or any tender not necessarily accepted.

G. R. GEARY, Mayor,

Chairman, Board of Control.

City Hall, Toronto,

April 12th, 1911. 17-19

City of Prince Albert, Sask.

Tenders for

Electrical Machinery

Sealed tenders addressed to the City Commissioners, and marked "Tenders for Electrical Machinery," will be received until Wednesday, May 31st, 1911, for the following.

A.—One 100 h.p. Cross Compound Engine with necessary condensing apparatus, steam piping, installed complete.

Tenders on Engine of the following classes will be considered:

(1) Horizontal Cross Compound Corliss Engine, 125-150 r.p.m.

(2) Vertical Cross Compound Corliss Engine, 125-150 r.p.m.

(3) Vertical Cross Compound Quick Revolution Engine, Forced Lubrication.

B.—600 k.w. 2,200 volt, 60 cycles, 3-phase Engine Type Alternator, Exciter, Switchboards, Automatic Regulator, installed complete.

C.—72 in. x 18 ft. Return Tubular Boiler, suitable for 180 lbs. working steam pressure.

Specifications will be furnished on application to the City Commissioners, or R. Wright, City Electrician.

The lowest or any tender not necessarily accepted.

ANDREW HOLMES,

C. C. DAVIDSON, City Commissioners.

D. A. CREWSON, 17-18

CITY OF GUELPH

Sealed tenders will be received by the undersigned up to noon on Thursday, May 11th, 1911, for the construction of approximately 4,900 feet of street railway track.

Plans and specifications may be seen at my office, or at the office of the City Engineer.

Each tender must be accompanied by a marked cheque for ten per cent. of the amount of the bid.

The lowest or any tender not necessarily accepted.

J. J. HACKNEY,

Manager Guelph Radial Railway.

Guelph, April 25th, 1911. 18-18

Tenders for
Bridge and Abutments

Tenders will be received by the undersigned up to noon, May 27th, 1911, at Arkwright P.O., for the erection of two concrete abutments, and one span Baltimore truss of 100 ft. span, over the Sauble River, about two miles from Tara.

Abutments to be completed by the 15th of July, and the superstructure to be completed by the 15th of August, 1911. An accepted cheque for \$100, payable to the Treasurer, Township of Arran, must accompany each tender. Tenders to be opened at Arkwright at 2 p.m., May 27th, 1911.

The lowest or any tender not necessarily accepted.

(Signed) JOHN H. WILES,

Reeve Arran.

Arran, May 1st 1911. 18-19

Tenders
FOR MAIN SEWERAGEMunicipality of North
Toronto

Tenders are invited for providing and laying Main Sanitary Pipe Sewers. Construction of Manholes, etc., as follows:

Contract No. 1.

Includes approximately Sewers to Streets and Trunk Sewers south of and including Eglinton avenue.

Contract No. 2

Includes approximately Sewers to Streets and Trunk Sewers north of Eglinton avenue and south of and including Glenview avenue to the west of Yonge street and south of and including Victoria avenue to the east of Yonge street.

Contract No. 3

Includes approximately Sewers to Streets and Trunk Sewers north of Glenview avenue to the east of Yonge street to the Town Limits north.

Plans may be seen and information obtained at the offices of T. Aird Murray, 303 Lumsden Building, Toronto, on or after the 3rd of May, 1911.

Copies of the Conditions of Contract, together with Key Plans, Bills of Quantities, Schedule and Forms of Tender may be obtained upon a deposit of twenty-five dollars (\$25), returnable on receipt of bona fide Tender together with all documents and plans supplied.

Tenders to be sent in under seal not later than Monday, the 15th of May, 6 o'clock p.m. addressed to Frank Howe, Chairman of Works Committee, Eglinton Town Hall. Each tender must be accompanied by a certified cheque equal to the value of 2 1/2 per cent. of the amount of tender, such cheque to be returned when tender or tenders is or are accepted or rejected.

The Corporation do not bind themselves to accept the lowest or any tender.

A. J. BROWN, Mayor,

T. Aird Murray, North Toronto, Ont.

Consulting Engineer. 18-18

City of Kingston

NOTICE TO PAVING
CONTRACTORS

Sealed tenders under registered post only, addressed to the undersigned will be received by the Board of Works up till 12 o'clock noon, Saturday, May 20th, 1911, for the construction of:

6,100 square yards of Pavement;

2,276 lineal feet of Curb and Gutter.

Plans and specifications may be seen and all other information obtained at the office of the undersigned.

Plans and specifications are also on file at the offices of the Contract Record, 220 King street west, Toronto, and B.34 Board of Trade, Montreal.

The lowest or any tender not necessarily accepted.

H. B. R. CRAIG,

City Engineer.

April 29th, 1911. 18-19

For Sale or Exchange

Municipal Pumping Plant
Deseronto, Ontario

Tenders will be received by the undersigned up to noon of June 4th, 1911, by the Corporation of the Town of Deseronto, for the sale of the following equipment:

One 75 h.p. Fairbanks-Morse Suction Gas Producer.

One 65 h.p. Fairbanks-Morse Vertical Producer Gas Engine.

One 12 x 15 Triplex Pump, direct connected by friction clutch to Gas Engine, capacity 1,000 gallons per minute.

The above equipment has only been operated a short time and is in first-class condition. Changing to hydro-electric power necessitates disposing of above equipment. Plant is offered complete as above or separately, or would consider an exchange for equal capacity rotary pump and motor.

Specifications and description of above equipment furnished on application to the undersigned or can be seen at the office of the Contract Record, B34 Board of Trade Building, Montreal; or at the office of the Canadian Engineer, 62 Church street, Toronto, or 404 Builders' Exchange, Winnipeg.

LUCIUS E. ALLEN,

Consulting Engineer.

18-20 Belleville, Ont.

EXTENSION OF TIME

City of Edmonton, Alberta

Sealed tenders marked "Tenders for Trunk Sewer," will be received by the City Commissioners up till 3 p.m. May 15th, 1911, for the supplying of all materials and one construction, in tunnel of a concrete sewer ten feet six inches (10 ft 6 in.), in internal diameter and approximately 3,290 feet long.

Plans and specifications and all particulars may be obtained from the City Engineer's office, Edmonton, on deposit of a marked cheque for the sum of \$25.00, which will be held until the return of plans and specifications. Duplicates of which may be seen at the office of the Contract Record, B34 Board of Trade Building, Montreal, Que.

Lowest or any tender not necessarily accepted.

CITY COMMISSIONERS.

A. J. LATONELL,

City Engineer.

Edmonton, Alta. 14-16

Previously advertised for May 2nd, 1911

TENDERS WANTED

for Excavating, Concrete Foundation, Brick Work, and Carpenter Work, for a two-storey and basement Factory, corner Dovercourt Road and Sudbury Street, Toronto. Plans at King Construction Company, 248 Wellington Street West, Toronto.

TENDERS FOR CLUB BUILDING

Bulk tenders, or tenders for the several trades required, will be received by the undersigned, up to **May 15th next (1911)**, at 6 o'clock p.m., for the erection of a club building, for the Galt Club, Limited, on Dickson Street, Galt, Ontario, according to plans and specifications which may be seen at the office of the Secretary, Gore Building, Galt, or Stewart and Witton, architects, Hamilton.

The Club do not bind themselves to accept the lowest or any tender.

M. A. SECORD, Secretary,
The Galt Club, Limited.

CITY OF MOOSE JAW Saskatchewan

Storm Sewer Extensions

Sealed tenders endorsed "Contract 32 or 33" will be received by the City of Moose Jaw addressed to the undersigned City Clerk until 8.30 p.m. on **Monday, May 22nd, 1911**.

Any tender received after the above stated time will be declared informal.

Contract 32.—The laying of approximately 9,000 lineal feet of Storm Sewer and 2,300 lineal feet of Catch basin connections and building manholes, catch basins, etc.

Plans and specifications may be seen at the City Engineer's office.

Contract 33.—The supply of approximately: 7,900 lineal feet of 10-in. Vitrified Tile Pipe; 1,100 lineal feet of 8-in. Vitrified Tile Pipe; 2,300 lineal feet of 6-in. Vitrified Tile Pipe, also junctions, bends, etc.

Specifications may be obtained from the City Engineer's Office upon application.

The lowest or any tender not necessarily accepted.

J. M. WILSON, W. F. HEAL,
City Engineer. City Clerk.
Moose Jaw, April 29th, 1911.

Positions Wanted

Advertisements under this heading one cent a word per insertion. Box No. ten cents extra

POSITION WANTED—As Clerk of Works in a good sized job. Six years experience with full charge of details and awarding of contracts. Thoroughly understand plans, specifications and details. First-class references. At liberty at once. Apply Box 267, Contract Record, Toronto, Ont. 18-18

Miscellaneous

Advertisements under this heading two cents per word per insertion.

Large European concern manufacturing water turbines, centrifugal pumps and steam turbines, wants to be represented in Winnipeg and Vancouver by well-known qualified and experienced firm. Box 265, Contract Record, Toronto, Ont.

Carpenters in Demand

Weyburn, Sask.

Carpenters are in great demand here. Contractors are paying 50c. an hour. There is room for a first-class building contractor with capital.

Power Plants, Electricity and Telephones

(Continued from page 57)

Ottawa, Ont.

The contract for supply of 150 more poles for the lights on Bank, Dalhousie and Queen streets, was awarded to the Canada Foundry Company, Toronto, \$44.60 per pole; the lowest. No. local firms tendered. Sparks street poles cost about \$47.

Winnipeg, Man.

The board recommended that the tender of the Canadian Fairbanks Company for a motor car to be used on the city's railway line from the C. P. R. switch to Point du Bois, be accepted. The price of the motor car, which will be used for both passengers and freight, is \$11,169.

Miscellaneous

Dunnville, Ont.

Tenders are called until May 8th for construction of sewer connections. A. M. Jackson, Town Engineer, J. W. Holmes, Town Clerk.

Galt, Ont.

Tenders are called until May 15th for erection of a club building for the Galt Club, Limited. Stewart & Witton, architects, Hamilton; M. A. Secord, secretary, Galt. Advertisement in "Tenders and For Sale Department" of this issue.

Harriston, Ont.

Tenders are called until May 25th for excavation and pipe laying for waterworks here. Bowman & Connor, engineers, Berlin. Advertisement in "Tenders and For Sale Department" of this issue.

Kingston, Ont.

Tenders are called until May 20th for pavement, curb and gutter. H. B. R. Craig, city engineer. Advertisement in "Tenders and For Sale Department" of this issue.

Kippewa, Que.

Tenders addressed to R. C. Desrochers, secretary, Department of Public Works, will be received until May 29th for construction of dam and sluiceway here. Plans, etc., with above department and with J. E. Sing, district engineer, Toronto, and on application to postmaster at Haileybury, Ont.

Ottawa, Ont.

Tenders addressed to R. C. Desrochers, Secretary, Public Works Department, will be received until May 15th for dredging required at Prince Edward Island—Summerside and Vernon River; Nova Scotia—Cheticamp, Digby, L'Archeveque, Larry's River, Margaro Harbor, St. Mary's River, West Bay; New Brunswick—Buctouche Beach, Cape Tormentine, Loggieville, Marquapit Lake, Ox Island, Raft Channel, Richibucto, Scotchtown, Shediac, Shippigan Gully, St. George, St. Stephen.

Toronto, Ont.

Recent building permits include:—Woodcock & Lock, 1 pr. semi-det. 2-storey brick dwellings, Folis, \$5,000; H. & J. R. Gray, 2 det. 2-storey brick dwellings, 6-8 Runnymede avenue, \$7,000; Bank of Ottawa, 2-storey brick office building, cor. Gerrard and Broad-

view, \$20,000; J. T. & H. Hutson, 2-storey brick apartments, cor. Avenue road and Cumberland street, \$80,000; N. Butler, 3-sty. brick apartments, Howard, \$20,000; Badali Bros., 2-storey brick store and dwelling, cor. Queen and Logan avenue, \$5,000; John Pherrill, 2 det. 2-storey brick dwelling, Edgwood Crescent, \$7,000; D. E. Kennedy, 2½-storey brick dwelling, 118 Warren road, \$8,500; P. K. McKissock, 2-storey brick apartments, 807 Bloor street west, \$12,000; J. H. Simpson, 2-storey brick addition to dwelling, 345 Gladstone avenue, \$6,000; S. J. Sharp & Co., 2 pr. semi-det. 2-storey brick dwellings, Palmerston Gardens, \$7,200; W. S. Meredith, 2-storey brick warehouse, Duchess street, \$25,000; Standard Sanitary Mfg. Co., alterations to foundry, Royce and Lansdowne, \$13,000; M. Spence, 1 pr. semi-det. 2-storey and attic brick dwellings, Strathcona avenue, \$5,000; W. E. Booth, 2½-storey brick dwelling, St. Clair and Vaughn, \$8,000; A. McColl, 2-storey brick factory, Dufferin street, \$5,000; H. B. Reesor, 2-storey brick apartments, Linden street, \$8,000; Joyce & Snow, 1 pr. semi-det. 2-storey brick dwellings, Armstrong avenue, \$5,000; S. Prest, 3 att. 2-storey brick dwellings, Davenport Road, \$6,000; W. I. B. Wellwood, 2-storey brick dwelling, Fredrica street, \$5,000.

New Companies

Contractors, Limited, Montreal, Que., incorporated, capital \$100,000. Incorporators, Joseph Wilfrid Simard, Civil Engineer; Henri Gerin-Lajoie, K.C., and Paul Lacoste, advocate, all of Montreal, Que.

The Grand Metis Power Co., Ltd., Montreal, Que., incorporated, capital, \$100,000. Incorporators, Wm. James Shaughnessy, advocate, and Alvin Ernest Woodworth, accountant, both of Montreal, Que.

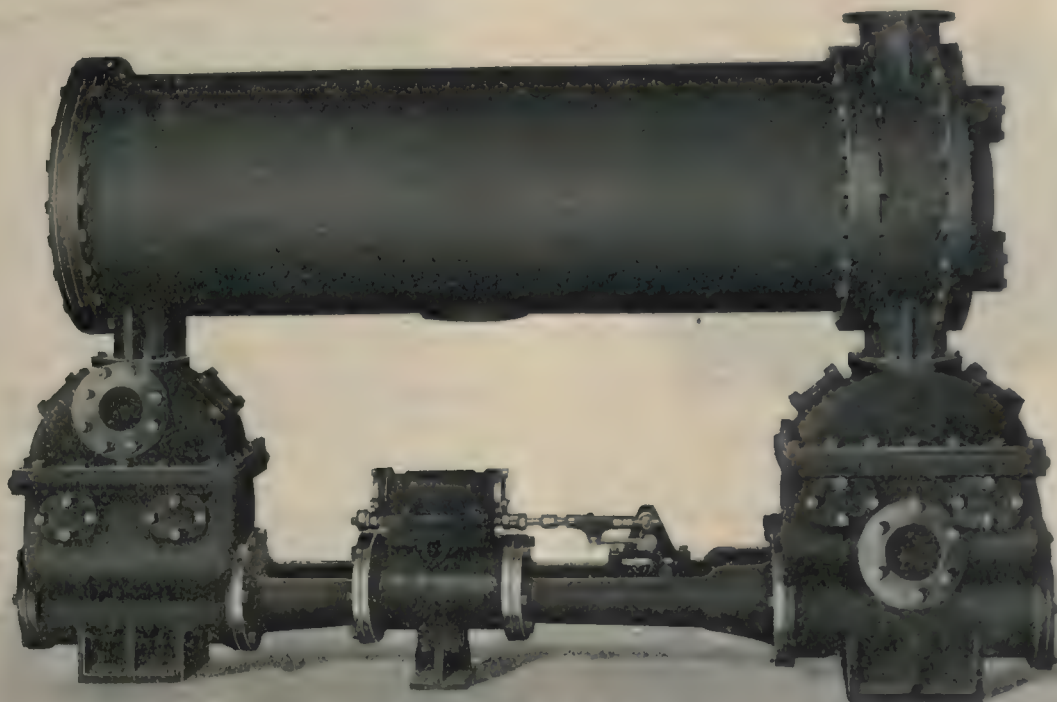
Canadian Yale and Towne, Limited, St. Catharines, Ont., capital, \$100,000, incorporated to manufacture safes, locks, hinges and locks of all kinds. Incorporators, Henry Robinson Towne and John Henry Towne, both of New York City, N.Y.; Walter Cleveland Allen, Stamford, Conn.; John Bell Miliken, Montclair, N.J., manufacturers, and Louis Hopkins Porther, Stamford, Conn., counsellor at law.

The United Engineering & Construction Co., Ltd., Toronto, Ont., capital, \$100,000. Incorporators, Frederick Philip Metzler, insurance manager; William John Taylor, accountant; Geoffrey Baron Taylor, C.E.; John Manly Spinks, and Edward Gillis, solicitor, all of Toronto, Ont.

The Masco Co., Ltd., Toronto, Ont., capital, \$100,000, incorporated to carry on the business of electricians, electrical supplies, etc. Incorporators, Edward Gordon McMillan, law student, John Fraser McGregor, William Hamilton Walter, accountants; Harry Riley, law clerk; Alfred Bicknell, solicitor, all of Toronto.

The Holophane Co., Ltd., Toronto, Ont., incorporated to carry on the business of electrical gas, etc., capital, \$50,000. Incorporators, James Stellar Lovell, accountant, and William Bain, bookkeeper, both of Toronto.

Condensors



Condensor built by The John Inglis Co., Limited

BOILERS, ENGINES, PENSTOCKS,
Water Towers, Steel Tanks, Heavy Plate
Work, Condensors, Air Compressors, Pump-
ing Machinery, Special Machinery of all kinds

Let us Submit Prices.

The **John Inglis Company**

Engineers and Boilermakers

Limited

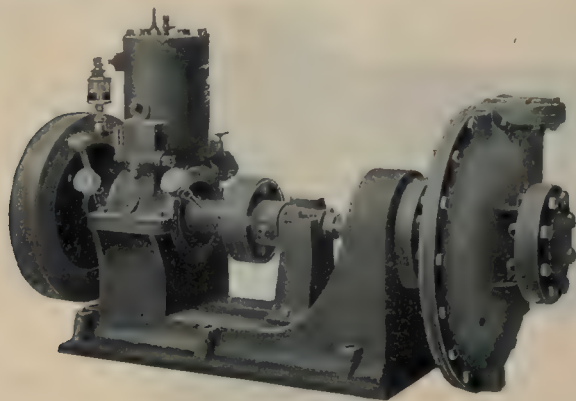
14 Strachan Ave., TORONTO, Canada

(Continued from page 51)

finger ring level sells for \$1, for which sum it can be obtained upon application to the Kokomo Level Company.

An Up-to-Date Centrifugal Pump

The accompanying illustration shows a side suction centrifugal pump, driven by a gasoline engine, as built by the Smart-Turner Machine Company, Limited, Hamilton, Ont. These pumps are built with one, two and three cylinder engines, the engine being of the two-cycle marine pattern, the speed of which may be adjusted by the carburetor and commutator, so that the pumps are good for services up to



Smart-Turner Centrifugal Pump

40 head. They are particularly useful on contracting work where it is not convenient to use a steam pump. They are easy to start and operate, and require little care. The company will be glad to give any desired information.

Canada Iron Corporation, Limited

The Canada Iron Corporation, Limited, Montreal, has secured contracts for the following municipal supplies:

At Edmundston, N.B., the entire pressure water pipe for new waterworks plant, amounting to 600 tons, equal to about five miles of iron piping.

At Stellarton, N.B., a considerable amount of iron pipe for the extension of the water system.

At Hebertville, Lake St. John District, Que., a quantity of material sufficient to lay about six miles of iron pipe for a new waterworks system being constructed under the direction of Mr. V. H. Dupont, Engineer, of Montreal.

At Ottawa, the total requirements of the city for pressure pipe for the year 1911. This will probably amount to 1,000 or 1,500 tons of all sizes.

At Fort William, 1,000 tons of pipe for municipal purposes.

At Winnipeg, from 800 to 900 tons.

At Prince Albert, Sask., the entire requirements for 1911, estimated at from 800 to 1,000 tons, equivalent to about eight miles of pipe. This is for the new waterworks system. This town is growing so fast that it is not known how far the waterworks system will have to be extended to meet the requirements of the population.

At Edmonton, Alta., the entire year's requirements, estimated at between 1,200 and 1,500 tons.

Messrs. Manders Bros., of Edmonton, who have been awarded the contract for a sewage disposal plant at Moose Jaw have ordered from the Canada Iron Corporation, Limited, some three hundred tons of pressure pipe for an extension of about two miles of conduit.

WATER - POWER PLANTS LOW PRESSURE TURBINES

ANY OUTPUT

ESCHER WYSS & CO.

Water Power Engineers

Works: Zurich, Switzerland

Canadian Office: Toronto: Lumsden Bldg., R. 408

Cablegrams: Neumuehle, Toronto

Phone Adelaide 234, Toronto

Contract Record

ESTABLISHED 1886

A Weekly Journal of
Building, Contracting, Engineering, Public Works
Municipal Progress, Advance Information

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SUBSCRIPTION RATES

Canada and Great Britain, \$2.00 U.S. and Foreign, \$2.50

Vol. 25

May 10, 1911

No. 19

Efficiency Engineering and Organized Labor

The efficiency engineer has in numerous instances succeeded in earning his title by distinguished success in lowering manufacturing costs. It is unquestionably true that most manual operations are not conducted in such a way as to minimize the effort required for the results sought. It has time and again been shown that a little scientific study of current manual methods may result in great economy of effort and consequent economy in production.

To reduce the matter to its lowest terms, if you can show a man how to perform a given operation in 10 movements instead of 12 you will enable him to perform it more rapidly and more easily, and consequently to turn out more work with the same effort, says *The Engineering Record*. If the operative at a machine has to turn around to secure or deliver stock, or to lift material unnecessarily, he is by so much less efficient. It necessarily follows, as experience has proved, that study and a campaign of education resulting from that study bring effective aid in manufacturing processes. As such efforts become more common organized labor of necessity takes cognizance of them and the attitude of organized labor toward the work of the efficiency engineer is at the present time both important and altogether uncertain. No intelligent workman can object to being shown how to economize effort and work more effectively, but sooner or later he is bound to ask the categorical question whether or no he is to benefit personally by his own increased efficiency. Beyond this, if he is a union workman he is bound to consider the question of the effect of the change upon his fellows.

At the present time with efficiency engineering just under way, so to speak, organized labor is generally pursuing a waiting policy, watching the progress of events with interest, pending information that will justify a definite stand for or against the movement.

and the chief matter of difficulty is that efficiency engineering is, as yet, far from being a definite proposition with respect to its effect on the labor situation. To define it is almost as difficult as to write a definite and clear-cut characterization of the New Thought movement or to explain the ethical bearing of pragmatism in a few pointed and well-considered sentences.

Organized labor is as uncertain about the bearing of the first proposition as it is about the actual meaning of the other two. In particular it is uncertain about the relation of efficiency engineering properly so-called, to the bonus system and to the still more simple operation of "speeding up" with which it is only too familiar. In a simple form its difficulty may be formulated somewhat as follows:

If by following a carefully planned scheme for economy of effort a bricklayer can double the number of bricks laid in a working day, to whom belongs the gain? And how can he distinguish the situation from one in which he is required to lay a certain number of bricks or get off the job, and from the intermediate proposition that if he will lay twice the usual number of bricks per day he will receive a more or less adequate bonus? We have nothing here to do with the effects of the distinction. What the workman wants to know is what the distinction means to him. At just this point the uncertainty of the efficiency proposition comes to the front. Again, the workman is interested in the effect of efficiency engineering on piece work. If he can learn how, without increase of effort, to turn out 200 articles a day instead of 100, will the price of piece work remain at the original figure or will it be cut in two?

These are simple economic questions, but from the workman's standpoint they are extremely pertinent. Is anybody prepared to provide them with definite answers? If so, the practical aspects of the matter are very easy to determine. But in the absence of definite information the hesitating attitude of organized labor and of labor generally is not to be wondered at. Indeed, it is hard to show the workman how in its result upon him efficiency engineering differs essentially from unscientific methods of "speeding up." That it does differ from such methods in a good many cases there is no reason to doubt. In one large works, for example, for some years past the management has fixed a price for piece work that it could properly afford to pay and has adopted the rule that thereafter the piece-work price would never be reduced unless there were furnished facilities to the workman which enabled him at least proportionately to increase his output. In this instance the management took the broad position that so long as the price for piece work was such that it could properly afford to pay, it did not in the least care how big the workman chose to make his earnings. In fact, the more money he made the more efficiency would the plant as a whole be utilized. It is quite unnecessary to state that the particular works here referred to have never had any labor troubles and that it has been increasingly prosperous and successful while this policy has been in force.

This represents one point of view regarding efficiency engineering and its results on the workman. On the other hand, in some instances of textile manufacture the piece-work price has been cut in one mill owing to increased facilities and cut in the mill next door without such increase owing to the action of

more enlightened labor. Where is the line to be drawn between the attitude of the two? Morally speaking, it is sufficiently clear; physically speaking it is less easy to define.

Equally uncertain is the connection of increased efficiency with the bonus system. In one instance the management may set a price which represents fair and adequate profit to itself for the performance of an intricate example of piece-work and offer a bonus for its more efficient performance. The works next door may offer a similar bonus and use it merely to establish later a new standard of hitting the pace, with liberty to draw one's pay as the penalty of failure. All sorts of gradations exist between these two extremes and organized labor is somewhat puzzled as to what particular gradation will be represented by any particular case of efficiency engineering.

Broadly, the efficiency engineer certainly leans toward the more liberal view of the case, but can he and will he stand firmly for his view or become merely a skilled agent for discovering new ways of "speeding up?" This question stands unanswered. So far increased efficiency means all things to all men. In the long run it is quite certain that the campaign for more efficient use of human strength is bound to have a good effect. Wasted effort is unfortunate from any point of view and no one would more readily recognize this truism than the workman himself. As a practical matter, however, in its bearing on the labor question the issue seems at present uncertain, and organized labor in particular is tempted to look askance at what in the long run may bring it material benefit.

Labor Efficiency and Construction Camps

Estimating labor efficiency is and probably always will be one of the big problems contractors have to face, particularly when undertaking work of any size. It is true that certain basic figures exist as to what a man can do in a given time, but experienced contractors will agree that this is subject to considerable fluctuation and that there are periods when labor is more efficient than at other times. The remedy usually applied is that of discharging inefficient help, but in times when labor is scarce this offers no solution of the problem. The resolution is that other methods must be sought. A mistake in considering the laborer merely as a cog in the machinery seems to be pointed out by a corporation which at the present time is employing in the neighborhood of 3,000 laborers, on one of the most important construction enterprises in America to-day. This corporation has tried getting at the laborer from the human side and is achieving a measure of success in keeping the laborer for a longer period than he will ordinarily remain, and getting a standard of efficiency. In this lay the crux of the problem, for it costs the company sixteen dollars for transportation to bring the man on the job, without figuring the cost of board.

As the work is isolated and offers no opportunities for breaking the monotony by casual visits to a city, this company made the experiment of making its construction camps as attractive as possible and supplying the best possible food, commensurate with a figure that was agreed upon to be sufficient for the purpose. The keynote of the whole was cleanliness. The quarters were constructed on a sanitary basis, with

plenty of ventilation, clean bunks, not too close together, provided with clean mattresses, pillows and sheets. The latter may seem a point too much for the average contractor, but it has proved a factor in raising the self-respect of the laborers. The interior of the bunkhouses are whitewashed and a janitor presides over each, employed in keeping it clean, and policing it so that there may be no breaches of the sanitary discipline. Reading and writing tables are also provided.

In the matter of food every precaution is taken to see that cleanliness prevails, both in storing it and in its preparation. A steward supervises this end of the work, and is accountable for the stores and the quality of the food. Experiments were made with various grades of flour, and when it was discovered that the best gave the best results it was adopted as a standard. The bread in this camp is as good as any obtainable. It was also discovered that when certain meat dishes were prepared by the cooks on the day previous to their use, they deteriorated and even caused sickness. This was stopped. Similar experiments were made with certain kinds of foods to find out which were best for the climate and gave best results in endurance. For the sick and indisposed a hospital has been placed in connection with each camp, provided with all first aid requirements. A competent nurse is in charge. This has been found a cure for loafing habits, as a man who reports as a sick man is treated as such.

This may seem by far too circumstantial for many and too expensive, but the organization which prevails and the cost data kept are not beyond reason. The laborers are kept in a cheerful mood and as the food is good, gives corresponding results in efficient labor returns. This fact was discovered by tests made, showing the amount of work done by the men during the afternoon hours. It is surprising what results can be achieved by raising the self-respect of the men. Some of the best foremen on this job were recruited from material which at first looked very unpromising. The large majority have accepted the sanitary methods and the attendant organization, and the others were speedily eliminated, proving that the surroundings of construction camps must be calculated on as a strong factor in figuring the efficiency of labor.—The Contractor.

City Engineer Rust, of Toronto, is entitled to some gratitude from the younger members of the profession in the east for the constant effort he is making to protect the interests and promote the welfare of his assistants. By his recommendation for an improved salary schedule for assistant engineers he is not only improving the prospects of those under him, but he is helping to raise the status of the profession and make municipal work, if not attractive, at least a little more remunerative. Of all the thankless undertakings—where a man gives his best in exchange for ignorant criticism—commend us to the job of the city engineer. In the past the city of Toronto has lost a number of promising young men through its niggardly policy of keeping the wage bill down, and the only wonder is that it has succeeded in retaining as city engineer a man who is held in such esteem as to succeed to the presidency of one of the strongest professional organizations on the continent, i.e., the Canadian Society of Civil Engineers.

Noteworthy Building Work at Montreal

Progress Reports on the Windsor Street and Place Viger Stations — Former will be One of the Largest on the Continent

With the huge steel skeleton of the new Windsor street station of the Canadian Pacific Railway rapidly pushing its way up past the surrounding buildings into the higher atmosphere, Montrealers are beginning to wonder whether or not the building will be finished before the end of 1912, which was the date given for its completion when the work was started.

Up to date 4,800,000 tons of steel have been erected by the Dominion Bridge Company. The exten-

The latest addition to the building operations is to consist of a boiler house, viaduct and a heavy retaining wall. These will be situated between the present main tracks on the upper level and St. Antoine street on the lower level, Mountain street on the east end. The estimated cost is about \$175,000.

The retaining wall will be 225 feet long, 28 feet high and about 15 feet wide at the base; it will rest on massive rectangular concrete caissons. The wall



Constructional View of the Windsor Street Station Extension, Montreal.

sions on Windsor and St Antoine streets are practically finished as far as the superstructure is concerned, and it is probable that the steel work of the tower will be finished by the end of May.

Good progress has also been made with the stone work of the building. The facings have been laid up as far as the floor of the second storey, the amount laid to date being over 10,000 face feet. Very little of the brick work has been laid as yet, but the concrete for the main floors has been commenced.

Shafts for three of the eleven elevators that will be installed in the building have now been dug and work has been started in connection with the digging of the artesian well which will supply the drinking water for the C. P. R. employees. This well, it is expected, will have a depth of between 900 and 1,000 feet.

will be given additional strength by the counterfort type of reinforced concrete and it will carry part of the baggage platform slab on top.

The concrete boiler house will extend 110 feet eastward from Mountain street and its width will be forty feet outside measurement; it will afford space for six huge boilers. A reinforced concrete coal hopper will be constructed over each boiler. Under the boiler house will be an ash tunnel, in the roof of which will be an opening from each boiler. Through these apertures the ashes will be dumped into a car conveyed to the ash hoist which will raise the refuse to the roof of the boiler house where it will be emptied into other cars running on top of the boiler house. The coal hoppers will be filled direct from cars also on the top of the boiler house.

Immediately the structure is completed three

boilers of the Babcock & Wilcox type will be installed. These will be equipped with Greene travelling grate stokers with Cochrane feed water heater and Weir feed pump. Steam will be piped from the boiler house through a tunnel below the retaining wall and viaduct to the engine room directly below the concourse floor of the new station extension. The roof of the boiler house and viaduct will at the same time constitute the flooring for the new railway tracks. Three new tracks will be laid as soon as the concrete work is completed and hardened, but the design provides for expansion, admitting of four more tracks being added, the whole to be covered by a single roof, making this an up-to-date train shed.

A new feature will be adopted in the arrangement of the tracks, the idea being to have the passenger platforms and baggage platforms separate. The passenger platforms extending lengthwise of the trains will be 16 feet wide and the baggage platforms 10

highest buildings in the British Empire, rivalling even the company's new building which is to be built in Toronto.

Place Viger Station

Good progress is being made with the new Viger station, hotel alterations and re-arrangement of the terminal trackage. The accompanying photograph shows the new station in the foreground and the old station and hotel building beyond. The view is from the corner of Notre Dame and Berri streets, the latter passing down to the left and the former to the right of the picture. The new station is a two-storey structure of Scotch brick and stone on concrete foundations set on piling. It required some engineering skill to get the foundations in a satisfactory condition. It is only a couple of short blocks from the station to the river St. Lawrence. The water soaked in very fast when the excavation was being done and a good deal of pumping was necessary. The ground



The Place Viger Station Contract—From the corner of Notre Dame and Berri Streets.

feet wide. Passengers will alight always on one side of the train and baggage will be discharged on the other side, thus providing for rapid and uninterrupted traffic. The same scheme will be applied to the present track space in due time.

The chimney of the boiler house will rise to a height of 225 feet above the grade of Mountain street. A 140 foot radial brick chimney, resting on a rectangular caisson of concrete, is carried on the corner of the boiler house. The boiler house itself rests on circular concrete caissons, there being three rows of eight bents each. The boiler house, being below the track level, was designed with buttresses to resist earth and train pressure. The tunnel carrying the steam from a boiler house to the station passes through the rectangular caissons which carry the retaining wall.

When the whole is completed, the Canadian Pacific Railway will have one of the largest stations on the continent. It is being built as an annex to the present Windsor street station and will be one of the

or track level is only fourteen feet above high water and 34 feet above the low water level, while the floor of the boiler room, which is in the sub-basement of the structure from which rises the smokestack, is only six feet above low water. The basement, however, has been made waterproof with heavy concrete. The boiler installed is a 600 h.p. Babcock & Wilcox, and it will furnish the heating for the entire terminal plant.

Between the station and Berri street there will be a large court yard for the accommodation of cabs, etc. A strong retaining wall will be built to divide this court from Berri street as Berri street is a sloping thoroughfare from ten to twenty feet higher than the level of the station platform. The walls of the station are strong enough to carry additional storeys should they ever be required.

On the east side of the station is the track or yard space. Formerly the trains entered the station in a northerly direction, but under the new arrangement they enter in a westerly direction, the ends of the tracks abutting the east side of the new station. What

was formerly the station in the east wing of the hotel building, is being altered for hotel purposes.

At the same time that this work is in progress a new steel and concrete viaduct is being built where Notre Dame street used to be. This will provide a roadway and foot path over head and freight sheds underneath. The whole will be fireproof.

Investigations of Flow in Brick Lined Conduits

In a paper read before the Western Society of Engineers, by John Ericson, city engineer of Chicago, the conclusion was drawn that for brick-lined conduits a value of n in Kutter's formula of 0.0130 is readily attainable. This is a coefficient due to roughness and is applicable to tunnels or sewers of ordinary sizes and velocities of flow, lined with sewer brick laid in cement mortar, if the brick is properly selected and not too warped or uneven, laid in a workmanlike manner and true to line, not disturbed by blasting and the mortar joints scraped off flush with the brick.

Under certain circumstances, especially if there has been any disturbance whatever of the brick on account of blasting, it will be found advisable and profitable to have in addition the entire interior surface of brick conduits washed with neat cement, the strokes of the brush applying the wash to be always along the geometrical axis of the conduit. By this method a coefficient of roughness, n , considerably smaller than 0.0130 should be obtained in well constructed tunnels of the sewer brick lined class.

In relation to blasting in the excavation of trenches for brick-lined conduits Mr. Ericson pointed out that if the lining is thereby at all disturbed, whether such disturbance is especially noticeable or not, it will have the effect of increasing the resistance to flow and consequently decreases the capacity of such a tunnel. The jarring of the brick work undoubtedly disturbs the mortar joints more or less, so that the bond with the brick will be broken. Slight projections and irregularities will be caused by this shaking of the brick work, and irrespective of any visible disturbance or distortion of the same, resistances to the flow of water are created.

A brick tunnel in rock should not be lined until after the completion of the entire excavation, or at least the brick lining should be kept far enough back of the face and be so protected as to be unaffected by the blasting.

In an earth tunnel, blasting should preferably not be permitted at all, and if anywhere found to be necessary care should be taken to protect the brick work from the effect of such blasting and to remedy any defects in the brick work that upon close inspection may be discovered.

Completion of the Rosenthal Building, Ottawa

The new building of A. Rosenthal & Sons on Sparks street, Ottawa, which has just been unveiled, is one of the most attractive commercial buildings in the city. It is a seven-storey building with basement and covers an area 67 feet by 100 feet deep. It is constructed of reinforced concrete, Kahn system of reinforcement. The work was started in June, 1910, and was delayed considerably on account of the large amount of rock excavation. For the basement and sub-basement it was necessary to go down 17 feet; in all, about 2,000 cubic feet of limestone rock was taken out. An arch type of floor construction was used, thus obviating the deep girders and floor slabs.

The ground floor, basement and half of the second floor are used by A. Rosenthal & Sons, for their own business, the main floor being devoted to jewellery with the cut glass and art department in the basement. The workroom and manufacturing department is in the rear of the second floor. The remainder of the building is devoted to offices.

Two elevators supplied by the Otis-Fensom Elevator Company connect with all the floors and the basement. On the main floor there is a large burglar-proof vault of concrete, reinforced with street car rails. About 30 tons of rails were used. The vault was provided by J. & J. Taylor.

All the stairs are of concrete, with marble treads and risers. The main entrance lobby is panelled to a height of eight feet with large slabs of Mississquoi



The New Rosenthal Building at Ottawa.

marble. The large columns in the store are finished in slabs of French Bresche Violet marble. The interior fixtures, which were supplied by the Library Bureau, are of mahogany on the main floor, with verde antique marble base. The store floor is of marble mosaic. The exterior of the building is of semi-glazed terra cotta manufactured by the Doulton Company, of England.

All the ornamental iron work in the store front and throughout the building was furnished by the Canada Foundry Company.

The building was designed by Mr. A. Le B. Weeks, architect, Ottawa; C. E. Deakin, of Montreal, had the general contract. The reinforced concrete work was done by Jago & Company, of Montreal; the marble work by A. K. Mills & Son, of Ottawa; the electrical work by W. J. O'Leary & Company, of Montreal; the mill work by the W. C. Edwards Company, and the plumbing and heating by McKinley & Northwood, of Ottawa.

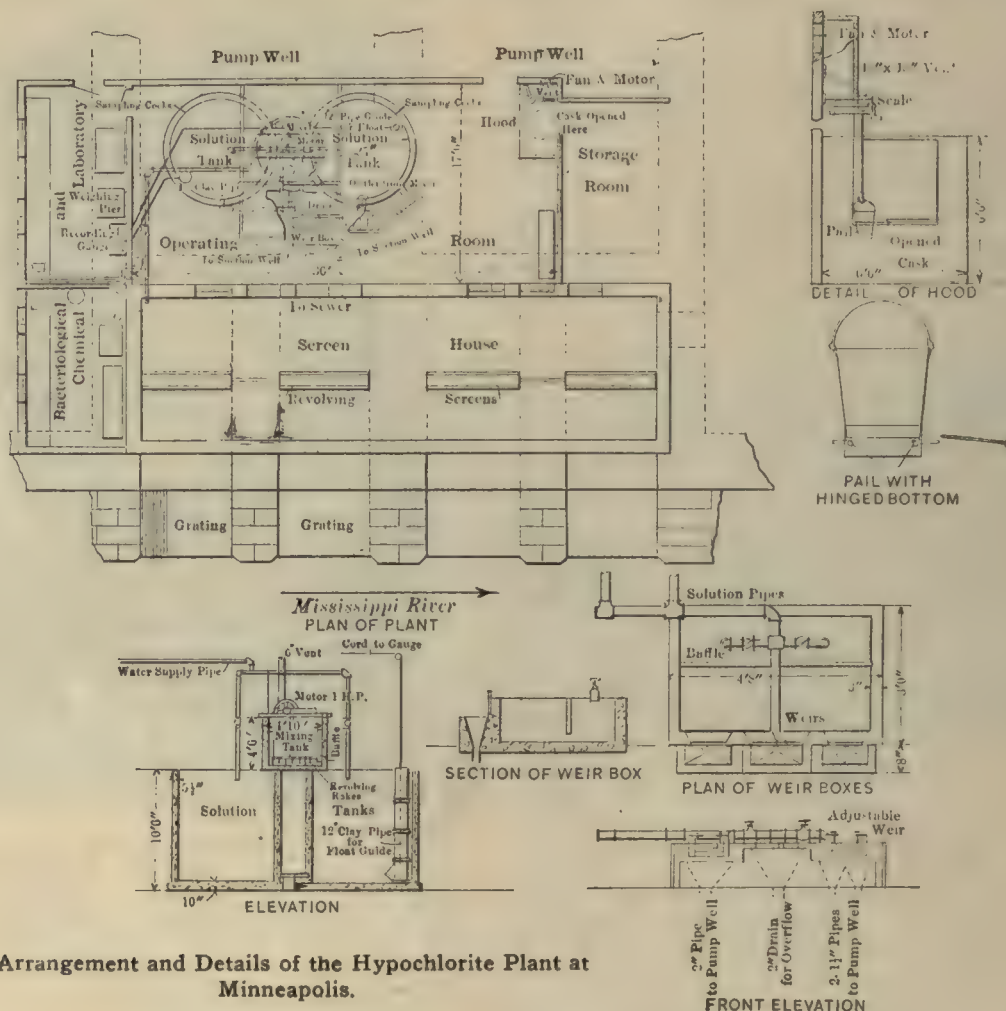
The Hypochlorite of Lime Treatment

Difficulties of Operation Encountered at the Minneapolis Plant and the Protective Devices Adopted—Gauging Flow of Solution—Periodical Tests of Water

About one year has elapsed since the hypochlorite of lime treatment plant at the Minneapolis waterworks was installed. During this time some of the early difficulties of operation have been eliminated.

As the attendants operating the original temporary plant were frequently sick, means were adopted in the permanent installation to handle the chemical under hoods. As no measuring device which will continue

galvanized iron pipe. The present use of hypochlorite of lime was an emergency measure brought about by an epidemic of typhoid fever caused by the infection of the water supply from the cities on the river above, where that disease was prevalent. The death rate being alarming, treatment was ordered by the city council, and through the co-operative efforts of the engineering and health departments, the temporary plant



Arrangement and Details of the Hypochlorite Plant at Minneapolis.

to give constant ratings is available, hand-adjusted weirs are used, reliance being placed on hourly readings of the drop in the solution tanks.

The plant has a capacity sufficient to treat from 20,000,000 to 30,000,000 gal. per 24 hours. The chemical is applied to the raw Mississippi River water entering the pump wells. As it is the intention to use hypochlorite of lime treatment in connection with the filters now in course of construction, the permanently installed plant consists of reinforced concrete tanks, weir boxes and discharging funnels connected up with

was constructed and put into operation eight days after authorization.

By introducing the chemical at the pump wells, a thorough mixing is obtained and a long contact period for reaction is provided by the passage of the water through the pumps to the reservoirs 3 miles away, whence it flows by gravity to the city. The original plant was built of wooden tanks and wooden measuring devices, thereby gaining several weeks' time as well as giving the designers valuable experience when it became necessary to replace the temporary appar-

atus. The permanent tanks and measuring devices are built of concrete, and measures have been taken to avoid the disagreeable odor in handling the hypochlorite, to resist its corrosive action and also to measure the solution applied to the water. For the sake of economy, the old tanks were used as outside forms for the new concrete tanks, which have walls 5½-in. thick and are reinforced with No. 11, rectangular mesh, wire fabric.

Suitable charges of hypochlorite are introduced into the 450-gal. mixing tank and dissolved by revolving rakes on a vertical shaft. A 1-h.p. motor drives the shaft by worm gear. Baffles on the sides of the tank prevent the water from swirling in a mass. The ceive a specially designed pail with a collapsible bottom. The fumes rising from the dumping of the bucket and the churning solution escape through a 6-in. vent in the cover, passing up through the roof.

The solution is run from the mixer alternately to two 4,500-gal. feed tanks. Each tankful is tested, samples being taken both from the top and bottom, for available chlorine. When the proper strength is obtained by dilution, the solution is ready for use. Each tank is provided with a float rising and falling in a 12-in. clay pipe which serves as a guide. These floats communicate with recording gauges in the laboratory, which make a record of the service and check the work of the attendant. A dial gauge in the laboratory, on which the level of the solution may be seen, is read each hour by the attendant and the record kept in a book provided for the purpose.

Gauging of the flow is effected by passing the solution through two weir boxes, each supplying the pump well of a 15,000,000-gal. pump. The boxes are provided with adjustable weirs, which are reversely calibrated by the fall of the liquid in the solution tank per unit of time. This was found to be the only absolute method of accurately measuring the solution, owing to its corrosive or encrusting effect on weirs, or orifices varying the size of such openings which was sufficient to vary the size and render the work inaccurate.

The head on the weirs is kept constant by an overflow from the box, and the level is obtained by the operator of the valves controlling the solution. These valves are adjusted by an attendant. The discharging sheet from one of the weirs is divided by a knife-edge partition between the funnels, as shown in the drawing. Each portion of this discharge corresponds to the volume of water passing on each side of a dividing wall in the pump well. The weirs can be seen at all times, and the accretions which form can be filed off as soon as they affect the discharge. As the actual quantity discharged is checked each hour, the calibration is used simply as an arbitrary scale.

Besides eliminating the fumes of the mixer, precautions have also been taken to remove the fumes while opening the casks and weighing out charges. For this purpose a hood of matched lumber was built, of sufficient size to hold the largest size cask. The hood has a rectangular vent 18 in. x 18 in. at the top of which is a 24-in. motor-driven fan. When the dry material is being handled the fan is put in motion, thus driving the dust away from the operator. The charging pail is hung in the hood on a rod connected to a scale beam which is above and away from the fumes. The improvements enumerated have rendered the handling of the hypochlorite free from injurious effects upon the attendants, so that no time is lost on

account of their being away on sick leave from this cause.

Four tests are made of the water daily—one of the river water, another after leaving the pumps, a third at the reservoir inlet, and a fourth at the tap in the bacteriological laboratory. In addition to these, periodical tests are made on water taken from various taps in the city. The colon bacillus has never been found in treated water since the initial installation, although it is always present in the river water. Two chemists and three attendants working in 8-hour shifts are in charge of the operation of the plant, which is fully equipped with a chemical and bacteriological laboratory. Owing to its remoteness from the city, the laboratory has its own gas-generating plant.

Experience has shown that to a certain extent the amount of chemical required is proportional to the fineness of the suspended matter, measured microscopically, rather than the amount of the turbidity. It has also been found that in summer harmless bacteria grow in the water, but in winter the bacteria counts continue to diminish from the pumps to the consumer, from which it would seem that in regulating the required quantity of chemical, more reliance should be placed on the removal of bacteria indicative of contamination, and less on the total number of bacteria. The following table gives a summary of the operating data of the plant for 1910:

OPERATING DATA OF MINNEAPOLIS HYPOCHLORITE OF LIME PLANT FOR 1910.

Month.	Av. Turbidity Parts Per 1,000,000		Av. Daily Bacteria Per Cu. Cm.		Av. Hypo. Used B. Coli. Treat. Per 1,000,000	
	Raw.	Treated.	Raw.	Treated.	Raw.	Treated.
March	10	1,100	365	+	0	1.68
April	10	8,000	1,200	+	0	2.01
May	5	7,500	520	+	0	3.04
June	10	6,000	274	+	0	2.94
July	15	6,000	1,090	+	0	2.45
August	5	5,800	213	+	0	2.37
Sept.	5	1,070	230	+	0	2.30
October	5	1,360	290	+	0	2.28
Nov.	5	250	7	+	0	2.23
Dec.	3	450	8	+	0	1.54

The plant was constructed under the supervision of Mr. J. Arthur Jensen, engineer of the waterworks. The laboratory and sanitary work is under the supervision of Dr. Frank J. Corbett, city bacteriologist, whose study in connection with the operation of the plant has resulted in the development of the protective devices described.

Labor on Railway Construction

The Dominion immigration regulations, providing that aliens entering Canada must come direct from the countries of their birth or naturalization, will be partially suspended, it is stated, until September 30 next, for the purpose of affording railroad contractors the opportunity to secure sufficient men for the vast amount of railway construction projected for the present season. The precise regulation acted is Privy Council order, No. 920. It was suspended on July 14, 1910, for three months as the contractors were unable to secure sufficient labor. In connection with the suspension of the order, it is added, however, that the applicants for admission must produce evidence to show that they are going to railway construction jobs. Laborers from the south of Europe will not be allowed to enter Canada, the change applying only to those from Northern Europe. Orientals are not affected.

Municipal Engineering at Hamilton, Ont.

Interesting Details from the Annual Report of City Engineer Macallum —Costs of Sewers—Supplementary Notes on Failure of Casting

Considerable activity is reflected in the annual report of Mr. A. F. Macallum, city engineer of Hamilton, Ont., which contains a number of items of interest in regard to the work accomplished during 1910.

The present population of the city is 73,538; the acreage is 6,090, and the assessment value is \$48,538,015. Mr. John R. Heddle is assistant city engineer; J. Albert Anstey is overseer of waterworks construction; James McFarlane, chief engineer Beach Pumping Station; Campbell Leckie, chief engineer Ferguson

and Mr. Macallum recommends the construction of a larger reservoir. He also advises that it will be necessary to extend one of the intake pipes at least 1,000 feet from the shore line of the lake. At present it extends only 200 feet, which distance is insufficient to clear the heavy ground ice formation upon the lake shore during the winter months, which practically puts these pipes out of commission during that period.

On account of the recent annexation of the district east of Sherman avenue, it was necessary to lay



Failure of 30-inch Y at Beach Pumping Station

Avenue sewage disposal station; John Hodgson, chief engineer Wentworth street sewage disposal station; James Boyd, engineer high level pumping station.

Dealing with the work of the waterworks department the report states that the two electrically-driven turbine pumps, each having a capacity of six million gallons a day, were installed in the new building at the Beach pumping station upon December 21st last. New valves were placed in the wells and a 30-inch main laid to and intersecting the 18-inch, 20-inch and 30-inch pipes connecting with the steam pumps, with necessary cut-off valves. Three more valves have yet to be placed on conduits from the settling basins. The capacity of the present reservoir is but two and a half million gallons, sufficient only for about a three hours' supply during an average day in the summer season,

out a complete drainage system. Trunk sewers were constructed at Lottridge, Trolley and Barton streets. These large concrete sewers will all discharge into the new east end disposal works. At these works a pumping house was built and two electrically-driven centrifugal pumps were installed to pump the sewage to the level of the sedimentation tanks. This plant is now complete and ready for electric power.

A considerable amount of asphaltum and macadam paving was done during the year. Stone from the city's own quarry was used but it was not found of sufficient toughness for the wearing surface of the macadam roads. Where street railway tracks were relaid, creosoted wooden blocks were placed between rails and for one foot outside outer rails. On the heavy grade on King street, between Hess and Ray



Electric Light Standards, Gore Park, Hamilton, at night



Grooved Wood Block Pavement, James Street South, Hamilton



Electric Light Standards, Gore Park, Hamilton



Street Railway Construction, King Street West, Hamilton

streets, grooved wooden blocks were laid across the full width of the driveway instead of asphalt, giving a better foothold for the horses.

The following costs of sewers are abstracted from the report. The sizes vary from 9 to 30 inches and the cost per foot from 90 cents to \$7.91.

Length in feet	Character	Total Cost	Cost per ft	Average Depth
230 965	12 in. Pipe 12 "	\$ 193 73 Included in Base Line	\$0 84	8 ft. 0 in 10 " 4 "
1400 467 325 1400	12, 18, 24 in. Pipe 12 in. Pipe 12 " 24 "	3,341 87 Not completed in 1910 293 73 Including whole system, 10,228.75	2 39 90 2 23	12 " 2 " 11 " 6 " 10 " 0 "
260 1218 1749 324	12 " 18 & 15 " 12 " 12 "	344 92 2,787 85 1,682 07 503 46	1 33 2 29 96 1 55	12 " 2 " 11 " 6 " 11 " 0 " 9 " 8 "
147 515 710	12 " 9 " 12 "	826 16 569 48 809 98	1 85 1 10 1 14	10 " 3 " 9 " 0 " 8 " 9 "
1068 664 2048 685	12, 15, 18 in. Pipe 12 in. Pipe 30, 24, 15 in. Pipe 18 in. Pipe	Not completed in 1910 600 03 Not completed in 1910	90	10 " 6 "
965	9 "	Included in Base Line		9 " 0 "
660 70 1823	12 " 24 " 30 in. Concrete	921 96 438 96 14,136 70	1 40 6 27 \$7 91	11 " 0 " 17 " 8 " 14 ft. 6 in
349 350	12 in. Pipe 12 "	305 77 Included with St. Clair Ave.	38	10 " 8 " 10 " 6 "
1010	2 ft. 3 in. egg shape concrete 24 in. Pipe	6,605 08	3 45	13 " 0 "
430 145 245	12 in. Pipe 9 " 9 "	643 49 87 74 272 09	1 50 60 1 11	10 " 6 " 12 " 0 " 8 " 6 "
1251	15 "	Included in Base Line		10 " 0 "
602 593 382 402	9 " 12 & 9 " 12 " 12 "	1,105 45 And Main St., 843,42 347 98 503 17	1 12 90 91 1 25	9 " 0 " 10 " 0 " 9 " 0 " 10 " 6 "
1307 345 2023	12 " 12 " 4 ft. 0 in. wall sided 4 ft. 6 in. circular	Not completed in 1910 258 35 Not completed in 1910	75	10 " 7 " 15 " 8 "
1022 592	20 in. Pipe 12 "	1,325 53 728 27	1 30 1 21	9 " 9 " 10 " 0 "
264 375	18 " 12 "	460 18 272 72	1 74 73	9 " 0 " 9 " 0 "

In connection with the failure of the casting shown in one of the cuts reproduced herewith we are indebted to City Engineer Macallum for the following information:

"The casting is a 30-in. Y connection between one of the city mains and the new electric pump pipe. This casting was designed according to the usual standard for heavy pressure, but upon turning the pipe into use and after about one hour's pumping at 120 lbs. pressure, the top of the casting blew off, as shown. The top half of the casting along the greatest diameter, in both cases, sheared off as if it had been cut. A new casting was made and the thickness of the shell was increased, also the thickness of the reinforcing ribs; and to strengthen the comparatively flat faces across the junction of the two branches, three 3/4-in. bolts were run through. This new casting has stood the pressure since. The failure of the

first casting was not due to any imperfections or flaws in it, so far as could be ascertained."

Road Improvement in Nova Scotia

Nova Scotia possesses, according to official figures, some 18,000 miles of highways, divided into road districts and under the superintendence of the road commissioner of the province. Of this total it is estimated that 10,000 miles are fairly good road for driving and automobiling, and every year many miles of graveled road are being added. During the year ended September 30, 1910, work to the amount of \$163,512, was done, and other work undertaken or mapped out, calling for an additional expenditure of \$21,951. This aggregated an outlay of approximately \$10,000 per county, which is about the usual average in this province.

The revenue for road repair in Nova Scotia is derived from taxes upon property (a certain per cent. of the whole going to the road fund) and from a poll tax, these being paid either in cash or labor at the prevailing wage rate per diem. The property tax for the fiscal year 1910 amounted to about \$95,000 in the eighteen counties of the province, and the poll tax to more than \$80,000, making a total of \$175,000, and this was pro rated among the several counties according to their requirements. Of this sum 70 per cent. was paid in labor—"worked out," as it is called.

During the year 25 road machines were imported from the United States at a cost of \$5,375; one grader, and some other machinery were likewise purchased, a total of nearly \$10,000 having been expended for new machinery. There are now about 75 road machines and 20 graders in the province. During the last five or six years road machinery to the value of over \$20,000 has been purchased.

It is estimated that there are 72,000 culverts in Nova Scotia, ranging from 6 feet in width down to 1 foot. Practically all of the culverts constructed up to a short time ago were of wood, costing on an average \$7 each, but some concrete, hard or vitrified brick, and stone culverts have been built in the last few years. Concrete culverts can be put in for an average cost of \$20 to \$25.

The permits issued last month at London, Ont., totalled \$132,334, compared with \$104,883 for April, 1910. The figures for the first four months of 1911 and 1910 are \$218,197 and \$326,715 respectively.

In the matter of building permits the city of Montreal last month practically tied with April, 1910, the totals being respectively \$1,711,971 and \$1,775,880. The permits issued from January 1st to April 30th of the current year, however, show an increase of nearly one million dollars over the first four months of 1910.

Surface blasting, or "dobeying," does not appreciably affect firm banks nor produce sliding of material, according to the report of an investigation made in Culebra Cut on the Panama Canal to determine the effects of blasting on the slides there. Little effect is noted in producing earth vibrations, and only small amounts of exposed material, previously loosened, are liable to displacement, but the air concussion is much greater than with heavy, deep shots and is mainly responsible for the shaking of houses. An instrumental test showed that the greatest shock of the "dobey" shots is transmitted through the air and little through the ground.

Possibilities of Brick and Terra Cotta

Practical Notes on Specifications and Other Interesting Details— Value of Lettering and Numbering Blocks—Constructional Details

In discussing the wonderful possibilities of brick over terra cotta in connection with building construction, a writer in a recent issue of Construction News points out that the material of which they are made plays many parts, and in conjunction with steel and iron framing is of the utmost value to architects and architecture. Continuing he says:

Terra cotta blocks are set in three different directions, viz.: placed vertically, horizontally and diagonally, and in arch work partake of and possess all the qualities of brick and stone without the excessive labor of cussing and setting always essential to these materials. Furthermore, in tile form, the possibilities are limited only by cost and requirements. Avoiding the use of terra cotta in work as alluded to, we will take up its employment in geometrical details, such as arches, groins, etc., all of which are difficult, both to manufacture and set. The fundamental basis of all construction is, of course, the drawing specifications, which for this class of construction must be clear and very specific, showing distinctly, to an exact scale, how the several constituent materials blend together to solidify the construction. Small $\frac{1}{8}$ or $\frac{1}{4}$ -in. scale plans, elevations, sections, etc., should be furnished by the architect with $\frac{1}{2}$ in., $\frac{3}{4}$ in. or $1\frac{1}{2}$ -in. scale details of all molded work or curved, so that the manufacturers may lay out the work accurately and intelligently, without error or loss of time. It is not always for the maker of terra cotta to strictly adhere to and follow out the architectural drawings, and in many cases changes have to be made to complete the construction, but this may all be done by the co-operation and mutual agreement of all interested.

There are, however, some good rules to follow which are worth noting. If the dimensions on the details are vague, it should be the duty of the draughtsman to visit the works and compare the steel frame erected with every measurement. It is not wise to accept curved members on plans as accurate. It is better to make light wood or stiff paper or cardboard templets to fit the steel as set. This is imperative for finished work. The matter of tying and anchoring to iron, steel or brick core, members or backing must be fully provided for leaving holes, slots, etc., when molding.

The beds of all blocks, top, bottom and sides, should, as far as possible, be in the direction of the thrust or pressure. In vertical or horizontal work this is simple, on curved details difficult. In arch work the compression center line is in the middle of the depth of the ring, so that all top and bottom beds must radiate to the centre or centres, from which the curve or arch is struck. This applies to all arches from semi-circular to elliptic, and similarly to groins, the lines and intersections of which can only be obtained by geometrical development, in full-sized details and with the extensive application of patterns and molds.

Lettering and Numbering Blocks

The matter of lettering and numbering every curved or ornamental block to correspond with the

numbers, etc., on the shop drawings must be done logically and systematically—using capital letters and Roman numerals for principal parts as bases, capitals, keystones, coigns, etc., and lower case letters, index figures and letters for minor parts.

The indexing, etc., is indispensable to the setter and should be accompanied by full classified lists with delivery invoice.

In arches, etc., special attention must be given to right and left-hand details when listing, especially for work of the higher class, such as for churches, schools, etc., where the Gothic and Romanesque styles of architecture are used, the blocks will be varied and intricate. Much delay and loss of time to masters and men are often caused by the absence of non-delivery of a single block, and it must be remembered that it is not always possible to employ a temporary dummy substitute of brick or wood. Of course, this is impossible in arches or groins.

On the building under construction, if a large amount of terra cotta is to be introduced, the constant presence of a skilled setter is imperative. He must act in unison with the ironworker and bricklayer foreman on the job, pick out all blocks, working from the listed and numbered plans and see them properly set, levelled and plumbed, test all centering and see same is the exact form required, ample in strength and in exact position, do all fitting and correct all errors and omissions, watch as to full anchoring and see that measurements are as shown, see to the full backing up with brickwork and so arrange that there shall be no possibility of cracking or disfigurement by unequal settlement or error in bonding. The difference between the thickness of the joints of the finished blocks and the rough brick backing is too frequently the cause of fractured blocks in fronts and other defects.

When Setting Brick or Blocks

In setting arch or ground brick or blocks, the top or extradii surfaces may be covered with paper, oiled or treated to resist water. This will give a fairly clean soffit to the completed arches.

The necessity of using good mortar, preferably cement, is urged and the keeping of all arrises and blocks fair on faces and beds, to preserve the equilibrium and thrust. The insertion of all tie rods in all roof and floor beams and girders, and their presence, thoroughly screwed up and assured, before laying up any arch of brick or terra cotta, are necessary.

All voids liable to occur in fireproof buildings, such as terra cotta casings or jackets around steel-framed columns, must be filled up solid with bricks and brickbats and be fully slushed up solid with cement mortar, to form, as it were, an integral part of the steel core. Similarly with vacant spaces in girders. This simple job increases the strength and rigidity of the steel and protects the metal from injury by dampness, cold, heat or fire.

When Smooth Centre Surfaces are Necessary

For all tile arches in floor or roofs, either laid in layers at right angles or diagonally to the beam or

girder-webs, smooth centre surfaces are necessary and are better covered with paper. Tile arches showing skew or herringbone soffits should invariably have the bonds reversed with each layer until the needed thickness of ring is built. It is advisable to have one ring layer set at right angles or square to the beam webs with the bonds broken. Never strike centres until it is assured that the mortar has entirely set.

From the foregoing it might be inferred that what has been written here is solely for those in charge, but it pertains to all interested in building, where constructions made of clay products are involved. So on this account it is of equal value to artisan, producer and mechanic alike. Building is largely a co-operative business, each branch of which contributes its share to erecting structures which architecturally shall constitute a perfect whole, each individual doing his part to gain this end, and receiving in return the compensation and reward of a reputation for perfect fulfillment of building laws.

Who Invented Portland Cement?

The question as to whether the original invention of Portland cement belongs to Mr. I. C. Johnson, of Gravesend, Eng., who is still living at the age of 100 years, or whether it should be ascribed to Jos. Aspdin, a bricklayer of Leeds, Eng., is raised by a correspondent of the "Engineering News," which deals with the matter in the following editorial:

"Portland cement, as it is known to-day, is a development and not an invention, so it is difficult to pick out one man to whom the honor of original discovery may be ascribed. Throughout the last half of the 18th century and the first quarter of the 19th, men were working on various perfections of the hydraulic lime first made in 1756 by Smeaton for his Eddystone Lighthouse, but although some of these experiments included the proportioning of various lime and clay compounds to be ground and burned together to form the cement—a marked improvement on Smeaton's simple burning of a natural rock—none carried the burning to the point of incipient fusion, which is the recognized essential in a Portland cement. Among these men was a bricklayer named Joseph Aspdin, of Leeds, Eng., who went farther than some others of his contemporaries apparently only in procuring, in 1842, a patent on his product, which he called "Portland cement," because, according to modern authorities, of the fancied resemblance of the set cement to Portland stone, an English limestone. Aspdin tried to establish factories for the manufacture of this cement but none of his attempts were highly successful, largely on account of mechanical defects in the plants and the uncertainty prevailing as to the correct proportioning of the ingredients.

"Some time between 1840 and 1850, it was found by the various manufacturers of hydraulic lime and "Portland cement," so-called, that burning to incipient vitrification produced a cement of much stronger and more stable qualities and beginning then, the manufacturer of Portland cement as now known, was developed. There is no definite record of just when this latest development started or who where the men behind it, but according to his own testimony, in a curious little pamphlet published a few years ago, the venerable I. C. Johnson, was among the first. About 1840 he left the well-known firm of White & Sons, cement and lime manufacturers, where he had introduced many improvements in their machinery, to take

over a run-down plant where Aspdin or his successors had been manufacturing the underburned "Portland cement" of his invention. In this plant Mr. Johnson probably turned out the first real Portland cement, and founded the modern cement firm of I. C. Johnson & Company, Limited. Although he undoubtedly was responsible for many of the methods and much of the machinery that made Portland cement a superior product, there is no evidence that he was the first to realize the importance of high burning temperatures."

The Hydro-Electric Inauguration at Toronto

The celebration in Toronto last week was a fitting recognition of the enterprise and ability of those who have harnessed the great Niagara Falls and furnished power to Toronto and other municipalities. It is two years since the city of Toronto commenced work on this undertaking, after authorizing an expenditure of \$2,750,000. To date over \$1,000,000 has



Mr. P. W. Sothman,
Chief Engineer Ontario Hydro-Electric Commission

been expended. Mr. P. W. Sothman is chief engineer of the Provincial Hydro-Electric Commission, and Mr. K. L. Aitken, chief electrical engineer for the city of Toronto. Mr. Sothman, whose photograph is reproduced herewith, is a native of Denmark, and is 41 years of age.

Active preparations are being made for the annual meeting of the American Waterworks Association, which is to be held at Rochester, N.Y., next month. J. M. Diven, Charleston, South Carolina, is secretary.

The city of Montreal is indignant because of the fact that the Mountain View apartment house, which was destroyed by fire recently, endangering many lives, was advertised as a fireproof structure. It is a coincidence that a Montreal paper reports the name of the builder of the Mountain View as "Jerry" instead of Jarry. The slip may or may not have been intentional, although there is every indication that the Mountain View exemplified the art of the jerry-builder.

Plant of the Erindale Power Company

A Power Plant of Unique Design—900 foot Underground Water Channel—A.C.B. Generators — Canadian Turbines — Ferranti Switchboard — 2500 h.p. available

A cleverly designed little power plant has just recently been placed in operation on the Credit river at Erindale village, three miles up stream from Lake Ontario and about 14 miles due west of Toronto. This plant was originally designed by the old Southern Light & Power Company, and was being financed by the defunct York Loan Company at the time of the latter's declaration of insolvency.

Some two years ago the property was taken over by the Erindale Power Company under the management of Mr. E. S. Edmondson. Since that date record progress has been made and in August of 1910 the first generator was placed in commission. A second generator has now been added and everything is ready for the installation of the third and last unit which will be placed in position as soon as the demand for power and light warrants it.

The Water Supply

At Erindale village the Credit river takes a sharp turn and doubles back on itself within a length of little more than half a mile, passing over, at the same time, a series of

the top. Large quantities of earth and rock fill support the wing dams on both up-stream and down-stream sides. Extensive excavations were made for the concrete work which rests at every point on a solid rock foundation.

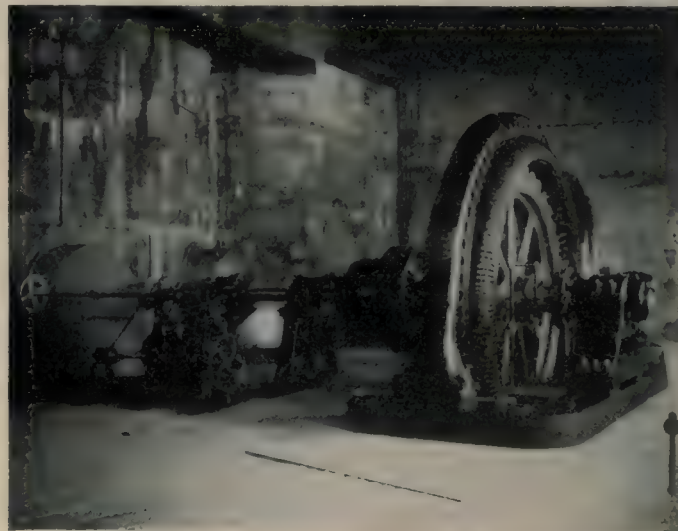
The intake is a concrete crib about twenty feet square, situated some distance up stream from the dam and equip-



Ferranti Switchboard—Erindale Power Co.

rapids representing a total fall of some twenty-five or thirty feet. Up stream a further series of rapids formerly obtained and the river was enclosed by high, wide banks well suited for storage purposes. A concrete dam has been constructed at this midway point, some 34 feet deep, above the river bed (the foundation being carried 20 feet below the river bed to the rock), thus creating a storage area of upwards of 100 acres. This forebay is connected by an underground tunnel, through the narrowest neck of the peninsula, with the power house located on the river's bank below.

The large diverting dam is constructed of reinforced concrete and is some 700 feet in length. A 100-foot spillway with three 6-foot stop-log sluiceways occupy the central portion of this structure. The spillway is in two sections, as shown in one of the accompanying photographs, with strong reinforcing buttresses in the middle and at each end, the latter heavily supported by staunch wing walls. The wing dams, lying to the right and left of the spillway, are concrete cored, with concrete cross wings averaging every 25 feet. (See figure of dam). These concrete cores are 8 feet wide at the base gradually narrowing to 16 inches at

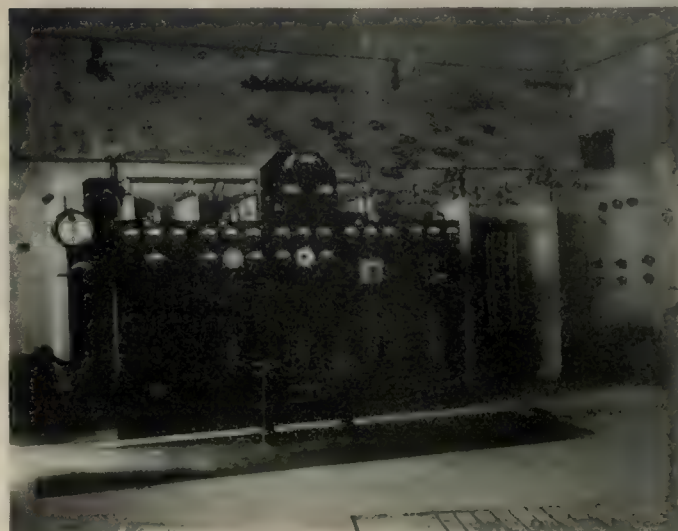


Two Operating Generators—Erindale Power Co.

ped with head operated gates, stop-logs and wooden rack. The water-channel is wholly underground, 12 ft. 6 in. in diameter, 900 feet long and lined with heavy reinforced concrete. This tunnel is horse-shoe shaped and has a drop of 1 ft. 6 in. in the 900 feet.

The Power House

The power house is located about 200 feet from the river and on the side of a steep bank, so that the bulkhead, which is a part of the power house building proper, is set right into the bank. The design of the bulkhead is quite unusual, as shown in one of the photographs and in the horizontal



Exterior Power House—Erindale Power Co.



700 foot Dam across Credit River, forming a 60 foot head—Erindale Power Company.

cross-section of the power house. It consists practically of four compartments: a main section containing the steel racks, feeding three smaller sections which project downwards to a level with the power house floor and correspond in fact to vertical penstocks. The main section of the bulkhead is supplied with a spillway closed with stop-logs, in case of water surges, and each of the three smaller sections may be shut off by hand operated gates. These were not installed when the photograph was taken.

Unusual care was observed in the reinforcement of the bulkhead and especially of the vertical concrete penstocks. In the latter, $\frac{3}{8}$ -inch iron rods placed horizontally encircle the penstocks every four inches, interlocking at each turn with the corresponding ring of the next penstock. In addition to this, heavy mesh reinforcement was installed on edge encircling the penstock, with $\frac{3}{4}$ -in. steel and old rails vertically, and the face walls are 28 inches thick.

The turbines are single runner, centre discharge, type, the well-known "Canadian" turbine manufactured by the Chas. Barber & Sons, Meaford, Ontario. Two of the turbines, rated at 1,000 h.p. each, are now operating and all construction work necessary for the installation of the third unit is completed. The arrangement of the draught tubes and the discharge tunnel (all concrete structure) is shown in the vertical cross-section of the power house shown herewith.

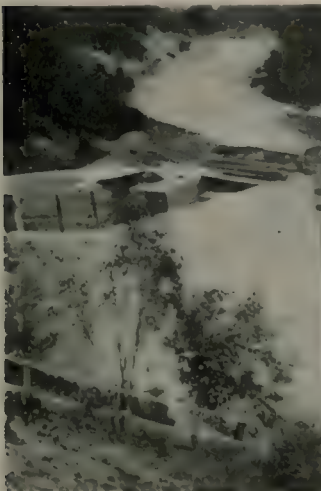
The generators are Allis-Chalmers-Bullock manufacture, 3-phase, 60 cycle, 36 pole, 200 r.p.m., 13,200 volts, 600 kw. capacity. These generators are 14 feet diameter, 16-foot base and were the main determining factor in the polygonal

shape of the power house. The generators are sets over pits 7 feet deep. These are all connected together forming a cable runway to the switchboard.

A feature of note in connection with the A.C.B. generators installed, and one which speaks well for the quality of insulation used by this company, is the fact that although the generators stood outside just as they came from the shop, for over four years, not a coil broke down. In drying out a bridge megger was used with excellent results. At the start the insulation resistance was so low that the instrument would not record it, but after running on short circuit with 150 per cent. full load current for 195 hours, a reading of 8 megohms was obtained. This was continued till a final reading of 150 megohms was obtained at the end of 315 hours.

The exciters are A.C.B. type, belt driven, 60 kw. capacity. Two are installed, either one capable of exciting all three generators. The governors are Woodward manufacture. Each turbine operates its generator through a flexible clutch.

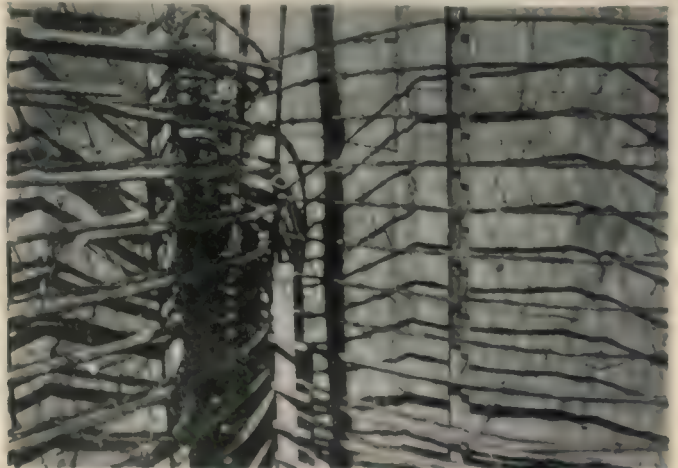
As current is generated at 13,200 volts no step-up transformers are required, transmission being at that pressure. The switchboard is Ferranti manufacture, 5 panel, slate. In the rear of the switchboard cement compartments contain: (1) a small balancing transformer for operating the oil switches; (2) and (3) oil switches between the generators and busbars; (4) and (5) oil switches between the busbars and the main line; (6) lightning protection apparatus and (7) a pair of small 13,200/2200 volt transformers for local service.



Top View of Concrete Bulkhead



Entrance to 900 foot Tunnel.



Reinforcements in Vertical Concrete Penstocks

The power house is lighted by twelve 250 watt tungstens with holophane reflectors. All wiring is in conduit. A hand operated ten-ton crane operates on a track running the length of the power house.

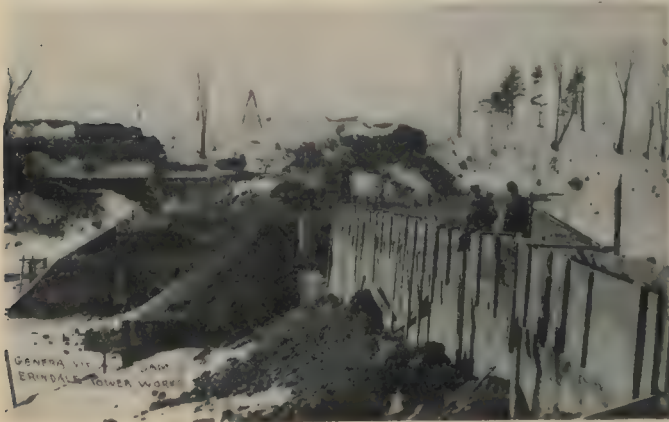
Transmission and Distribution

Provision is made for a double line, to be carried by the same poles, but only one is yet installed. The distribution of light and power is in the hands of a second organiza-

regulation. The low tension busbars in this station are also fed from the Humber generating plant of the same company where 900 kilowatts are generated by 4 units at 2200 volts, two-phase. From the low tension busbars West Toronto's light and power needs are served and lines pass in various directions to Lambton, Islington, Bracondale, Wychwood, Deer Park and North Toronto.

Power Rates

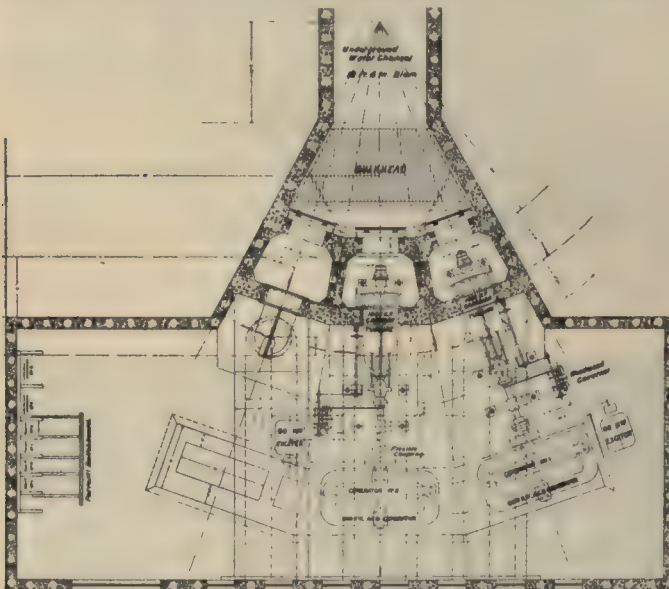
The power rates offered by this company run as low as 2 cents per kw.h. with a minimum charge of \$15 per h.p. year; they also sell at $\frac{1}{2}$ cent per kw.h. with fixed charge of \$12 per h.p. year where power is taken in fairly large quantities. The house lighting rates have been 6 cents per kw.h. with monthly meter rental of 25 cents. Following the lead of the other systems operating in Toronto the



c. Construction Work—Erindale Power Co.

tion, the Interurban Electric Company, though both companies are under the management of Mr. Edmondson and of the same engineer, Mr. Thomas Henry. As stated above transformers situated in the generating station supply local requirements, chiefly the lighting of Erindale village.

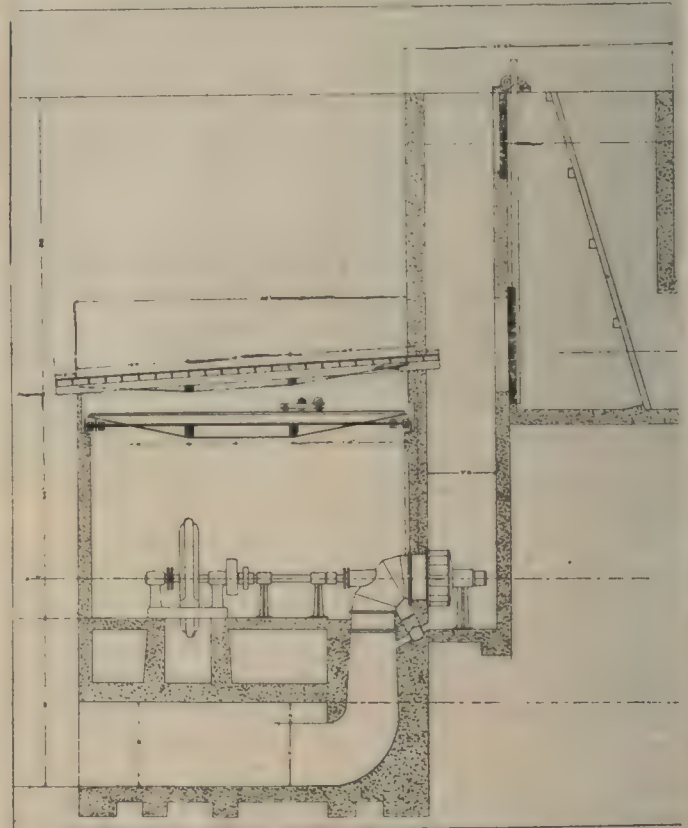
The main sub-station is at West Toronto, but two branches leave the main line before this point is reached; one to New Toronto where a sub-station, containing three 200 kw. 13,200 to 2200 volt transformers, serves the New



Horizontal Section Power House

Toronto, Mimico and Long Branch district; the other to Swansea to supply the Canada Nut & Bolt Works. This latter station contains two 250 kw. 13,200/220 volt, Scott connected transformers.

The West Toronto station contains two 300 kw. transformers, Scott connected to change from three to two-phase. The incoming lines carry expulsion type fuses and lightning protectors of the Garton-Daniel spark-gap type. This station is also equipped with a 300 kw. 2200 volt rotary condenser for keeping up the power factor and helping the



Vertical Section, Power House and Bulkhead

meter charge may now be removed, in which case Toronto's western suburbs will be receiving power and light at more favorable figures than almost any other Canadian town.

The generating plant at Erindale and the more recent extensions to the distributing system have been designed by the chief engineer, Mr. Thomas Henry, and constructed under his direct supervision. Mr. Henry is now chief engineer in charge of the operation of the whole system which is similarly combined under the management of Mr. E. S. Edmondson.

Messrs. S. Pearson & Sons' successors, of Mexico, have just placed an important order for the delivery of six water turbines of 9,700 h.p. each, with the well-known engineering firm of Messrs. Escher, Wyss & Co., of Zurich, Switzerland. The turbines are destined for the Santa Rosalia power plant on the Conches river, Mexico, and are of the double Francis type, designed for working under a head of about 150 feet with a speed of 360 revolutions per minute, and will be fitted with Escher, Wyss & Company's latest designed oil pressure governors. The order further comprises two 450 h.p. exciter turbines with governors.

Montreal's Defective Building By-Laws

Important Evidence Elicited at the Mountain View Apartment House Enquiry—G.T.R. Developments—Trade News and Items of Interest.

Office of the Contract Record,

Montreal, May 6, 1911.

A number of serious fires that have occurred recently in Montreal, endangering many people's lives, as well as destroying property of considerable value, have emphasized the need of stricter and more effective building by-laws. The destruction of the Mountain View House, containing over twenty apartments, 17 of which were occupied, on the morning of April 28th, seems to have brought matters to a climax. The damage is estimated at \$140,000. The proprietor, Mr. J. A. Jarry, of the City Law Department, stated in his evidence before the city fire commissioners, who held an investigation, that the building was worth \$90,000. The amount of damage above mentioned includes the loss of furniture and also a considerable amount of damage to the adjoining house which was a twin of the one destroyed. The Mountain View was a five-storey apartment house and was known as a second class building. According to the city by-laws second class buildings are not allowed over four storeys or 60 feet in height, but the Mountain View was erected under the building by-laws of the Town of St. Louis before it became annexed to the city. It was advertised as a fireproof building, but when the test came it proved to be anything but fireproof.

In a statement given out in answer to criticisms, Mr. J. A. Jarry, builder of the Mountain View apartment home, which was recently destroyed by fire, says:

"In the first place, when one speaks of a fireproof building, one does not necessarily refer to structures which are absolutely proof against fire. Fireproof may mean structures wherein every facility is afforded the occupants to escape in case of fire. The building destroyed by fire was advertised as a fireproof structure, but everyone knows that there is not one building in Montreal which cannot be destroyed by fire. The proprietors of these buildings call them fireproof, simply because every precaution against fire is taken. Thus, in the building which was recently destroyed, every means possible was taken to safeguard the occupants in case of fire. Fire escapes were provided and were placed in most accessible positions. The exits were spacious, and, in fact, everything, humanly speaking, was done to protect all who might be in the building when fire broke out. As a matter of fact, the expeditious manner in which the building was cleared of all people at the time of the fire speaks for itself. I would venture to say that the destroyed buildings and its counterpart, the Mount Royal, would compare favorably with any structure of the kind in this city."

Mr. J. H. Lauer, secretary of the Montreal Builders' Exchange, in an interview regarding the building, after the fire, stated that in company with Mr. J. R. Gardiner, president of the Architects' Association of the Province of Quebec, he had visited the building last October and afterwards laid a complaint about the construction in the City Building Inspector's office. Later they wrote to the board of control urging the prompt revision of the building by-laws. A committee had previously been appointed to study and revise the building by-laws but apparently little progress had been made, and as a matter of fact the revision is not complete. Mr. Lauer stated that he knew of four or five other buildings in Laurier Ward, formerly the town of St. Louis, that were worse fire traps even than the one just de-

stroyed. Mr. Lauer blamed the building inspection system of the city of Montreal, which, he said, was totally inadequate to accomplish the work owing to the insufficient number of inspectors.

Asked as to who prepared the plans for the building, Mr. Jarry declared that the court had no power to ask such a question. He refused to describe the plan of the building or the material used in its construction. He admitted, however, that there were four light wells surrounded by wood; that the staircase was of wood covered with brick, and the elevator shaft was of wood encased in iron. The building was insured for \$75,000, and witness asserted that it would be worth \$90,000.

The records at the city hall show that when the permit for this building was taken out the estimated value was placed at \$20,000. This is only one instance among hundreds in which the estimates given when the building permit is applied for have been much below the actual cost. This fact was admitted by an official of the city, in the course of conversation with the representative of the Contract Record. He said that for statistical purposes records kept in the building inspector's office were perfectly valueless. They might safely be considered as being from 25 to 50 per cent. below the actual value of the buildings erected. It has frequently been the cause of comment that with the extraordinary activity of building operations in Montreal, this city should appear, in comparative tables on building construction, in the third or fourth place in the list. The fact that so many buildings are under-rated either for the purpose of saving the fees on the building permit, or keeping down the taxes on the completed structure, will easily account for this discrepancy which the city official above referred to was not in any sense to the credit of the citizens.

As one result of this fire chief Tremblay, head of the fire department, has been instructed by the board of control to make a thorough inspection of all apartment houses in this city and to report the conditions existing at an early date.

A short time ago a campaign was started in some of the local newspapers against over-crowding in moving picture theatres as well as the lack of exits or fire escapes in case of fire breaking out. As a result of this agitation Chief Tremblay was instructed to inspect all such places. The fact is that exits from moving picture theatres are quite inadequate in a large number of cases. Moreover, it has been shown that galleries which according to law should be supported by iron or concrete columns or some other incombustible material are held up by wooden pillars which would quickly be destroyed in case of fire.

Several suburban municipalities adjoining Montreal are taking the lesson from this city's experience. Westmount has just decided that third and fourth class buildings, which include stucco and brick veneered houses, shall be prohibited in that city.

The council of the town of Outremont also is taking up the matter. The Mountain View apartment house was on Hutchison street, which is the boundary line between Outremont and Laurier Ward of the city of Montreal. A tenant in an apartment house similar to the Mountain View and only a block away from it has written the Outremont

council stating that there are not even fire escapes on the house in which he resides. The fact that any night they may be driven from their home or burned up in it makes the occupants all very nervous.

Grand Trunk Railway's Important Plans

The Grand Trunk Railway Company a few days ago sent to the city council a statement of its plans for new station accommodation to be erected at a cost of over \$3,000,000, and other work including the construction of elevated tracks between Montreal West and Windsor street to the value of over eight million dollars.

Following are the details of the estimated expenditure:

Right of way	\$2,390,829
Excavations of foundations	96,833
Embankments	520,248
Concrete for abutments, piers and flooring	366,865
Concrete for retaining walls	66,713
Steel works	539,172
Paving	132,748
Tracks	247,633
Ballast	107,795
Station buildings	3,210,751
Miscellaneous	475,386

Total \$8,154,973

To this must be added ten per cent, for contingencies and superintendence amounting to \$815,497, besides interest at five per cent. on a year and a half's construction, amounting to \$448,529, making a grand total of \$9,419,000. The city is authorized to contribute \$2,000,000 towards this project. The details have been submitted to the board of control for their consideration.

A serious deadlock was threatened at the last meeting of the Montreal city council when Alderman Bastien stated that unless the board of control would take steps to fulfill the conditions regarding pavement and other public works under which several municipalities were annexed to the city last year he would take out an injunction against the city which would prevent the board of control from proceeding with any public work in any part of the city this year. At the present moment there is some prospect of Alderman Bastien winning the day, as most of the representatives of the recently annexed municipalities are with him in this matter and it is expected that the controllers and other members of the city council will submit to his contention so as to obviate the delay that would be involved.

A new building society, known as the Mount Royal Building Society, has been organized, the directors of which are principally railway men connected with the Grand Trunk. The object of the new society will be to provide the shareholders with houses at a cost slightly exceeding rental.

It is stated that a row of 27 stores will shortly be erected on Mayor street by the Evans Estate at a cost of some \$55,000.

A new storehouse is to be erected on Recollet street by the Anglo-Canadian Oil Company at a cost of \$20,000.

At a recent caucus of aldermen of the city of Montreal it was agreed that the proposal of the board of control to purchase the waterworks of Beaurivage in Longue Pointe Ward at a cost of \$19,000. The present proprietor is Mr. Foucher.

Building permits to the value of \$6,911,758 were issued in Toronto during the first four months of 1911, compared with \$5,647,748 for the corresponding period of 1910. April, 1911, showed a good advance over April, 1910, the figures being respectively \$3,272,818 and \$2,522,058.

An Industrial Boom at Medicine Hat

According to information furnished us by Mr. A. K. Grimmer, city engineer of Medicine Hat, Alta., great activity is now prevailing in that city, which is enjoying an industrial boom through the development of natural gas. The construction programme for the present season is as follows: domestic sewers, \$55,000; new gas wells and mains, \$50,000; surface sewers, \$35,000; concrete sidewalks, \$35,000; water extensions, \$30,000; curb and gutter, and boulevarding, \$18,000; road grading and macadamizing, \$12,000; additional fire apparatus, including motor driven auxiliary fire engine, \$12,000.

An electric light plant, estimated to cost \$50,000, now under construction, will be completed and in operation by July 1. An evidence of the rapid growth of the city is found in the statement that during the last two months over 100 water services have been installed.

As an industrial centre Medicine Hat is attracting increased attention. Since last fall the city has located the Alberta Iron Rolling Mills, which will employ 100 men and install a plant and equipment at an estimated cost of \$100,000; also the Alberta Linseed Oil & Paint Company, whose plant and equipment will cost \$80,000. In addition, the city has granted concessions to a woodwork factory, a glass factory, machine shop and foundry, the Gordon Wire & Wire Nail Works, and a number of smaller institutions which, combined, will give employment to hundreds of men. At the present juncture it would seem that Medicine Hat is destined to become quite an important manufacturing centre. As indicated above, the development of natural gas is playing an important part in the city's progress. Another well has just been completed to the 1,000 feet level. Its capacity has not yet been determined but the indications are that it is stronger than any obtained heretofore. Operations are now in progress on other wells, special efforts in this connection having become necessary owing to the demands which will be made by the above-named industries. It is of interest to note that despite the heavy consumption of gas during the last five years, as shown by the daily records, absolutely no diminution of pressure has resulted.

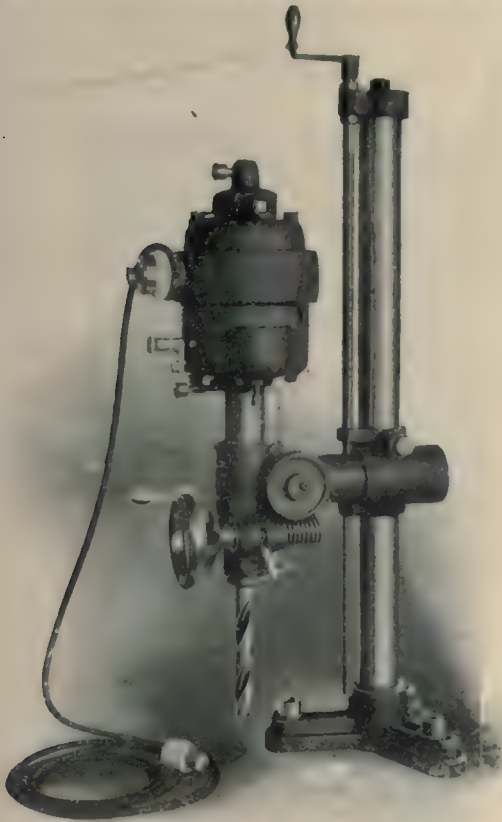
The permits issued at Calgary, Alta., for the month of April, totalled \$1,127,256. The total for the year to date is \$2,769,246.

The Canada Cement Company has just purchased a site of 100 acres of land, near Winnipeg, on which it is proposed to spend \$400,000 in the erection of a large and modern cement grinding plant capable of turning out at least 2,000 barrels per day. Senator Edwards, president of the Canada Cement Company, accompanied by Mr. Frank P. Jones, the general manager, spent several days in Winnipeg completing arrangements.

Tenders for the building of the Canadian Navy closed last week at Ottawa at the office of the Deputy Minister of Naval Affairs, Mr. George Desbarats. While no official statement was given out as to the names and number of firms tendering, it is learned from an authoritative source that six firms in all tendered, chief among which are the Swan, Hunter, Wigham, Richardson Company, of Wallsend-on-Tyne, represented in this country by Mr. Charles I. de Sola, of Montreal; the Vickers-Maxim Company, represented in Canada by Mr. Ore Lewis, of Montreal, and the Armstrong Shipbuilding Company of England. The tenders call for the construction of four cruisers and six destroyers within a period of six years. As the contracts also stipulate that the vessels are to be built in Canada, the successful tenderer will be compelled to construct a shipbuilding yard in this country.

Electrically Operated Portable Drill

The cut shown represents an electrically operated radial drill recently placed on the market by the Lamb Electric Company of Grand Rapids, Mich. The motor is designed for operation at either 110 or 220 volts d.c. or a.c., 60 cycles. The specifications follow—capacity in steel, 1 inch and smaller, operated in any position, extreme height 40 inches, greatest height from spindle to base 28 inches, distance from column to centre of spindle $8\frac{1}{4}$ inches, column is $2\frac{1}{2}$ inches



diameter, made of steel tubing, hole in spindle No. 3 Morse taper, travel of spindle 5 inches, operated by rack and pinion which in turn is operated by a worm and gear, two speeds furnished.

A meeting of the Council of the Royal Architectural Institute of Canada will be held in the rooms of the Royal Institute, No. 5 Beaver Hall Square, Montreal, on Monday, June 5, at 2.30 p.m., to elect a vice-president, for the election of members, the consideration of applications for membership, the organization of the 1911 General Assembly, and the transaction of any other business that may arise. F. S. Baker, president; Alcide Chausse, hon. secretary.

Considerable building activity is anticipated in South Africa during the next few years and there is stated to be a good field there for manufacturers of concrete machinery. According to a recent report from Johannesburg, one firm in that city has sold twenty-five American machines, which are the only ones obtainable. In the Transvaal only one firm makes a specialty of handling concrete mixers and it claims to have sold 90 per cent. of all the machines used. The selling price of the mixers mostly in use averages \$675. Machines of British manufacture enter South Africa free of duty.

The Carlyle Johnson Machine Company, of Manchester, Conn., have sent us a copy of their Catalogue E, devoted to the Johnson Friction Clutch and accessories. It is claim-

ed by the manufacturers that their product embodies all the principles which make a perfect friction clutch. The strong points about the Johnson clutch are that it is small, powerful and simple in operation, being compact and comprised of few parts, each of which is interchangeable. It runs at high speed, without vibration, and can be adjusted instantly to any tension with one screw. The Johnson clutch has been adopted by some of the leading manufacturers, who endorse it in the highest terms.

The Niagara & Ontario Construction Company has entered action against the F. H. McGuigan Construction Company, to recover over \$17,000, the balance of their account in connection with the construction of the high tension lines for the Hydro-Electric Commission.

Readers of this journal will be interested to know that the manufacturers of "Glenboig" and "Gartcosh" fire brick have now placed on the market a new brick which they call "Glenboig A1." This is a higher grade than they have hitherto supplied. Mr. Alexander Gibb, 13 St. John street, Montreal, the manufacturers' selling agent, informs us of several recent tests of these brick, from which most satisfactory results have been obtained and upon the strength of which excellent contracts have been made. "Glenboig" and "Gartcosh" are claimed to be unexcelled for use by all furnace users. They possess a high reflective power and are guaranteed against melting and splitting off.

A Nine-foot Valve

The cut shown herewith represents one of the three valves manufactured by the Chapman Valve Company, of Springfield, Mass., for the Ontario Power Company, of



Niagara Falls, Ont. The valve has a 108 inch opening, weighs 132,000 pounds, and is operated by a 15 horse power motor controlled from a distant station.

At Toronto 200 bridge and structural iron workers went on strike last week for an increase of 5 cents an hour. The present scale is 35 cents. The Hamilton members of the union are seeking the same increase. The carpenters' union is also negotiating with the employers for higher pay.

Personal Mention

Mr. R. S. Stockton has been placed in charge of the C. P. R. irrigation work at Strathmore, Alta.

Mr. Geo. W. Wright, formerly of Toronto and latterly assistant engineer to Mr. A. O. Graydon, has been appointed city engineer of London, Ont.

The city council of Toronto have adopted a recommendation to increase the salary of City Engineer Rust from \$5,000 to \$6,000. Mr. McCallum, the city architect, is raised from \$4,000 to \$4,500.

Mr. W. A. Clement, having severed his connection with the city of Vancouver, has opened offices in the Dominion Trust Building, Vancouver, and will carry on a consulting engineering practice with Mr. W. Coster, hydraulic engineer.

Mr. Norman L. Thompson, architect, Saskatoon, has taken into partnership Mr. T. B. Daniel (formerly with Messrs. Brown & Vallance) and Mr. G. B. Colhurst. The style of the new firm will be Thompson, Daniel & Colhurst.

His Excellency Earl Grey recently paid a visit to the Manitoba Bridge & Iron Works, of which Mr. T. R. Deacon is vice-president and general manager. The party afterwards proceeded to inspect the C. P. R. shops.

Mr. James E. Adamson, architect, has removed from the Coristine building and will in future be located in new office at Molson's Bank Building, corner of Stanley street and St. Catherine street west, Montreal.

Mr. Beaudry-Leman has been chosen by the Montreal city council as the civic representative on the electrical commission appointed to deal with the electric conduit system for the city. The Public Utilities Commission will name their expert shortly.

Mr. J. W. Astley, Engineer of Construction at Winnipeg, has notified the Board of Trade of that city of the receipt of an offer from the city of Victoria, B.C., of a post at a salary of \$5,000. It is almost certain that Winnipeg will pay the price to hold Mr. Astley, a decision to this effect having been practically agreed upon at time of writing.

City Engineer Angus Smith after a prolonged tussle at Victoria has been successful in obtaining his principal points. His services will be retained and he will be assisted by a construction engineer. The latter position is reported to have been offered to Mr. Astley, of Winnipeg, who is now occupying a similar post in that city.

Mr. J. B. O'Brien, president of the Toronto Civic Guild, returned last week from New York and Boston, where he obtained information bearing upon the improvements contemplated at the intersection of King and Yonge streets, Toronto. At Boston Mr. O'Brien found that the works department of that city had recently been reorganized after the works department of Toronto—a not inconsiderable tribute to the ability of City Engineer Rust.

According to a local paper Mr. C. H. Topp, of Victoria, has succeeded in "putting one over" Mayor Morley. It will be remembered that he was engaged to undertake the survey of Sooke Lake. After he had commenced the work his appointment was vetoed by the mayor. As he had already commenced the survey, however, Mr. Topp ignored the veto and quietly proceeded with the work, during the whole progress of which there has been much argument as to whether ex-City Engineer Topp would get paid for it or not. Finally a committee was appointed and this body decided that the city had better pay with the best possible grace.

Calgary spent over a million dollars last month in building. This is exclusive of the Hudson's Bay store and other large buildings for which permits have not yet been granted.

The Chief Architect of the C. P. R.

Mr. Walter S. Painter, chief architect of the C. P. R., has occupied that important position with the company for the past six years. Mr. Painter was born at Reading, Pa., his father being a well known stove manufacturer of that place. Mr. Painter had a good high school education as a foundation for his professional training. He never attended college, but gained his professional knowledge by practical work and as an apprentice in leading architects' offices. He was a diligent student of all subjects relating to architecture and gained a thorough knowledge of important branches of architectural science by a private tuition.

After completing his training, Mr. Painter commenced business as an architect with Mr. George D. Mason, of Detroit. He designed the Russell Theatre at Ottawa, Ont., the Auditorium at Quebec, and the Majestic Theatre in Toronto. Immediately before joining the C. P. R. he undertook the designing, engineering, and construction of the roundhouse and machine shops for the Grand Trunk Railway at Mimico, Ont.

Since becoming associated with the C. P. R. in 1905, Mr. Painter has had the professional oversight and designing of the following works for this company:

Algonquin Hotel at St. Andrews-by-the-Sea; Chateau Frontenac (extension), Quebec; station and hotel at Macadam Junction; station at Mile End, Montreal; Place Viger



Mr. W. S. Painter,
Chief Architect of the Canadian Pacific Railway

station and hotel (additions and alterations), Montreal; Westmount station; Port Arthur station; Banff Springs hotel (reconstructed, with 400 rooms); Lake Louise Chalet, 350 rooms; Glacier hotel (reconstruction); Sicomous hotel, B.C.; Vancouver hotel; Victoria hotel (extension).

It is stated that the G. T. P. has filed plans with the railway commission for the elevation of tracks and erection of new terminals at Montreal involving an expenditure of \$10,000,000. All the tracks approaching the city will be raised at Bonaventure station to the Turcot yards and from St. Henri to the Point St. Charles yards, involving an immense amount of heavy grading and the building of viaducts over every thoroughfare crossed by the trains.

Canadian City Engineers

John L. Feeney, Fredericton, N.B.

John L. Feeney, B.Sc., city engineer of Fredericton, N.B., is a native of that city and received his early education at the high school there. Afterwards he proceeded to the University of New Brunswick, from which, in 1910, he graduated in civil engineering. In 1907 and 1908 he acted as assistant city engineer during his vacations. During 1909 and until his appointment as city engineer in May, 1910, he had



City Engineer Feeney, of Fredericton, N.B.

charge of the water and filtration plant. During the spring of 1910 he took a special course of instruction in Boston and New York studying the system of mechanical water filtration, and also bacteriology. Subsequently he spent some time on street paving and drainage. He has recently written a report on street paving which has received considerable publicity in the technical journals.

The special committee of the Montreal city council appointed to revise the city's building by-laws, is sitting three times a week, but the work is so extensive that it will not be completed before next September. The experts who form part of the revising committee are Messrs. J. Venne, of the Architects' Association; S. D. Vallieres, builder; T. Charpentier, builder, representing the Builders' Exchange; P. C. Ogilvie, of the Master Plumbers, and W. J. Francis, of the Canadian Society of Civil Engineers.

The Oneida Lime Company, Limited, which has recently been reorganized, has commenced the erection of a large mill in the Township of Oneida, about five miles northwest of Cayuga, Ont. It is the purpose of the company to ship the sandstone, or silica, of which there are large deposits in the neighborhood of their quarries, to different points throughout Canada, for glass-making purposes. The plant will cost in the neighborhood of \$25,000, and after the erection of the mill at least thirty-five men will be constantly employed in the industry. The company are also running a spur railway line from the Nelles Corners, G. T. R., station, to the quarries, a distance of two and a half miles. They have purchased the right-of-way for the entire distance. They have also recently purchased considerable property in the neighborhood and will utilize the natural gas for pur-

poses of manufacture as they already own several wells. It is said that the opening up of these silica deposits may eventually lead to the operation of the glass factory in Cayuga, which was erected several years ago by an American company. It was then the purpose of that company to utilize these sandstone beds, but the American company sold the factory to an English firm.

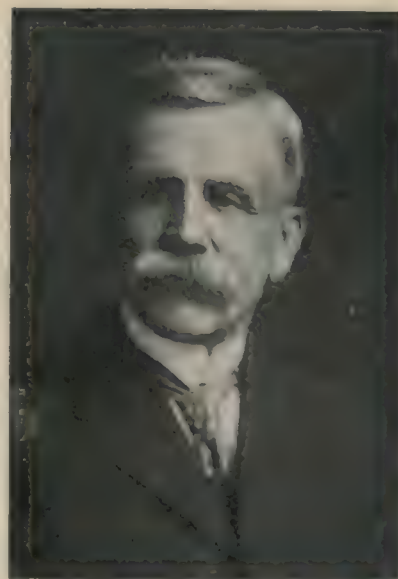
The superintendent of the Oneida Lime Company is Mr. L. J. Faith, and Mr. Walter Anderson, of Hamilton, who first organized the company, is largely interested in the enterprise. The president of the company is Mr. Levy, of the firm of Gibson, O'Reilly, Osborne & Levy, of Hamilton.

Obituary

It is with much regret that we have to record the death of Mr. Robert Malcolm Young, of Toronto, formerly a partner in the architectural firm of Simpson & Young, but latterly consulting engineer with the Dominion Radiator Company. His death resulted from pneumonia following a cold. The late Mr. Young, who was 30 years of age, was a veteran of the South African war, having been a member of the first contingent to leave Canada under Major Barker. He had attained the rank of sergeant-major in the Queen's Own Rifles. He was of fine physique and an all-round sportman, holding membership in a number of Toronto's leading athletic organizations. His loss will be felt keenly by the younger generation of the Queen City.

The Late C. C. Witchall, Toronto

The death of Christopher Charles Witchall, which occurred last week, removes a popular and familiar figure in Toronto contracting circles. The late Mr. Witchall was associated in business with his son John and had carried out the contracts for a number of important buildings, among which may be mentioned the Robert Simpson Company's store and warehouse, the Presbyterian Church at Rosedale, Knox Church, Broadway Tabernacle, John Leckie ware-



The Late C. C. Witchall.

house, Ogilvie & Sons' warehouse, Flett-Lowndes building, hydro-electric transmission station. Born at Coln, Eng., on June 7, 1846, and educated in the Old Country, the late Mr. Witchall came to Toronto 40 years ago. He had been carrying on business in Toronto for upwards of 30 years. He was an Anglican, a Freemason and an enthusiastic worker in the St. George's Society. The Bonar Presbyterian Church, the Yonge Street Methodist Church and the hydro-electric buildings were among his last contracts.

Contracts Department

News of Special Interest to Contractors, Engineers, Manufacturers and Dealers in Building Supplies.

Information for insertion in these columns is invited from Architects, Contractors, Engineers, etc.

Waterworks, Sewerage and Roadways

Burlington, Ont.

Tenders addressed to O. T. Springer, clerk, will be received until May 25th for laying cement or concrete walks.

Brandon, Man.

The city council received the following quotations per sq. yd. on paving: Asphalt blocks, \$3.39; creosote blocks, \$3.35; granitoid, \$2.55; bituletic, \$2.95; macadamized, \$2.70; Rocmac, \$2.20. It is expected that paving costing about \$110,000 will be done this year. Choice of pavement not decided.

Camrose, Alta.

The \$83,000 by-law for construction of waterworks and sewerage systems was carried.

Carlyle, Sask.

On May 15th a by-law for \$17,500 for waterworks purposes, will be submitted to the voters.

Cranbrook, B.C.

The sewer by-law to raise the sum of \$100,000 for a sewerage system will be again submitted to the ratepayers on May 22nd.

Cochrane, Ont.

Messrs. Sutcliffe & Neelands, town engineers, are in charge of the installations of waterworks and sewerage here. Estimated outlay, \$50,000.

Chilliwack, B.C.

Tenders were called until May 8th for construction of about 506 square yards of cement sidewalk and 535 lin. ft. of concrete curb on Main street. J. B. Croly, city engineer.

The by-law to authorize the borrowing of \$70,000 for street macadamizing was carried; drainage and road machinery by-laws, each \$10,000 also carried.

Esquimalt, B.C.

The commissioners for above district are prepared to receive applications from engineers for the superintending of sewer construction. Plans and specifications may be seen at the office of the B. C. Land & Investment Agency. All applications to be in by May 2 next.

Tenders are called by the Esquimalt Waterworks Company for excavation for the purpose of completing the laying of the water main from Goldstream to Burleigh, Victoria West.

Halifax, N.S.

The supply tenders of the Lawrence Hardware Company, for hardware (\$1,886.91), Brookfield Bros., for lumber (\$920.86), and Scotia Foundry Company, for special castings (\$941), were recommended for acceptance.

Indian Head, Sask.

Tenders will shortly be called for concrete sidewalks. Drawings, etc., prepared by J. Bell, town engineer.

Lachute, Que.

Tenders are called until May 22nd for supply of about 280 tons of 8-in. c. i. water pipe. J. W. Raitt, town clerk. Advertisement in "Tenders and For Sale Department" of this issue.

London, Ont.

Tenders will shortly be called for three or four deep wells with 8-inch casing, about 12,700 feet of 4-in., 6-in. and 8-in. cast iron water pipe; about 35 hydrants and 8 tons of special castings; also 1 steel elevated tank, 125 feet high, capacity 40,000 or 50,000 gallons; pumping equipment not decided upon until wells are driven. Power will probably be from gas or gasoline engines. Two half million gallon pumps or greater, also deep well pumps or air lift will be installed. F. W. Farncomb, C.E.

Melville, Sask.

See "Power Plants."

Medicine Hat, Alta.

The following by-laws will be submitted to the citizens for approval: \$4,000, plank sidewalks construction, \$33,500, cement sidewalks, \$17,500, curbs, gutters and boulevards; \$8,000, street grading. A. R. Perry, secretary-treasurer.

Moose Jaw, Sask.

The by-law to expend \$170,000 on permanent paving will be submitted on the 26th inst.

Tenders are called until May 29th for paving and concrete sidewalks, etc. J. M. Wilson, city engineer; W. F. Heal, city clerk. Advertisement in "Tenders and For Sale Department" of this issue.

Niagara-on-the-Lake, Ont.

Tenders for repairing and enlarging the tank of the Niagara Waterworks system will be received until May 23rd. F. W. Paulin, C.E.; W. E. Lyall, clerk. Advertisement in "Tenders and For Sale Department" of this issue.

North Vancouver, B.C.

The following by-laws will shortly be submitted: Sanitary sewers, \$180,000; storm sewers, \$70,000; street grading, \$205,000; sewers, \$122,000; clearing, \$11,000; school, \$46,000; water, \$25,000.

Ottawa, Ont.

Tenders are called until May 11th for supply of four street sprinkling carts. N. J. Ker, city engineer.

Prince Rupert, B.C.

Plans have been prepared for council by Col. W. H. M. Davis for a permanent water supply for the city. Estimated cost of \$330,000 for supply main, \$480,000 for whole work. The water supply is taken from Woodworth Lake, seven miles from the city on the mainland. It is proposed to build a rock and timber dam at the outlet to raise the surface 30 feet. Later on the city will construct a concrete dam. As a separ-

ate scheme it is also proposed to construct a million gallons reservoir on Acropolis Hill. R. H. Thompson, city engineer of Seattle, consulting engineer.

Ridgetown, Ont.

Tenders will shortly be called for installation of waterworks here. 8-in., 6-in. and 4-in. pipe will be used. Complete equipment required. D. Cochrane, clerk.

Rouleau, Sask.

Tenders are called until May 29th for trenching, laying street water mains, hydrants, etc.; constructing reinforced concrete reservoir; erecting brick power house, for this municipality. W. H. Stewart, sec.-treas.; J. Darlington Whitmore, Regina. Advertisement in "Tenders and For Sale Department" of this issue.

South Qu'Appelle, Sask.

The council may increase cement pavement.

St. John, N.B.

The lowest tenders for granite block pavement were as follows: Pond street, B. Mooney & Sons; Nelson street, A. R. C. Clark; Dock and Mill streets, Hassam Paving Company.

Tavistock, Ont.

A new system of waterworks for Tavistock will be installed later on confirmation of by-law. There will be required about 7,000 feet of 4-in., 6-in. and 8-in. c. i. water pipe; one 40,000 gallon steel elevated tank; two steam driven pumps, half million capacity each; and one steam boiler. Specifications not yet completed; fifteen or twenty hydrants and special castings. F. W. Farncomb, C.E., London, engineer in charge.

Vancouver, B.C.

The following tenders were received: Grade Twelfth avenue, Granville to Hemlock, A. R. Gibson, \$6,975; M. P. Cotton, \$8,287.50; H. V. Tucker, \$6,630; R. J. Preston, \$8,287.50; Cleland & McLeod, \$8,840; LaPlace Bros., \$6,398. Tenders for grading—Grade Thirteenth avenue, Spruce to Birch, Cleland & McLeod, \$5,149.90; A. R. Gibson, \$5,500; D. Matheson, \$5,149.90; LaPlace Bros., \$5,989.20.

Grade Eleventh avenue, Spruce to Alder; Cleland & McLeod, \$4,100; A. R. Gibson, \$3,950; LaPlace Bros., \$4,359.

Grade Twelfth avenue, Spruce to Alder, Cleland & McLeod, \$4,131; D. Matheson, \$4,712; A. R. Gibson, \$4,050; LaPlace Bros., \$4,608.

Grade Twelfth avenue, Main to Sophia, Cleland & McLeod, \$2,600; LaPlace Bros., \$2,841.

Bitulithic paving on Twelfth avenue, two sections, Columbia Bitulithic Company, from Bridge to Columbia, \$14,300; from Columbia to Main, \$20,891.34.

All the tenders were referred to the engineer for report.

Welland, Ont.

Tenders are invited until May 20th for construction of about one and one-half lin. miles. G. R. Boyd, town clerk.

Winnipeg, Man.

Tenders will be asked for the construction of the following sewers, the tenders to be in in two weeks: Portage avenue, Home street, Lenore, Ruby. The Portage avenue sewer from Smith to Colony will cost about \$16,000.

Tenders addressed to chairman, board of control, will be received until May 17th for supply of 2,500 $\frac{3}{8}$ -in. and 250 $\frac{3}{4}$ -in. water meters. M. Peterson, secretary.

AWARDED**Gleichen, Alta.**

This municipality voted on the 26th inst for the second time on a by-law to spend \$30,000 on waterworks and sewers, on account of a technical error in the original by-law, and carried the new by-law. The following contracts for materials have been awarded: Contract A., drilling deep well, the Alberta Well Drilling Co., Calgary; B., supply of lap-welded steel pipe, General Supplies Ltd., Calgary, for Stewarts & Lloyds. C., gate valves, Canadian Fairbanks Co., for Alley & McLellan's valves. D., hydrants, Calgary Ironworks Co., Calgary. E., elevated steel tank, Des Moines Bridge & Iron Co., Des Moines, Iowa. F., sewer pipe, Red Wing Sewer Pipe Co., Red Wing, Minn. G., manhole covers, etc., London Foundry Co., London, Ont. The work will be constructed by the John Galt Engineering Co., of Winnipeg and Calgary.

Harriston, Ont.

The following contracts were awarded for supplies for waterworks: Cast iron pipes and special casting, the Gartshore Tomson Pipe and Foundry Co., Ltd., Hamilton, \$31.20 per ton for cast iron pipe, and \$2.75 per 100 lbs. for special casting; for lead and gasket. The James Robertson Co., Ltd., for lead \$3.06 per 100 lbs., and \$14.50 per 100 lbs. for gasket; for building water tower, the Hunter Bridge and Boiler Co., Kincardine, \$3,505. That the tender of the Kerr Engine Co., of Walkerville, be accepted at \$30 each for hydrants, and \$24.50 for 10-inch valves, \$15 for 8-inch valves, \$9 for 6-inch and \$5.60 for 4-inch valves. Eight tenders were received for cast iron pipe, seven tenders for hydrants and valves; three for lead and gasket; five tenders for the construction of water tower.

Moncton, N.B.

The contract for concrete sidewalks was given to George B. Low, Halifax, at the lowest prices, being 19, 21, 22, 23, 25 cents per lineal foot for the different classifications. During the summer the city proposes constructing about a mile and three-quarters of concrete sidewalks similar to the permanent walks laid last year and an expenditure of nearly \$9,000 will be made.

Ottawa, Ont.

The Randolph Macdonald Co., Ltd., contractors, Toronto, have been awarded the following contracts by the Department of Railways and Canals for the improvement of the Upper Entrance to the Galops Canal, and also the contract for improving the entrance of the lower entrance of the Farrans Point Canal, both of the works are on the St. Lawrence Canals.

Victoria, B.C.

Paving contracts for 600,000 square yards have been given to the Canadian Mineral Rubber Company of Toronto. The contract for only 160,000 square yards could be let forthwith, and one company mentioned was awarded the contract for that portion of the work, but with the added proviso that if a satisfactory agreement could be made with them in regard to the balance of the work tendered for, but not yet authorized, they will be awarded the contract for the remainder of the work also, on the terms of their contract, they being the only firm which submitted a tender for the whole of the work. Although the successful bidders were not the lowest tenderers on every street of the eighty-seven mentioned in the list, taken all over, their total figures worked out to be \$24,000 cheaper than a combination of the lowest tenderers on all the streets, so that on the general paving of the approximate yardage tendered was 580,000 square yards. The pavements will be light or heavy, according to the measure of the traffic they are subjected to. The heavy calls for a five-inch base, a one-inch binder and a two-inch wearing surface, the light for a four-inch base and a two-inch wearing surface. The total bid of the winning company for the entire contract is \$1,150,000.

Waterloo, Ont.

The tender of Mr. H. B. Duerling, the lowest, was accepted for construction of cement sidewalks; that of Mr. Paul Bergman for the construction of cement curbing was also accepted.

The specifications for latter contract were as follows. Curb and gutter, 42c. per lin. ft.; driveways, 13c. per sq. ft.; 4-inch tiling, per lin. ft., 5c.; rate per hour for labor, 22½ cents; rate per team and man, 40 cents; brand of cement, National Durham. Specifications for former contract were as follows: cement wall, 10c. per sq. ft.; street crossings, 17c. per sq. ft.; alley, 13c. per sq. ft.; private, 12c. per sq. ft.; extra filling, 70c. per cu. ft.; extra gravel, 70c. per cu. ft.; 3-inch tile drain, 7c. per lin. ft.; 4-inch tile drain, 9c. per lin. ft.; 6-inch sewer tile drain, 15c. per lin. ft.; 9-inch sewer tile drain, 30c. per lin. ft.; 12-in. sewer tile drain, 50c.; brick work laid upon cement, \$20 per M.; rate per hour for labor, 22½c.; rate per hour, team with man, 40c.; brand of cement—

Welland, Ont.

The contract for pump and water-wheel for the new waterworks pumping station was let to the Canadian Boving Company, of Toronto, the lowest tenderer; the contract calls for a 3,300,000 horizontal triplex single acting pump developing 250 horse power on a 7-foot head, for which the price is \$11,900. Added to this is a travelling crane costing \$400, making the total contract price \$12,300. The pump and wheel are slow speed machines. Other tenders were: John McDougal Co., Montreal, pump and turbine, \$14,069; John T. Farmer, Montreal, pump and turbine, \$15,250; Goulds Pump Co., Montreal, pump and turbine, \$15,250; Smart Turner Machine Co., Hamilton, pump and turbine, \$18,500; Wm. Hamilton Mfg. Co., Peterboro, pump and turbine, \$14,600; Escher Wys & Co., Toronto, pump and turbine, \$14,365; the Canada Foundry Co. and John Inglis Co., tendered for pump only. As soon as the plans are

completed for the pumping station tenders will be called for.

Railroads, Bridges and Wharves**Brandon, Man.**

The Grand Trunk Pacific will commence at once the survey for a line into Brandon.

Beaumaris, Ont.

The Dominion government will build a wharf here, 280 feet long by 30 feet wide. It will be built of concrete with pile foundation. Tenders will be called for about June. Estimated cost, \$25,000.

Courtright, Ont.

Tenders are called until May 20th for building concrete abutments and concrete floor for the Club bridge over Black Creek, Bell & McCubbin, engineers, St. Thomas. Advertisement in "Tenders and For Sale Department" of this issue.

Chatham, Ont.

Tenders addressed to A. McArthur, clerk, Tp. of Chatham, will be received until May 18th for construction of two steel and concrete bridges to be built over the Maxwell Creek Outlet, Dredge Cut, etc. Plans, etc., at the clerk's office in Tupperville.

Coquitlam, B.C.

According to the plans submitted by the C. P. R. officials to the council, the proposed repair shops which the company will erect will comprise an immense plant capable of looking after all kinds of repairs to the company. These repair shops will cover an area practically two miles long. South of this area occupied by the various repair shops and roundhouses will be another tract having over a mile of water frontage on the Fraser, which is to be reserved for industrial enterprises or eventually such purposes as the company may require it for. F. Busted, general superintendent, C. P. R. Pacific division, divisional engineer, J. Rindall.

Edmonton, Alta.

Tenders are called until May 29th for construction of the piers and abutments for bridge over the Saskatchewan river. A. J. Latonnell, city engineer. Advertisement in "Tenders and For Sale Department" of this issue.

Fort Frances, Ont.

It is stated that E. W. Backus and others are about to build a combination foot, vehicle and wagon bridge across the head of the falls over to International Falls, Minn. The bridge will be a steel structure upon cement piers. The steel part will be 900 feet long; with the approaches the bridge will be 1,784 feet long, and the width 50 feet.

Harrietsville, Ont.

Tenders are called by W. B. Lane, clerk, Tp. North Dorchester, until May 17th for 7,000 feet of 2-inch plank 14 feet long, either rock elm, red beech or white oak to be delivered here on C. P. R. on or before June 1st.

Kindersley, Sask.

Tenders are called until May 12th by the Department of Public Works for the following: One reinforced bridge over creek, south of Kindersley; two reinforced concrete bridge abutments over Eagle Creek, west of Harris; two reinforced concrete bridge abutments over

creek, west of Harris. F. J. Robinson, deputy minister.

Little Anse, N.S.

Tenders addressed to R. C. Desrochers, secretary, public works department, Ottawa, will be received until May 22nd for construction of breakwater here. Plans, etc., at this department and at the offices of district engineers at Halifax and Antigonish, N.S., and on application to the postmaster at Arianchat, N.S.

London, Ont.

Tenders for the following work on bridges will be called until May 13th: Abutments and floor for bridge over Bear Creek, Caradoc Township; abutments and floor for bridge on the line between lots 12 and 13, concession 9, Lobo Township; abutments and floor for bridge on the line between London and Lobo Township, London Townships concrete floor and addition to concrete abutments for bridge in concession 11, on Proof Line road, London Township; concrete floor and abutments for bridge on the line between Lobo and East Williams Townships, Lobo Township; abutments and floor for bridge over Sauble river, on Sauble line, Biddulph Township; a reinforced concrete bridge on the line between Dorchester and Nissouri Townships, on the Governor's road—16-foot span; a reinforced concrete bridge on line between the town of Parkhill and the township of West Williams—16-foot span; a concrete culvert opposite lot 5, concession 6, McGillivray Township; a concrete breakwater on the line between East Williams and McGillivray Townships, on Mud Creek flats—100 feet long. County Engineer, Talbot.

North Vancouver, B.C.

Messrs. Cleveland & Cameron, consulting engineers, Winch block, have had plans prepared for the construction of wharves along the frontage of Lonsdale estate, a distance of about half a mile. One pier, 1,500 feet long, is a feature of the work. It is understood that tenders have been called privately.

Prince Albert, Sask.

Tenders addressed to R. C. Desrochers, secretary, department of public works, will be received until May 22nd for construction of wharf and protection work on the North Saskatchewan river at Prince Albert. Plans, etc., at above department and at the office of F. G. Goodspeed, Esq., district engineer, Edmonton, Alta.; L. B. Elliott, Esq., acting district engineer, Calgary, Alta., and on application to the local postmaster.

Regina, Sask.

The G. T. P. line into Regina will be completed in time for the Dominion Exposition.

Tenders are called by Department of Public Works until May 12th for construction of two reinforced concrete bridge abutments over Pipe Stone creek, south of Wapella; two reinforced concrete bridge abutments over Qu'Appelle river, south of Lipton. F. J. Robinson, deputy minister.

Vancouver, B.C.

Tenders addressed to R. C. Desrochers, secretary, department of public works, will be received until May 22nd

for supply of metallic fittings, railway mail service.

Winnipeg, Man.

The exact terms of the agreement between this city and the Midland Railway, it is reported, have been settled. According to the understanding reached, there will be four subways south of the Assiniboine river, at Crescent road on the north, at Wilkes avenue, the south boundary of the city, and at two other crossing avenues that may in the future be designated by the city. Special provision was also made for subways when required on the north side of the river at the crossing of Lavinia, Ellice and Sargent avenues. These avenues have not been opened up to the right-of-way of the Midland, but when they are and the city deems it necessary the railway will put in subways at its own cost. Chief Engineer Hogeland and R. E. Taft, engineer of construction. General manager J. M. Gruber, St. Paul, C. D. Eddy, assistant engineer, and J. T. Maher, right-of-way agent.

Zurich, Ont.

Tenders are called until May 22nd for construction of ten small cement abutment, cement floor and steel beam bridges. F. Hess, Sr., clerk, Zurich. Advertisement in "Tenders and For Sale Department" of this issue.

AWARDED

Lethbridge, Alta.

The Canadian General Supply Company have been awarded the contract for construction of overhead bridge on Coutts street by the C. P. R. Work will start at once.

London, Ont.

The Township of Nissouri has awarded contracts for bridges as follows: A steel and concrete 50-foot span over the Wye at Wyton, \$1,763; Joseph Patterson, of St. Mary's, gets the concrete work, and the Sarnia Bridge Company the steel. The same contractors have the work on a 45-foot span over Doty's Creek on the seventh concession, at \$1,378; a reinforced concrete bridge twenty feet long was awarded to Patterson at \$398. Two foot concrete affairs were awarded to George Holden and Robert Sugden at \$200 each.

Public Buildings, Churches, Schools, etc.

Aylmer, Ont.

It is announced that a new government building will be erected this year.

Berlin, Ont.

The ratepayers will vote on a \$15,000 by-law for hospital wing.

Burnaby, B.C.

A building site of two acres has been purchased on Vancouver Heights for the new school.

Chatham, Ont.

The school board have purchased the site known as the Scane property for the 8-room school building and have secured plans for erection of a building to cost \$20,000.

Campbellton, N.B.

Tenders were called until May 6th for erection of Baptist church here, of brick and stone. Leslie R. Fairn, architect, Aylesford, N.S.; W. P. Gray, chairman building committee.

Chesley, Ont.

A new government building containing the post office will shortly be erected on the west side of the main street.

Tenders were called until May 10th for erection of brick and cement school here. S. Laughlan, secretary, board of trustees; Leslie R. Fairn, architect, Aylesford, N.S.

Emerson, Man.

An immigration hall will be built by the Dominion government.

Elmira, Ont.

Elmira is now considering the erection of a Carnegie Library, on a site large enough for a town hall and fire hall.

Fenelon Falls, Ont.

W. B. Taylor, Fenelon Falls, is in charge of the erection of the Methodist church here.

Guelph, Ont.

Competitive plans for the new jail and jailor's residence will be invited by the committee in charge. Mr. Beattie, secretary.

Gull Lake, Sask.

Tenders were called until May 10th for erection of 8-room school here. Plans, etc., with James Ferguson, secretary-treasurer, this place.

Georgetown, Ont.

Tenders addressed to the secretary, public school board, will be received until May 20th for heating by steam of public school here. Specifications, etc., with above.

Galt, Ont.

Tenders addressed to John Lee, chairman, Box 323, Galt, will be received until May 17th for the different trades required in the erection of a school for No. 22 North Dumfries. Plans, etc., at residence of W. Scott, Chapman street, Galt, and at the office of the architect, Mr. Knechtel, Berlin.

Hull, Que.

D. Chene, city engineer, is preparing plans for the new kindergarten school to be erected here. Noted in last issue.

Hamilton, Ont.

The Poles of this city have under consideration the erection of a church to be used exclusively for their nationality. Estimated cost, \$40,000.

McTaggart, Sask.

Tenders addressed to H. R. McHoull, will be received until May 16th for erection of St. Andrew's Anglican Church. Plans, etc., at office of Standard Bank.

Medicine Hat, Alta.

The plans for the new St. Barnabas church have been accepted. Calls for tenders to be in by May 16th will be made at once.

Montreal West, Que.

Plans for a stone and brick church are being discussed. Messrs. E. J. Bedbrooke and R. A. Brook, wardens.

Montreal, Que.

Mr. Alphonse Venne has been appointed supervising architect for the new military college to be built at Montreal South for the federal government.

Mr. G. A. Monette, architect, is preparing plans and specifications for a large convent building and chapel to be erected on Mount Royal avenue for

the Sisters of the Congregation of Notre Dame.

The Grand Seminary of the Sulpician Order has called for competitive plans for a new library building, the competition being open until June 1st.

Permits were issued for Catholic church, Laurier avenue, \$55,000.

The Montreal Reform Club have under consideration the erection of a club house in the near future. Mr. J. C. McDiarmid, president.

Netherhill, Sask.

The Anglican congregation here will erect a new church.

Ottawa, Ont.

The Ottawa Amateur Athletic Club are calling for tenders until May 15th for purchase of buildings at present on their property. D. J. O'Donahoe, secretary.

Orillia, Ont.

Tenders addressed to Gordon & Hellwell, architects, Confederation Life Building, Toronto, will be received until May 20th for erection of Sunday school building for the Presbyterian church here.

Outremont, Que.

Tenders are being taken for all works, above ground line, in connection with the new Baptist Temple, corner of Fairmount and Durocher streets. J. E. Adamson, architect, Constine Building, Montreal.

Rosser, Man.

Tenders were called until May 10th for erection of frame school on the N.W. 30, 22 1E. E. R. James, secretary-treasurer.

Prince Albert, Sask.

Tenders were called until May 8th for erection of 4-room school. H. W. Halpin, secretary.

Port Rowan, Ont.

Tenders for masonry, carpentry, roofing, plastering, in connection with erection of the Neal Memorial Church here, will be received until May 18th. W. D. Chown, architect, Toronto. Advertisement in "Tenders and For Sale Department" of this issue.

Regina, Sask.

A country club has been formed and land purchased on which, it is stated, a building will be erected. G. R. Whitmore, G. H. Marsh and J. L. R. Parsons are interested.

Revelstoke, B.C.

The court house here will entail an expenditure of about \$100,000.

It is reported that tenders for the provincial court house will be called to be closed on May 23rd. R. H. Hooper has prepared the plans.

Saskatoon, Sask.

The Y. W. C. A. will build part of their new home this year. Mrs. F. G. Sparling, chairman, building committee.

St. Vital, Man.

A city hall will be erected here on St. Mary's Road at an estimated cost of \$15,000. Councillor Wilson is interested.

Seaforth, Ont.

Tenders addressed to R. C. Desrochers, secretary, public works department, Ottawa, will be received until May 29th for construction of public

building here. Plans at the office of Mr. H. J. Lamb, district engineer, London, Ont., at the post office, Seaforth, and at this department.

Saskatoon, Sask.

The Wesley congregation will erect an extension to their church at a cost of \$13,000. Frank P. Martin, architect.

Tenders are called until May 12th for erection of addition to the Land Titles Building. Messrs. Storey & Van Egmond, architects, Regina. F. J. Robinson deputy minister, department of public works, Regina.

The congregation of Christ Church appointed the following on the committee to proceed with the building operations of the church: Messrs. W. Warren, Cheetham, Benson and others.

It is understood that the property of Mayor Clinkskill recently purchased by the Dominion government, will be used as a building site for the new armory.

Tilsonburg, Ont.

A by-law to raise \$25,000 for a new public school has carried. Work will start during the summer.

Toronto, Ont.

Tenders are called by Burke, Horwood & White, architects, until May 12th for excavating basement of the new Central Y. M. C. A., also for removal of present house.

Tenders addressed to the secretary-treasurer will be received until May 12 for enlargement of Earls court school; also of Annette street school. Advertisement in "Tenders and For Sale Department" of this issue.

Dr. Hastings, M.H.O., in his report, recommends the following: To care for communicable diseases, other than tuberculosis and smallpox, the erection of six new buildings, alterations to the two old buildings now erected, and the purchase of more land; \$165,000 for new buildings and a dispensary to care for tuberculosis patients; a separate building for measles and whooping cough.

The congregation of St. Paul's Presbyterian Church have started a campaign to raise \$50,000, \$30,000 of which will be spent in the erection of an institutional S. S. hall.

Vancouver, B.C.

We are informed that tenders for the erection of a building for the British & Foreign Bible Society will be called about June. C. P. Jones, A.R.A.I.C., 429 Pender street west, architect.

Weyburn, Sask.

The Weyburn school board are asking for tenders for the erection of a four-roomed school. Plans, etc., at the office of Mr. Geo. J. Jarrett, architect. The building must be ready for occupation by September 1st next.

West Toronto, Ont.

The congregation of St. John's have decided to erect a parish house and school house.

Winnipeg, Man.

The erection of a new church is being considered by the congregation of St. John's Methodist church. Rev. R. L. McTavish, pastor.

Tenders are called until May 12th for construction of church basement for the congregation of St. Ignatius, Fort Rouge. H. J. Rill, architect.

The Masonic Temple Association have purchased a large block on Furby street. It is understood that a new Masonic hall will be built on this.

The Winnipeg Hunt Club and the Polo Club will probably erect a building in the vicinity of Luxedo park. Messrs. Hough, Abbott, Major Macdonell and Captain Shaw were appointed on a committee to report further on the matter. D. C. Cameron, president.

Tenders addressed to the chairman, board of control, will be received until May 15th for supply of labor and materials required in erection of Science and Arts building at the Exhibition grounds.

Permit was issued to Winnipeg School Board for addition to Strathcona school.

AWARDED

Calgary, Alta.

The contract for the new First Baptist Church, Calgary, corner of Thirteenth ave. and Fourth street west, has been let to J. B. Gunn & Co., of Winnipeg.

Carleton Place, Ont.

The contract for the rebuilding of Zion Presbyterian church, destroyed by fire a year ago, has been awarded to Messrs. Moffatt & McGregor, \$20,000. It will be built of Beckwith stone. The building will be heated by steam and will have a perfect system of ventilation. The date for completion is December 1st.

Edmonton, Alta.

The following contracts in connection with the interior work on the Parliament Buildings and Court House were awarded: electric conduit wiring, on both, Cunningham Electric Company, Calgary; plumbing and heating, court house, McKnight & Frost, Edmonton; ornamental iron stairs, both buildings, Canadian Ornamental Iron Company, Toronto; marble, court house, Wm. O'Neil & Co., Vancouver.

Regina, Sask.

The contract for erection of public library was awarded to Wilson & Wilson, \$43,700; other tenderers were, Snyder & Sutherland, \$44,318, Parsons Construction Co., Ltd., \$52,120; Smith Bros. & Wilson, \$51,500, all of Regina. Storey & Van Egmond, architects.

Winnipeg, Man.

The contract for erection of tubercular hospital has been awarded to Shepley Construction Company, Builders' Exchange, \$85,000.

Residences

Calgary, Alta.

Tenders were called until May 9th for erection of double house on Sixth avenue east. F. J. Lawson, architect, Norman block.

Hamilton, Ont.

A permit was issued to Stewart & Witton for residence for manager, Bank of Montreal, \$20,000.

Montreal, Que.

Ex-Ald. S. D. Vallieres is building ten houses on Fabre street at a cost of \$15,000.

S. Arnovitz is building three houses on Esplanade avenue at a cost of \$18,000.

Tenders were invited until May 10th for a large apartment house off Dor-

chester street west for Mr. Hibbard. Jas. E. Adamson, architect, Coristine Building.

Ald. Noe Leclair is adding four three-storey houses to the block on St. Urban street at a cost of \$14,000.

Mr. S. P. Forest is building four houses on Hutchison street, to cost \$16,000.

Permit was issued for a house on McGregor avenue, to Mr. McKim, \$25,000.

Ottawa, Que.

Tenders will be called for in a few days for block of 12 flats and stores to be erected here. J. E. Adamson, architect.

Prince Albert, Sask.

H. M. Hueston and A. C. Holmes have plans under way for the erection of fifty residences.

Toronto, Ont.

C. S. Williams, of 43 Kendal avenue, has purchased the southwest corner of Brunswick and Bernard avenue. The buyer intends to erect an apartment house on the site.

Mr. D. Lavine has purchased the property on the northwest corner of Parliament and Aberdeen streets. It is undecided as to whether an apartment house or four detached houses will be erected.

AWARDED

Montreal, Que.

R. P. Du Tremblay is building a residence on Laurier avenue. J. A. Karch, architect; O. Lamoureux, contractor.

The following contracts for erection of residence for Dr. A. Munro have been awarded: Painting and glazing, J. Sears; plasterer, E. Coulombe; roofers, Messrs. Richardson, Simard & Co.; electric wiring, the Moncel Electric Co.; excavation, masonry and brick work, James Young; carpentry, T. C. M. Bulmer.

Messrs. McVicar & Heriot are the architects and Messrs. Peel & Peel the contractors for a three-storey brick dwelling to be erected on McGregor street for Mr. A. McKim at a cost of \$25,000.

Nelson, B.C.

The contract for erection of residence for Mr. A. Leith has been given to J. Dancy & Co., \$3,800.

Winnipeg, Man.

Permit was given for three apartment buildings, St. Paul avenue, \$120,000, to Thos. Oddson; Davidson Bros., contractors.

The contract for erection of Ellesmere apartments has been awarded to Nelson & Foster, 273 Higgins avenue, \$55,000.

Business Buildings and Industrial Plants

Belleville, Ont.

The G. T. R. management will erect a new station, it is reported.

Bracebridge, Ont.

It is understood that the Queen's Hotel recently purchased by a syndicate representing the temperance interests will be torn down and a modern building erected in its place. Estimated cost, \$10,000. J. F. Williams, M.D.; John Thomson, druggist, and D. E. Bastedo, sheriff, are interested.

Calgary, Alta.

The Alberta Beet Sugar Company will build a factory.

Tenders were called until May 9th for erection of bank building here for Union Bank of Canada. F. J. Lawson, architect, Norman Block, Calgary.

Calgary, Alta.

R. W. Brown, a manufacturer, of Washington, D.C., has written the secretary of the board of trade offering to start a paper box factory here if he can secure certain civic privileges.

Chatham, Ont.

Palmer Bros. have secured plans for erection of 2-storey addition to their bakeries. Cost, about \$5,000.

J. L. Wilson & Son, architects, are preparing plans for a new 3-storey addition to be built of concrete, brick and slow burning wood construction for the Wm. Gray, Sons, Campbell Co., Ltd. Estimated cost, \$8,000.

Estevan, Sask.

Arrangements are being made for the formation of a company for the manufacture of sewer pipe under the supervision of F. N. Tennant.

Edmonton, Alta.

Tenders for the erection of the hotel here for the G. T. P., it is stated, will be called for on July 1st of this year. Plans for the hotel in Winnipeg will be completed in about three weeks.

Gilbert Plains, Man.

The Western Canada Flour Mills elevator was burned to the ground on the 4th inst.

Guelph, Ont.

The city council have authorized the city to make a loan of \$20,000 to the Independent Tire Company of Toronto. In return the Independent Tire Company are to erect in this city on or before the first of July, 1912, a factory which will cost at least \$50,000. The by-law will go to the ratepayers on May 29th. H. H. Hastings, general manager.

Humboldt, Sask.

M. F. Beach, Iroquois, Ont., has been inquiring regarding the location of a flour mill here.

Hamilton, Ont.

Permit was granted to the Westinghouse Company for a brick addition to pattern shop and addition to machine shop, \$65,000.

Lethbridge, Alta.

The Great West Saddlery Company, represented by R. J. Hutchings, have applied for an industrial site of one acre.

The Massey-Harris Company, Toronto, have under consideration the erection of a brick warehouse and office here. A. W. Trickey, manager of the southern branches.

Lachine, Que.

The Allis-Chalmers-Bullock factory is reported damaged to the extent of about \$60,000.

Medicine Hat, Alta.

The agreement with James H. Preston for the location of a planing mill here at a cost of \$50,000 has been ratified by the council.

The Gordon Nail Company, formerly

of St. John, N.B., will build a plant to cost \$80,000 at this city.

Tenders will be called about May 20 for erection of factory for Alberta Linseed Oil Mills, also elevator. John McNeely, official in charge.

Moose Jaw, Sask.

Storey & Van Egmond, architects, Regina, have been awarded the contracts for plans of three large buildings to be erected at Moose Jaw. One will be a six-storey office building; another a two storey structure for the Moose Jaw Times; and the third is a stone structure 25 by 80 feet and three storeys in height.

Tenders addressed to Storey & Van Egmond, architects, will be received until May 26th for erection of the following: One office building, reinforced concrete construction, six storeys and basement; one printing office, mill construction, two storeys and basement, both for the Times Company; one store building, three storeys and basement. Plans, etc., at the office of the Times Company, Limited, Moose Jaw; the Builders' Exchange, Winnipeg, and at the office of the architects.

Montreal, Que.

Permit was issued to Mr. Stanley Bagg for building, corner of Peel and St. Catherine streets, \$60,000.

The principal losers in the fire of May 5th are the Canada Furniture Company and the Ives Modern Bedstead Company. Estimated total loss, \$70,000.

An extension is being made to the C. P. R. Angus shops to be used for building and repairing locomotive tenders. The addition is 160 feet long, 116 feet wide, and 35 feet high, and adjoins the boiler shop.

Plans and specifications are being prepared by Messrs. Lockwood Green & Co., of Boston, Mass., for a five-storey reinforced concrete building for manufacturing purposes for the Gillette Safety Razor Company, Limited. This factory will have a frontage of 105 feet on St. Alexander street and a depth of 75 feet.

Messrs. Nobbs & Hyde are the architects for the large new office and manufacturing building to be erected for Messrs. Henry Birks & Sons, Limited, at the corner of Cathcart street and Union avenue.

Mr. Carl Rosenberg is preparing to erect a five-storey building with terra cotta front on St. Lawrence Boulevard. The plans are being prepared by Mr. C. Bufort.

North Bay, Ont.

Trout Lake Hotel near here was destroyed by fire on the 7th inst. Estimated loss, \$15,000.

Ottawa, Ont.

It is announced that W. C. Edwards Company will erect a branch planing mill near Westboro.

Owen Sound, Ont.

The by-law to grant civic privileges for the Knitting Factory was carried. Messrs. Lake & Ward are interested; that for the Adams Furniture Company, of Toronto, was carried; also that for the S. Lloyd & Company, of Toronto, towards the erection of a factory to manufacture children's carriages and wagons.

Ponoka, Alta.

The Wetaskiwin Produce Company will build a warehouse.

Penticton, B.C.

Daniel Williams will erect a harness factory.

Port Arthur, Ont.

A new match factory is contemplated for this city costing \$70,000. Mr. McArthur, of the Dominion Match Company, Deseronto, is interested.

Mr. Jack McRae, local contractor, double the capacity of his plant so as to include the manufacture of hardwood flooring, sashes and doors.

Regina, Sask.

Tenders addressed to J. G. Sullivan, assistant chief engineer C. P. R., will be received until May 17th for erection of stone station here. Plans, etc., at office of the division engineer at Moose Jaw and at the office of the above.

Storey & Van Egmond, architects, have prepared plans for the new 5-storey warehouse for the B. F. Ackerman & Company. It is understood that Parsons Construction Company will get the tender.

Plans have been approved for construction of brick and stone office building for the Western Trust Company, excavating has commenced. The plans, which have been drawn by Sharon and Karrach, call for a building five storeys in height. Tenders will be called shortly. Estimated expenditure, \$75,000.

St. Catharines, Ont.

The Buffalo Brake Peam Company will locate their Canadian branch here. President, S. A. Crone, Industrial Commissioner, Mr. Brunnell.

Swift Current, Sask.

Excavation has commenced on the site for the new 3-storey hotel to be erected for Wm. Drever, of the Alexandria Hotel, Regina. Estimated cost, \$60,000.

Sydney, N.S.

It is understood here that Sydney, N.S., has been chosen as the site for the naval building plant. Messrs. John Brown and the Fairfield Company are said to be interested.

Tenders addressed to P. D. Macneil, manager, will be received until May 12 for erection of new building for the Sydney Daily Post.

Saskatoon, Sask.

Frank P. Martia is the architect and supervisor of construction for the new Queen's hotel, on which building operations will be commenced shortly. Estimated cost, \$200,000.

A large warehouse will be erected in the new Cordage park. R. J. Upton, local manufacturers' agent is interested.

The Merchants Bank has purchased a site on Second avenue. It is reported that a branch will be erected there in the near future. N. Pike, local manager.

Campbell, Wilson & Adam, wholesale grocers, intend erecting a large three-storey warehouse on a space 75 feet by 110 feet. Although they are only contemplating the erection of a three-storey structure at the present time, it is understood the foundation is being laid with a view to carrying six storeys at

some future date. Mr. Adams, local manager.

It is understood that the National Drug Company, of Montreal, have purchased several lots where they purpose building a fine large structure, and that both the Miller Morse people and the Hart-Parr Company have in mind the establishment of wholesale branches in this city.

Toronto, Ont.

Tenders are called until May 17th for erection of large office and warehouse building for the James Robertson Co., Ltd., s.w. corner of Spadina avenue and Sullivan street. Plans, etc., at office of Messrs. A. R. Denison & Stephenson, architects, 20 King street west.

Victoria, B.C.

The city solicitor advises that no by-law or regulation can prevent the erection of the proposed hotel by Thos. Potter opposite the new George Jay school. Estimated cost, \$15,000.

Vancouver, B.C.

The tenants on the property on which the new 10-storey block for Ald. Rogers is to be erected, have been given notice to vacate by June 1st, when work will probably commence. Estimated cost, \$500,000.

The C. P. R. are understood to be considering the erection of an 8-storey block on the site where the present city telegraph offices stand. Estimated cost, \$200,000.

Winona, Ont.

Mr. L. A. Roy, of Chicago, it is reported, is making arrangements for erecting a \$50,000 cooling plant here.

Wakefield, Que.

McLaren Bros. will rebuild their grist mill recently destroyed by fire, at an estimated cost of about \$75,000.

Winnipeg, Man.

Permit was issued to J. H. Ashdown for warehouse, corner Rory and Bannatyne, \$73,000. J. H. G. Russell, architect; P. Burnett, contractor.

Tenders are called until May 13th for erection of brick business and apartment block for C. A. L. Fish, corner of Main street and St. John avenue. Plans, etc., with Glines & Co., 301 Northern Crown Bank building, Portage avenue.

It is officially announced that the Hudson Bay Company will erect the department store on Portage avenue, bounded by Vaughan street, Colony street and St. Mary's avenue. H. E. Burbridge, commissioner.

A building site has been secured for the Canada Cement Company's plant, two miles south of Oak Point Junction, and construction, it is stated will begin this summer.

Yorkton, Sask.

The estimated cost of warehouse for International Harvester Company here is \$70,000. Work on the departmental store here for the Hudson Bay Company will probably be commenced shortly; estimated expenditure, \$50,000. J. S. Smith; work will commence on the Temperance hotel for the Yorkton Hotel Company about June 1st. \$100,000. P. Pachal is stated to have under consideration the erection of a block of three stores on First avenue, \$30,000; excavation has commenced on the addition to block for W. D. Dunlop, \$10,000.

AWARDED**Calgary, Alta.**

The contract for erection of the block for the late Judge Travis has been awarded to R. A. Brookbank.

Chatham, Ont.

The Blonde Lumber & Mill Co. have been awarded the contract for the building for the American Pad & Textile Co., head office, Greenfield, Ohio. Estimated cost, \$11,500. The building will be of concrete from footings to grade line and rubble masonry from grade line to floor line from this point two storeys high of brick work, including parapets. The construction generally is slow-burning wood with reinforced concrete floors.

Montreal, Que.

Messrs. Marchand & Haskell are the architects and Mr. E. S. M. Cape the contractor for a factory to be erected at the corner of Duquette and Chambly streets for Ramsays Limited at a cost of \$27,000. The construction will be of Laprairie brick on stone and concrete foundation.

The George A. Fuller Company, Limited, have been awarded a contract for the excavation work for the new Carleton Hotel to be erected on Sherbrooke street west. The excavation is to go down about 28 feet below the sidewalk level. This work is to be completed by the middle of July. Some modifications have been made in the plans for the hotel which it is expected will contain about 200 rooms and is to be ready for occupation in September, 1912. The contract for the superstructure is likely to be given out within two or three weeks.

Messrs. John Stewart & Co. have been awarded contract for the erection of a three-storey brick store at the corner of Peel and St. Catherine streets. The building will be entirely fireproof and will cost about \$60,000.

Nelson, B.C.

The contract for erection of jam factory has been awarded to Waters & Pascoe. A. Carrie, architect. Estimated outlay, \$15,000.

The contracts for the completion of the Kerr block have been awarded as follows: the stone work having already been practically finished by Eric Palmquist; carpenter work, Waters & Pascoe; plumbing, B. C. Plumbing Co.; the roofing, Wood-Vallance Hardware Co.; painting and kalsomining, W. S. Percy; plastering, T. Brenilson; and the wiring for telephone and electric lighting, E. W. Steel & Co., \$60,000. A. Carrie architect.

Winnipeg, Man.

The contract for the Canada Fairbanks building has been awarded to Messrs. G. H. Archibald & Co., general contractors, Montreal. The construction will be brick with terra cotta trimmings on concrete foundation.

The contract for warehouse for Clare & Brockest has been awarded to John Heshup, 163 Walnut street, \$31,000.

Welland, Ont.

The Canadian Steel Foundries, Limited, have awarded the contract for the extensions and additions here to David Dick & Sons, Ltd.

(Continued on page 60)

Tenders and For Sale Department

CITY OF MOOSE JAW Saskatchewan

Incinerator Plant

Sealed proposals endorsed "Incinerator Plant" will be received by the City of Moose Jaw addressed to the undersigned City Clerk until 8.30 o'clock p.m., on Monday, 22nd May, 1911.

The proposals received may cover alternative designs and methods but in any case the plant shall be capable of handling 25 tons per day and provision made for generation of steam.

The price bid shall include the supply of all materials for and the complete construction of the plant, same to be turned over to the Corporation in satisfactory working order.

Satisfactory guarantees shall accompany each tender.

The lowest or any tender not necessarily accepted.

J. M. WILSON, W. F. HEAL,
City Engineer. City Clerk.
Moose Jaw, April 24th, 1911. 18-20.

PORT HOPE

Tenders

For Concrete Sidewalks, etc.

The Corporation of Port Hope invite Tenders for the construction of five lineal miles, or thereabouts, of Concrete Sidewalks and Crossings, with the necessary works connected therewith, in accordance with detail and specifications prepared therefore, copies of which, with forms of tender, may be obtained on application to the undersigned. A marked cheque equal to five per cent. of the gross amount of the contract to be furnished with each tender, and the lowest tender not necessarily accepted. Tenders will be received to noon, 15th May, 1911.

J. W. SANDERS,
Town Clerk.

Dated 19th April, 1911.

17-19

CITY OF TORONTO

Tenders

For Construction of Ash- bridge Bay Docks

Tenders will be received by registered post only, addressed to the Chairman of the Board of Control, City Hall, Toronto, Canada, up to noon on Tuesday, 23rd May, 1911, for the construction of dock in Ashbridge Bay.

Envelopes containing tender must be plainly marked on the outside as to contents.

Specifications and forms of tender may be obtained upon application to the Department of Railways, Bridges and Docks, City Engineer's Office, Toronto.

The lowest or any tender not necessarily accepted.

G. R. GEARY, Mayor,
Chairman, Board of Control.
City Hall, Toronto,
April 12th, 1911. 17-19

Bucket Crane

FOR SALE—One full circle, self-propelling, modern 10 to 15-ton capacity Browning size No. 1 Locomotive Crane, standard gauge, 4-wheel truck, 38 ft. steel boom, 8 x 10 engines, equipped to handle Clam or Orange Peel. Will furnish with or without bucket. Attractive price, fine condition, quick delivery. Inspection here.

WILLIS SHAW MACHINERY CO.

39 So. LaSalle Street, Chicago.

CITY OF MOOSE JAW Saskatchewan

Storm Sewer Extensions

Sealed tenders endorsed "Contract 32 or 33" will be received by the City of Moose Jaw addressed to the undersigned City Clerk until 8.30 p.m. on Monday, May 22nd, 1911.

Any tender received after the above stated time will be declared informal.

Contract 32.—The laying of approximately 9,000 lineal feet of Storm Sewer and 2,300 lineal feet of Catch basin connections and building manholes, catch basins, etc.

Plans and specifications may be seen at the City Engineer's office.

Contract 33.—The supply of approximately: 7,900 lineal feet of 10-in. Vitrified Tile Pipe; 1,100 lineal feet of 8-in. Vitrified Tile Pipe; 2,300 lineal feet of 6-in. Vitrified Tile Pipe, also junctions, bends, etc.

Specifications may be obtained from the City Engineer's Office upon application.

The lowest or any tender not necessarily accepted.

J. M. WILSON, W. F. HEAL,
City Engineer. City Clerk.
Moose Jaw, April 29th, 1911.

For Sale or Exchange

Municipal Pumping Plant Deseronto, Ontario

Tenders will be received by the undersigned up to noon of June 4th, 1911, by the Corporation of the Town of Deseronto, for the sale of the following equipment:

One 75 h.p. Fairbanks-Morse Suction Gas Producer.

One 65 h.p. Fairbanks-Morse Vertical Producer Gas Engine.

One 12 x 15 Triplex Pump, direct connected by friction clutch to Gas Engine, capacity 1,000 gallons per minute.

The above equipment has only been operated a short time and is in first-class condition. Changing to hydro-electric power necessitates disposing of above equipment. Plant is offered complete as above or separately, or would consider an exchange for equal capacity rotary pump and motor.

Specifications and description of above equipment furnished on application to the undersigned or can be seen at the offices of the Contract Record, B34 Board of Trade Building, Montreal, and 441 Seymour street, Vancouver, B.C.; or at the office of the Canadian Engineer, 62 Church street, Toronto, or 404 Builders' Exchange, Winnipeg.

LUCIUS E. ALLEN,
Consulting Engineer,
Belleville, Ont.

TENDERS FOR CLUB BUILDING

Bulk tenders, or tenders for the several trades required, will be received by the undersigned, up to May 15th next (1911), at 6 o'clock p.m., for the erection of a club building, for the Galt Club, Limited, on Dickson Street, Galt, Ontario, according to plans and specifications which may be seen at the office of the Secretary, Gore Building, Galt, or Stewart and Witton, architects, Hamilton.

The Club do not bind themselves to accept the lowest or any tender.

M. A. SECORD, Secretary,
18-19 The Galt Club, Limited.

Tenders for Bridge and Abutments

Tenders will be received by the undersigned up to noon, May 27th, 1911, at Arkwright P.O., for the erection of two concrete abutments, and one span Baltimore truss of 100 ft. span, over the Sauble River, about two miles from Tara.

Abutments to be completed by the 15th of July, and the superstructure to be completed by the 15th of August, 1911. An accepted cheque for \$100, payable to the Treasurer, Township of Arran, must accompany each tender. Tenders to be opened at Arkwright at 2 p.m., May 27th, 1911.

The lowest or any tender not necessarily accepted.

(Signed) JOHN H. WILES,

Réve Arran.

Arran, May 1st, 1911.

18 19



SUPPLY OF 72-inch Steel Pipe

Tenders will be received by registered post only, addressed to the Chairman of the Board of Control, City Hall, Toronto, up to noon on Tuesday, May 23rd, 1911, for the supply of between three thousand and three thousand five hundred feet of steel pipe, seventy-two inches in diameter, for the Waterworks Intake.

Envelopes containing tenders must be plainly marked on the outside as to contents.

Tenderers shall submit with their tender the names of two personal sureties, approved by the City Treasurer, or in lieu of said personal sureties the bond of a Guarantee Company, approved as aforesaid.

Plans and specifications may be seen and Forms of Tender obtained from the Waterworks Department at the office of the City Engineer, Toronto.

The usual conditions relating to tendering, as prescribed by City By-law, must be strictly complied with, or the tender will not be entertained.

The lowest or any tender not necessarily accepted.

G. R. GEARY, Mayor,
Chairman of Board of Control.
City Hall, Toronto, May 3, 1911. 19-19

Tenders Wanted

Bulk or separate tenders for the masonry, carpentry, roofing, plastering and painting in connection with the erection of the Neal Memorial Church at Port Rowan, will be received by J. W. Schofield, Port Rowan, until **May 18th, 1911.**

Plans and specifications may be seen at the office of J. L. Buck, Port Rowan, or W. D. Chown, architect, 75 Yonge street, Toronto.

The lowest or any tender not necessarily accepted. 19-19

Province of Quebec Municipality of Lachute Town

TENDERS For Cast Iron Water Pipes

Sealed tenders addressed to the undersigned and endorsed "Tenders for Pipes," will be received until noon of **Monday, May the 22nd**, for about 280 tons of 8-inch cast iron water pipes. Specifications prepared by Wm. Kennedy, Jr., C.E., may be obtained from the undersigned.

J. W. RAITT,
Town Clerk and Secretary-Treasurer,
Lachute, Que. 19-19

Notice

Tenders for the construction of ten (10) small cement abutment, cement floor and steel beam bridges, will be received by the council of the Township of Hay, up to **Monday, the 22nd day of May**, at two o'clock p.m. Also for cleaning out "Schwalm" Drain and "West Branch South" Drain. Engineer's estimate on the Drains, \$1,237.

Particulars may be obtained and plans and specifications seen at the office of the undersigned.

The lowest or any tender not necessarily accepted.

FRED HESS, Sr., Clerk,

19-19 Zurich, P.O.

Zurich, Ont., May 4, 1911.



City of Toronto

Tenders for the Construction of Turner's Bath Bridge

Tenders will be received by registered post only, addressed to the chairman of the Board of Control, City Hall, Toronto, Canada, up to noon on **Tuesday, 30th May, 1911**, for the construction of a steel and concrete bridge at Turner's Baths, Hurlan's Point, Toronto Island.

Envelopes containing tender must be plainly marked on the outside as to contents.

Specifications and forms of tender may be obtained upon application to the Department of Railways, Bridges and Docks, City Engineer's Office, Toronto.

The lowest or any tender not necessarily accepted.

G. R. GEARY, Mayor,
Chairman of Board of Control.

City Hall, Toronto, May 6, 1911. 19-20

Tenders

For

Bridge Piers and Abutments

Tenders will be received at the office of the City Commissioners up till 3 p.m. **May 29th, 1911**, for the construction of the Piers and Abutments for bridge over the Saskatchewan River. Plans and specifications may be seen and all information obtained at the office of the City Engineer. Lowest or any tender not necessarily accepted.

CITY COMMISSIONERS,

A. J. LATORNE, City Engineer.

Edmonton, April 20th, 1911.

19-20

BOARD OF EDUCATION

Tenders Wanted

Sealed tenders addressed to the Secretary-Treasurer of the Board will be received until

FRIDAY, NOON, MAY 12th, 1911

FOR

Enlargement of Earls Court School

AND

Enlargement of Annette Street School

Plans and specifications may be seen and all information obtained at the office of the Board, City Hall. Each tender must be accompanied by the deposit mentioned in said specifications and forms of tender.

The lowest or any tender will not necessarily be accepted.

W. W. HODGSON,

Chairman of Committee.

W. C. WILKINSON,

19-19 Secretary-Treasurer.



Tenders for the Erection of an Addition to the Administration Building upon the Exhibition Grounds

Bulk tenders will be received by the undersigned by registered post only up to noon of **Tuesday, May 16th, inst.**, for the various trade works in connection with the erection of an addition to the Administration Building upon the Exhibition Grounds.

Specifications and plans may be seen and any information required in relation thereto obtained forthwith at the office of George W. Gouinlock, architect, Temple Building, Toronto.

Provisions of the city by-laws in relation to tenders must be strictly complied with or the tenders may not be entertained.

The lowest or any tender not necessarily accepted.

G. R. GEARY, Mayor,

Chairman of Board of Control.

City Hall, Toronto, May 8, 1911.

19-19

To Contractors

Sealed tenders addressed to either of the undersigned will be received until noon on **Saturday, the 20th instant**, for building concrete abutments and concrete floor for the Club Bridge over Black Creek on the town line between Moose and Sombra. Plans and specifications may be seen at the residence of J. T. Whiteside, Court right, or at the residence of Neil McGugan, Wilkesport, or at the office of Bell & McCubbin, Engineers, St. Thomas. A marked cheque must accompany tender as specified. The lowest or any tender not necessarily accepted. The committee will open tenders in the Village of Sombra on Monday, 22nd instant, at 3 o'clock p.m.

NEIL MCGUGAN,

Wilkesport, Ont.

J. T. WHITESIDE,

Courtright, Ont.

19-20

CITY OF MOOSE JAW Saskatchewan

Paving and Sidewalks

Sealed tenders endorsed "Contract 34 or 35," will be received by the City of Moose Jaw addressed to the undersigned City Clerk until 8.30 p.m. on **Monday, May 29th, 1911.**

Any tender received after the above stated time will be declared informal.

Contract 34.—The laying of approximately 41,000 square yards of pavement.

Contract 35.—The laying of approximately 206,061 square feet of concrete sidewalks and 46,306 lineal feet of curb and gutter, also 1,056 square yards of Wood Block Crossing.

Specifications may be obtained from the City Engineer's Office upon application.

The lowest or any tender not necessarily accepted.

J. M. WILSON,

City Engineer.

W. F. HEAL,

City Clerk.

Moose Jaw, May 4, 1911

19-20

TOWN OF ROULEAU

Sealed Tenders

Sealed tenders, endorsed "Tender A," "Tender B," "Tender C," will be received by the undersigned Secretary-Treasurer, up till 8.30 o'clock on **Monday, May 29th, 1911**, for the undersigned.

Any tender received after the above stated time will not be considered and the Corporation reserves the right to reject any or all tenders.

An accepted cheque equal to 5 per cent. of the amount of the tender must accompany each tender, and envelope must be endorsed with the letter of the contract referred to.

Tender A.—erecting, laying steel water mains, hydrants, valves, etc., and back filling.

Tender B.—Constructing reinforced concrete reservoir.

Tender C.—Erecting brick power house.

Plans and specifications can be seen at the offices of the Secretary-Treasurer or the Engineer, or copies can be had from the Engineer on receipt of a marked cheque for ten dollars, which cheque will be returned on return of the plans.

W. H. STEWART, Secretary-Treasurer,
Rouleau, Sask.

J. DARLINGTON WHITMORE,

Rooms 21 and 22 MacKenzie & Brown Block,
Regina, Sask. 19-19



Sealed tenders addressed to the undersigned, and endorsed "Tender for Gordon Creek Dam, Kippewa Village, Que.," will be received at this office until 4 p.m., **Monday, May 29, 1911**, for the construction of a dam and sluiceway across the head of Gordon Creek at Kippewa Village, in the County of Pontiac, Que.

Plans, specifications and form of contract can be seen and forms of tender obtained at this Department at the office of J. E. Sing, Esq., District Engineer, Confederation Life Building, Toronto, Ont., and on application to the postmaster at Haileybury, Ont.

Persons tendering are notified that tenders will not be considered unless made on the printed forms supplied, and signed with their actual signatures, stating their occupations and places of residence. In the case of firms, the actual signature, the nature of the occupation, and place of residence of each member of the firm must be given.

Each tender must be accompanied by an accepted cheque on a chartered bank, payable to the order of the Honorable the Minister of Public Works, equal to ten per cent. (10 p.c.) of the amount of the tender, which will be forfeited if the person tendering decline to enter into a contract when called upon to do so, or fail to complete the work contracted for. If the tender be not accepted the cheque will be returned.

The Department does not bind itself to accept the lowest or any tender.

By order,

R. C. DESROCHERS,

Secretary.

Department of Public Works,
Ottawa, April 25, 1911.

Newspapers will not be paid for this advertisement if they insert it without authority from the Department. 19-19



Sealed tenders addressed to the undersigned and endorsed "Tender for Public Building, Seaforth, Ontario," will be received until 4 p.m., on **Monday, May 29, 1911**, for the construction of a Public Building at Seaforth, Ont.

Plans, specifications and form of contract can be seen and forms of tender obtained at the office of Mr. H. J. Lamb, District Engineer, London, Ont., at the post office, Seaforth, and at this Department.

Persons tendering are notified that tenders will not be considered unless made on the printed forms supplied, and signed with their actual signatures, stating their occupations and places of residence. In the case of firms, the actual signature, the nature of the occupation, and place of residence of each member of the firm must be given.

Each tender must be accompanied by an accepted cheque on a chartered bank, payable to the order of the Honorable the Minister of Public Works, equal to ten per cent. (10 p.c.) of the amount of the tender, which will be forfeited if the person tendering decline to enter into a contract when called upon to do so, or fail to complete the work contracted for. If the tender be not accepted the cheque will be returned.

The Department does not bind itself to accept the lowest or any tender.

By order,

R. C. DESROCHERS,

Secretary.

Department of Public Works,
Ottawa, May 1, 1911.

Newspapers will not be paid for this advertisement if they insert it without authority from the Department. 19-20

Tenders Wanted

Tenders will be received by the undersigned until 5 p.m. on **Saturday, May 20th**, for the various works required in the erection and completion of a large building for Sabbath School and Church Parlor purposes for the Presbyterian Church, Orillia, Ont. Plans and specifications can be seen at the offices of the architects, and also at the offices of Mr. Robertson, architect, Orillia. The lowest or any tender will not necessarily be accepted.

GORDON & HELLIWELL, Architects,
525-7 Confederation Life Building.

19-19

Toronto

Tenders Wanted

Tenders for repairing and enlarging the Tank of the Niagara Waterworks System according to plans and specifications which may be seen or had by applying to the undersigned or to F. W. Paulin, C.E., Niagara Falls, Ont., will be received to 8 p.m., **Tuesday, May 23rd, 1911.**

Envelopes must be sealed, and marked "Tenders for Repairing and Enlarging Tank."

The Council do not bind themselves to accept the lowest or any tender.

W. E. LYALL,
Clerk.

Niagara-on-the-Lake,
May 5th, 1911.

19-20

Positions Wanted

Advertisements under this heading one cent a word per insertion. Box No. ten cents extra

POSITION WANTED--As Superintendent or walking boss on railroad or other construction work, by experienced man who can furnish excellent references. Apply Box 271, Contract Record, Toronto, Ont.

Miscellaneous

Advertisements under this heading two cents per word per insertion.

Large European concern manufacturing water turbines, centrifugal pumps and steam turbines, wants to be represented in Winnipeg and Vancouver by well-known qualified and experienced firm. Box 265, Contract Record, Toronto, Ont.

Power Plants, Electricity and Telephones

Berlin, Ont.

A \$20,000 electric light by-law will be voted on by the ratepayers on May 31st, also \$7,900 by-law for street railway.

Calgary, Alta.

C. H. Mitchell, of Toronto, will make a definite report to the government on the water supply in the Bow and Elbow rivers and also on the power available.

Cochrane, Ont.

The franchise for telephone service here has been given to W. J. Bouldry. Work will commence at once.

Montreal, Que.

The National Hydro-Electric Company has been incorporated, capital, \$1,000,000. H. Miles, president; L. Gosselin, secretary. Carillon Falls, on Ottawa river, 35 miles from Montreal, will be the source of the power.

Melville, Sask.

By-laws for the construction of waterworks, electric light and storm sewer have been carried by the ratepayers.

Tenders are called until May 25th for supply of the following machinery and materials for delivery during current season: Two 50 k.w. generators; two exciters for same; three 2,300 volt a.c. motors; 1 marble switchboard, etc.; 300 cedar poles; 3 tons copper wire; 10 lighting transformers, 2,300-110 volt; series street lighting system; two 3-stage turbine pumps; one 6-in. vertical submerged type centrifugal pump, with shafting and piping; about 3 tons of 10-in. standard c. i. water pipe; about 60 tons of 8-in. standard c. i. water pipe; about 200 tons of 6-in. standard c. i. water pipe; about 25 tons of 4-in. standard c. i. water pipe, special castings for all above sizes; 4-in., 6-in. and 8-in. gate valves and valve boxes; 44 fire hydrants; about 17,000 lbs. of pig lead; about 1,000 lbs. of oakum; 400 ft. of 8-in. wood pipe. Information obtained from John Crow, secretary-treasurer.

Port Arthur, Ont.

On May 29th two by-laws will be voted on, one for \$25,000 street railway purposes, and the other for \$15,000 floating debt.

Penetanguishene, Ont.

The by-law to raise by debentures \$27,000 for the municipal hydro-electric power system was carried. Of this \$10,500 will be used for extensions and improvements.

Victoria, B.C.

The city will purchase sufficient standards to commence the installation on those streets already passed for the present type of standard. Tenders will be called for a large number of other standards both of the present type and of the New Westminster type, which latter is favored out only on account of the design, but also on the score of cost, the New Westminster standard costing some \$24 less than that now in use here.

South Qu'Appelle, Sask.

The Electric Light Company here contemplate erecting a more substantial power house, and also installing gasoline power. L. G. Bell, sec.-treas., board of trade.

St. Thomas, Ont.

It has been decided to recall the proposed by-law for \$35,000, for the renovation of the street railway system.

Winnipeg, Man.

Tenders are called until May 12th for supply of copper wire, galvanized iron wire, insulators, cross arms and top pins, mast arm parts, cut-outs, hardware and miscellaneous materials. M. Peterson, secretary, board of control.

Tenders addressed to chairman, board of control, will be received until July 3rd for supply of apparatus and materials required for installation of police patrol telegraph system. Specifications, etc., at office of F. A. Cambridge, city electrician; M. Peterson, secretary.

AUTOMATIC SASH HOLDER

saves cord, weights, pulleys, and materials--no pockets--easier to install--for old and new windows. Send for sample and catalogue to-day. Agents wanted. Sold by the hardware trade or direct from 277 Broadway, New York.

Automatic Sash Holder Company

Contract Record

ESTABLISHED 1886

A Weekly Journal of
Building, Contracting, Engineering, Public Works
Municipal Progress, Advance Information

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THOMAS S. YOUNG, General Manager.

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MONTREAL Telephone Main 2299 B34 Board of Trade
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VANCOUVER - Tel. - 26 Crowe & Wilson Chambers
CHICAGO - - - - - 4059 Perry Street
LONDON, ENG. - - - - - 3 Regent St., S.W.

SUBSCRIPTION RATES

Canada and Great Britain, \$2.00 U.S. and Foreign, \$2.50

Vol. 25

May 17, 1911

No. 20

Expert Report on Toronto's Defective and Unreasonable Building By-Law

For some months it has been known that a Citizens' Committee, comprised of representatives of the architectural, engineering and business interests of Toronto, has been preparing a memorial to the Mayor and Board of Control requesting a revision of the Toronto Building By-law. As will be seen by a list given in another column, this committee numbers among its members some of the best known architects and engineers of Toronto, and for this reason its findings have been awaited with much interest by all those identified in any way with building operations. After some seven months' exacting and gratuitous work the conclusions of the committee have been embodied in a memorial (abstracted in this issue) which was presented to the Mayor and Board of Control on Tuesday, May 16th.

The investigations of the committee reveal a most interesting state of affairs in regard to building construction in Toronto. The by-law is shown to be objectionable from innumerable standpoints. It must not be imagined that the objections are all on the ground of undue severity, for many instances of remarkable laxity are cited; moreover, the present ordinance is incomplete and badly edited—shortcomings which result in the greatest inconvenience and much loss of time to those who are obliged to consult it.

The grounds for the conclusions of the committee can of course only be appreciated by a careful perusal of the memorial, which has now been made public property. The majority of our readers will find the report of outstanding interest, in that it discusses clearly and intelligently, fairly and fearlessly, matters of vital concern to constructional interests which heretofore have received all too scant attention. The conclusive evidence brought to bear on the high cost of

building, discussed in Part I., cannot fail to provide the civic authorities with food for careful reflection—we were going to say uncomfortable reflection—and this is only one of a hundred reasons which justify the committee's application.

With the authoritative statement of a large committee, composed principally of expert architects and engineers, that the by-law is so remarkably defective, there can surely be no room for argument as to the necessity for revision.

It scarcely seems possible that the civic authorities will set aside or refuse the application, and for this reason it is timely to consider the most approved method of securing a revised and up-to-date by-law. In other cities this has been found to consist in the co-operation of a number of experts making up a small commission. Large commissions, comprised of a dozen or more members, are unwieldy, slow and inefficient, this being attributable to the fact that the numbers are generally made up by padding. In a work of this sort no one has any place on a commission who is not an expert in some particular line or lines dealt with in the by-law. The city of Toronto may be assured that in the framing up of a new code the best results will be obtained from a small commission of some four or five members, inclusive of the City Architect.

It would be impossible to speak too highly of the self-sacrificing work of the men who have prepared this memorial, and whether they think it or no, the Mayor and Board of Control—in common with the rest of the city—are under a great obligation to the committee for this comprehensive and valuable work. As far as we know, the investigations of the committee and the compilation of the report—gratuitously, as it has all been, is quite unprecedented. That it was brought about by repeated failures to secure revision by ordinary means only enhances its present value and makes it the more final. The city has the memorial and it has the list of those who compiled it, and this should be sufficient to warrant the work of revision.

The Contract Record congratulates each member of the committee upon his share in the preparation of such a historic memorial and in particular the Secretary, Mr. C. R. Young, upon the lucidity and general arrangement of the various sections.

Reinforced concrete piles spaced 10 feet apart, were used for the extension of a timber quay at Ipswich, England. Some of the piles were 14 x 18 in. and the rest 14 x 14 in.; they averaged 30 feet in length and were reinforced by a rod in each corner, the rods being tied together. The piles were driven through gravel and one of them required to be struck 2,000 blows with the 2-ton pile driver hammer.

The set of uniform symbols which has been devised by the Architectural Club of Minneapolis, for use by architects generally, is a great step in the right direction, says the Improvement Bulletin. The symbols favored seem to have been worked out with much care as to their practicability, and they deserve serious and careful consideration. The amount of time wasted through uncertainty, the errors of figuring caused by misunderstanding plans and the trouble which the architects, owners and builders all encounter through these misunderstandings, all show the urgent need of standardized symbols.

A Noteworthy Building Project at Toronto

Features of Interest in the Erection of the General Hospital—Activity at the Scene of Operations—Don Valley Brick Works' Big Contract

At a first glance the view shown on the opposite page might be mistaken for a souvenir of the ruined cities of Pompeii and Herculaneum; but in place of a ruined city of the Old World it is an embryo city of the New—a city in the upbuilding, a city of brick, which will be known as the Toronto General Hospital. During the last few years many noteworthy contracts have been carried to completion in Canada and numerous buildings in our principal cities stand as a monument to the enterprise and ability of Canadian institutions, but it has remained for the city of Toronto in its present undertaking to take the palm of the Dominion for a set of hospital buildings which will be not only unequalled in Canada, but approached by very few other similar institutions in the world.

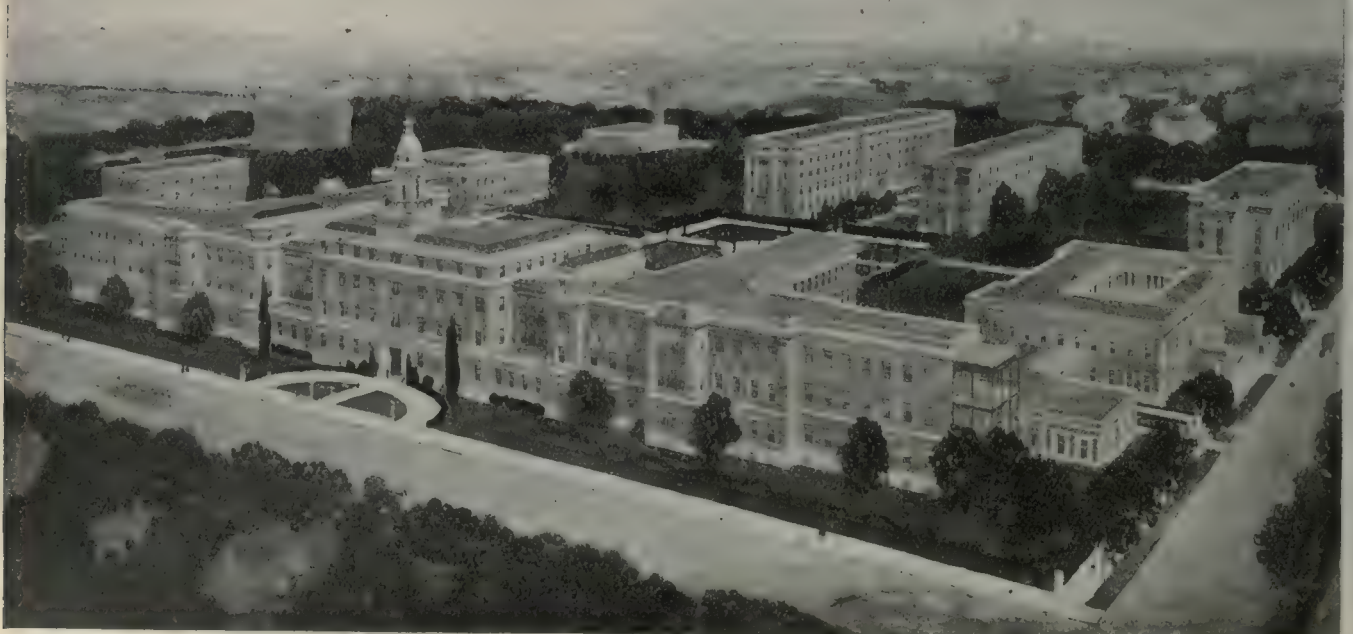
While the above-mentioned photograph is the best obtainable it conveys quite an inadequate idea of the extent of the work—which will be readily understood when it is recalled that the buildings cover a site of no less than ten acres of ground. The estimated cost of this noteworthy group of buildings is \$2,500,000. The location—three minutes' walk from the corner of College and Yonge streets, is central and appropriate. The exact dimensions of the site are 600 by 700 feet.

The general scheme consists of an Administration Building, with entrance on College street, flanked on one side by the Surgical wing and on the other by the Medical. The Out-Patients' department and Emergency Building are approached from University

avenue. South of this building is the Pathological Building, while at the south of the property, along Christopher street, are the Nurses' Home, a private patients' building, and to the east, on Elizabeth street, the Obstetrics and Servants' Buildings. The power plant and laundry are located at the southeast corner of the property.

The Administration Building is to be four storeys high and will form the main entrance to the hospital. The contract for the erection of this building was awarded to H. N. Dancy & Son, Toronto. Other contracts now in hand were awarded as follows: Surgical Wing, Thomson Bros.; Medical Wing, Holtby Bros.; Out-Patients' and Emergency Building, Witchall & Son; Pathological Building, R. Robertson & Sons, Limited; Nurses' Home, Teagle & Son; power house, Self Bros.

The contract for the whole of the brick and porous terra cotta fireproofing which is being used in the construction of the buildings was awarded to the Don Valley Brick Works, Toronto. No less than twenty million brick will be required. The brick specified is a semi-vitreous variety which has been named by the manufacturers, the "J. A. P." This brick was designed especially by the Don Valley Brick Works to meet the particular requirements of the hospital contract. It is made in Roman length and standard depth, oriental faced, and has a pronounced contrast in colors ranging from flecked golden to deep-



Bird's eye view of the Toronto General Hospital as it will appear upon completion. Architects, Darling & Pearson



The above photograph conveys an idea of the excellent progress that has been made to date on the Toronto General Hospital

est bronze and purple. The Don Valley people, with their customary enterprise, installed special machinery in order to obtain the best results, both in regard to the manufacture of the brick and the expediency of its delivery. A description of the Don Valley Brick Works was published in our Special Brick Number of December 7, 1910.

The Don Valley industry was practically indispensable to the successful completion of this great undertaking. Certain it is that only such a plant could meet the demands of such a contract. This is emphasized by the fact that the leading brick manufacturers of the world competed for this contract and that in face of this the "J. A. P." brick from the Don Valley was chosen, owing to its superiority in every point of comparison.

When His Excellency, Earl Grey, laid the corner stone of the Toronto General Hospital a month ago, he referred to the undertaking as one which marked a new epoch of development in hospital work in the Dominion and said that he would always consider the privilege of placing the stone the greatest honor accorded him during his term of office.

Lage stone ballast on a considerable extent of track reballasted by the Missouri Pacific Railway, has been reworked with an addition of smaller stone with the result that the roadbed has become practically a

macadam surface. The track has been raised sufficiently to put the coarse rock below the bottom of the ties, and the filling between the ties, and for about an inch below them, made with smaller material, which is more cheaply worked. Other similar experience of this road has shown that a 6-in. stone can be used to good advantage if mixed with other finer material, as in the construction of a highway, according to Mr. M. L. Byers, chief engineer maintenance of way, in a discussion before the American Railway Engineering Association.

An Italian engineer has devised a protection river embankment with concrete blocks strung on wires. The blocks are like big bricks, which interlock one with another top and bottom and at the ends. Each carries six holes so that for every ten feet of space there are 25 holes. When the river bank has been smoothed 25 wires for every 10 feet on the bank are stretched from a stout cable down in the water five feet under the surface of the embankment to a temporary bench at the top. Then the blocks are strung upon the wires, six wires passing through each block and slid down the frame at the top of the embankment to the cable in the river. When the curtain is completed the bench is removed, the wires twisted together at the upper ends and made fast to posts fixed firmly in the ground. The lower part of the curtain in the water is held down by its own weight.

Various Methods of Awarding Contracts

Respective Merits of the Several Forms in Use—Objections to Lump Sum Bidding - Fundamental Considerations in Successful Construction

By Daniel J. Hauer

There are a number of different forms and methods of letting contracts. Some few have been used but little, while some of the others have been in use ever since contracting has been in vogue. There are in all some eight or ten methods of letting work, but they are all some variation of the following well defined methods:

1. Contracts let on the unit basis.
2. Contracts let for lump sum.
3. Contracts let on a percentage.
4. Contracts let for cost plus a fixed sum.

Under these heads come the many variations, such as the two ways payment, percentage bidding, keeping within certain percentages, force account contracts, and lump sum and percentage work. Some of these are not necessarily different in form, only in the method of bidding on the work, but this difference in the end means a variation in the manner of obtaining and carrying out the contract.

1. Contracts let on a unit basis, is one of the oldest methods of letting work, and although there are some objections to it, yet this method presents many advantages.

Unbalanced Bidding

Many of the forms of bidding and of contracts that have been tried within the past twenty years, have been originated almost entirely to overcome the objection of unbalanced bidding, under the unit basis method. Unbalanced bidding has been carried to extremes, especially in connection with city work. For laying pipe for instance, contractors have been known to bid an extremely high price for pipe per ton delivered and only one cent per lineal foot for excavating, refilling the trench and laying the pipe. Also on paving work, contractors have frequently bid one cent per lineal foot for furnishing and laying curb, and then added to the other items of work the deficiency on the curb. In the pipe work, it is very evident that the bid is gotten up in this unbalanced manner, so as to have a high price for material delivered and obtain large payments on the contract before any of the work is done. This sometimes allows a dishonest contractor to collect nearly all the money due on his contract and then refuse to do any more work. On street work it is evidently the intention to hide the prices bid on the various items of work. These are all tricks, and cannot be defended even from the contractor's standpoint. There is another method of unbalancing bids, for which a defence might be made. A contractor in bidding on a job notices a small item of work listed in the preliminary estimate and upon investigation arrives at the opinion that this class of work will greatly increase, and accordingly bids a price slightly higher than he would otherwise have done. This class of work does increase, with a corresponding decrease in the cost of doing the work, with the result that a very handsome profit is realized on this one item of the contract. The writer remembers a case of this character. A contractor bidding on a large railroad contract noticed that there was an item of a few thousand feet board

measure of timber guards to go at the ends of embankments at pile bridges on timber trestles. There was a large number of bridges, and the contractor reasoned that if timber guards were necessary for a few openings, that they would be needed at most of the bridges. He accordingly bid a price that was a little higher than ordinarily paid for such timber work. After construction commenced, the contractor's surmise proved correct, with the result that he made a large profit on these timber guards, much larger than on any other item of the work. In a measure the contractor was entitled to this as he was able to size up the situation quicker and better than the engineer, who had planned the work. It was a case of matching one man's wits against another, and the contractor won.

The unbalancing of bids is a benefit to the individual contractor, but in the end it works a hardship on the contracting business. It is against all economic laws, and contractors should assist engineers in preventing unbalanced proposals from being made. It might be termed a petty form of graft, as excessive payment is made for work, thus obtaining more than a recognized or legitimate profit.

The Unit Price Method

In discussing the unit price method of letting work, this objection to it must be kept in mind. Contracts let on this basis consist in estimating all classes of work to be done, setting a unit for measurement and payment at the stipulated price. When all classes and quantities of work are found or estimated, then by applying the unit prices, it is possible to know the cost of the work before it is started, but if all quantities of work to be done are not known the exact cost cannot be obtained until the job is finished. If changes are made in the plans during the progress of the work, the contract is not affected, as the unit prices remain unchanged and an increase in quantities is paid for at the stipulated rate while a diminution will not increase the cost. It is possible under this form of contract, provided prices have been named for every class of work to be done, to do the job without bills for extras.

The item of extras is one over which many a law suit has been fought. When work does not come within the contract it is done as "force account," and is charged extra. Some contractors like force account work, but it would be better for the profession if it could be entirely eliminated from construction work. To obviate having extra work, a price should be named for every description of work that may be encountered, even though the engineer's estimate may not include all such items. Two classes of work should not be included under one price, but a strict unit basis should be maintained throughout the specifications and contract. The hauling and delivery of materials can also be arranged for under the unit system. Hauling can be paid for per ton mile, or on a similar basis. Materials can be paid for first as delivered and then in place. With only a price for materials in place, contractors may be slow in providing it, while if the

owner should furnish the materials the contractor will more than likely be extravagant with them and negligent in caring for them.

A "two-way payment contract" is a unit basis contract, but instead of paying for the work under one heading, it is paid for under two items. This method was very common at one time for excavation and is still used to a limited extent. Thus when earth is excavated and placed in an embankment, instead of setting one price to cover the entire operation, a price is set for excavation, and another for placing the material in the embankment, thus making a two-way payment. However, if the material is excavated and wasted, or if material has to be borrowed for embankments, only one payment is made. There is little to recommend this method except in unusual conditions.

A good many public contracts are let on a unit basis, but the units of work selected often consist of several items or classes of work. Thus under the head of concrete, such work as excavation, pumping, shoring, and the concrete is paid for as one item. Thus, if any of this work is not needed, as the pumping or shoring, then the contractor is paid for work he does not do. Then too, it is to the interest of the contractor to make his excavation excessive so as to receive pay for extra concrete. This could happen if each item were paid for separately, but it is not as likely, as the excavation must then be measured by the engineer, and he in checking up the work in this manner, will prevent such conditions.

In letting work on the Barge Canal in the State of New York, bids are taken on a unit basis, and in order to prevent the bids from being unbalanced, the state engineer's estimate of the cost of doing the work is published and given to a contractor before he makes his bid. He is then told that his bid will be considered informal and rejected if his bid varies more than ten per cent. from the engineer's estimate in the total, and twenty per cent. on any one item. This method has not proven satisfactory in every respect, but it has been a step in the right direction, and has so far been such a help in preventing the unbalancing of bids that it has been continued in letting the work.

The unit basis form of contract is especially adapted for railroads, canals, bridges, reservoirs, dams, ditches, walls wagon roads, streets, sewers, conduits, tunnels, subways, filter beds, pipe lines, transmission lines, all forms of excavation and many other kinds of outdoor construction.

Contracts Let for Lump Sum

2. Lump sum contracts are those for which the contractor agrees to complete such work as is listed in the contract and specifications and shown on the plans for a specific amount of money. In this form of contract every detail must be thought of before bids are asked on the work and plans and specifications must be complete or else the lump sum will not be binding to either party of the contract.

Lump sum contracts are very popular in some sections of the country and on certain classes of work. Many engineers seem to prefer this form of contract, but the writer believes that contractors as a class have a decided preference for unit price contracts. This preference was shown at the first letting of work on the 1,000 ton Barge Canal of the State of New York. Contractors were asked either to submit itemized bids or lump sum proposals. Most of the contractors bidding, gave unit prices. The director of public work, before making the final awards submitted the merits

of the two methods to special board of engineers, who decided it was for the best interests of the state to accept only unit price proposals.

The fundamental basis of all successful construction is that the labors of the engineer should be complete and comprehensive, and the most skilful and artistic planning, consistent with economy be shown. This fact controls all bidding. The general public has become so accustomed to reading, in regard to public work of large bills of extras, or the cost of the work being done, exceeding the estimates, that the public has turned to lump sum contracts as the preventive of this practice, but this is not necessarily the remedy. Should an engineer's estimate of the work be complete in every detail, and the same time so designed as not to admit of improvements being made as the work progresses, then either unit prices or a lump sum contract should give the same results as to costs, and there could not be any extras to be paid at the end of the job.

This is based on the supposition that the engineer's estimate is complete, but both engineers and contractors have experienced that these estimates are seldom verified by the costs of construction, consequently when a contractor makes a lump sum bid, he must add a percentage to cover the small changes and chances of increased costs, for which a claim for extras cannot be made after the job is finished, thus adding to the cost of the whole work. Such a percentage is not needed when the contract is based on unit prices, as the contractor does not assume the same risks.

This form of contract is objectionable, as every dollar that the contractor saves on the work goes into his own pocket and changes made to cut down costs do not necessarily mean a saving to the owner. It is difficult to live up to a time limit with this form of contract, as almost any changes in the plans will make the limit set of little value.

Objections to Lump Sum Bidding

The following are some of the reasons that should carry weight against lump sum bidding:

(a) Unit prices are not named in the contract for increased amount of work that may be made necessary by changes in the plans, or caused by incomplete surveys. Nor can money be deducted for decreasing the amount of work. Allowances made by the engineer for changes in most cases would not be satisfactory to contractors, causing disputes when these parties disagree, frequently ending in suits at law.

(b) Contractors object to this method as a specific sum is not stated in the contract to be paid as a monthly estimate, as is the case in a unit price contract, but the amount is left to the judgment of the engineer, who is more likely to underpay than overpay the contractor.

(c) To ask for lump sum proposals may in itself be a confession of incomplete surveys and hastily made estimates.

(d) This risk and all others, the contractor must run, and as he has to assume the entire responsibility, he must ask an increased price to cover it. He has his money and property at stake and must protect them. The contractor under this system, is expected to check in a few days, all surveys and estimates, that it may take the engineer months or years to make. As it is not possible to do this, he must add to his price to cover the possible errors made by another. Under the unit price method he studies the cost of each item, bids

accordingly, and the company letting the work pays for it as it is actually performed under the supervision of their engineer, and as the work progresses.

(e) Lump sum bids, not setting unit prices, cause all extra work to be done by "force account." Men do not give as efficient work under this system. The contractor may not object to this, but the engineer should. Then too, on public contracts of any size this may be a prolific cause of charges being made of fraud between the engineer and contractor, when none really exist.

(f) On lump sum work the personality of the engineer counts for much, hence to change engineers after the contract work is under way means a hardship to the contractor. This fact may also limit the number of bidders on a job, as many contractors do not care to have lump sum contracts under engineers they do not know.

This form of contract is much used for buildings, the furnishing and setting of machinery, the construction of sewers and water supply plants, the construction of power plants and many other jobs. It is frequently resorted to for irregular work.

The National Government lets a large number of lump sum contracts and in order to vary from the established amount of work to be done, they ask the contractors to name unit prices for additional work that may be necessary and also prices for work that may be omitted. As a rule, contractors name a higher unit rate for additional work than for work to be omitted. This in itself shows that it would be more economical to let the work on a unit basis.

Contracts Let on a Percentage

3. The percentage plan of letting contracts is also known as "force account work" and consists in doing construction under a contract, at a cost for labor and materials, plus a fixed percentage for superintendence and profit. This percentage varies from five to twenty-five per cent—it is generally ten per cent. This percentage is too low. When but little machinery was used on construction work, ten per cent. was ample for tools, superintendence and profit, but with expensive machinery another ten per cent. should be added.

When it is stated that the more the work is made to cost, the greater is the profit of the contractor, it is at once shown that this method of doing work is objectionable, and counter to all business principles. Yet much work is done under this form of contract. However, there is not a class of work done under this method that cannot be done under some other.

This method must not be confused with "percentage bidding," which is a method now being used by a number of cities to prevent unbalancing bids. It is a variation of the unit price method. The engineer makes up an estimate of work to be done, setting down unit prices for each item. This estimate is given to the contractor who bids a per cent. of the prices named, and the contractor bidding the smallest per cent. is awarded the work. It is also possible to have percentage bidding on lump sum contracts.

Cost Plus a Fixed Sum

4. The cost plus a fixed sum contract, is a variation of number 3. The owner pays actual cost for all labor and materials and in addition a fixed sum as profit to the contractor, who brings his organization and knowledge of construction. By this method each party knows in advance the profit to be made, but the total

cost of the work need not be known and seldom is. There are advantages and objections to this method. Some of the advantages are: the owner's and contractor's interest should be identical, as to increase the cost will not add to the contractor's profits. The owner must pay the entire cost of the work as the contractor risks neither his time nor his money, as he does under the lump sum method. There cannot be disputes as to extras, as they cannot occur. Changes can be made in plans and specifications when ever it may suit the owner. Work can be started before all the plans have been made. Likewise the owner can take possession of any part of the work at any time and not wait for the entire job to be completed. The incentive of the contractor should be to do the best class of work and to do it as rapidly as possible. The fixed sum charged is generally about ten per cent. on the total estimated cost of the work, but should the work cost more or less than the estimate, the contractor's profit still remains fixed.

One objection to this style of contract is that the contractor ceases in the true sense of the word, to be a contractor, as he becomes a labor agent and a superintendent of construction for the owner. This form of contract also creates a tendency to take from the engineer and architect certain work that is rightly theirs and also rob them of prerogatives. Differences can arise between the owner and his engineer or architect caused by the position taken by the contractor.

The contractor may be placed in an unusual position as to buying and using outfit, as in cases where special machines are needed the owner would not be willing to pay the entire cost of such machines, and the contractor would not wish to purchase as he may never have use for them again. Thus the job may be done without proper machinery. The contractor is liable to gain a bad name in the labor world, as, at the command of the owner, he is compelled to mass large numbers of men on a piece of work for short periods of time, and then must discharge them as soon as the material is used up. It is but natural that men should resent this. Under other methods the contractor maintains a force of men that he can work economically at all times. The cost plus a fixed sum method has a tendency to throttle competition, as the nature of the contract is more of a deal for each job than a proposal and competition bid. It is a case of calling in a contractor and offering him the work.

The cost plus a fixed sum method is used for all classes of work, but if it has any special merit, it is in foundation work, and other construction where it is very difficult to estimate the work to be done, and also to keep a record of the work as it is accomplished.—The Contractor, Chicago.

Ozone Plant at St. Petersburg, Russia

A new ozone plant and mechanical filters have been installed at St. Petersburg, Russia, to purify a portion of the water supply of that city, which had formerly been pumped from the Neva River without undergoing treatment. The municipal supply is furnished by three waterworks; the largest one includes a sand filtration plant, while the other two used the raw river water. At one of the latter the ozone plant and filters were built and put into operation at the beginning of the present year. The plant serves a district in which the daily consumption of water amounts to 13,200,000 gal.

The river water, according to an article by Dr. G.

Erlwein in "Metallurgical and Chemical Engineering," contains a large amount of suspended matter and before reaching the filters coagulation with sulphate of alumina and sedimentation in eight basins are employed. The rapid filter plant comprises 38 units of the Howatson type, which are similar to the American Jewell filters. The filter effluent passes directly to the ozone sterilization towers, a small amount being reserved as wash water.

The ozone plant comprises 128 Siemens & Halske ozonizers of the tube type and 5 sterilization towers. Before entering the ozonizers the air is dried by a refrigerating plant in order to increase the yield of ozone. Otto injectors, operating at a water pressure of 14 feet, suck the ozonized air from the ozonizers and drive it, mixed with water, to the sterilization towers. The absorption of the ozone and the sterilization of the water occurs partly in the injectors at the top of the sterilization towers and partly in the towers in which the ozonized air rises from the bottom in a finely divided state and is brought into intimate contact with the water. From the towers the water passes over cascades to remove the air and into a pipe line leading to a storage tank for pure water, from which it is pumped into the supply lines of the city.

For the operation of the whole plant a special electric station has been erected, containing boilers, steam engines and three-phase generators. By means of three high-frequency converters the three-phase currents produced in the generators are brought to a frequency of 500 periods, for the ozonizers require a high-frequency current. The current is transformed up to a voltage of 7,000, the operating voltage of the ozonizers. The power plant contains two steam engines, each of 150 h.p., direct connected to three-phase generators; a third machine is held in reserve. The electric current is used not only for the ozone plant, but also for driving the stirring devices, wash-water pumps and the other machinery of the mechanical filtration plant.

The cost of operation, including the cost of aluminum sulphate and rapid filtration, is said to be from about \$15 to \$17 per 1,000,000 gal. Ozonization is said to amount to about one-half of the total cost. The bacterial content of the treated water, according to Dr. Erlwein, varies from 0 to 3 per cubic centimeter; pathogenic bacilli are not present in the effluent of the plant. The plant was installed as the result of experimental work conducted on a large scale by a committee of Russian bacteriologists and sanitary engineers; the experimental plant had a capacity of about 26,418 gal. per hour.

A Goat Story

Eighty Angora goats put to work by the Puget Sound Electric Company in clearing its right of way between Seattle and Tacoma are making good progress. They are moving in the direction of Seattle at the rate of a mile a month, devouring the underbrush and attacking the roots of shrubbery along the right of way of the interurban system. The company put the army of Angora goats to work four months ago, and the experiment has proved an absolute success. Their work has been so thorough that they will not have to repeat the trip over the 26 miles of right of way. At the present rate at which they are grazing along the interurban road they should reach Seattle in about a year and a half.—Portland, Ore., Press.

Tests of Hollow Building Bricks from Medicine Hat

Highly successful results were obtained by Professor Brydone-Jack, professor of civil engineering in the University of Manitoba, upon a test of some hollow clay blocks submitted by Mr. Hook for the Alberta Clay Products Company, of Medicine Hat, Alta. Through the courtesy of Mr. A. K. Grimmer, city engineer of Medicine Hat, we are enabled to give the following details, which will doubtless be of interest to many of our readers:

University of Manitoba

WINNIPEG CANADA.

April 6th, 1911

Compression tests made on hollow bricks, submitted by Mr. Hook, for the Alberta Clay Products Co., Medicine Hat, Alberta

DIMENSIONS	Load required to produce gross failure Pounds	STRESS REQUIRED TO PRODUCE FAILURE		Breaking Load Pounds	BREAKING STRESS		REMARKS
		Pounds per sq. in.	Pounds per sq. ft.		Pounds per sq. in.	Pounds per sq. ft.	
8"x8"x16"	88000	830	119500	140800	1230	191500	Load was applied to three specimens as shown below.
" "	46000	430	60700	178780	1620	233000	
" "	83000	780	108400	26040	870	125500	
6"x8"x12"	29000	287	41300	96550	950	137500	
" "	17000	160	22600	109800	1084	150000	
" "	53000	512	73700	124990	1210	174000	
5"x8"x12"	13000	124	17360	91870	825	126000	
8"x8"x16"	67000	2050	295000	121490	3740	528000	
5"x8"x12"	52000	2970	427500	92670	5300	763000	
4"x12"x12"	39000	1680	242000	49430	2130	306500	Tested on end
3"x12"x12"	57000	2880	415000	79070	3990	575000	
5"x8"x12"	13000	204	29400	63000	832	119800	
4"x12"x12"	13000	238	34250	31630	578	83200	Tested on edge
5"x12"x12"	7000	172	24800	23310	574	82800	

NOTE.—Unit stresses are calculated from the full bearing area.

(Signed) E. BRYDONE-JACK.

April 6th, 1911.

Professor of Civil Engineering

Four waterproofed reservoirs, built by the El Paso Southwestern Railway a year ago, have given satisfactory service as the result of surface treatment of the concrete linings. The depth of water is 12 feet. Soap and alum were first used in coating the lining, which was 4 to 6 inches thick. Two coats of each were applied, beginning with the soap, and alternating. Hot asphalt, or cold prepared asphalt paint, was then put on the surface. Some trouble was experienced in making the asphalt adhere permanently, probably due to the fact that the surface was smooth and glossy as a result of the alum and soap treatment. The prepared asphalt paint adhered more firmly, however, and proved generally satisfactory. The work was done on the basis that dense concrete, rich in cement, is the primary requisite for watertightness. The treatment was selected after tests to determine the qualities of the soap and alum solutions and the asphalt and paint.

Traffic on Canadian canals during 1910 amounted to 42,503,305 tons, an increase of 9,857,407 tons as compared with 1909. The increase in tons occurred in the following canals: The Soo, 9,155,503; Welland, 313,166; St. Lawrence, 335,754; Ottawa, 43,204; Rideau, 43,107; St. Peters, 746; Murray, 62,693. Decreases in tonnage for the year of 82,818 and 13,948 are reported for the Chambly and Trent canals respectively.

Criticism of the Toronto Building By-Law

Abstract of Memorial Presented to the Mayor and Board of Control by Expert Investigating Committee—A Defective and Unreasonable Code

The following pages contain an abstract of a memorial presented to the Mayor and Board of Control of Toronto on Tuesday, May 16th, by a general committee of citizens representing various technical and business organizations, requesting a revision of the Toronto Building By-law.

The following is a list of members of the General Committee:

Toronto Branch of the Canadian Manufacturers' Association

W. C. Phillips, Phillips Manufacturing Company.
J. P. Murray, Toronto Carpet Manufacturing Company.
Thos. Roden, Roden Bros.
Geo. Brigden, Brigden's Limited.

Ontario Association of Architects

H. B. Gordon, Gordon & Helliwell, Architects.
Murray A. White, Burke, Horwood & White, Architects.
Edwin Menges, Reid & Brown, Structural Steel Works.

Toronto Society of Architects

C. H. Acton Bond, Bond & Smith, Architects.
J. C. B. Horwood, Burke, Horwood & White, Architects.
C. D. Lennox, care E. J. Lennox, Architect.

Engineers' Club of Toronto

C. M. Canniff, Fielding & Canniff Company.
L. J. Street, Vice-President Canadian Inspection Co.
C. R. Young, Barber & Young, Structural Engineers.

Toronto Branch of the Canadian Society of Civil Engineers

Dr. John Galbraith, Dean of the Faculty of Applied Science and Engineering, University of Toronto.
A. W. Connor, Bowman & Connor, Structural Engineers.
C. W. Noble, Contracting Engineer.

Canadian Cement and Concrete Association

Peter Gillespie, Lecturer in Applied Mechanics, University of Toronto.
Gustave Kahn, Director, Trussed Concrete Steel Company of Canada.
Robert F. Havlik, Engineer, Ideal Concrete Machinery Company.

Builders' Exchange

R. L. McIntyre, McGregor & McIntyre, Structural Steel Works.
Arthur Dinnis, Richard Dinnis & Son, Contractors.
John Aldridge, Contractor.

W. F. Evans, Engineer, Steel & Radiation, Limited.
A. H. Gregg, Wickson & Gregg, Architects.
A. H. Harkness, Structural Engineer.
W. Ford Howland, Langley & Howland, Architects.
T. Harry Mace, Structural Engineer.
J. Morrow Oxley, Chief Engineer, McGregor & McIntyre, Structural Steel Works.
John A. Pearson, Darling & Pearson, Architects.
W. E. Wagner, Engineer and Contractor.
A. F. Wells, Wells & Gray, Contractors.

The memorial, which is discussed editorially in another column, is divided into Parts I. and II.

Part I. contains "an enumeration of the principal grounds of complaint and a consideration of the practical effect of having to conform to the present imperfect code," prefaced by an account of the developments which led up to the formation

of the committee and an interesting explanation of the constructive nature of the investigations.

Part II. contains a detailed criticism of the present by-law.

The recommendations are based upon the best engineering practice and not upon comparisons with the building codes of other cities, many of which contain unjust and discriminating clauses.

The objectionable features of the by-law upon which the committee bases its request for revision may be stated briefly as follows:

1. The exacting and unreasonable demands of many of its provisions.
2. Undue laxity in certain other provisions.
3. Incompleteness.
4. Faulty editing.

1. Undue Severity

Exacting and unreasonable demands are met with in many sections of the written by-law. In the interests of brevity only the most important of these will be indicated here, the remainder being cited and discussed in Part II. It should be noted in passing that the objectionable requirements enumerated below are those of the written code only, and that the faulty interpretation of the by-law constitutes an additional grievance. The features to which most objection is raised on the ground of undue severity are as follows:

(a) Ten inches of fireproofing (nine inches of brick work and one inch of Portland cement grout) all around external iron and steel columns, and the compulsory use of fireproofing for iron and steel columns in timber construction buildings.

(b) The requirement of curtain walls fourteen inches or more in thickness for all materials, parapet walls fourteen inches thick, and the fixing of the thickness of basement bearing walls, however lightly loaded, at not less than fourteen inches.

(c) Ridiculously low allowable bearing pressures on brick work, necessitating 50 per cent. excess material in piers, pilasters or walls in which the compressive resistance of the brick work is the determining factor of the design.

(d) Unduly exacting rules respecting the number of piles in certain pile foundations.

(e) An allowable bending stress on encased grillage beams much less than is commonly adopted; excessive thickness of the encasing concrete, and the requirement of unnecessary asphalt and plaster coatings.

(f) Impossible assumptions as to the amount of live load on columns, involving in the case of tall office buildings a load in some instances as much as 50 per cent. greater than the maximum probable load.

(g) Lower allowable stresses and severer assumptions of design for plate girders than are customary in good practice; low permissible stresses on shop rivets; the requirement of excessive material for steel columns in the lower storeys of buildings.

(h) Exceptionally low allowable stresses on timber columns.

(i) Specifications of impossible floor loads in a number of classes of buildings.

(j) The provision that the horizontal wind pressure on sloping roofs shall be considered as acting with the full specified intensity of 30 pounds per square foot on the sloping area of the roof.

(k) Excessively low allowable stresses on plain and reinforced concrete; untenable assumptions respecting the design of reinforced concrete structures, the impossible requirement that the deflection of a slab loaded beyond the elastic limit shall be proportional to the load.

2. Undue Laxity

This committee wishes it to be clearly understood that the primary object of its labors was not to cheapen building construction in Toronto, but to secure the enactment of a reasonable, safe and workable by-law. Consequently,

wherever certain provisions were, in the opinion of the committee, such as to permit questionable construction, more stringent requirements have been recommended. The more important instances of undue laxity in the written by-law are as follows:

- (a) The allowing of the use of inferior grades of Portland cement.
- (b) The limitation of the use of fireproof shutters, wired glass or outside sprinklers to warehouses and factories over two storeys in height.
- (c) The permission of non-fireproof public schools up to 55 feet in height.
- (d) The allowing of woodwork within two feet of cupolas of foundries, and the requirement of only four inches of brick work on a 3/16 inch sheet of metal under boilers or furnaces resting on wooden floors.
- (e) Insufficient strength in steel columns in the upper storeys of buildings.
- (f) Higher allowable stresses on wind bracing than are usually permitted.
- (g) Insufficient protection against corrosion of steel towers supporting water tanks.
- (h) The omission of special stair protection in factories, warehouses and retail stores equipped with automatic sprinkler systems.
- (i) The fixing of the required strength of concrete blocks at too low a limit.
- (j) Inadequate provision for the fire protection of lumber and wood yards in congested districts; insufficient restrictions respecting the storage of hay, straw, ashes and highly corrosive acids.
- (k) The permission of wood framing construction for buildings of any size in Fire Limit D (south of the Esplanade).

3. Incompleteness

A critical examination of the present by-law discloses the fact that little or no reference is made to a number of new materials and forms of construction which are now taking an important place in building operations. It is true that some of these are used by special permission of the City Architect, but for the sake of convenience and definiteness the conditions under which their employment is permitted should be inserted in the written code at the earliest possible opportunity. Again, important considerations materially affecting the designs are in many instances not mentioned. While under ordinary conditions this would not prove a serious matter, so frequently has the City Architect's Department placed interpretations on the present by-law entirely at variance with generally accepted engineering theory and practice, that it is considered desirable to have all important assumptions of design clearly stated in the code. In this way the inconvenience and loss of time consequent upon learning the unusual methods of calculation adopted by the City Architect's Department would be avoided.

In the interests of convenience to the public it would also be desirable to have all constructional requirements of the Ontario Factories Act and the Ontario Shops Regulation Act covered in the by-law.

The following are some of the important matters which receive no consideration in the by-law:

- (a) Provision for the use of reinforced concrete footings, piles, lintels, pads, retaining walls and chimneys.
- (b) The use of cement stucco veneer, as well as brick veneer for frame buildings.
- (c) The use of metal lath and cement plaster for the enclosing walls of light and elevator shafts.
- (d) The use of hollow concrete walls.
- (e) Specifications of the requirements of terra cotta or hollow tile, with respect to strength and absorption and permission for its use as an independent material in residences and similar buildings.
- (f) The use of radial firebrick chimneys.
- (g) Provisions for light forms of construction commercially practicable for greenhouses.
- (h) The number of stairs required for given floor areas.
- (i) Necessary dimensions of fire escapes.
- (j) The relative transverse and longitudinal bending moments on concrete floor slabs; the distribution of loading along beams carrying slabs reinforced in both directions.
- (k) Requirements concerning bridges between buildings. Some of the subjects which are imperfectly or indefinitely treated in the code are as follows:
 - (a) The classification of buildings.
 - (b) The reduction of live loads on columns and footings.

- (c) Proportioning of column footings to obviate unequal settlement.
- (d) Wind pressure on sloping roofs.
- (e) Workmanship in reinforced concrete construction.

4. Faulty Editing

Faulty editing of the by-law is responsible for much loss of time and inconvenience to the architect or engineer who is called upon to use it. In a number of instances provisions are located in sections to which they do not belong. For example, the title of sections 27, page 72, is "Wooden columns," while the subjects treated under the section include not only "Wooden Columns," but "Wooden Beams," "Wind Pressure," and "Working Stresses." A further complication in this section results from the treatment of the subject "Eccentric Loads" under the sub-heading "Wooden Beams." Another case of bad arrangement consists in including under the title "Apartment Houses," sections 43, 44, 45, 46 (pages 96 and 97), which refer to asbestos paper between floors, trimming of wooden beams away from flues, metal stirrups, post caps and projections over the street line. Lack of clearness in statement is, of course, a more serious defect than bad arrangement, and of this there are numerous instances. The following examples may be cited in illustration:

- (a) The provisions respecting height of ceilings and window areas, while apparently intended to apply only to buildings for human habitation, are not so described in the by-law.
- (b) The limitation of the offsets of concrete footings to one-half of the depth of the course below might, for all that is said to the contrary in the by-law, be made to apply to reinforced concrete footings.
- (c) While the limitation of the maximum height of piers to seven times their least lateral dimension is obviously based upon the use of brick this fact is not stated.
- (d) The formula for the strength of wooden beams purports to give the "ultimate strength," while in reality this is only the "safe strength."

Since the ease with which a building code can be used depends to a considerable extent on the comprehensiveness and good arrangement of the index, it is particularly desirable that improvement be made in the by-law in this respect. Many complaints have been expressed to members of the committee concerning the unsatisfactory indexing of the present ordinance.

The practical outcome of the imperfections of the present by-law and of the erroneous rulings which its indefinite and incomplete character permits, must be apparent to all. If the investor or owner is forced to submit to unreasonable demands in the construction of buildings, the cost of building is thereby increased and the amount and character of it cannot but be affected. It follows further that this excess of cost must finally be paid by those who patronize the owner. The results may be stated concisely as follows:

1. High cost of building, especially in fireproof construction.
2. Location of industries elsewhere than in Toronto because of unreasonable requirements of the by-law.
3. Limitation or restriction of building projects.
4. The encouragement of non-fireproof construction.
5. Inconvenience and loss of time to those engaged in building operations.

1. High Cost of Building

The high cost of building in Toronto, particularly in fireproof construction, is a matter of common knowledge and comment among architects and engineers throughout the country. This can not be attributed to especially high prices for material and labor, for the situation in this respect compares favorably with that existing in neighboring large cities. The resulting high cost must therefore be largely assigned to the unduly exacting requirements of the Building By-law.

As has already been indicated, the burden unfortunately falls heaviest upon fireproof construction. The erection of steel and reinforced concrete structures is thus virtually discouraged to the extent that the demands of the by-law may be unsound.

In steel construction the amount of additional material necessitated in order to conform to the present by-law after the requirements of sound engineering practice are satisfied, is sufficient to increase the cost of the skeleton, that is, the steel work, floor slabs or arches, roofs, foundations and fireproofing by from 15 to 30 per cent. For example, Shea's Theatre, Toronto, was designed almost as a duplicate of that in Buffalo, but before the plans got past the Toronto City Architect the weight of steel required was increased by 30.7 per cent. and its cost by approximately the same amount.

The total cost of a steel construction building is, of course, not increased to this extent, since the cost of the skeleton as defined above will only represent from 40 to 60 per cent. of the total cost. In the case of the Bell Telephone Company's building recently completed on Adelaide street west, the total cost of the building was, according to the opinion of the company's architect, at least 10 per cent. more than it should have been had the whole been designed in accordance with good current engineering and architectural practice.

The unusual severity of the Toronto by-law is most strikingly exhibited in its effect on the cost of reinforced concrete construction. It is now generally admitted that this form of construction possesses marked advantages for employment in fireproof buildings, but nevertheless very few buildings of this type have been, or are being, erected in Toronto. The reason is not that natural local conditions are unfavorable, but that the exactions of an unreasonable by-law make its use commercially impracticable. Some actual instances may be of interest.

The Glidden Varnish Company, of Cleveland, contemplated the erection of a five-storey reinforced concrete grinding building here last summer. This structure had been designed by the Osborn Engineering Company, of Cleveland, in accordance with the building code of that city, but the changes in the design necessitated by the Toronto Building By-law so increased the cost of the building that the plans were abandoned and a number of smaller buildings substituted. It was found in this case that the difference in requirements of the building codes of Toronto and Cleveland was responsible for an increase in cost of 15 per cent.

The Union Stock Yards Company wished to use reinforced concrete construction throughout in the 300,000 square feet of buildings which were erected last summer at West Toronto; but after looking into the matter it was found that wood construction would have to be adopted for the roofs, owing to the excessive cost of concrete construction in Toronto. It was found in this connection that the cost of reinforced concrete roofs was at least thirty per cent. greater in Toronto than where the owner would be permitted to take advantage of recent economical developments in constructional practice.

Last summer one of the members of this committee proposed the construction of a reinforced concrete floor for a new school building in this city, basing his design upon the best Canadian and American engineering practice, but adopting the live loads specified in the Toronto by-law. A test was devised and carried out which demonstrated a capacity of 37 per cent. in excess of the test requirements of the by-law, but the City Architect refused a permit and required the addition of concrete and steel which under ordinary conditions as to the prices of material and labor increased the cost of the floor 21 per cent. If the excessive requirements of the present by-law respecting floor loads in schools had been taken into account, the extra cost of this floor over one rationally designed would have been substantially more than 21 per cent.

The foregoing examples have been cited merely to illustrate the excessive cost of reinforced concrete construction in a number of specific instances. Many other similar cases are known to the committee, concerning which information might be furnished, but it is scarcely necessary to multiply examples.

In order to procure additional evidence, the committee has made comparative estimates of the cost of a typical reinforced concrete factory or warehouse building designed (1) in accordance with good current practice, as expressed in the "Recommendations Concerning Reinforced Concrete" submitted in Part II. of this memorial, and (2) in accordance with the Toronto Building By-law as interpreted by the City Architect's Department. The assumed floor and roof live loads are the same in each case, viz., 150 pounds per square foot on each floor, and 40 pounds per square foot on the roof. As a result it was found that the amount of concrete required in the skeleton in order to pass the City Architect's Department was $12\frac{1}{2}$ per cent. more and the amount of reinforcement steel was $56\frac{1}{2}$ per cent. more than the amount required to satisfy the demands of good conservative engineering practice. The cost of the skeleton of such a building was ascertained to be, on the basis of current prices, 20 per cent. more than it should be. Assuming that the cost of the skeleton constituted, say, 55 per cent. of the total cost of the building, and making allowance for the usual percentage of excess cost of curtain walls, parapet walls, etc., a complete reinforced concrete building of this type would then cost about 13 per cent. more than a building meeting with the entire approval of this committee, or

any architect or engineer experienced in reinforced concrete construction. The opinion of this committee, based upon the foregoing facts and upon experience in constructing and estimating the costs of reinforced concrete buildings, is that such structures cost complete in Toronto from 10 to 20 per cent. more than they should were a reasonable and at the same time safe by-law in force, and all-concrete constructions, such as floors, cost from 20 to 30 per cent. more than they should.

Due principally to the especially heavy live load for floors specified in the by-law or fixed by the City Architect, and to the low allowable stresses on timber columns, the cost of mill construction is also found by this committee to be about 10 per cent. greater than it should be.

With these facts in mind, it is evident that the cost of building construction, especially of fireproof buildings, in Toronto, is materially greater than it should be after satisfying all the requirements of sound architectural and engineering practice. On steel construction and mill construction buildings the waste has been shown to be about 10 per cent., and on reinforced concrete buildings from 10 to 20 per cent. In addition the severe requirements respecting floor loads, pressures on brick work, compulsory fireproofing of columns in non-fireproof buildings, are reflected in the cost of buildings of ordinary construction. It is true, on the other hand, that in residences and in some buildings of a similar class there is but little waste involved. Taking this fully into consideration, however, the total cost of building in Toronto in any period is, in the opinion of this committee, at least five per cent. greater than it should be, or with an annual building programme of \$21,000,000 there is a yearly waste of over a million dollars.

2. Location of Industries Outside of Toronto

It is to be expected that when building construction, especially of permanent or fireproof character, is unduly expensive in Toronto, investors will from time to time pass by this city in selecting a location for their plants and buildings. An example of this is afforded in the following incident:

Some years ago, just after the present by-law was enacted, a Toronto architect received enquiries from a Pittsburgh client asking for a copy of the City Building By-law, and stating that he thought of establishing here a branch of a large manufacturing concern which would involve an expenditure of about half a million dollars in building and plant. The only outcome of this was thanks for the by-laws and the statement that they made building much too expensive and practically prohibited the particular kind of building required for his business.

3. Limitation of Building Projects

The curtailment of building projects must of necessity often follow the attempt to enforce an unjust and irrational building code. A typical example of this is as follows:

In the spring of 1910 the National Carbon Company of Cleveland contemplated the erection of a three-storey reinforced concrete warehouse 63 ft. x 102 ft., making it a stand-fireproof building according to the classifications of the underwriters, or a building of the first-class according to the City of Toronto Building By-law. Their architect visited Toronto and after investigating the local conditions, submitted plans for tender on his interpretation of the Toronto by-law. When tenders were received it was found that the cost ran so far in excess of expectations that their original plans had to be abandoned, and it was decided to erect a one-storey building in reinforced concrete instead of the proposed three-storey building. The company was prepared to spend from \$28,000 to \$30,000 for the building originally contemplated, but owing to the cost, based on actual tenders, totalling over \$40,000, or nearly 50 per cent. more than the preliminary estimates, a building was finally erected costing in the neighborhood of \$20,000.

4. Encouragement of Non-Fireproof Construction

Probably the most deplorable result of the present objectionable by-law is the premium which, in effect, it places on non-fireproof construction. Whatever may be said of the probable resistance of mill or slow-burning construction buildings to destruction by fire, it must be apparent that the employment of structural or load-bearing members of combustible materials is always attended with more risk than the use of incombustible materials. No better corroboration of this is needed than in the relative insurance rates of fireproof and mill construction buildings. According to a statement furnished the committee by the Canadian Fire Underwriters' Association, the rates on the latter type of buildings run from 40 to 75 per cent. higher than on the former. It

is especially unfortunate that the use of fireproof construction in schools is attended with so much expense, since the peculiar requirements of school buildings lend themselves remarkably well to certain types of fireproof construction, and where the building code admits of the application of modern constructional ideas, fireproof school buildings can be built at very little additional cost over those of timber construction. Under average conditions fireproof buildings in general should be built for from 10 to 15 per cent. more than for mill construction buildings, but from data in the possession of this committee it is evident that the difference in cost in Toronto is from 20 to 30%. If there were only the normal differences in cost of 10 to 15 per cent., owners would frequently pay the difference and obtain fireproof buildings, but rather than pay 20 to 30 per cent. more, most owners prefer to erect a non-fireproof building and pay higher insurance rates, or go to the expense of equipping the non-fireproof building and pay higher insurance rates, or go to the expense of equipping the non-fireproof building with automatic sprinkler systems throughout.

5. Inconvenience to Architects, Engineers and Others

The inconvenience and loss of time occasioned by the necessity of conforming to an incomplete, indefinite and badly-edited by-law is an important consideration. Many instances are known to the committee where plans prepared strictly in accordance with the text of the by-law have been rejected because they did not satisfy some erroneous assumptions of the City Architect's Department. The designer, who perhaps may reside in another city, cannot be expected to know of the personal views of any members of the City Architect's Department, and he must of necessity base his calculations on the written code. Since this instrument is not followed by the Department, it is absurd to issue it for the guidance of designers, for it necessarily follows that plans prepared in strict accordance with it will not be accepted, and must be re-made, perhaps several times, to meet with the final approval of the City Architect.

To conclude, the net results of the objectionable building by-law which we now have in Toronto are, that the investors of this city waste a million dollars annually, not considering the loss due to vexatious delays in dealing with the City Architect's Department; investors seeking locations for their buildings and plants have more than once passed by this city; extensive building projects have had to be seriously curtailed; and, most serious of all, non-fireproof construction is being effectively encouraged.

For these reasons this committee requests that immediate steps be taken by the City Council to secure the thorough revision of the present ordinance and the enactment of a reasonable, safe and workable by-law.

Respectfully submitted,

Chairman, C. M. Canniff. Secretary, C. R. Young.

Committee.

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Part II.—Detailed Criticism of the Present By Law

DEFINITION OF TERMS

Cements

Section 14, sub-section 26, page 13.—The cement specification given in the by-law does not conform to that followed in standard practice, being somewhat low in its requirements respecting strength. It would thus permit inferior grades of cement to be used. This committee would recommend that the Standard Specification for Cement of the Canadian Society of Civil Engineers be followed in the by-law.

Fireproof Construction

Section 14, sub-section 43, page 19.—In the definition of fireproof construction, the provision that for buildings exceeding one hundred feet in height, all outside window frames

and sash shall be of metal or wood covered with metal, should be amended by eliminating "or wood covered with metal," and by providing that these frames and sash are to be required on exposed sides of buildings only, and further that the windows shall be glazed with wire glass, or protected with fireproof shutters or water curtains, except on the ground floor. In the case of all buildings over one hundred feet, or approximately eight storeys, in height, the committee considers the protection of all exposed openings necessary to provide against the possibility of fire jumping across a street or lane.

Skeleton Construction

Section 14, sub-section 44, page 20.—The provision of the present by-law that in all buildings of skeleton construction the thickness of brick around the exterior columns must not be less than nine inches, is needlessly severe in the light of engineering experience and authoritative testimony of experts who have examined and reported upon buildings subjected to large fires. Thus the special committee of the American Society of Civil Engineers, which made an exhaustive report on the San Francisco fire, found that 4 inches of brick work was quite as satisfactory for fire protection as a greater thickness.

This committee therefore recommends that exterior columns or columns in shop fronts, be fireproofed with either (a) 4 inches of brick work, reinforced with metal fabric or bands spaced not more than three feet apart vertically, with a space of not less than one inch between the columns and the brick work filled with Portland cement grout, or (b) with four inches of reinforced concrete.

The requirement of a minimum thickness of 14 inches for curtain walls, whether of brick or concrete, should not be applied to reinforced concrete. Eight-inch concrete walls reinforced to withstand a uniformly distributed pressure of 30 pounds per square foot on either face of the wall, and properly keyed into the wall columns, would, in the opinion of this committee, be quite as satisfactory as 14-inch brick curtain walls.

It should further be permissible to use any material equivalent to wire glass in fire resisting properties for the spandrel sections from the top of a window in any storey to the bottom of the window in the next storey above, provided this distance does not exceed six feet.

The provision that curtain walls must be increased by 4½ inches in thickness below the uppermost 75 feet of the building and by an additional 4½ inches below the uppermost 135 feet, adds no security to the building and should be removed from the by-law.

REQUIREMENTS AS TO STYLE OF BUILDINGS

Section 16, sub-section 1, page 23.—This sub-section should be rearranged so that (a) no building in ordinary construction is allowed to exceed 50 feet in height, (b) buildings over 50 feet in height and not over 70 feet high to be mill or slow burning construction, and (c) all buildings over 70 feet high to be fireproof construction.

Section 16, sub-section 2, page 23.—This sub-section, providing that all buildings to be used as apartment houses, hotels, schools, etc., shall be of the first class, should be amended by striking out the word "schools." A new sub-section should be framed requiring all schools over two storeys high to be first class (fireproof).

FOUNDATIONS

Section 21, page 33.—The reduction of the specified live loads for the determination of the carrying capacity of footings, piers and columns, is, in the judgment of this committee, smaller than might safely be adopted.

It is recommended that for buildings of group 1 (office buildings, hotels, hospitals, lodging houses, etc.) of the classification proposed above, the full live load on the roof be assumed in figuring the columns supporting the roof, and that the live load on a column between any two floors be the sum of the gross live loads transmitted to that column from all the floors above (and from the roof as well), less a percentage equal to ten times the number of the floors above the column section under consideration until a maximum reduction of 50 per cent. of the gross live load is reached, after which a constant reduction of 50 per cent. shall be used for all column sections below and for the footings as well.

For buildings of groups 2 (factories, warehouses, etc.) and 3 (departmental stores) the provision for reduction of live loads should be similar to that for group 1, except that on account of the more constant character of the live load in these buildings, the reduction should be 5 per cent. per floor,

and the minimum live load should be 65 per cent. of all the gross live loads above.

It is of importance to note that the clause in the present by-law respecting reduction of live loads on columns, and which was copied from the New York Building Code, is not interpreted by the City Architect's Department as the framers of the original clause intended it should be. The correct method of obtaining the live load on any column section in accordance with the spirit of the provision is to reduce the sum of the gross floor and roof loads above by a percentage equal to five times the number of the floors above the column under consideration, beginning at the second floor below the roof. For the columns supporting the roof and the first floor below the roof no reduction is made. The Toronto City Architect's Department has, on the other hand, required that the live load on any column section below the first two sections from the roof shall be made up of the full load on the roof and the full load on the first floor below the roof, plus the remaining floor live loads down to the section under consideration individually reduced by 5, 10, 15, etc., per cent., beginning with the second floor below the roof. By this erroneous ruling the live load which must be figured on a column section in a typical building is figured much higher than could ever be realized. Thus in an office building with a roof live load of, say, 40 pounds per square foot, and a floor live load of 75 pounds per square foot, the total gross live load on the area tributary to one column would be for the column section between the 11th and 12th floors from the top, 865 pounds per square foot. According to the ruling of the City Architect this would be reduced for the column section mentioned to 660 pounds per square foot, whereas the correct load according to the written code would be 50 per cent. of 865, or 433 pounds per square foot. Similar but less serious results would be obtained for the upper tiers of columns. The interpretation placed upon the by-law by the City Architect, thus, in the case cited, requires 49 per cent. more live load to be counted for this particular column section than was contemplated by the authors of this clause. Quite apart from the original intention of the specification, it is obvious that for an office building the requirement that the column section between the 11th and the 12th floors from the top should be figured for 76 per cent. of the sum of the maximum live loads that could ever arise on the various individual floor at any time, is absurd, and involves a great waste of material.

In addition to a revision of the paragraph respecting the determination of the maximum probable loads on footings, piers and columns, some definite provision should be made for the proportioning of footings to obviate unequal settlement. The areas of the various footings should be fixed so that they are to each other as the sum of the dead loads plus such a percentage of the live load as is likely to occur from day to day under average conditions.

Piling

Section 21, sub-section 3, page 33.—The clause should be amended to allow the use of the proper number in the particular work, on the basis of the load to be carried and the safe bearing power of piles, provided the tops are encased in concrete or spanned by distributing beams properly designed to carry the load of the wall to the piles.

Since the use of concrete piles is now becoming common, definite permission should be given in the code for the use of such types as may be approved by the Inspector of Buildings. As the piles might sometimes be moulded in place, special provision for the determination of their bearing power should be made in the code.

Steel Grillages

Section 21, sub-section 7, page 34.—This sub-section is wrongly entitled "Reinforced Concrete Foundations," since it refers altogether to steel grillages encased in concrete. In addition to changing the title it should also be amended as follows: (a) The thickness of the concrete bed below the rails or beams should be proportioned to the spacing of the latter, but in no case should it be less than four inches and the minimum thickness of the concrete casing above them and on the sides and ends should be four inches. It is evident that the requirement of eight inches in the present code is excessive, since two inches covering in reinforced concrete is considered sufficient. (b) The requirement of asphalt coats on the concrete footing course, or a paint of cement grout or red lead on the beams, is detrimental and should be omitted. (c) An external plaster coat of cement mortar is not necessary if a proper mixture be adopted for the concrete of the footing. (d) The permissible working stress of 16,000 lbs. per square inch in bending on steel beams of

grillages encased in concrete, is needlessly low, as good practice permits a stress of 18,000 to 20,000 lbs. per square inch. (e) The 1:2:5 mixture for the concrete of footings is not satisfactory, since enough mortar is not provided to completely fill the voids in the aggregate. Approximately a 1:3:5 mixture should be used for grillages and 1:2:4 for reinforced concrete footings. (f) The requirement that the offsets of concrete footings shall be not more than one-half the depth of the course below, should be limited to plain concrete footings.

Allowable Pressures on Brick Work and Masonry

Section 21, sub-section 13, page 37.—In the table given in the present by-law for the safe loads per square foot on brick work and masonry, the allowable pressures on all classes of brick work are very much lower than the values used in common practice and in the building codes of other large cities. Mr. Peter Gillespie, of the University of Toronto, in an article in the Contract Record for December 7th, 1910, discusses at some length the strength of brick masonry in the light of a large number of recent tests in Canada and in the United States. He shows that from tests made in the University of Toronto on Canadian products, the average crushing strength of ordinary brick masonry laid in lime mortar is 67 tons per square foot, and when laid in cement mortar, 122 tons per square foot. In view of these results it is interesting to note the following safe loads per square foot specified in the Toronto by-law for brick masonry:

Kiln run bricks laid in lime mortar	3 tons
Ordinary bricks laid in Portland cement mortar	5 tons
Hard brick laid in lime mortar	6 tons

It is thus evident that in Toronto the average factor of safety required for brick laid up in lime mortar is 22, and for ordinary brick work with Portland cement mortar no less than 24.

For purposes of comparison Mr. Gillespie quotes from the by-law the following permissible loads per square foot on different kinds of soil:

Gravel and coarse sand, well cemented	8 tons
Dry, hard clay	4 tons
Sand, compact and well cemented	4 tons

His conclusion is most significant:

"Apart altogether from the evidence of tests, does it not seem preposterous that a well compacted sand should be capable of sustaining more load per unit area than any kind of brick masonry, however poor, or that a well cemented gravel should have a sustaining power of nearly three times that of the latter?"

From a study of the available records of tests of brick masonry, the committee is convinced that the permissible stresses on brick work might with perfect safety be increased 50 per cent.

The mixture of concrete specified in the table of safe bearing pressures on page 38 of the by-law being objectionable, as already pointed out, because of insufficient mortar to completely fill the voids of the aggregate, safe bearing values are given for two better-proportioned mixtures.

For foundation walls it should be permissible to use a 1:3:6 mixture of concrete, for which the safe bearing pressure should not be greater than 18 tons per square foot.

The list of safe bearing pressures per square foot on brick work and concrete recommended by the committee is therefore as follows:

	Safe load per Square foot.
Kiln run bricks laid in lime mortar	4½ tons
Ordinary brick laid in Portland cement mortar ..	7½ tons
Hard brick laid in lime mortar	9 tons
Hard brick laid in Portland cement and lime mortar	13½ tons
Hard brick laid in Portland cement mortar	18 tons
Pressed brick laid in lime mortar	12 tons
Pressed brick laid in Portland cement mortar ...	21 tons
Concrete, one part cement, three parts sand, six parts stone	18 tons
Concrete, one part cement, three parts sand, five parts stone	20 tons
Concrete, one part cement, two parts sand, four parts stone	30 tons

In case of fine water-washed sand being used exclusively in concrete, the safe loads per square foot shall be 20 per cent. less than those given in the above table. If the concrete contains equal parts of water-washed and pit sand, the values given in the table may be used; or if it is desired to use water-washed sand only, and adhere to the values given in the table, this may be done by substituting a

1:2½:4 mixture for the 1:3:5 mixture and 1:1½:3 for the 1:2:4 mixture.

WALLS OF BUILDINGS

Section 22, sub-section 4, page 45.—For pier construction the requirement in all cases of a 14-inch spandrel wall is excessive, and a 9-inch reinforced brick wall laid in cement mortar should be allowed for walls up to a clear span of 12 feet and a clear height of 12 feet. If both dimensions are greater than this, the thickness should then be 14 inches.

Section 22, sub-section 6, page 45.—Internal bearing walls in basements should be allowed to be of 9 inches of brick or 6 inches of reinforced concrete if the stress upon them does not exceed the allowable pressures on brick work and concrete.

In this connection it is of interest to note that while piers alone would be permitted to carry the ends of beams or girders, if a connecting wall is built between the piers it is required to be 14 inches thick.

Section 22, sub-section 7, paragraph (e) page 45.—The requirement of 9 inches of brick work around iron or steel columns introduced in brick walls for carrying trusses or girders is needlessly severe and should be reduced to 4½ inches.

Section 22, sub-section 16, page 51.—The use of cement stucco veneer, as well as brick veneer, should be allowed for frame buildings. The former should consist of a cement plaster coat on metal lath or of reinforced slabs suitably tied to the building.

Section 22, sub-section 18, page 52.—Parapet walls need not be 14 inches thick except where they exceed three feet in height. For lesser heights nine inches is sufficient. All parapet walls should have a suitable coping laid in cement mortar.

Sections 22, sub-section 24, page 54.—The hanging of a fire door on wooden frames covered with metal is objectionable, as the entire frame might drop out during a severe fire, and the use of a cord to hold open such a door in the hope that the fire burning it would enable the door to close, is antiquated and unsafe. Such doors should be hung so as to be secure in the severest fire; they should overlap the opening four inches on the sides and top; the thresholds should be of concrete or other fireproof material; and the cord should be replaced by a fusible link melting at 155 degrees.

Cast Iron Columns

Section 25, sub-section 3, page 68.—In the interests of simplicity the formulas in the present by-law for the safe loads on cast iron columns should be replaced by a single straight-line formula. The following formula, giving approximately the same working stresses as the present ones, is recommended:

$$p = \frac{10,000 - 200l}{d}$$

where

p =permissible stress in pounds per square inch.

l =unsupported length in inches.

d =least lateral dimension (diameter or side) in inches.

STEEL AND WROUGHT IRON

Riveted Plate Girders

Section 26, sub-section 1, page 70.—The requirements with respect to the net flange area of plate girders are much more severe than hold in standard practice. The permissible flange stress on steel should be increased from 14,000 to 16,000 pounds per square inch, and one-eighth of the gross area of the web should be allowed as flange area.

The permissible shearing stress on the webs of plate girders should be increased from 9,000 to 10,000 pounds per square inch, to conform more closely to common engineering practice.

Rivet Stresses

Section 26, sub-section 2, page 70.—This sub-section should be arranged more clearly. The permissible shearing stress on steel shop rivets should be increased from 9,000 to 10,000 pounds per square inch, and the permissible bearing stress on steel shop rivets from 18,000 to 20,000 pounds per square inch. The permissible bearing stress on steel field rivets should be reduced from 18,000 to 15,000 pounds per square inch.

Columns

Section 26, subsections 3 and 4, page 71.—While the use of wrought iron in the form of columns is comparatively unimportant and is now limited to wrought iron tubes or pipes, the committee recommends that formulas for its use

be retained in the by-law. The present formulas should be replaced by a single straight-line formula similar to that proposed below for steel columns and based on the lower compressive resistance of wrought iron.

Section 26, sub-sections 5 and 6, page 71.—The formula for the design of steel columns specified in the by-law is based upon a small group of column tests made years ago and does not conform very closely with the entire range of tests now available nor with the improved knowledge of steel columns resulting from recent investigation. It is now very generally held that the working strength of a steel column should be based, not upon the ultimate strength, as was formerly the case, but upon the elastic limit, since loading a permanently deformed column would be attended by considerable danger. The usually accepted factor of safety on the elastic limit is two. Consequently the suitability of the present formula can only be investigated by observing its conformity with the recorded elastic limits of full-sized columns under test. For this purpose Fig. 1 has been prepared, in which are shown the plotted values of the elastic limits divided by two for all tests known to the committee, an

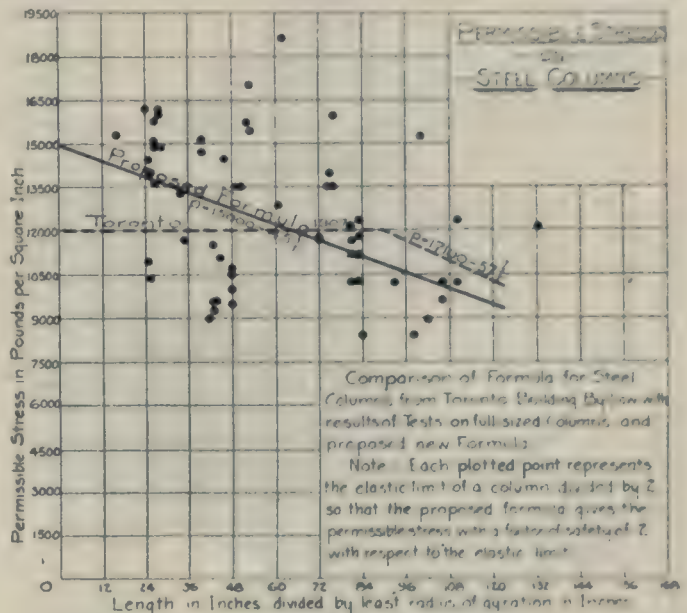


Fig. 1

adjustment being made in the figures for the wrought iron and nickel steel columns to express the probable safe strength of medium structural steel columns of the same dimensions. From the figure it is evident that columns having a low value of l/r are at present required to be unnecessarily strong, while relatively slender columns are allowed to be much too light for the computed loads. This committee therefore recommends that for steel columns and struts where l/r does not exceed 125 the following formula be adopted:

$$p = \frac{15,000 - 45l}{r}$$

where p =safe compressive stress in pounds per square inch.

l =unsupported length in inches.

r =least radius of gyration in inches.

WOOD

The allowable stresses on wood prescribed in the by-law in a number of instances do not conform very closely to the results of tests, and should therefore be changed. Simplification of the column and beam formulas is also desirable.

Wooden Columns

Section 27, sub-section 1-3, page 72.—From an extensive series of tests reported by the Watertown Arsenal, the following formulas have been developed.

$$p = \frac{1100 - 15l}{d} \text{—for oak and long leaf pine.}$$

$$p = \frac{700 - 10l}{d} \text{—for white pine, red pine, spruce and hemlock.}$$

They are based on a factor of safety of five and give for an assumed value of l/d , stresses considerably higher than those which the present code recommends. In addition, it

is believed that a straight line formula will fit the tests already available quite as well as the more complicated ones in the present by-law. A graph showing the tests consulted is shown in Fig. 2. No distinction is necessary between square and round columns and the formulas are therefore the same for both.

It is recommended that the maximum value of l/d be 30.

Wooden Beams

Section 27, sub-section 4, page 73.—The form of the expression given in this sub-section for the safe carrying capacity of wooden beams is objectionable, in that it is particular and applies only to beams for which the entire load is uniformly distributed. The statement that the formula is for "ultimate loads" is incorrect. From the coefficients listed it is evident that the formula is for "maximum safe loads."

The use of the special coefficients "C" and the definition of "L" as the span in feet while on the preceding page "L" signifies the length of a post in inches, is liable to create confusion. Errors in the use of a formula would therefore be much less likely if it were of the following form:

$$bd^2 = \frac{6M}{f}$$

in which b =breadth of beam in inches.

d =depth of beam in inches.

M =bending moment in inch-pounds.

f =permissible fibre stress in pounds per square inch.

WIND PRESSURE

The provision that all structures shall be designed to resist a horizontal wind pressure of 30 pounds per square foot of exposed area, including the roof in any direction, should be modified by altering the last few words to "In-

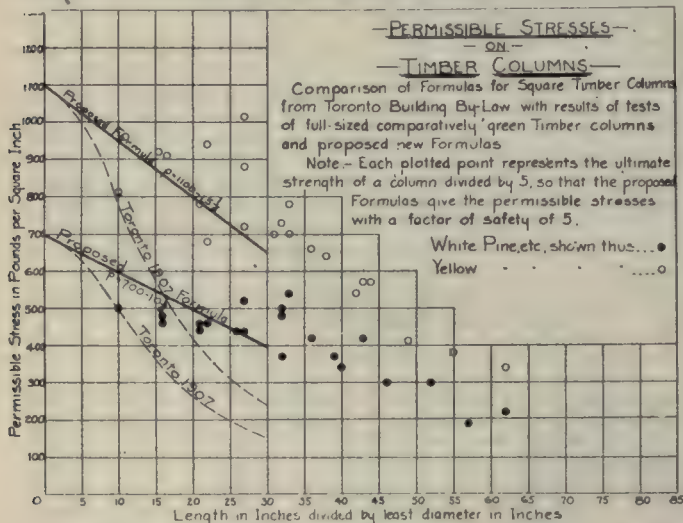


Fig. 2

cluding the vertical projection of the roof." The ruling of the City Architect that the horizontal wind pressure on a sloping roof shall be considered as 30 pounds per square foot on the area of the roof as measured up the slope, is absurd. A horizontal wind pressure of 30 pounds per square foot could not possibly produce a pressure of 30 pounds per square foot on any inclined surface.

It is recommended that for sloping roofs the wind pressure be considered as acting normal to the roof with an intensity in pounds per square foot of sloping surface of

$$p = \frac{2}{3} i$$

where "i" is the angle of inclination of the roof to the horizontal in degrees. In no case shall "p" exceed 30 pounds per square foot.

Provision should also be made in the by-law for the computation of the wind pressure on cylindrical surfaces, such as water tanks or chimneys. It is recommended that the pressure on such surfaces be taken as 30 pounds per square foot,

acting on an area equal to $\frac{2}{3} dh$ where d =the diameter and h =the height in feet.

WORKING STRESSES

Section 27, sub-section 11, page 75.—This list of working stresses should be made complete by covering all ma-

terials specified in, or recognized by, the by-law. The working stresses on masonry, brick work, concrete and reinforcement for concrete, should therefore for ease of reference be stated in this section, as well as elsewhere.

The following changes in permissible stresses now specified in the by-law are recommended, based upon a close examination of recent tests of the materials concerned. Rolled steel should in each case be specified as medium steel.

Compression (Direct)

The bearing pressure on shop rivets and pins should be increased from 18,000 to 20,000 pounds per square inch, and that on field rivets should be specified as 15,000 pounds per square inch.

Shear

The allowable shearing stresses on steel web plates and rivets should be altered as already specified under section 26. The shear on ordinary steel field bolts should be reduced from 7,000 to 5,000 pounds per square inch, and for steel turned bolts with drilled or reamed holes it may be made the same as for field rivets, viz., 7,500 pounds per square inch. Reference to wrought iron web plates, shop rivets, pins and field bolts should be omitted, as these are no longer used.

Extreme Fibre Stresses (Bending)

Rolled steel pins are commonly designed for a bending stress of 25,000 pounds per square inch, and this figure is recommended instead of 18,000 pounds per square inch of the present by-law.

FLOOR AND ROOF LOADS

Section 29, page 79.—The specified live loads on floors are in a number of cases much greater than are at all likely to occur in practice, and in the interests of economical construction some reduction in such loadings should be made. As has already been pointed out, this section should be made to include the provisions respecting wind pressure, amending the title to conform to the change.

Sub-section 1, paragraph (b), page 79.—The probability of the main entrance halls of hotels, apartment houses, tenements or other buildings used as dwellings being loaded to the extent of seventy-five pounds per square foot, is exceedingly small, and for this reason it is recommended that this specified live load be reduced to the same amount as fixed for the private rooms or apartments, viz., fifty pounds per square foot.

Sub-section 1, paragraph (d), page 79.—It has been clearly shown by many careful investigations that with the exception of the ground floor, the floors of office buildings are not subjected to any greater loading than those of an average residence. For this reason the requirement of the present by-law that the office floors shall be calculated for a live load of seventy-five pounds, the halls and lobbies for one hundred pounds, and the ground floor for one hundred and twenty-five pounds, is, in the opinion of the committee, much too severe. It is strongly recommended that these requirements be reduced to fifty pounds without partitions and 75 pounds including partitions on all floors except the ground floor, where it should be one hundred pounds per square foot, no distinction being made between the loading in the corridors and in the offices.

Sub-section 1, paragraph (e), page 80.—For churches, theatres and public buildings with fixed seats a live load of one hundred (100) pounds per square foot is impossible, and this committee recommends that for such buildings the specified load be reduced to fifty (50) pounds on the floor and aisles and seventy-five (75) pounds per square foot in the corridors and lobbies.

Sub-section 1, paragraph (f), page 80.—This committee does not regard live loads of eighty-five (85) pounds per square foot in school rooms and one hundred (100) pounds per square foot in the corridors and lobbies of schools as possible loads, and recommends that the loads be fixed at sixty (60) pounds per square foot in class rooms, corridors or lobbies.

A new paragraph (i) should be inserted relating to the loads on garage floors, in view of the fact that impossible live loads, such as 300 and 350 pounds per square foot are fixed by ruling of the City Architect's Department for the floors of such buildings. It is recommended that the loading for the ground floors of garages and stables be two hundred (200) pounds per square foot, and for all upper floors of such buildings it be one hundred and twenty-five (125) pounds per square foot.

WATER TANKS

Section 32, page 83.—The specification concerning the supports of water tanks should be amended to permit the use of concrete bearing walls or reinforced concrete beams of columns. It should further be stipulated that metal tank supports should be protected from rust by encasing in concrete or by the use of other protecting material.

STAIRS

Sub-section 1, page 84.—This sub-section states that hotels, tenements, lodging or rooming houses having twenty-five or more rooms shall have at least two independent stairways, etc., but it does not state for what number of rooms or for what floor area, three, four or more, stairways will be required.

Sub-section 2, page 85.—The committee would suggest that the size and number of stairs in factories, work rooms, etc., be directly proportionate to the floor area, which is fixed, instead of to the number of people to be employed in the building, which is a variable and a highly indefinite quantity.

Regulating the number and size of stairways to the number of people occupying a building seems practicable in theatres, assembly halls, churches, etc., where there are fixed seats.

Sub-section 2 should, in the opinion of this committee, be amended and enlarged as follows, beginning with the sixth line from the bottom of page 85:

"In all cases the staircases are to be located at the most advantageous points to serve as exits for the whole floor, and where two or more staircases open on a floor they shall be at as great a distance from each other as practicable.

"The staircases as described above shall be enclosed with fireproof partitions of one of the types specified in the recommendations of this memorial concerning section 22, sub-section 41, page 59, of the by-law. Staircases are to be entered at each floor through fireproof doors designed to swing outward. Each staircase is to have a hinged window at each floor opening, so as not to obstruct the passage of the stairs."

FIREPROOFING IRON OR STEEL COLUMNS

Section 37, paragraph 1, page 87.—The encasement of iron or steel columns under breastsummers supporting any portion of the external or party walls of buildings over two storeys in height should be more definitely specified. Instead of "four inches of brick work or other incombustible material," it is recommended that this be "four inches of brick work, tile or concrete, reinforced with mesh fabric or a double casing of metal lath and cement plaster, with an air space between.

It is also recommended that columns without fireproofing in street show windows be limited to buildings less than 4 storeys in height.

Section 37, paragraph 2, page 87.—Since the fireproofing of iron or steel columns in the internal portion of non-fireproof buildings could not of itself retard the complete destruction of the building by fire, this paragraph should, in the opinion of the committee, be omitted, thus leaving the use of such fireproofing optional.

FIREPROOF SHUTTERS

Section 48, page 99.—In the opinion of this committee metal window frames and sash, with standard wire glass, are preferable to fireproof shutters, as the shutters are useless if not closed. The requirement of sub-section 2, that such shutters shall be closed upon completion of the business of the day, is futile, since it is not enforced. Either metal window frames and wire glass, outside sprinklers, or fireproof shutters, should be provided on all buildings (except private dwelling houses and churches) on every exterior window opening above the first storey, except front openings of buildings fronting on streets which are more than 100 feet wide, or where no other buildings are within 100 feet of such openings. The committee does not consider it sufficient to take these measures merely on warehouses or factories over two storeys in height, and only on these buildings where the openings do not face on a street more than 60 feet wide. Where fireproof shutters are used they should be equipped with an automatic closing device.

FIREPROOF FLOOR TESTS

Section 110, sub-section 3, page 138.—It is specified in this sub-section that at the end of the water test the panel shall be loaded to three times the load for which the panel

was designed and that under this increased holding the deflection of the beams or girders shall not exceed three times the allowed deflection for the specified live load. This requirement is unreasonable and impossible, since the deflection is not proportionate to the load after the elastic limit has been passed, but increases at a more rapid ratio than the load.

REINFORCED CONCRETE CONSTRUCTION

Section 111, page 139.—The committee has not found it desirable to submit a detailed criticism of the existing provisions of the code with respect to this form of construction, inasmuch as a thorough revision is necessary. Its views on the principal points at issue are given below in the form of recommendations. These recommendations are obviously not to be regarded as a complete specification for reinforced concrete.

Objection is made to the provisions of the present by-law respecting reinforced concrete on the following general grounds: (1) the strength and reliability of this form of construction is greatly underestimated, (2) the assumption of design and the principles of calculation adopted are not in conformity with sound and generally recognized engineering theory, and (3) the specification is not sufficiently complete to form an effective set of working rules for the designer and constructor. Further, while the shortcomings of the written code are sufficiently serious in themselves, the erroneous interpretations placed upon it by the City Architect's Department, constitute an additional source of objection.

The lack of confidence in the strength and reliability of reinforced concrete is exhibited in the following, among other particulars: A permissible working stress in bending on concrete of only 500 pounds per square inch; an allowable compressive stress of 350 pounds per square inch on concrete in columns; the requirement of a 14-in. concrete wall in lieu of a 9-in. brick wall; the fixing of the test load for concrete floor panels at three times the load for which it is designed.

Some assumptions of design which do not meet with the approval of the committee are: the neglect of all continuity in beams and girders and the fixing of a maximum bending moment in slabs as not less than $1-10 w l^2$; the assumption of the ratio of the modulus of elasticity of steel to that of concrete as 12 inches in all cases; the figuring of longitudinal steel in columns at 12,000 pounds per square inch; the limiting of the ratio of the length to the least lateral dimension of reinforced concrete columns to 12.

Incompleteness of the present by-law allows loop-holes, in the opinion of the committee, for a number of objectionable interpretations, or rulings, of the City Architect's Department. For example, the statement of the formula for the moment of resistance of a concrete beam economically reinforced; the neglect of flange value in a slab which extends on only one side of the beam; the use of compression reinforcement in beams.

In view of the many imperfections of the portion of the by-law dealing with reinforced concrete construction, and in order to avoid misunderstanding as to what is meant, the views of the committee on the principal points at issue are submitted below in the form of certain recommendations. It should be clearly understood that these recommendations in no sense constitute a complete specification for reinforced concrete.

Recommendations Concerning Reinforced Concrete

(1) There shall be no fixed limit to the height of buildings of reinforced concrete except that arising from the requirements of the by-law.

(2) Fine aggregate shall consist of sand, crushed stone or gravel screenings, passing when dry a screen of quarter-inch mesh. Not more than six per cent. shall pass a sieve having 100 meshes per lineal inch. It shall be of clean material, free from vegetable loam or other deleterious matter.

(3) Coarse aggregate shall consist of inert material, such as crushed stone, or gravel, which is retained on a screen of quarter-inch mesh. The particles shall be clean, hard, durable and free from all deleterious material. The maximum size of the coarse aggregate shall be such that it will not separate from the mortar in laying and will not prevent the concrete fully surrounding the reinforcement or filling all parts of the forms. Aggregate containing soft, flat or elongated particles shall not be used.

(4) For reinforced concrete construction the mixture shall not be leaner than one part of cement to six parts of fine and coarse aggregate measured separately and proportioned for maximum density, nor shall the crushing strength

be less than two thousand pounds per square inch after hardening for 28 days. Richer mixtures may be used, for which the permissible stresses hereinafter specified may be increased by amounts proportionate to the increased compressive strength.

(5) Reinforcement steel shall conform to the Manufacturers' Standard Specifications. Either medium or high elastic limit steel may be used, at the discretion of the architect or engineer.

(6) As a basis for calculations for strength of reinforced construction, the following assumptions shall be made:

(a) A plane section before bending remains plane after bending.

(b) The modulus of elasticity of concrete in compression within the usual limits of working stresses is constant.

(c) In calculating the moment of resistance of beams the tensile stresses in the concrete shall be neglected.

(d) Perfect adhesion is assumed between concrete and reinforcement. Under compressive stresses the two materials are therefore stressed in proportion to their moduli of elasticity and their distance from the neutral axis.

(e) The ratio of the modulus of elasticity of steel to the modulus of elasticity of concrete shall be assumed to be 15 for concrete with a crushing strength of 2,000 pounds per square inch at 28 days.

(f) Initial stress in the reinforcement due to contraction or expansion in the concrete may be neglected.

(7) The span length for beams and slabs shall be taken as the distance from centre to centre of supports, but shall not be taken to exceed the clear span, plus the depth of beam or slab. Brackets shall not be considered as reducing the clear span.

(8) Where slabs and beams are figured as simple beams the length shall be considered as the clear distance between supports, excluding brackets.

(9) Length of columns shall be taken as the maximum unsupported length.

The ratio of least diameter to height shall be taken as one-fifteenth.

(10) The bending moment on slabs or beams uniformly loaded and supported at two sides or two ends only shall be taken as $\frac{1}{8}wl^2$ where w is the load per unit of length and l is the span.

(11) For interior spans of slabs, beams and girders, the sum of the maximum positive bending moment at the support shall be taken as $\frac{1}{6}wl^2$ for uniform loading, and for

other loading $\frac{4}{3}$ of the maximum moment for a simple beam loaded in the same manner. The relation of maximum negative moment to maximum positive moment is to be fixed by the architect or engineer and the distribution of the reinforcement arranged accordingly.

(12) For beams simply supported at one end and continuous at the other, the maximum positive bending moment shall be figured at not less than eight-tenths that of a simple beam.

(13) Floor slabs may be designed and reinforced as continuous over the supports. The distribution of loads longitudinally and transversely in slabs reinforced in both directions shall be determined by the following formula:

$$r = L^4 \div (L^4 + B^4)$$

where r is the ratio of the load carried transversely to the whole load, L is the length and B the breadth of the slab. If the length of the slab exceeds 1.5 times its width, the entire load shall be assumed to be carried by the transverse reinforcement. Square slabs are preferably reinforced in both directions, using one-half the computed reinforcement in each direction.

(14) The loads carried to beams by slabs which are reinforced in two directions will not be uniformly distributed to the supporting beams, but may be assumed to vary as the ordinates to the sides of an isosceles triangle, the base of which is the length of the beam. The moments in the beams shall be calculated accordingly.

(15) In beam and slab construction an effective metallic bond shall be provided at the junction of the beam and slab. When the principal slab reinforcement is parallel to the girder, transverse reinforcement shall be used extending over the girder and well into the slab.

(16) Where adequate bond between the slab and the web of the beam is provided, the slab may be considered as

an integral part of the beam, and its effective width shall be determined by the following rules:

(a) It shall not exceed one-fourth of the span length of the beam.

(b) Its overhanging width on either side of the web shall not exceed four times the thickness of the slab nor twice the thickness of the web.

(c) Where the slab extends on only one side of the beam it shall be permissible to consider as effective flange area an overhanging width not greater than four times the thickness of the slab nor twice the thickness of the web.

(17) The working stresses proposed below are for a concrete the ultimate crushing strength of which at an age of 28 days is 2,000 pounds per square inch. For concrete greater or less compressive strength, proportionate increments to, or reductions from the proposed stresses, shall be made.

(a) Bearing compression, 650 pounds per square inch.

(b) Compression in extreme fibre, 650 pounds per square inch, with increase of 15 per cent., near supports in continuous beams.

(c) Axial compression in columns, 500 pounds per square inch and 7,500 pounds per square inch on vertical reinforcement.

(d) Safe shearing stress (combined with diagonal tension) on the concrete in beams, 50 pounds per square inch.

(e) Bond between plain bars and concrete, 60 pounds per square inch of surface of bar; where adequate mechanical bond is provided, a maximum stress of 120 pounds per square inch of surface of bar may be permitted.

(f) The allowable tensile stress in steel reinforcement shall be 16,000 pounds per square inch for steels, with an elastic limit up to 48,000 pounds per square inch; for steels with a higher elastic limit, the permissible stress shall be one-third of the elastic limit; but in no case shall it exceed 20,000 pounds per square inch.

(18) The compressive stress in the steel reinforcement shall be fifteen times the allowed compression in the concrete in which the steel is embedded.

(19) The resisting moment in inch-pounds of a rectangular beam, economically reinforced, shall be taken at Rbd^2 where

b =the breadth of the beam in inches.

d =the depth in inches to the centre of the steel.

R =a coefficient varying with the allowable stress in the steel as follows:

Permissible Stress in Steel in Pounds per Square Inch

	R.
16,000	108
17,000	104
18,000	100
19,000	97
20,000	94

(20) Reinforced concrete walls may be used in place of brick or stone exterior or bearing walls with thickness reduced to two-thirds the thickness specified for brick walls. Such walls shall not be less than six (6) inches thick.

(21) Reinforced concrete-bearing walls shall be reinforced at both faces. The maximum spacing of bars in the same vertical plane shall be 18 inches on centres. The quantity of metal employed shall be sufficient to provide for a uniformly distributed horizontal pressure of 30 pounds per square foot acting on either side of the wall.

(22) Whenever floors are built with a combination of tile or other fillers between joists, the following rules regarding the dimensions and methods of calculation shall be observed:

(a) The ratio of minimum depth to clear span of joist shall not be less than one to twenty-four.

(b) Wherever a portion of the slab above the tile joist shall be considered as acting as a Tee-beam section, the slab portion must be cast monolithic with the joist and must have a minimum thickness of at least two inches. In such case all regulations applying to Tee-beams shall apply to tile and joist construction.

(c) In no case shall the tile or other fillers be considered as bearing stress.

(d) Wherever porous tiles or other materials which by their nature will absorb water from the concrete, are used between the joists, care must be taken to thoroughly saturate the tiles or other materials with water immediately before the concrete is placed.

(23) The minimum clear distance of the reinforcing steel from the face of the concrete shall be two inches for the main reinforcement in columns, one and one-half inches for the reinforcement in girders and beams, and one inch for floor slabs.

(24) The lateral spacing of parallel bars shall not be less than three diameters, centre to centre; and the clear spacing

between two layers of bars shall not be less than one inch.

(25) Definite provisions should be made in the by-law to ensure care and accuracy in construction, since upon this the excellence of reinforced concrete work largely depends. A series of clauses based on the best engineering practice of to-day should be inserted covering the following matters in detail:

- (a) Proportioning and measurement of ingredients.
- (b) Mixing by machine and by hand.
- (c) Placing of concrete.
- (d) Placing in water and in freezing weather.
- (e) Keeping concrete wet.
- (f) Joining up new work to old.
- (g) Shrinkage.
- (h) Splicing of reinforcement.
- (i) Location of joints in concrete work.
- (j) Character of forms.
- (k) Removal of forms.
- (l) Installation of conduits of piping.

Canadian Railroad Development

A syndicate has been formed in London for the construction of a railway from the Saguenay River to Cape Charles Bay, on the east coast of Labrador, a point 650 miles from Quebec. Montreal people, including Rodolphe Forget, are interested in the enterprise, which will connect with the Quebec & Saguenay line, which M. J. O'Brien of Ottawa, will build during the next eighteen months to Murray Bay.

It is understood that governmental legislation authorizing the construction of the Hudson Bay Railway and a supplementary estimate, covering the preliminary cost will be introduced before the end of the present session of Parliament.

Construction work has been started on the first section of the Quebec and Saguenay Railway which is to extend from Ste. Anne de Beaupre to Murray Bay. This work is being undertaken by Messrs. O'Brien & Dohoney, the sub-contractor for the first stage of the line being Mr. R. Kennedy.

Advices from Lethbridge, Alta., quote A. M. Grace, chief engineer of the South Alberta Land Company, as stating that the survey is completed and stakes driven for a railway line from Kipp, across the river from Lethbridge, to Sutherland, on the Canadian Pacific main line, bringing Lethbridge into direct communication with the irrigated tract of land.

D. McNicholl, Montreal, Que., Vice-president Canadian Pacific Railway, has directed the engineering department to begin work at once on the new lake shore line to Toronto. A single track will be laid first, and a double track will be added as soon as business warrants it. At least that is the proposal at present, though there is a possibility that a double track may be built at the outset. In order to expedite the work one party of engineers will work east from Toronto and another west from Glentay.

The difficulties over the construction of the Second Narrows bridge at Vancouver, across Burrard Inlet, have been definitely settled by an agreement that the Burrard Inlet Tunnel & Bridge Company will construct the bridge on the site chosen for the structure by the V. W. & Y. Railway Company, securing for the purpose the railway subsidy of \$200,000 which the Dominion government originally granted to the railway. This sum is to be revoted to the V. W. & Y. and will be turned over by it to the other company. The V. W. & Y. will construct, in turn, the approaches to the bridge as well as connecting lines on the north and south shores.

The Canadian Pacific Railway is to start work shortly on the location of the line from Glentay, 16 miles west of Smith's Falls, to Toronto. The location will extend from Glentay southwest to Belleville, thence along the lake shore

to a point east of Leaside Junction. It will then work up to Leaside. The company will have a grade of about four-tenths of one per cent. per mile. The line between Guelph Junction and Hamilton has been located, and the bulk of the right of way bought. Grading is now progressing on the Victoria Harbor route from a point six or seven miles from Orillia to Bethany. Steel will be laid on the new railway from Victoria Harbor to Bethany, near Peterborough, this year, and before the snow flies it is expected that wheat will be hauled from that harbor.

The Canadian Northern Railway is planning extensive work in British Columbia this season. Contracts will shortly be awarded for the building of the 163-mile stretch of main line from Hope to the crossing of the North Thompson, near Kamloops. The work will be awarded in four sections and in round figures probably represents an expenditure of \$15,000,000. It will include the driving of two and three-quarter miles of tunnels along the Fraser river and the north side of Kamloops Lake.

Kennedy & Macdonald, Edmunston, N.B., have started work on their 65-mile contract on the Transcontinental Railway from Grand Falls, N.B., to Baker Lake, N.B. The construction is in charge of Mr. John Kennedy, who hopes to see the work completed on or about December 1st, 1911. The firm is well provided with both labor and equipment. They will employ 300 men this year. Their equipment consists of 5 locomotives; 15 Hart convertible cars, and 90 other cars; Lidgerwood rapid unloader; Jordan spreader; Marion and Bucyrus steam shovels; track-laying machine; and a complete grading outfit.

The Cowan Construction Company, Winnipeg, Man., which has the contract for the first 40 miles of the new Canadian Northwest line towards Peace River, is to start work at once. The new line towards Peace River has been located for a distance of 80 miles northwest of Edmonton. The line leaves the main line at Oneway, about 30 miles west of the city, and runs northwest to Pembina and to the Athabasca River, and crosses at Habaska, 30 miles below the mouth of the McLeod River. It is understood to be the intention of the railway company to push this line forward as fast as possible, and to have at least 40 miles completed this year. The survey of the line is to be carried through next year to Dunvegan on the Peace River, and eventually through Pine Pass to the Pacific coast.

Work has just been commenced on the laying of an electrical transmission line from Shawinigan Falls to Montreal, a distance of about 85 miles, by the Shawinigan Water & Power Company. This line will consist of two 3-phase circuits. A new receiving and distributing station is being erected by the company near their other east-end station at Maisonneuve as the Montreal terminal of this new line. The cable used will carry 100,000 volts, furnishing the equivalent of 25,000 h.p. This voltage will constitute the first instalment of a contract made by the Shawinigan Company to furnish the Montreal Light, Heat & Power Company with 60,000 h.p. of electrical current. The new line between Shawinigan and Montreal will follow closely the line of the C. P. R. between those points and for the greater part of the distance it will be about ten miles from the line built a few years ago which lay close to the Canadian Northern. The construction work will be done entirely by the company's own staff. The line will be carried on steel towers and it is hoped to have the work completed during the present season. When this line is completed the company will be ready to build another line to furnish the balance of the power contracted for with the Montreal Light, Heat & Power Company.

Personal Mention

Herbert B. Rugh, the well-known Winnipeg architect, was the successful competitor in the competition arranged by the city of Winnipeg for plans for the proposed infectious diseases hospital to be erected at once on the property secured by the city of Riverview. Tenders for construction, estimated to cost \$200,000, will be called immediately.

David Wagstaff, of Toronto, was in Regina recently looking over the prospects for the establishment of a brick making plant in that vicinity.

F. S. Keller and J. L. Keller, late of Mametique, Michigan, have started in the building and contracting business in Moose Jaw. The Keller brothers are Canadians, their home town being Newmarket, Ont.

Mr. O. L. Dickeson, until recently Inspector of Transportation of the Chicago, Burlington & Quincy R. R., has been elected vice-president of the White Pass & Yukon Route, which includes four small railways in Alaska and British Columbia. He will make his headquarters at Vancouver, B.C.

Wm. Henderson, of New Westminster, has retired from the position of waterworks superintendent of that city. Mr. Henderson, who leaves shortly on a trip to his old home in Ireland, will be succeeded as superintendent by Mr. A. S. Wooton, of Vancouver.

The New Chief Engineer of the Quebec Bridge Commission

Mr. C. N. Monsarrat, who has just been appointed Chief Engineer and Chairman of the Quebec Bridge Commission, was born and educated in Montreal. Having a natural aptitude for constructive and designing work he fitted himself for an important position in the draughting office of the C. P. R. some twenty years ago. He received his technical education along architectural and engineering lines by private tuition, being unable to take the full university course owing



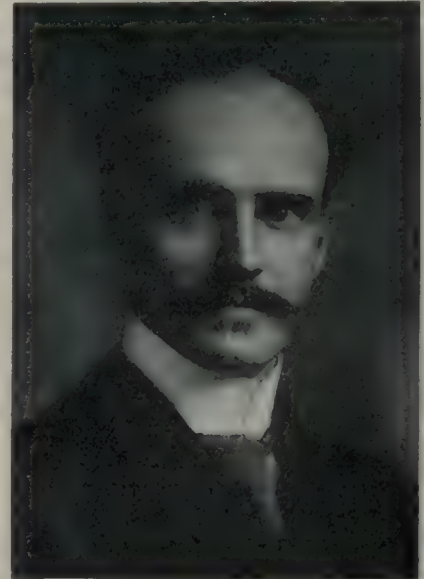
Mr. C. N. Monsarrat, of Montreal,
who has been appointed Chief Engineer of the Quebec Bridge Commission.

to ill health. From 1890 to 1896 he was employed as a draughtsman in the bridge department of the C. P. R., and from 1896 to 1902 as assistant to the engineer in charge of the design and construction of bridges for the C. P. R. In 1903 he was appointed engineer of bridges for the C. P. R., which position he has held until the present time. On account of his new appointment Mr. Monsarrat will be obliged to sever his connection with the C. P. R. That his services have been highly appreciated is indicated by his promotion

to the important position which he has filled for the last eight years. Mr. Monsarrat will succeed Mr. Vautelet on the Quebec Bridge Commission. It is a coincidence that Mr. Monsarrat succeeded Mr. Vautelet as Bridge Engineer for the C. P. R.

Mr. Beaudry Leman,—Montreal Electrical Commission

Mr. Beaudry Leman, general manager of the Canadian General Development Company, Limited, and one of the engineers recently appointed on the electrical commission of the city of Montreal, was born in Montreal and is the son of the late Dr. J. Leman. He received his early education at the Mount St. Louis College in this city, and received his classical training by private tuition. So as to obtain



Mr. Beaudry Leman.

the best possible technical instruction Mr. Leman went to France, where he studied for four years, graduating at the Ecole des Hautes Etudes Industrielles of the University of Lille as a civil engineer. Returning to Montreal he entered McGill University and at the end of a year graduated as Bachelor of Science. This was in 1900. From 1900 to 1905 Mr. Leman was engaged with the Shawinigan Water & Power Company, superintending the installation of their hydro-electric power plant and the construction of the transmission line from Shawinigan to Montreal. In 1905 Mr. Leman spent part of the summer in New York State, being associated with Mr. Wallace C. Johnson in the installation of the first hydro-electric power plant constructed at Niagara Falls. In the latter part of 1905 and the early part of 1906 Mr. Leman was employed on construction work for the St. Maurice Valley Railway. Subsequently he acted as consulting engineer in connection with several hydro-electric development projects.

In 1909 Mr. Leman was appointed by the city of Montreal along with Messrs. Ross and St. George on the first commission to study and report upon the feasibility of constructing a comprehensive conduit system to accommodate all the overhead wires, excepting trolley wires, in the streets of the city. This commission reported to the conduit committee of the city council and acting in conjunction with this committee formulated amendments to the city charter which were adopted by the Provincial Legislature in 1909. This enactment constitutes the basis and authority for the operations of the present electrical commission. The other engineers on the commission are R. S. Kelsch and L. A. Herdt, both of Montreal.

Mr. S. H. Chapman, president and general manager of the Ontario Wind Engine and Pump Company, was in Winnipeg recently, accompanied by Mr. G. M. Miller, architect, for the purpose of awarding contracts for the company's large new warehouse at the corner of Logan avenue and Arlington streets.

Mr. W. M. Arnold, city engineer of Lethbridge, Alta., has resigned.

Winnipeg lost one of its pioneer railway contractors last week in the death of Mr. John Hargrave. The deceased was in his 82nd year.

Mr. R. H. Thompson, city engineer of Seattle, Wash., who was called in to consult with City Engineer Davis, of Prince Rupert, B.C., on the waterworks problem there, reports an ample supply at Woodworth Lake, sufficient indeed to supply the needs of a city of 700,000—Which leaves room for some development at Prince Rupert.

The members of the city engineering staff of Vancouver, B.C., recently presented Mr. W. A. Clement, the retiring city engineer, with a solid gold watch and fob as a souvenir of their regard. The presentation was made by Assistant Engineer Cooper. Mr. Clement, who has been city engineer at Vancouver for the last six years, is going into private consulting practice.

Constructional News and Items of Interest

A noteworthy contract was awarded at Victoria, B.C., recently when the bid of the Canadian Mineral Rubber Company, of Toronto, was accepted for the paving of 568,000 square yards of paving—nearly 30 miles.

Something in the nature of a cement famine is reported from Calgary, Alta., from which city an order has been sent to Spokane for the immediate delivery of 5,000 barrels. The Canada Cement Company at Calgary attribute the shortage to the delay in the arrival of the hydro-electric power. At present they are obliged to rely upon a steam plant which necessarily means a small output.

The Montreal Board of Control is submitting a recommendation for water mains and sewers involving a total expenditure of \$1,200,000.

Plans for the proposed dry dock at Montreal, as submitted by Messrs. Vickers, Sons & Maxim, have been approved.

A special committee of the Calgary city council recommends that in future buildings in that city be limited in height to ten storeys, or not more than 130 feet.

At Victoria, B.C., building permits aggregating in value \$894,450 were issued during the first four months of the year, compared with \$717,945 for the corresponding period of 1910, an increase of 23 per cent.

Saskatoon, Sask., continues to make remarkable progress. Last month the permits totalled \$804,000, compared with \$292,956 for April, 1910.

Fire in the works of Allis-Chalmers-Bullock, Limited, Montreal, caused damage estimated at nearly \$100,000. The loss is amply covered by insurance.

Moose Jaw, Sask., expended a quarter of a million in building last month, against \$150,000 in April, 1910.

The Western Canada Cement Company has been incorporated at Edmonton with a capital stock of \$1,500,000. Lieut.-Governor Bulyea is chairman of the directors of the company. The headquarters will be in Edmonton. The construction of a plant to develop marl deposits west of the city, near Edson, will be commenced at once.

The Canadian Cement Company will commence the erection of a \$400,000 factory at Winnipeg this summer.

The mill will have a capacity of 2,000 barrels a day. Senator Edwards, president of the company, and F. P. Jones, general manager, were in Winnipeg last week completing the preliminary details.

The Prairie Glass Company, of Winnipeg, has incorporated.

The Brown Construction Company, of Winnipeg, has obtained a charter.

Ernest N. Steele and W. A. McKay have formed a partnership as electrical contractors and will carry on business under the firm name of E. W. Steel & Company, at Nelson, B.C.

Doyle & Thomas have started in the contracting business at Calgary.

Gracey & Crane have started an electrical contracting business at Calgary.

The Canadian General Supply Company, Limited, have commenced business in building and mining supplies at Lethbridge.

The McManus Construction Company, of North Battleford, has obtained a charter.

We are advised that the proceedings of the recent annual convention of the Canadian Cement and Concrete Association held in Toronto will be issued shortly. The report of the specification committee, embodying the labors of the committee during the past year, will also be ready at an early date. The executive report a successful season with a balance in the treasury after meeting all claims.

A. W. Berry & Company, contractors, of Boston, are establishing a branch at Moose Jaw.

The North Battleford Concrete Company will shortly commence the manufacture of cement blocks and pipe at North Battleford, Sask.

The plans of Storey & Van Egmond have been accepted for the new Carnegie Library to be erected in Regina. The plans submitted by F. C. Clemens came second in the competition.

Mr. J. F. L. Thomas has opened an office at Winnipeg as representative of Vickers, Sons & Maxim, of Sheffield, Eng., and a plant will be erected.

Thos. Kelly & Sons, contractors, Winnipeg, have removed their offices from Nanton building to the Venus building, corner Notre Dame avenue and Princess streets.

Mr. McCrossen, city electrician, of Vancouver, has been obliged to engage two competent electricians as assistants in order to keep up with the work of inspecting the wiring being put in the hundreds of new buildings in course of erection in all quarters of the city.

The Occidental Construction Company, a large and well-known contracting firm of Minneapolis, has decided to locate in the Canadian West with headquarters at Moose Jaw, Sask.

Work on a factory for the Perfection Concrete Company was commenced at Winnipeg recently. The dimensions of this building are 150 x 90. The works are being erected on a 3½ acre tract, with railroad facilities. All machinery is now on the ground.

A despatch from Cordova, Alaska, states that the last spike in the Copper River and Northwestern railroad has been driven. The first ore from the Bonanza property on Copper mountain will be shipped next week to the Tacoma smelter. The railroad is less than 200 miles long, but cost \$20,000,000. It is owned by the Guggenheim-Morgan syndicate.

The Canada Iron Corporation, Limited

The Splendid Properties Owned by this Company in the Maritime Provinces, Quebec and Ontario—Extensive Use of Electricity

The Canada Iron Corporation, Limited, was incorporated in June, 1908. Under this firm name the following companies became consolidated: Canadian Iron & Foundry Company, Limited; Canada Iron Furnace Company, Limited; Annapolis Iron Company, Limited; and John McDougall & Company. One of the chief aims of the consolidated companies was to secure control of their own mines so as to be absolutely independent in respect to raw material. As a consequence this corporation now owns the following mines, blast furnaces, foundries and machine shops: Iron mines—Annapolis, N.S.; Bathurst, N.B.; Radnor, Que.; Drummondville, Que.; Eganville, Ont. Blast furnaces—Drummondville, Que., capacity 4,500 tons per annum; Radnor, Que., capacity 7,500 tons; Midland, Ont., capacity 150,000 tons. Car Wheel foundries—Hamilton, Ont., 40,000 wheels annually; St. Thom-

Iron Corporation, Limited, now controls the most important iron mines known in Canada.

Mention might be made of the peculiar virtues of Three Rivers iron, which have been known since the earliest days of New France. In 1733 forges were erected for smelting the bog ores on the west side of the St. Maurice river, about eight miles above Three Rivers. The Radnor forges were established in 1860. This property includes not only the Radnor Works, but charcoal kilns and water power on the St. Maurice at Grand Piles, bog ore deposits at Lac-a-la-Tortue and rights over one hundred thousand additional acres of ore bearing lands and swamps in the district of St. Maurice. The corporation owns another extensive tract of bog ore bearing lands and swamps at Drummondville, Que., with about 4,000 acres of hardwood suitable for charcoal. There are also a large proportion of low grade magnetite at the corporation's Radnor mine near Eganville, Renfrew County, Ont., awaiting profitable treatment by magnetic concentration.

In the last half century enormous strides have been made in the reduction of iron ore and the most recent improvements have all been incorporated in the blast furnaces of the Canada Iron Corporation, Limited, at Midland, Ont. There are few sites more advantageous for the erection of blast furnaces.

The furnaces and yards occupy 44 acres of land and the corporation owns 687 acres immediately adjoining. The harbor is available for the deepest boats on the lakes and by the acquisition of the adjoining water lots the corporation has made provision for shipping facilities proportionate to its territory for all time to come. The ore supply is obtained chiefly from the Lake Superior district.

The corporation has a second modern blast furnace plant at Radnor, Que., which is on a branch of the Canadian Pacific Railway, about nine miles north of Three Rivers. A third blast furnace plant is situated at Drummondville. The operations here are similar to those at Radnor, charcoal pig iron being one of the principal products. The iron manufactured from these bog ores is soft, tough, clean, and close in texture, and has fine chilling qualities, the higher grades being admirably adapted for the manufacture of car wheels, and the lower grades for stove work.

The Canada Iron Corporation, Limited, was the first on the continent to make the process of casting pipe, vertically, a continuous operation. At the Fort William plant, where this product is turned out in immense quantities, there are two long parallel pipe pits joined by transfer cars and the pipe flask carriages are moved through them by an endless chain. The ovens are built over the end of one pit and fires from below. The pipe flasks, having been rammed in the other pit, are carried across by the transfer cars and onward slowly through the ovens. The hot metal is poured into them as they emerge and by the time they complete half of the circuit the freshly made pipes are ready to be stripped. In the Fort William plant all sizes of cast iron pipe are manufactured at the rate of 80 to 120 tons every twenty-four hours.

In adopting electric power wherever the conditions are favorable the Canada Iron Corporation, Limited, has followed the practice of the most modern plants in other countries. The first application of it to steel mill work was in the form of the direct current motor, but it was found that



Mr. T. J. Drummond, President
Canada Iron Corporation, Limited, Montreal

as, Ont., 40,000 annually; Fort William, Ont., 50,000 annually; Three Rivers, Que., 40,000 annually. Pipe foundries—Londonderry, N.S., capacity 8,000 tons per annum; Three Rivers, Que., 20,000 annually; Fort William, Ont., capacity 20,000 annually. Machine shops—Londonderry, N.S.; Three Rivers, Que.; Fort William, Ont.; Midland, Ont.; St. Thomas, Ont.; and Hamilton, Ont.

Although the foundries are devoted largely to the manufacture of cast iron pipe and chilled cast iron car wheels, the corporation through its unusual facilities turns out a great variety of other products such as boilers, brake shoes, building castings, columns, hydrants, ore buckets, tank works, etc. From Fort William, where three transcontinental railways meet the head of inland navigation, through the valley of the St. Lawrence to the provinces by the sea there is the same effort to provide for Canadian demands by utilizing Canadian materials from the mine to the finished product.

Experience has shown that the most successful iron and steel manufacturers are those who control the raw material, and in this connection it may be said that the Canada



Canada Iron Corporation's Plant at Fort William, Ont.—The Pipe Pits



Interior View of Car Wheel Shop at the Fort William Plant

the induction motor was more suitable. The works of the corporation at Fort William are operated entirely in this way. Altogether there are 57 motors, aggregating over one thousand horse power.

Originally pipe varied a great deal in length and shape, but a specification standard has been adopted by the American Water Works Association which has greatly simplified matters. This standard has been adopted by this corporation and in due time it is expected that it will become the standard throughout Canada.

The car wheel which to the lay mind may appear unimportant as an article of equipment, is, after all, one of the most important features of a railway train. It has received the best attention that scientific minds could bestow upon it, and the finished article to-day is the product of the highest degree of skill that workmen can attain. The Canada Iron Corporation, Limited, manufactures chilled cast iron car wheels of single plate, double plate, reinforced and spoke patterns; and steel tired wheels with cast iron, wrought iron, cast steel or forged steel centres. It also makes a specialty of wheels of small diameter loose, or mounted on axles, with or without bearings, for contractors' equipment. In Canada there are over one million car wheels in daily use and of these fully 90 per cent. are made of chilled cast iron. Experience has proved that wear of car wheels depends upon the chill. Car wheels are made at Fort William, St. Thomas, Hamilton and Three Rivers.

Montreal Building Notes

Messrs. Wright & Son are the architects for an apartment house containing 24 dwellings on Lincoln avenue. The building is being erected by Mr. J. H. Hand at a cost of some \$40,000.

An apartment house to contain 19 dwellings is being erected at the corner of Labelle and Berri streets, for the estate of Madame Therese Ouimet. The structure will cost \$40,000. The architect is Mr. G. A. Monette, and the contractors, Messrs. Marsen Brothers.

A house to contain 12 families is being erected on St. Charles street for Mr. Isaac L. Hibbard at a cost of \$35,000. The architect is Mr. J. E. Adamson, and the builder, Messrs. Alex. MacKay & Company.

The Catholic School Commissioners of the parish of the Infant Jesus in Laurier Ward are rebuilding the girls' school at the corner of Boulevard St. Joseph and Cadieux street, which was burnt down a couple of months ago. The new structure will for the present be only two storeys high with a basement, and the cost will be \$55,000. The architect is Mr. Dalbe Viau, and the contractors, Messrs. A. Kelly & Company.

Good progress is being made in the erection of the steel work for the new Dominion Express Company's building at the corner of St. James and St. Francois Xavier streets. The concrete columns sunk by the Foundation Company had only been down a week or so when the steel work began to go up. More than half of the ten storeys of steel frame is now in place. Messrs. Peter Lyall & Sons are the contractors.

The work of demolishing the old seminary buildings on St. James and St. Francois Xavier streets opposite the post office is proceeding rapidly. Under the direction of Messrs. Peter Lyall & Sons the building has seemed to melt away, so that within two weeks of the time the razing operations began the old buildings disappeared from the site on which will be reared within the next twelve months the new Transportation Building, whose reputation is that it will be the largest office building in existence in Canada.

Rapid progress is being made with the additions to the General Hospital. This contract is in the hands of Messrs. John Stewart & Company, general contractors, with the Structural Steel Company and F. J. Jago & Company as sub-contractors, in addition to the Bishop Construction Company, who put in the foundations. Messrs. Edward & W. S. Maxwell are the architects.

Obituary

We regret to report the death of Mr. Alexander Niven, the well-known land surveyor, of Toronto. The late Mr. Niven was born at Niagara-on-the-lake in 1836.

The death occurred last week at Regina of Mr. Robert B. Watson, Inspector of the Department of Public Works for the province of Saskatchewan.

Mr. Thomas Pringle, the well-known Montreal hydraulic engineer, and founder of the firm of T. Pringle & Son, died last week. The deceased gentleman was born at Huntingdon, P.Q., in 1829. In 1850 he started business in Montreal as a milling engineer and for many years was prominently identified with numerous water power developments and mill building operations throughout Canada. Early in the sixties the late Mr. Pringle reported upon power development on the Lachine Rapids. Many years later, in 1891 in fact, Mr. Pringle reported a second time on this power in the interests of the Royal Electric Company. In the following year he reported on Chamblay water power for the same concern. He was closely associated with the late Mr. W. MacLea, Walbank, and the two played an important part in the formation of the Lachine Rapids Hydraulic and Land Company, which in 1903 passed into the control of the Montreal Light, Heat and Power Company.

The Missisquoi Marble Company, Phillipsburg, Que., has increased its capital stock from \$500,000 to \$1,000,000. It is understood that the company will make a number of enlargements at its property in order to meet the growing demand for its product, which is richly veined and regarded by architects and builders generally as one of the highest grade marble quarries.

Mr. H. P. Anderson, having disposed of his interest in the Andresen-Evans Company, of Chicago, Ill., of which he was formerly vice-president and chief engineer, is now the sole owner of Canadian patents relating to the Andresen-Evans grab bucket as well as ore and coal handling plants. He has opened an office at Room 16, Liverpool and London and Globe Building, 112 St. James street, Montreal, where, in addition to his own line, he will handle the Milwaukee concrete mixer for the eastern half of Canada.

Automatic Sash Holder

A device for automatically holding a window in any position without the use of cords, weights, or pulleys is the sash holder which has been introduced to the trade by the Automatic Sash Holder Company, 277 Broadway, New York city. A small metal ratchet wheel is sunk in each side of the window sash, and by means of two short spiral springs is made to press firmly against the inside of the frame. The body of the holder requires only an easily made mortise in the side of the sash, about $3\frac{1}{4} \times \frac{7}{8} \times 1\frac{5}{16}$ in., all of which can be done with a $\frac{7}{8}$ -inch auger bit and chisel. The claim is made that the sash holder is equally suitable for old or new construction, but in the latter case there is a great saving both in material and freight as well as bulk by having window frames made without weight pockets, and that owing to constant side pressure the windows, regardless of swellings or shrinkings, will always fit snugly and thus not rattle.

Contracts Department

News of Special Interest to Contractors, Engineers, Manufacturers and Dealers in Building Supplies.

Information for insertion in these columns is invited from Architects, Contractors, Engineers, etc.

Waterworks, Sewerage and Roadways

Amherstburg, Ont.

Tenders for drainage in Malden, Essex County, will be received until May 25th. Information obtained from James Honor, tp. clerk. Estimated cost, about \$20,000.

Banff, B.C.

Tenders for material for extensions to the waterworks here will be received until May 25th. There will be required: 1,680 feet 4-in. cast iron pipe; 2 4-in. gate valves; 3 specials, 6-in. off 4-in. T.; 2 specials, 4-in. off 8-in. T.; 1 special, 4-in. with 45 degree bend; 3 extension valve boxes for 4-in. valves for 6-foot trench; 1 extension valve box for 8-in. valve for 6-ft. trench; 2 two-way standard hydrants for 6-ft. trench, nozzle and thread of these hydrants must correspond with the "Toronto Hydrant." Lyndwode Per-

Barrie, Ont.

The citizens are considering the question of permanent paving for this year.

Calgary, Alta.

The city will erect a sewage disposal plant on the site recently purchased from Mr. Theinbolt.

Tenders will be called shortly for construction of a 6-ft. concrete trunk sewer, length about 3 miles. By-law for \$318,000 was carried recently for same.

Collingwood, Ont.

Tenders will be called within the next three weeks for some two miles of sewers. Nothing definite has been decided in regard to the bituminous paving under consideration by the council.

Tenders are called until May 31st for construction of all-concrete sidewalks to be laid during the year 1911. K. S. Macdonell, city engineer. Advertisement in "Tenders and For Sale Department" of this issue.

Edmonton, Alta.

It is reported that the commissioners have decided to call for new tenders for pumping machinery.

Fort William, Ont.

A by-law will be voted on on May 20th for construction of another 12-in. force main leading from the power house; and also another stand-pipe on the hill, 50 ft. diam. by 100 ft. high.

The city council is considering the paving of about five streets. Estimates are being prepared for asphalt block, sheet asphalt, bitulithic, granatoid and rocmac.

Ingersoll, Ont.

The Board of Health have recommended the council to institute a sewerage system for the town.

Lethbridge, Alta.

Tenders are called until May 31st for the following: street grading, about 130,000 cubic yards; cement sidewalks, about 45,000 square yards; water mains, about 10 miles; sanitary sewers, about 6½ miles; storm sewers, about 28 miles. Plans, etc., with C. M. Arnold, city engineer. E. Adams, mayor.

MaKinak, Man.

Tenders addressed to J. N. Campbell, secretary, Makinak Improvement Committee, will be received until May 20th for construction of about 5,000 square feet (more or less) concrete sidewalk here.

New Liskeard, Ont.

Tenders addressed to P. R. Craven, clerk, will be received until May 31st for supply of No. 1 vitrified sewer pipe and laying of it, including the supplying of cement and gasket, etc. C. H. Fullerton, town engineer.

Ottawa, Ont.

The waterworks committee have recommended to the city council that three by-laws, calling for an expenditure of a million dollars, be submitted to the property holders of the city for ratification. The first by-law calls for the expenditure of \$150,000 to finish the work on the aqueduct. The second is for \$40,000 for main extensions, and the third for \$60,000 for the installation of a booster system.

It is stated that the paving of Little Sussex, Bessier and Mosgrove streets will be proceeded with at once. City Engineer, N. J. Ker.

Prince Albert, Sask.

Tenders are called until May 31st for extensions to water and sewerage systems, construction of concrete sewage pumping station No. 2, supplying and erection of two electrically driven centrifugal sewage pumps and motors. Advertisement in "Tenders and For Sale Department" of this issue.

Olds, Alta.

A waterworks system will be installed here shortly. The C. P. R. management have contracted for 20,000 gallons per day.

Quebec, Que.

Tenders were called until May 17th for the following paving material with the guarantee attached: Granite, 2 years; scoria blocks, 2 years; street asphalt, 10 years; compressed concrete, 10 years; asphalt blocks, 15 years. W. D. Bailarge, City Engineer.

Richmond, B.C.

This municipality have under consideration the expenditure of about \$200,000, part of which will be used to purchase road machinery and to make general road improvement.

Regina, Sask.

Additional paving this year will probably be done on 16th avenue between Broad and Albert streets, 12,000 square yards; Rose street between 16th and Victoria avenues, 64,000 square yards; also Albert and Broad street between Victoria and 16th avenue, 10,000 square yards each.

Stettler, Alta.

The citizens voted in favor of the grading of streets, construction of sidewalks and crossings.

Shawinigan Falls, Que.

The municipality will macadamize 1,200 feet of road this summer by day labor, for which they have all the machinery required. For the 4,000 feet of proposed sewer, the pipe and wood for sheathing, brick for manholes and manhole frames and covers will be required.

Tenders may be called for the three-quarters of a mile of road to be opened on Melville Island.

This municipality contemplate the installation of a turbine pump of 1,500,000 gallons.

Toronto, Ont.

Tenders are called until May 23rd for concrete walks, concrete curbs and sewers. G. R. Geary, Mayor.

Sarnia, Ont.

Tenders are called until May 27th for repair of the Perche drain in Tp. of Sarnia. R. Beattie, reeve. Advertisement in "Tenders and For Sale Department" of this issue.

Victoria, B.C.

The following by-laws will be submitted to the ratepayers on May 18th. For sewer and surface drainage extension, \$300,000. For the purchase of additional park and playground sites, \$235,000.

Waterloo, Ont.

Tenders are called until May 29th for various kinds of pavements in this town. F. S. Kumpf, town clerk. Advertisement in "Tenders and For Sale Department" of this issue.

Windsor, Ont.

A by-law will shortly be submitted to the ratepayers of the city authorizing a \$50,000 bond issue for the purpose of extending the water mains.

AWARDED

Burlington, Ont.

Messrs. Elliott and Riley have secured the contract for a number of concrete sidewalks.

Fort William, Ont.

Contracts for the paving of May and Brodie streets were given to the Warren Bituminous Paving Company and A. P. McNeill respectively.

Ottawa, Ont.

The tenders for the paving of Queen street from Bank to Bay streets were

received by the board of control and the contract awarded to the Ottawa Construction Company, whose tender was the lowest. The amounts were, Ottawa Construction Company, \$14,999; Union Construction Company, \$15,470; and Barber Asphalt Company, \$15,780.

The contract for paving Fairmount avenue from Wellington street to near the G. T. R. tracks was awarded to the Union Construction Company for \$9,563, the lowest tenderer. The other tenders were, Ottawa Construction Company, \$9,985; Barber Asphalt Company, \$10,590. In both instances the Barber Asphalt Company's tender was declared irregular as the guarantee cheque was not sufficient.

Prince Albert, Sask.

The council accepted the commissioners' recommendation in regard to acceptance of tenders, as follows. Canada Iron Corporation for cast iron pipe and specials; Dominion Sewer Pipe Co., for sewer pipe and junctions; Agnew Bros., cement at \$3.26¼ per barrel for Canada Brand; Mussels Limited, hoisting drum; Agnew Bros., for hardware; the Manville Hardware Co., oils, iron pipe and pipe fittings, also for gasoline; Canada Foundry Co. got the contract for a new cement mixer, complete at \$2,309.65; the Hamilton Machine Company's tender for a stone elevator at \$1,145 was accepted. The Climax Good Roads Co. put in a tender for \$395 but the commissioners, after last year's experience with a machine costing \$650, decided in favor of the first named, Hamilton Machine Co., road plow, \$40.00.

Regina, Sask.

The Ontario Asphalt Block Company have been awarded the contract for electric street car track paving, consisting of about 20,000 square yards at \$2.68 per square yard.

South Vancouver, B.C.

It was decided to do the grading on Main street between Fifty-first and Sixty-third avenue by day labor. Six dump carts will be purchased at \$51.40 each, from E. G. Prior & Co., providing the same are satisfactory to the engineer.

Tenders were opened for a topographical survey of the municipality, a rock crusher site, the supply of pipes and fittings for the extension of the water works system, the purchase of additional fire fighting equipment, the purchase of dump carts, the position.

In the former case the tender of Mr. M. L. Gordon of \$2,100 was accepted, the work to be completed within three months. This was by far the lowest tender, the next lowest being \$3,900. Other offers were \$4,150, \$4,900, \$4,925, \$5,840, \$6,500, \$7,070, approximately \$11,500, and one on \$27,200. D. Philpot was awarded the contract for grading Westminster road at \$10,012 (74 cents per cubic yard), the work to be done in eight weeks. The grading of Fraser street between Fifty-first and Fifty-ninth avenues was awarded to F. C. Lane at \$3,540, work to be completed in four weeks.

Railroads, Bridges and Wharves

Beaumaris, Ont.

Tenders are called until June 12th by the Public Works Department for construction of wharf, etc., here. Plans,

etc., at offices of J. G. Sing, district engineer, Toronto; H. J. Lamb, district engineer, London, and on application to local postmaster. R. C. Desrochers, secretary. Noted in last issue.

Cape Rouge, N.S.

Tenders are called until May 31st by Public Works Department, Ottawa, for construction of a landing wharf here. Plans, etc., at offices of the district engineers at Antigonish, Halifax, at above department and on application to the local postmaster.

Edmonton, Alta.

The city commissioners have instructed City Engineer Laternel to prepare plans and specifications for subways under G. T. P. and C. N. R. tracks on Namayo, Syndicate and First streets.

Hickson, Ont.

Tenders addressed to James Anderson, clerk, East Zorra, will be received until May 29th for a bridge in the Tp. of East Zorra.

Montebello, Que.

Tenders are called by Public Works Department, Ottawa, until June 12th for construction of wharf here. Plans, etc., at this department, at the office of District Engineer, Merchants Bank Building, St. James street, Montreal, on application to the local postmaster.

Mulgrave, N.S.

Tenders are called by Public Works Department, Ottawa, for construction of wharf here. Plans at this department, at the offices of District Engineers at Halifax, Antigonish, N.S., and on application to the local postmaster.

Macgillivray Bridge, Ont.

Tenders addressed to Geo. H. Macgillivray, tp. clerk, Charlottenburgh, will be received until June 5th for construction of two concrete abutments on the site of the South Branch bridge, also the removal of the old bridge and foundation and necessary excavation, pile driving and coffer damming (if necessary), and supply of material; for all material and labor necessary for erection of a steel-riveted Warren truss bridge span, between 45 and 50 feet in length with concrete flooring and pipe railing. Specifications at residence of the Reeve, G. B. Cain, Grant's Corners, or at the office of the above.

The Dominion government will place \$80,000 in the estimates for the construction of an overhead bridge across the Rideau canal at Bank street. A reinforced concrete bridge is proposed to cost about \$130,000, the remainder of the cost to be borne by the city. The electors will be asked to vote on it.

Port Arthur, Ont.

In the Commons Railway Committee to-day a bill was considered incorporating the Quebec and Great North-Western Railway Company, whose purpose is to build a line of railway from Port Arthur to Quebec with a branch to Ottawa and Montreal. The directors are Dr. R. Cheverier, P. O'Reiley, P. Clarke, and E. J. Daly, of Ottawa, and Jos. Bourque, of Hull.

Roxton Falls, Que.

Tenders are called until May 20th for construction of two steel bridges of 86 feet in length and also for construction of four abutments in concrete. Plans, etc., prepared by engineer of Public

Works Department of Quebec, at office of the secretary-treasurer, L. Tranche-montagne.

St. John, N.B.

The Provincial government, the St. John Railway Company, and the C.P.R. may unite for the joint erection of a new bridge across the reversing falls here. The citizens of St. John have voted to grant \$300,000 towards the erection of a \$1,000,000 bridge farther down stream at the head of the harbor.

Shawinigan Falls, Que.

Tenders have been called by the municipality for construction of bridge across the St. Maurice river. Cost, about \$40,000. Contract will probably be awarded this week.

Toronto, Ont.

Tenders addressed to Barber & Young, York County Engineers, will be received until May 30th for construction of concrete abutments for bridge over Humber river. Advertisement in "Tenders and For Sale Department" of this issue.

Windsor, Ont.

The government estimates provide for a new dock here, \$30,000.

Welland, Ont.

Tenders are called until May 27th for erection of one large concrete arch across Lyons' Creek and seven smaller ones for the Tp. of Crowland. Information with Reeve, O. A. McKenney; H. L. Pratt, Tp. Clerk.

Woodstock, Ont.

Tenders for construction of three small concrete bridges in the Tp. of Blenheim addressed to E. J. Ure, county engineer, will be received until May 20th. Plans, etc., at office of the above, or at the home of J. O. Given, reeve.

Public Buildings, Churches, Schools, etc.

Brantford, Ont.

The Y. M. C. A. building campaign has closed with \$117,000 to its credit.

Barrie, Ont.

The plans for the new collegiate as a whole have been approved by the Educational Department, Toronto. Mr. Colquhoun, deputy minister.

Blairmore, Alta.

The school trustees here have been authorized to borrow \$5,000 to erect a school.

Black Mountain, B.C.

Tenders are called for a large one-room school until May 31st by Public Works Department, Victoria.

Calgary, Alta.

There is some talk of the tSarland Picture House Co. building a vaudeville and picture house to cost about \$100,000.

Plans are in preparation for six new schools. Tenders will be called in a few days. Each building when complete will cost about \$4,000.

Tenders for heating, ventilating, and plumbing in the new civic market, will be called for in a few days. Cost, \$38,400.

Tenders addressed to F. J. Lawson,

Norman Block, will be received until May 20th for erection of a club house for the Calgary Golf and Country Club, South Calgary. Plans, etc., at office of the above.

Cobourg, Ont.

Tenders for steam heating of Victoria Hall here will be received until June 1. Plans, etc., at office of the County Clerk, Cobourg, George Greer, chairman of committee.

Collingwood, Ont.

P. C. Palin is the architect for the new fire hall to be erected here. Plans are being prepared. Estimated cost, \$12,000.

Cranbrook, B.C.

Plans are being prepared by Mr. J. J. O'Gara, architect, of Calgary, for the brick addition to the St. Eugene Hospital.

Essex, Ont.

Tenders are called until May 31st by Public Works Department, Ottawa, for erection of public building here. Plans, etc., at the office of H. J. Lamb, district engineer, London, Ont., at the postoffice, Essex, Ont., and at this department.

Fleming, Sask.

The ratepayers of the school district here have passed a resolution requesting the school trustees to proceed with the building of a new school.

Fort William, Ont.

Tenders are called until May 27th for reconstruction of St. Peter's Church. Plans, etc., at 705 McIntosh street.

Tenders are called until May 22nd for alterations and additions to Central school. Plans, etc., with R. E. Mason, architect, Victoria Block.

The plans for the new Salvation Army Citadel have been changed to admit of a building to be used strictly for Army purposes only. Captain Walker is in charge.

Tenders addressed to R. E. Mason, architect, Victoria Block, will be called until May 22nd for alterations and additions to Central school. Plans, etc., at office of the above.

The plans have been approved for the addition to Central school. Options on a site in the Wayland addition will be taken for a school.

Georgetown, Ont.

Tenders addressed to secretary, public school board, will be received until May 20th for heating by steam of public school here. Plans, etc., at office of the above.

Hamilton, Ont.

The First Methodist Church have about decided to build a new church on the old site. Plans have been prepared by E. B. Patterson. Contracts not yet let.

Congregational church has bought ground on Main street east for the proposed new church in the near future.

Herbert, Sask.

A new school will be erected. A by-law for \$12,000 will be submitted shortly.

Hull, Que.

The offer of the Sisters of Providence of Montreal, in regard to the taking over of Hull hospital has been definitely accepted. By this contract the Sisters of Providence agree to erect a \$43,000 hospital. Mayor Archambault.

Kindersley, Sask.

A new school costing about \$30,000 will be erected here this summer.

Lennoxville, Que.

Mr. J. W. Gregoire, architect, Sherbrooke, is preparing plans for an academy to be erected here. Approximate cost, \$15,000.

London, Ont.

The plans prepared by W. G. Murray for the new Masonic Temple have been accepted. Estimated cost of building, \$45,000. C. W. McGuire, president.

Medicine Hat, Alta.

The Royal Bank have purchased the property owned by the Methodist Church, corner of Fourth avenue and Toronto street, which will be remodelled for their use. The church have property on corner of 5th avenue and Montreal street and are about to engage an architect to complete the plans for erection of new church. The church have the use of the church on property purchased by bank for one year from date.

The plans of Clemsha and Coltenan of Regina, were accepted for the construction of the new St. Barnabas church. Tenders closed on May 19th. Pressed brick with heavy stone trimmings. Estimate of cost, \$30,000. Plans, etc., with Mr. H. W. Ireland, Medicine Hat, and with Clemsha & Coltenan.

Montreal, Que.

Tenders are being called for extensive additions on the north and east sides of the Engineers' Club, Beaver Hall Sq. The additions will conform to the general style of the existing building, which is of grey cut stone and two storeys high. The cost will be approximately \$90,000. The interior will be richly furnished and decorated. Plans and specifications have been prepared by Messrs. Saxe & Archibald, 59 Beaver Hall Hill.

Plans and specifications are being prepared by Mr. H. C. C. Stone, architect, for extensive alterations and additions to the St. James' Club, Dorchester street.

Mr. Alphonse Piche, architect, is preparing the plans for the new O'Connell bath to be erected in St. Ann's Ward. Cost, about \$30,000.

Plans and specifications have been prepared by Mr. Alphonse Piche, architect, of Montreal, for the new post office to be erected by the government in the city of Westmount. Tenders will be called for shortly.

The Norwood School Board and representatives of Ahuntsic are discussing the ways and means of increasing the school accommodation in their district which at present is not under the jurisdiction of the Protestant Board of School Commissioners of Montreal.

Moose Jaw, Sask.

A by-law for the raising of \$75,000 for hospital extension will be prepared.

A campaign will be started by the Y. M. C. A. to raise \$50,000 for their proposed new building. President, Mrs. Alexander.

Nelson, B.C.

The citizens are beginning a campaign to raise \$35,000 for proposed hospital, and a by-law will be submitted to authorize the borrowing of \$15,000 by the council to be applied to this purpose.

Oshawa, Ont.

Plans have been approved by Dominion government for the extensions and additional postal boxes for the new post office. Twenty-one new collection boxes are to be installed in different parts of the town and an illuminated clock set in the tower.

Ottawa, Ont.

Fifty thousand dollars was voted by the Dominion government to make improvements to Rideau hall.

The specifications for departmental building are in the hands of the printer and tenders will be called this week or at latest, week after.

Tenders are called until May 23 by Public Works Department for supply of hot water boilers, etc., for printing bureau. Plans, etc., at above department. R. C. Desrochers, secretary.

In the supplementary estimates provision to the extent of \$100,000 is made for a new Printing Bureau.

\$25,000 has been set aside for alterations to the old Museum building on Sussex street.

Owen Sound, Ont.

Tenders are called for the removal of the buildings on the site required for the new public library. W. H. Taylor, secretary, library board.

The Board of Education will erect two new schools, one in Owen Sound north and the other on East Hill. \$30,000 was voted by the board, which will partly cover the expenditure entailed. J. R. Brown, chairman of the building committee.

Petawawa, Ont.

The Ordnance stores building and others were destroyed by fire on the 12th inst. Estimated loss, about \$25,000.

Portage la Prairie, Man.

It is reported that W. A. Snyder has been given the contract for erection of Armory here.

Port Hope, Ont.

Two new schools are under consideration here, the new Central School, cost, \$40,000, and primary school. Option good until July has been taken on a building site for the latter on the Athletic Grounds. Dr. Powers, chairman public school board; Mr. Ellis, of Ellis & Connery, Toronto, architect.

Red Deer, Alta.

It has been decided to proceed at once with the erection of the main building of the proposed Ladies' College here to cost about \$65,000. Col. Walker, Calgary, Alta., president; G. W. McKenzie, secretary.

Revelstoke, B.C.

Tenders addressed to the Minister of Public Works, will be called until May 31st for erection of court house here. Plans, etc., at offices of the government agents here, and at Nelson, Kamloops, and New Westminster; Provincial Timber Inspector, Vancouver, and at the Department of Public Works, Victoria. J. E. Griffith, public works engineer.

Rossland, B.C.

Tenders are called until May 22nd for erection of the retaining walls, steps, approaches, etc., adjacent to the court house here.

Saltcoats, Sask.

By-law has been passed for erection of a \$15,000 town hall at an early date.

Shawville, Que.

Tenders were called until May 10th for erection of Academy here. W. W. Ireland, secretary-treasurer school board.

South Vancouver, B.C.

Tenders will be called at once for a municipal hall, to cost about \$15,000.

Stratford, Ont.

The supply committee submitted recommendation for erection in Romeo Ward of a new 4-roomed school.

Strathcona, Alta.

Tenders are called by public works department, Ottawa, until May 29th for construction of Armoury here. Plans at the office of Mr. J. E. Cyr, superintendent of public buildings for Manitoba, Winnipeg, Man.; Mr. W. T. Mollard, clerk of works, Regina, Sask., on application to Mr. W. G. Congdon, clerk of works, new post office, of Strathcona, Alberta, and at above. R. C. Desrochers, secretary.

Sturgeon Creek, Man.

The foundation is being put in for the new school, eight rooms, costing \$59,000.

Sutherland, Sask.

Tenders were called until May 15th for erection of town hall here. J. J. O'Neill is interested.

St. John, N.B.

Tenders will be called for shortly for a new building for the convent of the Good Shepherd on Cliff street. The new building will cost in the vicinity of \$75,000. Tenders were called for previously but on being opened it was found that the building was to cost rather more than anticipated. Some revision will therefore be made and tenders called for again. The work is in charge of C. W. West, C.E., of Newport, New Virginia. The structure will be forty-three feet deep with wings 120 feet each way "E" shape, and will be three storeys with a basement, the entire of brick.

Trail, B.C.

The by-law to authorize the expenditure of \$25,000 for school sites will be submitted on May 19th.

Toronto, Ont.

The residents of Fisherman's Island have petitioned for a new public school.

Work will start at once on the new St. Jude's church on Roncesvalles avenue. Rev. J. L. P. Roberts, rector.

The public library board has selected a site for the branch library at the corner of Bloor street and Dovercourt road.

A new public school will be built in Ward One. Superintendent of Buildings, Mr. Bishop.

The Toronto Hunt and Polo Club will erect a new club house of stucco, to cost about \$40,000, in East Toronto. F. Pearson, Darling & Pearson, architect.

Tenders for erection of Deer Park Presbyterian Church will be received until May 19th. Plans, etc., at office of Sharp & Brown, architects, 18 Wellington street east.

Tenders addressed to the chairman, building committee, will be received until May 27th for erection of Servants' Building for the Toronto General Hos-

pital. Plans, etc., at office of the architects, Darling & Pearson, 2 Leader Lane.

Tenders addressed to G. R. Geary, chairman, board of control, are called until May 22nd for erection of Shelter building for the city of Toronto in St. Andrew's supervised playground. Specifications at office of the Parks Department, City Hall.

At a special meeting of the Northern Congregational Church a building committee consisting of J. H. Nasmith, A. W. Thomas and F. J. Smith was appointed to report on the erection of a new church building on the property at the southeast corner of Bloor and Jarvis streets.

The property at the corner of University avenue and Anderson street was purchased by the Ontario government as the site for the new Ontario Veterinary College, and building operations will start next autumn. Cost, \$25,000. C. C. James, Deputy Minister of Agriculture.

At a recent meeting of the publishing department of the Methodist Book-Room the question of Metropolitan Square as the building site for the contemplated building was not considered favorably. Other sites were discussed, the one now occupied by the Carlton Street Methodist Church being favorably considered as a good site for a large office building. The reported sale of this has not been sanctioned by Conference.

Vernon, B.C.

Tenders were called until May 8th for erection of fire hall in Vernon. D. G. Tate, clerk.

Winnipeg, Man.

By-law for the erection of a \$50,000 school for Brooklands was carried.

The University authorities will spend about \$20,000 in beautifying the site for university in Tuxedo Park.

Tenders are to be called at once for erection of new council rooms for the municipality of St. Charles.

At a recent meeting of Hebrew citizens it was decided to erect a substantial school building to accommodate from 800 to 1,000 children on a site which has been purchased on the corner of Flora avenue and Charles street. The site is 66 by 120 feet, and the building will be three storeys in height with 16 class rooms. Its estimated cost is about \$39,000. Plans have been prepared by M. Blankstein, architect. Tenders will be called at once.

AWARDED**Calgary, Alta.**

The contract for three Alto furnaces in the civic market building has been awarded to the Western Foundry & Metal Co., Ltd.

Florence, Ont.

The contract for new concrete block and frame construction church here has been awarded to Reid Bros., Bothwell. Building, to commence at once. All ceilings to be metal; hot air heating.

Montreal, Que.

The contract for erection of building for the Montreal Art Association, to be built of gray marble, it is stated, has been awarded to the Norcross-West Co., of Manchester, N.H., branch at Sherbrooke, Que.

Orillia, Ont.

Joseph Langland has been given the contract for building a verandah on the Orillia Hospital for the Feeble-minded. The cost will be in the neighborhood of \$2,500.

Renfrew, Ont.

The contract for the erection of a new separate school has been awarded to the Renfrew Planing Mill, which is owned by Mr. J. O'Brien, \$28,740. John Conley, of Renfrew, will do the plumbing and the James Smart Company, of Brockville, will put in the furnaces. Total cost, \$32,590. C. P. Meredith, Ottawa, architect.

Sherbrooke, Que.

The contractors, Lefevre & Boivin, have commenced work on the extension to St. Charles Seminary at a cost of \$75,000.

Toronto, Ont.

Contracts were awarded for the erection of the new addition to the Annette street school, at a cost of about \$43,400, and of an enlargement to the Earls court school, costing \$14,151. The successful tenderers are as follows: Annette school, masonry, J. C. Bayliss & Son, \$15,500; carpenter, Crocker & Drew, \$14,400; plastering, W. J. Haddock & Son, \$3,230; painting and glazing, J. Phinmore, \$1,775; heating, Fred Armstrong, \$1,998; heat and regulation, Johnston Temperature Regulating Co., \$1,015; structural steel and iron, Reid & Brown, \$1,995; roofing and tinsmith, John T. Flowers, \$1,867; terra cotta fireproof floor, Robert Bennett, \$1,620; Earls court school, masonry, H. Lucas & Son, \$11,620; terra cotta, R. Bennett, \$4,598; carpentering, F. Armstrong, \$7,447; plastering, W. J. Haddock & Son, \$1,309; painting, James Phinmore, \$695; structural steel, Reid & Brown, \$775; roofing and tinsmith, John T. Flower, \$1,727. Grace street school, cabinets, Simpson Planing Mill, \$50; Humber side Collegiate, iron cornice, G. Duthis & Son, \$242.

Vancouver, B.C.

The contract for erection of the Lord Nelson school has been awarded to D. Matheson, \$73,300.

Residences**Collingwood, Ont.**

Tenders will shortly be called for new residence for A. D. Cayley. It will be of pressed brick. Estimated cost, \$7,000. Architect, Mr. J. Wilson.

Calgary, Alta.

Plans are under way for an apartment house to cost about \$25,000, for Mr. Douglas. Architect, Mr. Leo Dowler, M.A.A.A.

Messrs. Holman & Gotch, A.R.I.B.A., architects, Room 8 Herald Block, have plans for the following: Apartment and stores block for Mr. Nimmons, \$17,000; residence for Mr. Jones, \$13,000; residence, E. D. Adams, \$9,000; residence for Mrs. V. Smith, \$3,000; Methodist parsonage, \$3,000; residence for E. Telfer, \$5,000; double house for W. Wrigley to cost \$5,000.

Vancouver, B.C.

Plans have been filed for a 6-storey apartment house, corner of Bute and Nelson streets, 66 x 132 feet.

Winnipeg, Man.

Tenders addressed to E. D. Tuttle, architect, 701 McArthur Building, will be received until May 18th for erection of residence for W. H. Morgan.

Business Buildings and Industrial Plants**Buckingham, Ont.**

The Cosgrove Block, owned by Mrs. Cosgrove, Ottawa, and the McCallum and Labie Blocks were destroyed by fire on the 8th inst.

Belleville, Ont.

The Industrial Committee will recommend that a free site, etc., be given to the Allard Platinum and Gold Refinery Company, of Rochester, N.Y., seeking location here.

Buckingham, Ont.

Messrs. McCallum & Lahale have commenced to clear away the debris preparatory to the erection of the new Bank of Ottawa building to replace the one recently destroyed by fire.

Carleton Place, Ont.

J. P. McLaren, architect, of Ottawa, is calling for tenders for the Union Bank at Carleton Place. It will be a two-storey solid brick building with pressed brick facings and stone trimmings.

Collingwood, Ont.

Plans are being prepared by Mr. J. Wilson, architect, for additions and alterations to Arlington Hotel. Estimated cost, about \$6,000.

Calgary, Alta.

Plans are being prepared by Leo. Dowler, architect, for an hotel estimated to cost \$75,000 for Mr. C. Rhol.

Excavation has commenced on the site for addition to Pryce-Jones, Ltd.'s store here. J. J. Hill, local manager.

Plans have been prepared by the architect, L. Dowler, for a large business block, estimated to cost \$29,000. Plans have been sent to the owner, J. S. Disimore, Esq., London, Eng., for approval.

Application will be made for a building site by a company newly incorporated to manufacture nails in this province. W. E. Davies and N. Shaw are interested.

The Alberta Engineering & Construction Company contemplate the erection of a structural steel shops with foundry and a machine shop in connection with same and are looking around for a suitable site.

Edmonton, Alta.

A large business block is to be erected on First street covering the full size of the 50-ft. lot. For further information apply Alberta Investment Company.

Guelph, Ont.

The Guelph Stove Company plan an addition to their plant in the near future.

Plans for the new plant of the International Tire Company have been prepared by Architect A. A. Mahoney. If the by-law carries on May 29th work will be started at once.

Hamilton, Ont.

The Bank of Nova Scotia propose erecting a new bank building at an early date.

The Hamilton Bridge Works are calling for tenders for foundations for their new east end plant.

The International Harvester Co. will have an addition built to their wood shop at East Hamilton.

G. H. Lees, manufacturing jeweller, plans extension to his plant on Main street. W. A. Edwards, architect.

Tenders will be asked shortly for business building and apartments to be built for Messrs. S. D. Biggar and J. G. Gaul.

The Sawyer Massey Company and Canadian Westinghouse Co. are planning further extensions; also the Diamond Flint Glass Company will double their plant.

Montreal, Que.

Ingram & Co., organ builders, London and Liverpool, Eng., will build a manufacturing plant here. E. Ingram, managing director.

The work of demolishing the stores and residences on the site of the new Birk's Building to be erected on the southwest corner of Cathcart and University streets, has been begun.

Medicine Hat, Alta.

The Medicine Hat Milling Company propose enlarging their plant at an estimated cost of \$60,000.

Plans for a 3-storey office building, 50 x 130, are being prepared by Mr. Binning. Estimated cost, \$35,000. Tenders may be called later.

Plans have been prepared by W. T. Williams for Hutchison block, Toronto street, pressed brick with stone trimmings. Estimated cost, \$25,500.

Mr. W. R. Hull, of Calgary, is having plans and specifications prepared for a building on Toronto street, 125 x 130, two storeys; cost, \$75,000, and will contain opera house, stores and offices.

The by-laws concerning location of Alberta Foundry & Machine Company, Glass Works (\$80,000), Gordon Wire & Nail Works, \$40,000, and Preston Planing Mills will be submitted on May 26.

Mr. Strong, of Calgary, is the representative of the Alberta Linseed Oil Company. The by-law regarding the erection of plant has been carried. Work will commence at once. Noted in issue of April 26th.

Plans and specifications have been completed by Mr. W. T. Williams, architect, for a two-storey block with full basement for J. C. Beveridge. Stone front, brick walls. Estimated cost, \$25,000. Plans on file at Mr. W. T. Williams's office.

W. T. Williams, architect, is preparing plans for a block for Mr. Doty of this city. Cost, \$25,000. Mr. W. T. Williams is preparing plans for the extension of the Cosmopolitan Hotel. The addition will be three storeys, 28 x 130. Estimated cost, about \$35,000.

North Moncton, N.B.

Tenders addressed to A. W. Campbell, chairman, Government Railways' Managing Board, will be received until May 20th for construction of addition to

the General Office Building here for the Intercolonial Railway. Plans, etc., at the chief engineer's office here.

Ottawa, Ont.

J. A. Ewart has plans prepared for the addition to the factory for McFarlane & Douglas on Slater street.

J. P. McLaren is calling for tenders for alterations to Mr. G. H. Perley's building on the corner of Bank and Somerset streets.

Another change has been made in the building being erected by Hiram Robinson on Queen street. This building will now be six storeys instead of four and will cost about \$70,000. James Mathier, architect.

A. LeB. Weeks will call for tenders this week for an addition to John M. Garland & Sons' warehouse at the corner of Queen and O'Connor streets. The new building will be six storeys high and will be of reinforced concrete construction. Estimated cost, \$50,000.

Port Arthur, Ont.

The Riley-Ramsay Co., Ltd., wholesale grocers, will erect a 3-storey reinforced concrete warehouse this season at the corner of Water street and Cameron, 60 x 140. C. Wirth, Fort William, architect; estimated cost, \$40,000.

The council have ratified the agreement with J. L. MacRae for construction of a hardwood finishing plant to cost not less than \$60,000.

Quebec, Que.

Mr. R. P. Lemay, architect, has prepared plans for the new building to be erected by the Dominion Fish and Fruit Co., on St. Peter street. The new building, which will be constructed in stone, will be ten storeys high.

Regina, Sask.

Plans have been drawn for warehouse for Thos. Wilkinson, about \$15,000.

The Farmers' Fence & Steel Wire Company, capitalized at \$100,000, will build at once a factory and warehouse here. J. M. Stowe, president and general manager. This firm will employ about 150 men.

Steelton, Ont.

The charcoal plant of the Standard Chemical Iron & Lumber Company was destroyed by fire last week.

St. John, N.B.

The Crosby Molasses Company will erect a warehouse, 250 feet long by 110 feet. N. Brodie, architect.

Shawinigan Falls, Que.

The Belgo Canadian Pulp & Paper Company will erect an addition to their plant and install another paper machine.

St. Boniface, Man.

The Martin-Seymour Paint Company, connected with the Winnipeg Paint and Glass Company, will erect a new factory to cost about \$50,000. Contracts are stated to have been let.

Shawville, Que.

A company to be known as the New Hotel Co., Ltd., will erect a modern temperance hotel here.

St. John, N.B.

Manchester, Robertson, Allison, Ltd., will add to their plant the new one to

be erected on Prince William street. The plans are being prepared by G. Ernest Fairweather, but nothing in the way of details will be given out until the return from Europe of James F. Robertson of the firm.

Toronto, Ont.

It is stated that the Canadian Northern Railway has purchased the entire block bounded by King east, Church, Court and Toronto streets, and will erect on that block a magnificent building taking the form of a big hotel and railway office combined.

Vancouver, B.C.

The Hudson Bay Company have purchased additional property adjoining present site for extensions to their store.

Wood, Vallance & Leggat Company will erect a brick and steel warehouse costing about \$300,000. The site has been secured.

Wakefield, Que.

J. P. Morgan is the architect in charge of the erection of the flour mill here for Mr. Alexander McLaren. Work will be commenced the last of June.

Woodstock, Ont.

The Bain Wagon Company will extend their plant.

AWARDED

Chatham, Ont.

Wells & Gray, Limited, have been awarded the contract for erection of reinforced concrete warehouse here for the International Harvester Co. here, \$60,000.

Medicine Hat, Alta.

The contract for erection of store for T. Hutchinson has been let to J. L. Peard, \$12,000.

The contract for the Bank of Montreal, Toronto street and South Railway street, has been awarded to Fulton & Worthy, of this city, \$15,000. This building will consist of pressed brick and stone trimmings. Architects, Hutchinson, Bates & Balten, Calgary.

Montreal, Que.

The contract for the extension to the Windsor Street Station of the C. P. R. consisting of concrete boiler house and elevated tracks, has been awarded to Messrs. Byers & Anglin. The sum involved will be about \$175,000. Work will be commenced on this contract at once.

Ottawa, Ont.

The contract for the iron stairs for the Blackburn building have been awarded to the Canada Foundry Company. W. E. Noffke, architect.

Regina, Sask.

The contract has been let for the new Imperial Bank to be erected at the corner of Scarth street and 11th avenue to the McKay Construction Company. Work will start at once. Estimated cost, \$55,000.

St. Catharines, Ont.

F. C. Hitch & Co., of Montreal, are reported to have secured the contract to erect the plant here for the Steel & Radiation Co., Ltd., comprising six buildings, all brick, surfaced with concrete, and include a foundry, 120 x 200 feet; machinery and pattern shops; cost, approximately \$125,000.

Wallaceburg, Ont.

McNairnie Bros., Wallaceburg, have been awarded the contract for the erection of Dupont Hotel. Estimated cost, \$20,000. Concrete foundation, brick, two storeys high, with cement trimmings.

Winnipeg, Man.

John McQuarrie has been awarded the contract for the building of a garage on Garry street.

Permits granted to Mortgage Company of Canada, for office building on Garry street, \$72,000; contractors, Kelly, Simpson Construction; architects, Pratt & Ross; also to the Consolidated Plate Glass Company for warehouse between Portage & Ellice, \$40,000. J. D. Atchison, architect; J. W. & H. P. Fred, contractors.

Wakefield, Que.

The Dominion Bridge Company has been awarded the contract for the steel work of Alex. McLaren's elevator and flour mill at Wakefield. J. P. McLaren, architect.

Power Plants, Electricity and Telephones

Calgary, Alta.

There is to be an addition of three more car tracks added to the east side of the present car barns. Supe intendent McCauley will have plans prepared at once.

Tenders addressed to city commissioners, will be received until May 26th for supply of three K.V.A. single-phase transformers and switchboard. W. D. Spence, city clerk.

Jonquiere, P.Q.

Penstocks, water wheels, generators, etc., required for Price Bros. Co.'s new pulp mills here will be purchased at an estimated cost of \$300,000. R. S. Kelsch, consulting engineer.

London, Ont.

The city is considering the placing of 200 more lights, City Engineer Wright; Superintendent Glaubitz.

Millbrook, Ont.

The Seymour power by-law was carried. Work on the new sub-station will be commenced at once.

Moncton, N.B.

Another big gas well has been struck by the Maritime Oilfields Company at a depth of about 1,570 feet. Under test it shows four million feet of gas a day. Mr. O. P. Boggs, manager.

Montreal, Que.

A new power house and laundry for the Windsor Hotel here will be erected. The power house will have a capacity of 800 h.p. R. S. Kelsch, consulting engineer.

Magog, Que.

The Dominion Textile Company has retained the services of R. S. Kelsch in connection with the new power plant to be built jointly by the town and the above company. This plant will be used for supplying light and power to the town, all surplus being consumed at the mills of the Dominion Textile Company. T. Pringle & Son, represent the town.

Ottawa, Ont.

Conduits for the Ottawa Electric Co., G. N. W. and civic electric department

will probably be laid under the sidewalks on either side of Sparks street from Bank to the canal and under the Plaza Laurier and along Rideau street to Little Sussex. Separate conduits will be provided for the low and high tension wires, G. N. W. wires carry a voltage of 250 volts, while the Ottawa Electric carry 2,500 volts. Mayor Hopewell; W. J. Duckworth, G.N.W.; A. A. Dion, Ottawa Electric Company.

Port Arthur, Ont.

No tenders were received for material for street railway track on account of short time for delivery. Tenders closed May 4th.

Pincher Creek, Alta.

A recommendation has been sent to council to report on the feasibility of securing a site on the lower end of the south fork canyon for the development of electrical power.

Prince Albert, Sask.

Tenders are called until June 13th for construction of dam and headworks and canal and power station foundations for this city. Advertisement in "Tenders and For Sale Department" of this issue.

Stettler, Alta.

The by-law to erect an electric power and lighting plant was carried. The power plant, providing for 2,500 16 c.p. lights, will be erected at once.

Shawinigan Falls, Que.

The Shawinigan Water & Power Co. will continue the work on the new power building during the summer. Tenders may be asked for the installation of a 10,000 h.p. dynamo and corresponding turbine.

Winnipeg, Man.

Different offers of various companies to construct a street railway, etc., for Springfield, are being considered.

Plans submitted by the Winnipeg Electric Railway Company for a double track line on Mountain avenue to McPhillips street, with the necessary connections at Main street, were approved, the electrical construction to be satisfactory to the city electrician.

Miscellaneous

Calgary, Alta.

Contract was awarded quite recently to Messrs. Phillips, Lang & Co., of Chicago, for coal and ash handling machinery and coal bunkers for No. 1 municipal power house to be erected in Victoria Park. Contract price, \$42,300.

The following bids were opened for street paving: People Municipal & Highway Paving Company, bituminized concrete, \$1.87 sq. yd.; Crown Paving Co., asphalt, 4-in. concrete base, \$2.27 sq. yd.; Forest City Paving Co., concrete, No. 1, \$2.30; No. 2, \$2.35; Kettle River Quarries Co., wood block, 3½-in. blocks, \$3.65, \$3.75; 3-in. blocks, \$3.47, \$3.67; Bitulithic & Contracting Ltd., on concrete base, 4-in., \$2.75; 6-in. base, \$2.85; bituminous base, \$2.45; R. S. Blonce Co., granitoid, \$2.65; Calgary Paving Co., 4-in. concrete base, \$2.25; 5-in. base, \$2.45; bituminous base, \$2.15.

London, Ont.

Tenders are called until May 25th for supply of scarifier and hose. G. W. Wright, city engineer. Advertisement in

"Tender and For Sale Department" of this issue.

Ottawa, Ont.

Tenders were received for a 40 horse power boiler for the Dowe's Lake drainage scheme. They were Canada Machine Company, \$760; Jenckes Machine Company, Sherbrooke, \$800; E. Leonard & Sons, London, \$778; Canada Foundry Company, \$950; P. J. Powers, Ottawa, \$858. These were referred to the city engineer to report on.

Tenders are called until May 30th by the Public Works Department for sorting cases for post offices. Plans, etc., on application to T. A. Hastings, clerk of works, postal station "F," Toronto, and at the above department. R. C. Desrochers, secretary.

Seaforth, Ont.

Tenders are called until May 27th for construction of steel bridge, etc., over the River Maitland, about seven miles from here. James Campbell, clerk of Hullett, Londesboro. Advertisement in "Tenders and For Sale Department" of this issue.

South Vancouver, B.C.

At a total cost of \$1,250, it was decided to purchase five Badger chemical engines, this order to include the one now at Collingwood, with which the others are to be identical, and to be delivered within thirty days.

Toronto, Ont.

Tenders addressed to G. R. Geary, chairman, board of control, will be received until May 22nd for construction of permanent sea wall along a portion of the cribwork in front of Exhibition Park. Specifications at office of the Parks Department, City Hall.

AWARDED

Montreal, Que.

The Bishop Construction Co., Ltd., Montreal and Toronto, have been awarded the contract for the building for the Verral Storage Company. Messrs. Wragge & Fox, architects. Contract price, \$60,000.

Unclassified Items

Calgary, Alta.

Tenders closed on the 18th inst. for a bungalow for C. P. R. dining and sleeping car crews. Cost, \$3,000.

Contract for substructure of bridge on Elbow river was let to Mr. Fehrenback, for \$20,402. The Algoma Steel Bridge Co., Winnipeg, will erect the superstructure at a cost of \$34,800.

Second street east bridge has two spans of 150 ft. each and 12th avenue one span of 150 feet.

Paving of the bridges will be called for after erection.

Edmonton, Alta.

The contract for clearing line of the C. N. R. from Onoway, on Lac Ste. Anne, 30 miles west of Edmonton, in a northwesterly direction toward the Athabasca river, has been let by the Northern Construction Company to the contractors White & Tobin. They will commence work on the contract immediately.

Goderich, Ont.

Engineer Roberts is making new surveys and planning sewer in south end of town.

The Kensington Furniture Factory will likely re-build that part of factory destroyed by fire, at an estimated cost of about \$40,000.

A new building for the Marine and General Hospital is being contemplated, to cost about \$15,000.

Seaforth, Ont.

This municipality is considering plans for a Carnegie library to cost about \$10,000.

South Vancouver, B.C.

The following contracts for waterworks supplies were awarded: Robertson, Godson Company, to supply 300 four-inch gate valves at \$6.15 each; Canadian Fairbanks Company, 200 six-inch gate valves at \$8.30 each; Vancouver Engineering Company, 20 tons of cast iron specials at \$3.20 per 100 pounds; Robertson, Godson Company, brass fittings, \$1,680.25, and galvanized fittings, \$153.72, both as specified; Canadian Fairbanks Company, galvanized iron pipe, \$5.86 for twenty miles of one-inch; \$4.07 for twenty miles of three-quarter-inch; \$3.12 for forty-five miles of half-inch; all per 100-foot length. Owing to the early delivery promised by Evans, Coleman & Evans, that firm was awarded the contract for supplying forty-two miles of four-inch steel pipe at \$28.17 per 100 feet, and eight miles of six-inch pipe at \$40.36 per 100 feet. After a long discussion on the tenders for 300 hydrants the matter was referred back to the waterworks committee. There is a difference amounting to almost \$3,000 between the prices offered by local and those of eastern firms.

St. John, N.B.

Tenders are called until May 23rd for construction of sewerage system of Fairville drainage eastward by way of North street; also construction of sewerage system draining westward into septic tanks. Plans, etc., at office of the city engineer, G. G. Murdock. J. King Kelley, county secretary, 108 Prince William street.

Victoria, B.C.

Tenders for the construction of the proposed causeway at Coal Harbor, B.C., will be called for, to be in June 2 next. The estimated cost of the bridge is approximately \$120,000.

Winnipeg, Man.

It is announced here that five new immigration halls are to be constructed in Saskatchewan and Alberta, a large one at Calgary will cost \$35,000 and another at Gravelbourg about \$5,000. The others will be located at Kerr Robert, Tisdale and Castor, and will cost from \$3,000 to \$4,000 each. In addition detention houses are to be built by railway companies at Emerson Junction, Emerson and North Portal.

Supplementary Estimates

Among the supplementary government estimates for the year ending March 31st are the following: Halifax, N.S., docks and wharfs at \$600,000; Moncton, N.S., addition to general office building, further amount required, \$48,500; Mulgrave, N.S., improvements at \$30,000; Truro, N.S., to increase accommodation at, further amount required, \$42,800; towards the construction of a railway from a point on the Intercolonial Rail-

way at or near New Glasgow in the county of Pictou, (or from Sunny Brae in the said county, in event of the branch line of railway to that place being acquired, as it may be under this appropriation) to the town of Guysboro, and from the said line of railway at Cross Roads Country Harbor to the deep water of the said harbor, \$1,000,000; towards the construction of a railway from a point on the Intercolonial Railway at or near Dartmouth in the County of Halifax via Musquodoboit Harbor and the valley of the Musquodoboit to Dean Settlement in the said county, \$1,000,000; towards the construction of a railway from a point on the Intercolonial Railway, at or near Alba in the County of Inverness to the town of Beddeck in the County of Victoria, \$200,000; Aspy Bay, North Harbor, N.S., protected entrance channel at Dingwall, \$50,000; Prince Edward Island Railway, branch line, O'Leary to West Point, \$50,000; branch line from Kensington to Stanley Bridge via Long River and Clifton, \$100,000. Hudson Bay Railway, construction, \$2,000,000. Welland Ship Canal, to complete survey, \$50,000. Quebec Bridge, refund of subsidy paid by the Province of Quebec, \$250,000, and city of Quebec, \$300,000, to the Quebec Bridge and Railway Co., for a highway and railway bridge, \$550,000; Lachine Canal, bridge at Rockfield, \$80,000; Murray Canal, electrical equipment, \$9,500; Rideau Canal, towards construction of bridge over Rideau Canal at Bank street, Ottawa, \$80,000; St. John, N.B., new post office, \$75,000; Montreal, Que., new ordnance depot, \$50,000; Montreal new customs examining warehouse, \$100,000; Montreal Postal Station "A," St. James street, \$30,000; Quebec post office, enlargement, \$40,000; Quebec Citadel, quarters for married N.C.O's and men, \$50,000; Quebec, ordnance stores, foot of Palace Hill, \$50,000; Stanstead Plain, Que., post office and armory, \$10,000; Kingston, Ont., R.M.C., additional dormitory accommodation for cadets, further amount required, \$45,000; Ottawa, Ont., explosives testing station, buildings and equipment, \$50,000; Ottawa Old Museum Building, Sussex street, alterations, etc., \$25,000; Calgary, Alta., new post office building, \$75,000; North Vancouver, B.C., public building, \$50,000; Chatham, N.B., new wharf, \$100,000; Gaspé, Que., deep water wharf, \$75,000; Three Rivers Harbor, Que., completion of deep water wharf at west end of harbor, \$115,000; Burlington Beach Canal, Ont., deepening and widening, \$100,000; Goderich, Ont., harbor improvements, further amount required, \$116,000; Kingston, Ont., harbor improvements, \$50,000; Owen Sound, Ont., harbor improvements, \$25,000; Peterborough, Ont., wharf, \$20,000; Sarnia Bay, Ont., improvements, \$50,000; Toronto, Ont., harbor improvements, \$30,000; Windsor, Ont., landing dock, \$30,000; Red River, Man., St. Andrews Dam, construction of approaches, \$63,000; Fraser River, B.C., to commence construction of training pier, \$200,000; Powell River Harbor, B.C., to take over breakwater and complete same, \$55,000; British Columbia, dredging, further amount required, \$44,000; Maritime Provinces, dredging, further amount required, \$200,000; Ontario and Quebec, dredging, further amount required, \$200,000; Ontario and Quebec, dredging, shipyard on Victoria Island, \$60,000; British Columbia, new dredging

(Continued on page 66)

Tenders and For Sale Department

To Contractors

Sealed tenders addressed to either of the undersigned will be received until noon on Saturday, the 20th instant, for building concrete abutments and concrete floor for the Club Bridge over Black Creek on the town line between Moore and Sombra. Plans and specifications may be seen at the residence of J. T. Whitside, Court-right, or at the residence of Neil McGugan, Wilkesport, or at the office of Bell & McCubbin, Engineers, St. Thomas. A marked cheque must accompany tender as specified. The lowest or any tender not necessarily accepted. The committee will open tenders in the Village of Sombra on Monday, 22nd instant, at 8 o'clock p.m.

NEIL MCGUGAN,
Wilkesport, Ont.
J. T. WHITSIDE,
Courtright, Ont.

19-20

CITY OF MOOSE JAW Saskatchewan

Incinerator Plant

Sealed proposals endorsed "Incinerator Plant" will be received by the City of Moose Jaw addressed to the undersigned City Clerk until 8.30 o'clock p.m., on Monday, 22nd May, 1911.

The proposals received may cover alternative designs and methods but in any case the plant shall be capable of handling 25 tons per day and provision made for generation of steam.

The price bid shall include the supply of all materials for and the complete construction of the plant, same to be turned over to the Corporation in satisfactory working order.

Satisfactory guarantees shall accompany each tender.

The lowest or any tender not necessarily accepted.

J. M. WILSON, W. F. HEAL,
City Engineer. City Clerk.
Moose Jaw, April 24th, 1911. 18-20.



City of Toronto

Tenders for the Construction of Turner's Bath Bridge

Tenders will be received by registered post only, addressed to the chairman of the Board of Control, City Hall, Toronto, Canada, up to noon on Tuesday, 30th May, 1911, for the construction of a steel and concrete bridge at Turner's Baths, Hanlan's Point, Toronto Island.

Envelopes containing tender must be plainly marked on the outside as to contents.

Specifications and forms of tender may be obtained upon application to the Department of Railways, Bridges and Docks, City Engineer's Office, Toronto.

The lowest or any tender not necessarily accepted.

G. R. GEARY, Mayor,
Chairman of Board of Control.
City Hall, Toronto, May 6, 1911. 19-20

Steam Shovels

We own and have for sale near Buffalo, N.Y., two Vulcan 75-ton 2 1/4-yard steam shovels; late model, with new extra large boilers and in excellent condition; also one 70-ton. These will stand most rigid inspection and we are offering them at unusually low prices. Confer with us.

WILLIS SHAW MACHINERY CO.,
39 So. La Salle Street,
Chicago, Ill.

CITY OF MOOSE JAW Saskatchewan

Storm Sewer Extensions

Sealed tenders endorsed "Contract 32 or 33" will be received by the City of Moose Jaw addressed to the undersigned City Clerk until 8.30 p.m. on Monday, May 22nd, 1911.

Any tender received after the above stated time will be declared informal.

Contract 32.—The laying of approximately 9,000 lineal feet of Storm Sewer and 2,300 lineal feet of Catch basin connections and building manholes, catch basins, etc.

Plans and specifications may be seen at the City Engineer's office.

Contract 33.—The supply of approximately: 7,900 lineal feet of 10-in. Vitrified Tile Pipe; 1,100 lineal feet of 8-in. Vitrified Tile Pipe; 2,300 lineal feet of 6-in. Vitrified Tile Pipe, also junctions, bends, etc.

Specifications may be obtained from the City Engineer's Office upon application.

The lowest or any tender not necessarily accepted.

J. M. WILSON, W. F. HEAL,
City Engineer. City Clerk.
Moose Jaw, April 29th, 1911.

For Sale or Exchange

Municipal Pumping Plant Deseronto, Ontario

Tenders will be received by the undersigned up to noon of June 4th, 1911, by the Corporation of the Town of Deseronto, for the sale of the following equipment:

One 75 h.p. Fairbanks-Morse Suction Gas Producer.

One 65 h.p. Fairbanks-Morse Vertical Producer Gas Engine.

One 12 x 15 Triplex Pump, direct connected by friction clutch to Gas Engine, capacity 1,000 gallons per minute.

The above equipment has only been operated a short time and is in first-class condition. Changing to hydro-electric power necessitates disposing of above equipment. Plant is offered complete as above or separately, or would consider an exchange for equal capacity rotary pump and motor.

Specifications and description of above equipment furnished on application to the undersigned or can be seen at the offices of the Contract Record, B34 Board of Trade Building, Montreal, and 441 Seymour street, Vancouver, B.C.; or at the office of the Canadian Engineer, 62 Church street, Toronto, or 404 Builders' Exchange, Winnipeg.

LUCIUS E. ALLEN,
Consulting Engineer,
Belleville, Ont.

18-20

Tenders Wanted

Tenders for repairing and enlarging the Tank of the Niagara Waterworks System according to plans and specifications which may be seen or had by applying to the undersigned or to F. W. Paulin, C.E., Niagara Falls, Ont., will be received to 8 p.m., Tuesday, May 23rd, 1911.

Envelopes must be sealed, and marked "Tenders for Repairing and Enlarging Tank."

The Council do not bind themselves to accept the lowest or any tender.

W. E. LYALL,
Clerk.

Niagara-on-the-Lake,
May 5th, 1911.

19-20

Tenders

For

Bridge Piers and Abutments

Tenders will be received at the office of the City Commissioners up till 3 p.m., May 29th, 1911, for the construction of the Piers and Abutments for bridge over the Saskatchewan River. Plans and specifications may be seen and all information obtained at the office of the City Engineer. Lowest or any tender not necessarily accepted.

CITY COMMISSIONERS,
A. J. LATORNELL, City Engineer.

Edmonton, April 29th, 1911.

19-20



Sealed tenders addressed to the undersigned and endorsed "Tender for Public Building, Seaforth, Ontario," will be received until 4 p.m., on Monday, May 29, 1911, for the construction of a Public Building at Seaforth, Ont.

Plans, specifications and form of contract can be seen and forms of tender obtained at the office of Mr. H. J. Lamb, District Engineer, London, Ont., at the post office, Seaforth, and at this Department.

Persons tendering are notified that tenders will not be considered unless made on the printed forms supplied, and signed with their actual signatures, stating their occupations and places of residence. In the case of firms, the actual signature, the nature of the occupation, and place of residence of each member of the firm must be given.

Each tender must be accompanied by an accepted cheque on a chartered bank, payable to the order of the Honorable the Minister of Public Works, equal to ten per cent. (10 p.c.) of the amount of the tender, which will be forfeited if the person tendering decline to enter into a contract when called upon to do so, or fail to complete the work contracted for. If the tender be not accepted the cheque will be returned.

The Department does not bind itself to accept the lowest or any tender.

By order,

R. C. DESROCHERS,
Secretary.

Department of Public Works,
Ottawa, May 1, 1911.

Newspapers will not be paid for this advertisement if they insert it without authority from the Department. 19-20

Contractors' Material TENDERS for HEATING CITY OF LONDON, ONT.

90 Austin 6-yd. two-way Dump Cars, 4 ft. 8½-in. gauge.

Davenport 10 x 16 Dinkey, Standard gauge.

Baldwin 16 x 24 American type locomotive, 4 ft. 8½ in.

Bucyrus 55-ton Steam Shovel, built 1903.

Marion A. A. Steam Shovel, built 1903.

Six Wheel Scrapers.

Two Lidgerwood Cableways, complete.

All of this material in Canada. No duty. Have you anything to sell? Write us.

THE MALES COMPANY,
82 Perin Bldg., Cincinnati, O.

Tenders

Toronto General Hospital

Tenders addressed to the Chairman of the Building Committee will be received by the undersigned up till noon Saturday, May 27th, 1911, for all the trades required in the erection and completion of a Servants' Building for the Toronto General Hospital.

Plans and specifications and all other information can be obtained at the office of the architect,

DARLING & PEARSON,
2 Leader Lane.

The lowest or any tender not necessarily accepted. 20-20

City of Prince Albert

TENDERS

Sealed tenders addressed to the City Commissioners will be received until noon on Wednesday, the 31st day of May, 1911, for the following:—

(a) Extensions to Water and Sewerage Systems:

12-in. Cast Iron Sewage Pumping Main, 2,365 lin. ft.

10-in. Cast Iron Water Main, 2,906 lin. ft.

8-in. Cast Iron Water Main, 1,034 lin. ft.

6-in. Cast Iron Water Main, 8,798 lin. ft.

24-in. Storm Sewer (Vitrified Pipe) 1,300 lin. ft.

18-in. Storm Sewer (Vitrified Pipe) 1,650 lin. ft.

8-in. Storm Sewer (Vitrified Pipe) 928 lin. ft.

12-in. Sanitary Sewer (Vitrified Pipe) 3,580 lin. ft.

10-in. Sanitary Sewer (Vitrified Pipe) 440 lin. ft.

8-in. Sanitary Sewer (Vitrified Pipe) 7,048 lin. ft.

Manholes, 35.

Catch basins, 28.

(b) Construction of Concrete Sewage Pumping Station No. 2.

(c) Supplying and erection of two Electrically driven Centrifugal Sewage Pumps and Motors.

Plans and specifications (see (a) and (b)) may be seen at the office of the City Engineer. Sec. (c) will be forwarded on application and will be on file at the office of Canadian Engineers, Builders' Exchange, Winnipeg, after May 15th.

Marked cheque payable to Secretary-Treasurer of the City of Prince Albert must accompany each tender as follows:

Section (a)—\$2,000.

Section (b)—\$200.

Section (c)—\$200.

The lowest or any tender not necessarily accepted.

ANDREW HOLMES, Mayor.

C. O. DAVIDSON, Secretary-Treasurer.

F. A. CREIGHTON, City Engineer.

CITY COMMISSIONERS.

Dated at Prince Albert, Sask.,

May 8th, 1911.

Sealed tenders for steam heating of Victoria Hall, in Cobourg, Ont., addressed to the County Clerk, Cobourg, will be received up to noon on Thursday, June 1st next, marked "Tenders for Heating." Plans and specifications can be seen at the office of the County Clerk, Cobourg.

GEORGE GREER,

Chairman of Committee

Cobourg, April 13, 1911.

20-20

Tenders Wanted

Bulk and separate tenders for all or any of the several branches required in the erection and completion of a Baptist Church Building to be erected in St. George, Brant County, Ont., will be received up to noon, Thursday, June 1st, 1911.

All tenders shall be sealed and marked "Tender," and addressed to Dr. Patten, St. George, Ont.

The plans and specifications may be seen upon application to Dr. Patten or at the office of Taylor & Taylor, architects, Hope Chambers, Brantford, Ont.

The lowest or any tender not necessarily accepted.

Brantford, Ont., May 15, 1911.

20-20

YORK COUNTY

Tenders

For

Concrete Bridge Abutments

Tenders will be received by the undersigned up to twelve o'clock noon, Tuesday, May 30th, 1911, for the construction of Concrete Abutments for a bridge over a branch of the Humber River, on the Townline between the Townships of Vaughan and York, in the 4th Concession of the Township of York, in the County of York.

Plans and specifications may be seen and all necessary information may be obtained at the offices of the undersigned, 57 Adelaide street east, Toronto.

The lowest or any tender not necessarily accepted.

BARBER & YOUNG,

York County Engineers.

Toronto, May 16th, 1911.

20-20

CITY OF MOOSE JAW Saskatchewan

Paving and Sidewalks

Sealed tenders endorsed "Contract 34 or 35," will be received by the City of Moose Jaw addressed to the undersigned City Clerk until 8.30 p.m. on Monday, May 29th, 1911.

Any tender received after the above stated time will be declared informal.

Contract 34.—The laying of approximately 41,063 square yards of pavement.

Contract 35.—The laying of approximately 206,061 square feet of concrete sidewalks and 46,396 lineal feet of curb and gutter, also 1,066 square yards of Wood Block Crossing.

Specifications may be obtained from the City Engineer's Office upon application.

The lowest or any tender not necessarily accepted.

J. M. WILSON,

City Engineer.

Moose Jaw, May 4, 1911.

W. F. HEAL,

City Clerk.

19-20

Tenders For Scarifier and Hose

Sealed proposals addressed to the "Chairman and Members No. 2 Committee," will be received at the office of the City Clerk until 5 p.m. on Thursday, May 25th, 1911, for 500 ft. 2½ in. 6 ply, rubber lined scow hose, complete with couplings, also for a road scarifier.

Bids to state price for London, Ont.

The city reserves the right to reject any or all bids and to accept any bid.

NEIL COOPER,

Geo. W. Wright,

Chairman No. 2 Committee City Engineer

Dated, May 12th, 1911.

20-20

TO CONTRACTORS

Tenders will be received by the undersigned up to the 27th of May, 1911, at 12 o'clock noon, for the repair of the Perche Drain in the Township of Sarnia, by dredging.

Plans and specifications can be seen at the Clerk's office, H. D. Kewley, Sarnia Township.

The lowest or any tender not necessarily accepted.

A marked cheque for \$500, payable to my order, must accompany each tender as security that contract will be executed, if tender accepted. Successful tenderer must give satisfactory security for the performance of contract.

The work extends over a distance of about 2,029 rods.

ROBT. BEATTIE, Reeve,

Sarnia P.O.

May 2nd, 1911.

20-20

Street Paving

Sealed tenders marked "Tenders for Paving," will be received by the undersigned up to 12 o'clock noon of Monday, May 29th, for paving in the Town of Waterloo. Tenders are invited for various kinds of pavements.

Patent pavement tenders are to be accompanied by full specifications.

Pavements to be constructed approximately 12,500 square yards.

Marked cheque for five per cent. of amount of tender must accompany each bid.

The lowest or any tender not necessarily accepted.

FORD S. KUMPF,

Town Clerk

Waterloo, May 12, 1911.

20-21

Tenders For Waterworks Supplies, Etc., Ridgetown, Ont.

Sealed tenders addressed to the Town Clerk will be received up to Thursday, the 1st day of June, inclusive, 1911, at 8 o'clock p.m., for Waterworks supplies and labour as follows:

Approximately 2,000 ft. of 8 inch, 6,400 ft. of 6-inch and 3,700 ft. of 4-inch cast iron water pipe, about 8 tons of special castings, about 35 hydrants, valves, etc. Also excavating for, laying and covering pipe. One steel elevated tank.

Conditions and terms of tender, plans and specifications may be seen at the office of either of the undersigned.

Lowest or any tender not necessarily accepted.

F. W. FARNCOMB, Consulting Engineer,

64 Bank of Toronto Building,

London, Ont.

D. COCHRANE, Town Clerk,

Ridgetown, Ont.

20-21

Tenders Wanted

Tenders will be received by the Council of the Township of Hullett up till 2 p.m. on Saturday, the 27th of May, for the building of a steel bridge 100 feet, between abutments, 16 ft. roadway with cement floor on the River Maitland, about 7 miles north of Seaforth. Also for the building of cement abutments to support said bridge. And also for the building of one cement abutment at Wallace's Bridge near Summerville in said Township.

The lowest or any tender not necessarily accepted.

Specifications for the cement work can be seen at the Clerk's Office.

JAMES CAMPBELL,
Clerk Tp. Hullett,
Londesboro P.O.

20-21

Corporation of Collingwood

Sealed tenders will be received by registered mail addressed to K. S. Macdonell, Town Engineer, until 4.00 p.m. **31st May, 1911**, for the construction of all-concrete sidewalks to be laid by the Corporation during the year 1911. Approximately 40,350 sq. ft. to be laid at once.

An accepted bank cheque drawn in favor of the Town Treasurer, for the sum of two hundred dollars, must accompany each tender, same to be forfeited to Corporation on failure of successful tenderer to sign contract.

Specifications may be seen at the office of the Engineer after 16th May, 1911. Tenders to be plainly marked "Sidewalk Tender."

The lowest or any tender not necessarily accepted.

K. S. MACDONNELL,
Town Engineer.

Collingwood, Ont.,
May 12th, 1911. 20-21

City of Prince Albert

Tenders for POWER WORKS

Sealed tenders will be received until 8 p.m., Tuesday, June 13th, 1911, by the Corporation of the City of Prince Albert, Province of Saskatchewan, for the construction of Dam and Headworks and Canal and Power Station Foundations, being portions of the proposed Hydro-Electric Power Development, on the North Saskatchewan River, at La Colle Falls, (distant 25 miles east of the city).

Tenders are invited on each separately, and must be plainly marked on the outside of envelopes, and addressed to the Secretary-Treasurer, City of Prince Albert, Saskatchewan.

Each tender must be accompanied by an accepted bank cheque, for \$5,000, payable to the Secretary-Treasurer, which cheque will be returned to the bidder, unless he fail to execute a contract, should it be awarded to him.

The successful bidder, on each of the works, will be required to execute a Bond, in the sum of \$40,000, for the faithful performance of the contract.

The City reserves the right to reject any or all tenders.

The plans and specifications will be on file, and may be seen on and after **May 23rd, 1911**, at the City Hall, Prince Albert; office of "Canadian Engineer," at Winnipeg; office of "Canadian Engineer," Montreal, or at the offices of the Engineers, C. H. & P. H. Mitchell, Traders Bank Building, Toronto, Ont.

ANDREW HOLMES, Mayor.

C. O. DAVIDSON, Secretary-Treasurer.
Prince Albert, Sask.,
May 9th, 1911. 20-22

Sand Dredge for Sale at a Sacrifice

Hydraulic Sand Dredge in excellent condition, complete with necessary pumps, engines, boiler, "A" frame, spud cutter, etc.

Accessories include 500 feet of steel discharge pipe, of which 250 feet is fitted with flexible joints; also seven pontoons to carry same.

For further information and details, apply to the City Engineer of Hamilton, Canada.

Hamilton, Canada, May 15, 1911. 20-20

Positions Wanted

Advertisements under this heading one cent a word per insertion. Box No. ten cents extra

POSITION WANTED—As Superintendent or walking boss on railroad or other construction work, by experienced man who can furnish excellent references. Apply Box 271, Contract Record, Toronto, Ont.

Positions Vacant

WANTED—Foreman to take charge of sewer construction work where steam shovel is used for excavation. State salary expected and give experience and references. Apply Box 273, Contract Record, Toronto, Ont. 20-20

Wanted—At once, an experienced draughtsman. Give references and state salary expected. Taylor & Taylor, architects, Hope Chambers, Brantford, Ont. 20-20

WANTED

Assistant City Engineer for City of Hamilton, Ontario, salary \$2,000 per year, applicant to submit credentials showing experience and qualifications in municipal engineering to the undersigned on or before May 18th, 1911.

S. H. KENT,
City Clerk.
Hamilton, May 10th, 1911. 20-20

Business Chances

There is an opening in Goderich, Ont., for a planing mill.

Humboldt, Sask.

We are informed that there is an opening for a brick manufacturing plant in Humboldt and also a first class machine shop.

Supplementary Estimates

(Continued from page 57)

plant, further amount required, \$200,000; Manitoba, new dredging plant, further amount required, \$35,000; Ottawa City Bridges, extension of Sappers' and Dufferin bridges, further amount required, \$180,000.

New Companies

The Sherbrooke Land & Water Power Co., Ltd., Sherbrooke, Que., capital, \$50,000, incorporated. Incorporators, Rennie Ogilvie McMurtry, advocate; Francis Bush, bookkeeper, and George Robert Drennan, both of Montreal, Que.

The Telephone City Oil and Gas Co., Ltd., Brantford, Ont., capital, \$25,000, incorporated. Incorporators, John Bechtel Detwiler and William Houlding Whitaker, manufacturers; David Zealand Gibson, gentleman; David Stewart Gibson, coal merchant; all of Brantford.

Canadian Arrowsmith Manufacturing Co., Ltd., Toronto, Ont., capital, \$50,000, incorporated. Incorporators, James Wilson Arrowsmith, manufacturer, and Willis Renville Sanders, salesman, both

of Morristown, N.J.; Joseph Beekman Saums, Chicago, Ill., salesman; George Washington Hopping, Morris Plains, N.J.

United Bradd & Lead, Ltd., Toronto, Ont., capital, \$500,000, incorporated. Incorporators, Alexander Frederick Falls, Chatham, Ont., chartered accountant; Frederick Somerville, and Murray James Woodbridge.

The Lennoxville Light & Power Co., Ltd., Lennoxville, Que., incorporated, capital, \$20,000. Incorporators, Messrs. Sydney Lee Spafford, gentleman, Lennoxville; Arthur Lucius Spafford, Capleton, Jacob Nicol, advocate, Sherbrooke.

Toronto Lumber Company, Limited, Toronto, capital, \$40,000, incorporated. Incorporators: H. B. Bishopric, merchant; T. B. Scott, merchant, both of Toronto.

The Baden Lumber and Manufacturing Company, Limited, Baden, Ont., incorporated, capital, \$20,000. Incorporators, D. G. Steinmann and Henry Ratz, laborers, both of Baden.

Edwards Electrical Company, Limited, Toronto, incorporated, capital, \$250,000. Incorporators, D. Henderson and W. H. McGuire, barristers, both of Toronto.

Clements Road-builder and Ditcher Co., Ltd., Winnipeg, Man., incorporated, capital, \$100,000. Incorporators, C. H. Clements, B. Clements, both of Winnipeg.

The Rishton Construction Company, Winnipeg, Man., incorporated, capital, \$40,000. Incorporators, J. Robinson, merchant, and B. L. Beacon, barrister, both of Winnipeg.

Thibodeau's Gas & Oil Co., Three Rivers, Que., incorporated, capital, \$20,000. Incorporators, J. D. Thibodeau, gentleman; J. Bureau, advocate, both of Three Rivers.

San Antonio Land and Irrigation Co., Ltd., Toronto, capital \$8,000,000, incorporated. Incorporators, James Stellar Lovell, accountant, and Wm. Bain, bookkeeper, both of Toronto.

Z. O. Limoges, Ltd., Montreal, capital \$100,000, incorporated to manufacture, produce, buy and sell lime, cement, asphalt, etc. Incorporators, Z. O. Limoges, lime-burner, and Alfred Lacroix, both of Montreal.

Gloucester Galent Zinc Mines, Ltd., Montreal, capital \$180,000, incorporated. Incorporators, J. F. McKenzie and H. J. Murphy, brokers, both of Montreal.

Dominion Architectural Ironworks, Ltd., Montreal, capital \$100,000, incorporated. Incorporators, Gilbert Humphreys, manufacturer, and J. R. Estey, engineer, both of Montreal.

Upper Fraser River (British Columbia) Lumber Co., Ltd., Montreal, capital \$2,500,000, incorporated. Incorporators, F. G. Bush, bookkeeper, and G. R. Drennan, stenographer, both of Montreal.

Dominion Industrial Co., Ltd., Montreal, capital \$2,000,000, incorporated. Incorporators, T. C. Casgraine, King's counsel, and A. C. Casgraine, both of Montreal.

The Grand Metis Power Co., Ltd., Montreal, capital \$100,000, incorporated. Incorporators, W. J. Shaughnessy, advocate, T. S. Owens, student, both of Montreal.

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The Toronto Building Code

The memorial relating to the Toronto Building By-law, presented to the Mayor and Board of Control on May 16th, and which was abstracted in our last issue, has been referred to the Fire and Light Committee. The City Architect, Mr. McCallum, states that he is looking carefully into the various sections of the by-law under criticism and that a number of the suggestions made by the committee will undoubtedly be adopted. He thinks, nevertheless, that many of them will be opposed on the ground that they have not received sufficient consideration. Evidence has yet to be shown, according to Mr. McCallum, that the building regulations of Toronto have kept manufacturers away from the city and retarded building operations. He admits that the restrictions on steel and concrete construction are rigid. The regulations were adopted when this form of construction was in the experimental stage and they will probably be modified. The city of Toronto, he says, could not afford to take such chances as Cleveland, where eight people were killed by the collapse of a building of this type.

A Poor Defence

While it was to be expected that Mr. McCallum would rush to the defence of the regulations of his department, it is unfortunate that so many incorrect and misleading statements should have been made public by the City Architect. The character of the published interviews indicate that Mr. McCallum was not unwilling to give the impression that the Citizens' Committee was trying to force flimsy and dangerous construction on the city of Toronto. The following dramatic incident related in a Toronto evening paper is an illustration:

"'Look at this,' said City Architect McCallum, this morning, and he held up a brick which had been broken in two. 'Take hold of it.' Squeezed between one's

thumb and finger it crumbled up like mud. 'Material of that kind will not be used in Toronto buildings if I can prevent it,' said Mr. McCallum."

The skill displayed by the City Architect in imparting a wrong impression concerning the proposals of the committee is to be admired, but it might have been better employed. No body of men in the community would be more unwilling to sanction the use of material such as Mr. McCallum exhibited than the members of the Citizens' Committee, and it is sincerely to be regretted that Mr. McCallum should have found it necessary to employ such unfair tactics.

Cleveland Reference Misleading

The City Architect's statement concerning the relative merits of the building regulations of Cleveland and Toronto is also misleading. In the memorial, the committee states that a reinforced concrete building designed in accordance with the Toronto Building By-law would cost 15 per cent. more than if designed to conform to the Cleveland Code, whereupon Mr. McCallum produces an account of the collapse of the Henke reinforced concrete building in Cleveland and asks, "Are those the kind of buildings we want erected in Toronto?" Were this question put to the Citizens' Committee we are of the opinion that every member of it would reply quite as vehemently as Mr. McCallum, "No!" The fallacy in the City Architect's argument is in assuming the collapse of the Henke building was due to the laxity of the Cleveland Building Code. Turning to the report of the expert commission on this disaster we read as follows:

"It is the belief of your Commission that the initial failure was due to the premature removal of forms and supports in the third storey. . . ."

" the removal or changing of these forms and shores was the one primary cause of the collapse."

"From the evidence submitted, your Commission is satisfied that the reinforced concrete design was a safe one."

There is certainly no indication in these findings that failure was due to the designing of lighter structures in Cleveland than in Toronto, and it is absurd to claim that the building regulations of Cleveland, with respect to reinforced concrete are dangerous because they are somewhat less severe than those of Toronto.

Concerning Reinforced Concrete Work

The contention of Mr. McCallum that reinforced concrete construction requires careful inspection is sound, but this should not necessitate the retention of building regulations which make it impossible to take advantage of the excellence of this form of construction. The proper solution of the difficulty is not in excessively low working stresses and unduly severe assumptions of design, but in the requirement of adequate inspection. Mr. McCallum derides the Cleveland Building Code, but if part of section 473 of that same Code were embodied in the Toronto By-law, it would overcome the difficulty. If this section had been enforced by the Cleveland Inspector of Buildings—and he had every power to enforce it, the Henke building would not have failed. The portion to which we refer is as follows:

"When any concrete wall or armored, reinforced or trussed concrete is used in construction, the owner shall provide for the inspection of cement and inerts, as required by the Inspector of Buildings; he shall also provide a special inspector of the work who shall

be satisfactory at all times to the Inspector of Buildings, and who shall be on the work continually during the mixing and placing of concrete and steel. Such special inspector shall make daily reports to the Inspector of Buildings on the progress of the work.

"Before issuing a permit for the work, the owner shall name in writing the special inspector and such special inspector shall pass such examination as may be required by the Inspector of Buildings to determine his competency."

Concerning Mr. McCallum's contention that the code has not deterred or hindered building, we may have something to say in a later issue. Evidently Mr. McCallum, like the rest of us, has yet a little to learn, and doubtless he will be interested in any information which throws additional light upon this important matter.

Finally, we would urge the Fire and Light Committee to consider the report very carefully so that there may be no mistake as to the necessity for the revision of the code. The defects are many and serious, and a score of them are so flagrant that a school boy could pick them out. This report is not a subject for quibbling and circumvention, and the dilatory methods which characterize the majority of civic proceedings should be set aside for once. As we pointed out in our last issue, a great deal of self-sacrificing work was entailed in the preparation of this report, and having in mind the status of the men who brought it in, it is not altogether to the credit of the city that such misleading statements as we have criticised above should have been made public.

Activity in the Western Field

Prospects and present conditions in connection with building and contracting work throughout the west are quite up to the mark set earlier in the year by even the pronounced optimist. At present writing there is no important element in connection with these industries but presents to those interested a favorable aspect, with the exception of the labor troubles existing in British Columbia. While for the time being these have an unfavorable influence upon the work at some points in that province, it is quite probable that this influence will be only temporary.

The prospects in regard to the volume of building are probably unparalleled in the history of the west. With a uniformity that, applied to any other phase would be monotonous, advices from western cities and towns tell of increasing activity in building projects with the indications of a still greater volume in the near future.

It could scarcely be said that activity is marked in any particular line; rather it might be said to extend to all lines from cottages in country districts to town halls and government buildings. Great activity in the way of water and sewerage systems and other civic improvements is a feature of the situation.

Calgary is the centre of a great wave of building activity. The extent of this may be judged from the fact that the volume of permits issued in April considerably exceed the million dollar mark. Winnipeg building operations were somewhat less in money value during April, 1911, than in the corresponding month of 1910. This condition was due entirely to the uncertainty which existed as to the course to be pursued by the bricklayers when their agreement with the builders expired on the first of May. That this influence was felt principally by the promoters of large

projects is shown by the fact that the number of permits issued at the Winnipeg office during April, 1911, was practically the same as during April, 1910.

There have been a number of changes in the prices of building materials at Winnipeg. Building stone has advanced from \$10 to \$11.50 per cord, lime has climbed from 28c. to 32c. per bushel, and sand is also higher in price. The demand for all these lines is very strong, and this circumstance, coupled with the fact that it is hard to get quarry and kiln laborers, has caused a scarcity and a consequent increase in price.

Canadian Nationality, British Connection and Fiscal Independence

In these days, when any assertion of national feeling is regarded more or less in the light of jingoism, it is quite refreshing to read the frank admission of the Canadian National League—that the basis upon which it has been formed is Canadian Nationality, British Connection and Fiscal Independence.

Our attention to the work of the League is attracted by the receipt of a pamphlet, the contents of which we have perused with considerable interest.

The Canadian National League believes that the principles underlying the proposed pact are utterly inconsistent with those by which the affairs of the country have been conducted successfully for years past. The pamphlets issued by the League will contain accurate and non-partisan information upon the questions involved, the idea being that the surest way to defeat the agreement lies in the array of indisputable facts and statistics which are so readily obtainable. The Canadian National League wishes to show the people of Canada that Toronto at least is the headquarters of an enthusiastic, substantial and national-thinking body of men who are convinced that the president of the United States never made a greater mistake in his life than when he informed Congress that Canada was "at the parting of the ways."

The Canadian National League is opposed to an agreement which will endanger British connection; it is unwilling to allow considerations of personal gain to govern when Canadian interests are in jeopardy, and it believes that the Dominion has a higher destiny than that of becoming "a business part of the United States," as was prophesied recently by Thomas C. Shotwell, in the New York American.

It might be well to say that the Canadian National League has come into being as the result of opposition to the reciprocity agreement on the part of those hitherto not hostile to the government. The chairman is Z. A. Lash, K.C., LL.D., and the secretary, Arthur Hawkes.

Messrs. Raphael Tuck & Sons, Limited, of London, Eng., have favored us with an advance copy of the facsimile of His Majesty's Letter to the Nation, published by them at the King's command, and which is now ready for issue to the public. The letter is reproduced in various forms, ranging in price from 25 cents to \$15, and may be procured through all stationers and booksellers throughout the Empire. The facsimile letter is contained within a beautiful emblematic border designed by Sir Lawrence Alma Tadema, R.A., the original of which is exhibited in this year's Royal Academy.

Publicity for Brick

In our issue of May 3 we illustrated a display of front and ornamental brick seen in the office of a leading manufacturing firm of New York City. The detail shown herewith is a portion of the same exhibit and is an example of formal interior decoration, showing a combination of rough surfaced, glazed and polychrome enamel brick and raked mortar joints.

Concerning the value of the brick display we had something to say in the former issue, but we would again emphasize the fact that the manufacturer who



An effective display of front and ornamental brick

can demonstrate most convincingly the advantage of his particular product usually gets the contract. The architect may have an idea that he would like to use a combination of colors, or he may wish to combine architectural terra cotta with limestone and front brick. Often he cannot work these out in his own mind and the opportunity for seeing the finished brick en masse is a great advantage. Indeed, he has no other proof that the company can actually turn out the shade he wants.

Here in Canada, with the present imperfect organization of the clay interests, we cannot hope to do anything on the elaborate lines laid down in cities like Chicago or New York, but nevertheless, much could be done that remains undone. We neither hear

enough nor see enough of the possibilities of brick. The blame for this must be laid largely at the doors of the industry itself, which in the past has shown very little enterprise in the moulding of public taste.

The brick manufacturer will often tell you that people know what brick is and that the industry does not need publicity. That such statements are fallacious is proven by innumerable instances from other fields. Just as surely as competition is the life of trade, so is publicity a vital consideration among the things that make for success in business. The trade customs and traditions of the Canadian brick industry—with one or two well-known exceptions—are stale and unprofitable, and there is room for something like a revolution in the selling methods which have prevailed in the past. Brick has three outstanding virtues—economy, permanency and artistic possibility, and these are not appreciated as they should be by the building interests of Canada.

Contractors' Field Force

The field force of the Aberthaw Construction Company, of Boston, Mass., is organized with the object of keeping the home office in daily contact with the amount and direct cost of all work on all contracts. Each job is directly in charge of a general superintendent who reports daily the number of men employed on each class of work, the amount of each man's pay, the class and quantity of work done, and the materials received and used. The superintendent has under him a clerical force, consisting of timekeeper and stock clerks, who distribute the costs among the various classes of work and check all materials received and used; a labor boss, who directs the work of the gang bosses on excavation, concreting and handling materials; a steel boss, in charge of all reinforcing work; a carpenter boss for concrete form work, and a carpenter boss for mill work, putting down floors, etc. The bosses on each class of work are in charge of the several gang bosses of foremen who supervise the labor. All instructions from the home office, owner or architect must be transmitted first to the general superintendent, who is the only person authorized to give orders to the bosses under him. Only in emergencies are directions given to the labor force by persons not their immediate superiors. The policy of the company is to furnish each job with a first-class clerical force, thereby relieving the home office of as much detail work as possible. This also makes it easy to charge the time of the clerks to the job where they are actually working and enables the company to conduct a large business with a comparatively small home office force so that overhead charges are light when work is slack. On the payrolls the only work of the home office is the checking of the extensions and putting the money in envelopes ready for shipment. The payroll is sent to the home office every Thursday night and the money shipped to reach the job Saturday.

Improved methods for handling brick on the yard are quite the order of the day now, but so far as known there is not offered any improvement for laying brick that gives promise of reducing the cost of construction.

There are two valuable possessions which no search warrant can get at, which no execution can take away, and which no reverse of fortune can destroy; they are what a man puts into his brain, knowledge; and into his hand, skill.

A Noteworthy Piece of Foundation Work

**Encountered in the Construction of the Dominion Express Building, Montreal
—Methods Employed by the Contractors, the Foundation Company, Limited**

Possibly the most interesting and difficult piece of foundation work in the city of Montreal, has just been completed in the above job. This building, located on the site of the old St. Lawrence Hall, long a famous hostelry, has a frontage on St. James street of 120 feet, and extends back along St. Francois Xavier street a distance of 95 feet. The design provides for a ten-storey building above the curb, with three floors below the sidewalk level. The deepest basement will be 35 feet below the St. James street curb. At that level will be located the boiler plant, refrigerating machinery, etc.

The building will be of steel skeleton construction, fireproof throughout, with floors and walls supported by the steel superstructure. The total weight of the structure itself, plus the weight of its contents, neglecting the stresses due to wind pressure, is esti-

encountered. In some parts of the city hard clay overlying rock is found, in others, a very soft clay of considerable depth, while again in other localities, quicksand and water bearing gravel.

To make it clear how it has been possible to expose the rock found at great depths below water level, it may be well to describe briefly the method used in sinking the caissons for the Dominion Express and high buildings in other cities. The caissons are simply air-tight bottomless boxes, rectangular or cylindrical in cross-section, having interior chambers large enough for a gang of men to enter and excavate at the bottom. In the roof of the box is an opening from which a shaft communicates with the ground level and of a size sufficient for the conveyance of men and material. Compressed air is pumped into the caisson as it sinks below the water



Foundations for the Dominion Express Building, Montreal.—Sinking the Pneumatic Caissons.

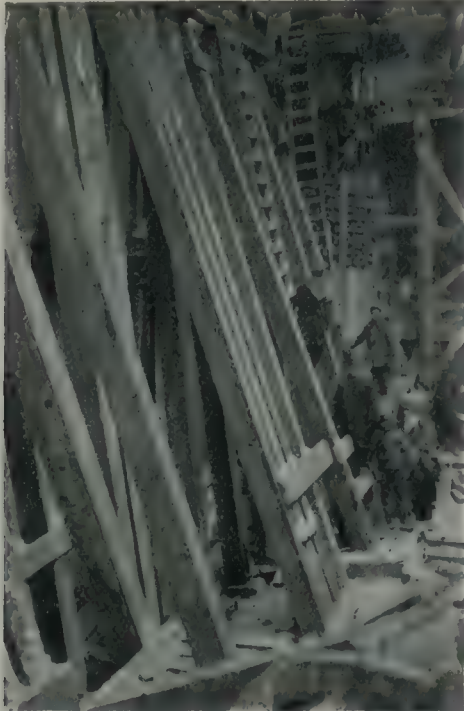
mated at about 18,500 tons, all of which will be carried by 42 main columns resting on 42 pneumatic caissons, sunk through water, quicksand, coarse sand, gravel and boulders to the greatest depth of any building in Montreal, viz., approximately 90 feet below St. James street.

In the construction of tall office buildings in Montreal, many interesting foundation problems arise. The soil overlying the rock varies widely in its nature and also in its depth to rock. In the past, buildings of few storeys in height, with the consequent light loading on the soil, gave but little trouble. Now, with the great advance in real estate values, the tall building erected for the sake of the return on the investment to the owner, is beginning to make its appearance everywhere. Hence the frequent serious foundation problem. The variety of these foundation problems arises, principally, from the character of the soil

line, to expel the water from the open lower or cutting edge. The caisson is thus sunk by undermining, aided by the heavy weight of concrete which is added over the roof of the caisson as the latter gradually sinks, and also by the addition of pig iron blocks. When it has reached a satisfactory hard stratum, which is cleaned and levelled, the whole interior of the caisson and of the shaft, connecting the working chamber with the outer air, is filled with well-rammed concrete, forming a solid monolith, upon which the superstructure is supported. To permit the passing of men and material from the outside air to the working chamber, or vice versa, without excessive loss of compressed air, an air lock or intermediate stage between the atmosphere and the high pressure, is used. This air lock surmounts the top of the shaft leading to the working-chamber, and it is now possible to sink caissons through quicksand and water

close enough to adjoining buildings without causing a flow of material from under the latter, which if allowed to occur might settle and crack them.

Preliminary borings had been made by the architect for the building. Based upon these and the column loads, the building was designed to have 42 caissons, 6 ft. 6 in. in diameter, carried down to rock, a distance of approximately 90 feet below the St.



An Interesting Feature of the Contract.—Shoring the Royal Bank Building.

James street sidewalk level. Inasmuch as the lot had been previously excavated to a distance of from 19 ft. to 30 ft., the actual sinking of the caissons was from 60 ft. to 71 ft. To hold back the water and quicksand at such depths when sinking the caissons, it was necessary to introduce compressed air at a pressure, which just before landing caissons on rock reached a maximum of 27 lbs., or nearly two atmospheres above normal. The "sand hogs" were worked in three shifts of eight hours each, a period of one half hour on each shift being taken for lunch, at which time hot coffee was served by the company to the men in a warm room provided for their use. The regulation and temperature of the air being carefully watched no case of "bends" occurred.

Work began on the site of the new building about December 1st and the month was spent in the installation of the boiler plant, compressors, derricks, etc., and building up of the caissons. After the working-chambers were put into position, and the forms set up, the concrete was deposited inside of same to a height of 36 feet. After the first build-up of concrete, the caisson was sunk through the water-bearing ground with the aid of compressed air until the top of the concrete had reached the ground level, when another section of the concrete was built up, and the caisson finally sunk to rock.

The material excavated from the caissons was

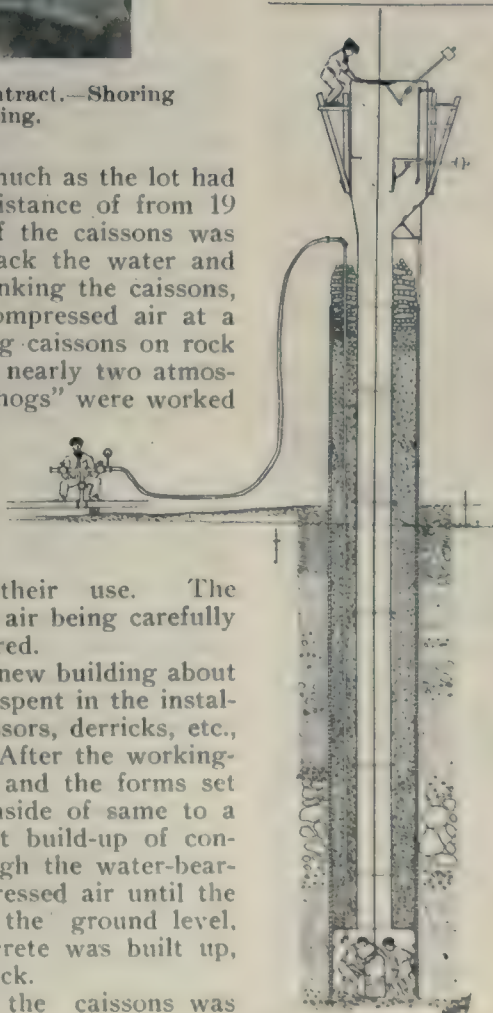
hoisted out in cylindrical buckets by means of stiff-leg derricks located so as to command all of the lot. This material was dumped into dirt hoppers by trip lines operated by the signal man on each derrick. From the hoppers the dirt was unloaded by gravity into the wagons in which it was removed from the lot. Inasmuch as the six derricks could excavate faster than these hoppers could take care of the spoil, it was finally found necessary to supplement these hoppers by dumping directly on the street and shovelling into the carts.

To overcome the frictional resistance on the sides of the caissons in sinking same, pig iron to the amount of 350 tons was used in addition to the weight of the concrete itself. The concrete (1:3:5) was mixed in a Ransome mixer and handled in cyclopean buckets by means of the derricks.

One of the interesting features in connection with the work was the shoring of the Royal Bank building which adjoined the site. To preclude any possibility of a settlement of same, this building was taken care of in the following manner: A continuous plate girder 42 in. in depth was bolted to the wall columns of the building for its full length. Against this were long 12-in. x 12-in. Y. P. pushers which were seated on a heavy timber mat in the lot parallel to wall and also running the full length of the building. Daily readings were taken with a level and adjustments made by wedging the pushers off the mat.

The work was executed by The Foundation Company, Bank of Ottawa Building, Montreal, Edw. & W. S. Maxwell being the architects.

The following was the plant used on the job:—



On the left, Typical Caisson; on the right, Caisson "Lock" a chamber between the atmosphere and high pressure in the Caisson.



One 100 h.p. Oil City boiler; one 80 h.p. Kewanee boiler, one 75 h.p. Nagle boiler, one 70 h.p. vertical boiler, two 20 h.p. vertical boilers, one pipe threading machine, six 5-ton stiff leg derricks, four air locks, four $\frac{3}{4}$ -yd. Cyclopean buckets, four caisson dirt buckets, four caisson concrete buckets, two Ingersoll compressors, each 22-in. x $26\frac{1}{4}$ x 24; one Rand compressor, 14 x 19 x 22; one Beatty feed water heater, one air receiver, one after cooler, six double drum hoisting engines, one Ransome concrete mixer, two 1-yd. Stubener dirt buckets.

The Integrity of Contractors

A few years ago there were rumors that dishonest methods were used in awarding contracts and carrying them out in connection with the work on a large American railroad. At that time that company had spent millions of dollars in practically rebuilding its lines and all of this work had been done by contractors as the railroad company had learned by experience that this is the cheapest method of doing work. The board of directors of the railroad company appointed a committee to investigate all graft and collusion in connection with their construction operations.

The variety of work done was great and the amount was enormous, covering numerous contracts, many of them for half a million dollars and some for even more than a million dollars. The committee investigated all of these contracts, the manner in which they were let, as well as how they were carried out.

After a full investigation the committee reported that there was not a case of dishonesty, not even the giving of small presents and gifts by contractors to employees of the road; and in every case they reported that the best interests of the road had been served by the contracts made and the work done under them. This is a remarkable statement, when it is considered that this one company had spent about one hundred million dollars.

The charges of dishonesty and corruption which the daily papers are so fond of laying at the doors of contractors inspire the "Contractor," of Chicago, with an editorial in a recent issue.

Contractors as a class do not claim to be saints, says our contemporary, but they are honest, if not more so than most business men. Moving from place to place and handling, as they do, large sums of money, it is seldom one hears of a contractor absconding and beating his creditors. On the other hand we know of many cases, when contracts were not profitable ones, of contractors, doing business as corporations, bankrupting themselves individually to meet the obligation of their companies. We feel that contractors have never failed with money in their pockets.

Contractors, as a rule, stick too long to losing contracts. In most cases they are the injured party and they would be justified in abandoning the work, but you seldom find a contractor who will take such a course.

Contractors, sometimes, in carrying on their work, resort to practices that are to be condemned, but in most cases this is caused by unfair specifications and an unreasonable engineer. Thus the contractor, who has his capital at stake, is put on the defensive and it is but human nature for anyone to take care of himself under such conditions.

A large number of contractors make money, but few of them amass large fortunes and die leaving vast wealth. Their financial resources are generally overestimated, so it is rather ridiculous to state that contractors quickly make fortunes by graft. It cannot be stated too emphatically that a fair contract and equitable specifications, together with intelligent inspection, go a long ways towards making an honest contractor.

Re-rolled Steel for Concrete Reinforcement

A prejudice, which has long been entertained, is that against reinforcing bars, which are rolled from old material. These bars, commonly rolled from old rails, have a high carbon content. A finding of interest to makers and users of such bars is that of the committee which was appointed in Cleveland recently to examine into and report on the causes of the collapse of the Henke building in that city on November 22, 1910. The main cause for the collapse of this building, a four-storey and basement reinforced concrete structure, was given as the condition of the concrete, which had not been given sufficient time to set before being subjected to the weight of the building. Although not included in the official report, members of the committee, when interviewed, stated that the reinforcing bars used in the building, while bent and greatly distorted as a result of the collapse, showed only a minimum amount of breakage. The bars which were used in this building were high-carbon re-rolled from old rails.

These high-carbon re-rolled bars are hot-twisted, and not cold-twisted, as is usually the case. Numerous tests made by inspection bureaus show that re-rolled high carbon bars of average size develop a tensile strength of from 80,000 to 95,000 lb. and an elastic limit of 50,000 to 65,000 lb. per square inch, combined with a ductility which will permit bending through 180 degrees to the arc of a circle of which the diameter is equal to three times the diameter of the specimen tested. These figures exceed those generally required by engineers for concrete reinforcing purposes.

Mechanical Shaker for Cement

A mechanical shaker for cement and sand sieves at the testing laboratory of the Intercepting Sewer Board, Syracuse, N.Y., consists of an old sewing machine rigged up to transmit a reciprocating motion to a wooden tray. The machine is driven by a belt from a small water motor, connected to a nearby tap, the spent water flowing into the sink. The tray on which the sieve and its collecting pan are placed contains a circular depression of slightly greater diameter than that of the sieves and around the edge of the hole are set soft rubber buffers so that when the apparatus is in operation the sieve is shaken well and at the same time rotated.

Excellent progress is being made on the extensions and improvements to the plant of the Dominion Steel Company, at Sydney, C.B. During the past year the company has completed 120 coke ovens at a cost of \$1,300,000. With a new repair shop and office building the total expenditure will reach \$4,000,000.

Concerning Gypsum and Gypsum Products

Value and Progress of the Industry—Plaster Boards, Gypsum Studding, Hardwall Plaster, etc., as Modern Fireproofing Materials

By W. H. Price

In the modern better class of building construction gypsum products are playing a very important part, and as a result the gypsum industry has enjoyed a remarkable increase in business during the past few years.

The importance and value of gypsum and the extent of the industry in this country is realized by comparatively few people—the public generally is very much in ignorance on the subject. Some idea of its magnitude may be gained through the fact that millions of tons of gypsum are now annually made into wall plasters and wall finishes of various types, fireproof partition tile, gypsum fireproof studding, plaster boards, plaster of Paris, casting and moulding plasters, dental plasters, wall coatings, stucco, staff, etc., the manufacture of each product requiring a special process. Portland cement contains about two per cent. of gypsum, and gypsum is also used extensively by plate glass manufacturers; the latter requiring the material in the form of a quick setting stucco.

Gypsum products are rapidly relegating old-fashioned methods of wall construction. Plaster board is taking the place of wood lath; and gypsum wall plaster has supplanted lime mortar in the better class of buildings. This condition, however, is natural when we take into consideration the fact that gypsum is a fireproof material and a big time saving factor. When made into plaster board gypsum represents one of the best and most economical insulators against fire, heat and cold—advantages impossible to secure with former methods, and when plastered over with gypsum plaster, on account of the affinity between the products, the board and plaster become a solid mass forming a dense, strong, durable wall. The walls made of gypsum materials in this manner are coldproof and heatproof, making the building more comfortable both during hot or cold weather. Then again, gypsum, either in plaster or in the plaster board, does not contract or expand; thus marring the walls by cracks, pops, and stains, the common troubles of old wall methods.

Lime mortar and wood lath belong to the materials of yesterday, and the fact that they represent only firetrap construction is being discovered rapidly by both builders and tenants. In this day of progress it is not an infrequent occurrence for prospective purchasers or tenants to inspect the walls of the building, as no one who knows the value of plaster board and hard plaster wants to live in a house with walls built in the old way, where cracks, pops and spoiled decorations are more or less constant eye sores. The wiser builders of apartments in the larger cities have also discovered this and are specifying plaster board and gypsum plaster, knowing that this makes the building or apartment more desirable to tenants because of the fireproofing, soundproofing and the many other advantages of gypsum products which naturally appeal to prospective home owners.

The technical uses of gypsum are manifold. Wherever insulation against heat and cold is desired

there gypsum may be found, thus we find the so-called "Asbestos pipe covering" to be 90 per cent. gypsum, the dentists' muffle furnace to be jacketed with gypsum, the cold storage house to have partitions and wall furring of gypsum blocks, etc.

For the purpose of fireproofing, gypsum is used in a number of ways, the most common being plastering on metal lath, plaster board plastered over with gypsum plaster, gypsum tile for partitions, column covering, wall furring, etc., and gypsum studding used in connection with plaster board or metal lath and plastered over with gypsum plaster.

Analyzing the special features of gypsum in general which make the material desirable as fireproofing, it has the following advantages: Low conductivity of heat; low co-efficient of expansion, practically zero; resistance to water under fire conditions; incombustibility; lightness; strength; adaptability or plasticity; and low cost.

Low heat conductivity is an essential point. In partitions heat is not conducted through to set fire to furnishings, etc., on the opposite side. In the protection of structural steel work the steel is protected from the weakening action of heat. Many fires attain a temperature of 2,000 degrees F. At 1,700 degrees F. a steel column can only bear its own weight. Heat penetrates gypsum at such a slow rate that in the fires of ordinary duration the metal would hardly get warm. Tests and experiments have failed to indicate any appreciable expansion of gypsum under heat action.

Gypsum plaster properly applied on metal lath forms strong, substantial fireproofing. The gypsum plaster provides for the fire resisting properties of this form of construction, the metal fabric being used as a base for the plastering and as a strengthening mesh.

Plaster board is too well known as a reliable and satisfactory modern building material to need any extended explanation here. Gypsum plays an important part in the make-up of many forms of plaster board. In thickness of $\frac{1}{4}$ to $\frac{1}{2}$ inch, composed of calcined gypsum and fibrous material, plaster board has given splendid results as a fire retardant when used for partitions, ceilings and furring.

The $\frac{1}{2}$ -inch board is in the class of high fire retardants and as such is used in buildings of ordinary construction for the fire protection of stairs, etc., being required for this purpose by the building laws of many cities.

In connection with incombustible studs, plaster board makes a fire-resisting partition of high class for use in office buildings, etc., where lightness and sound-proofing are desirable.

An incombustible stud made of calcined gypsum is attaining great popularity, especially in connection with plaster board. This stud is made 3 by 3 inches in 8 to 12 foot lengths, reinforced with two strips of wood, these strips being in the centre of the stud are completely embedded in gypsum concrete.

A partition constructed of these two materials is

light in weight, soundproof and affords high fire protection at a cost not very far in excess of wood construction. The studs are handled and erected in the same manner as wooden studding, being generally set on 16-inch centres, but instead of toe-nailing they are fastened at plates, sills and bridging by galvanized sheet metal clips. The plaster board is applied as to ordinary studding, breaking joints every other board horizontally and nailing with galvanized wire nails $1\frac{3}{4}$ inches long with large head. Both the studs and the plaster board are easily cut with the ordinary saw, and with the exception of plastering, this fireproof partition is erected entirely by the carpenter.

Plaster boards have been in use for the past fifteen years. They were primarily designed to take the place of wood lath and as such have played an important part in the building of the country. For general lathing purposes the board is made in thicknesses of $\frac{1}{4}$ and $\frac{3}{8}$ inches, the $\frac{1}{4}$ -inch thickness being in most common use. The size of each board is uniformly 32 by 36 inches. Light in weight, tough and easily applied, it is nailed direct to studding, furring or joists and is plastered over just the same as any other lathing material.

The Proper Application of Plaster Board

There is a right way and a wrong way to use any material and plaster board must be used right in order to obtain the best results. The writer has been a close observer of modern building materials in general and has often heard adverse comment on very meritorious materials because some builder or mechanic happened to have trouble in their use. And thus the sale of a good product is sometimes temporarily injured in a market when the fault is not with the product but entirely due to a wrong application—a misunderstanding as to the proper use of the material.

Plaster board is not a substitute for both lath and plaster as sometimes misunderstood, but is a lathing material only and should be covered with a good coat of gypsum plaster, not less than $\frac{1}{2}$ inch over the face of the board. Improper application of the board or the attempt to get a good job by using a thin coat of plaster often results in dissatisfaction. The proper method of applying plaster board is to break joints every other board horizontally on the walls, which is easily done by starting every other tier with a half board. Joints should be broken on ceilings every other board at right angles with furring or joists.

It is important that the boards be spaced not less than $\frac{1}{4}$ to $\frac{1}{3}$ of an inch apart on all sides, and these spaces or joints should be well filled with gypsum mortar, forming a good key and allowed to set before the base coat is applied. By filling in the joints in this manner the boards are all joined together into a homogeneous mass, forming a solid plastering surface and also preventing any cracking at the joints.

The plaster coat is applied to the dry board and the two materials bond together perfectly. The excessive amount of water required in plastering on wood lath has always been one of the serious objections to that material as this moisture not only warps and buckles the wood lath but also frequently warps the trim and frame work and is often responsible for many of the cracks and other defects in walls and ceilings.

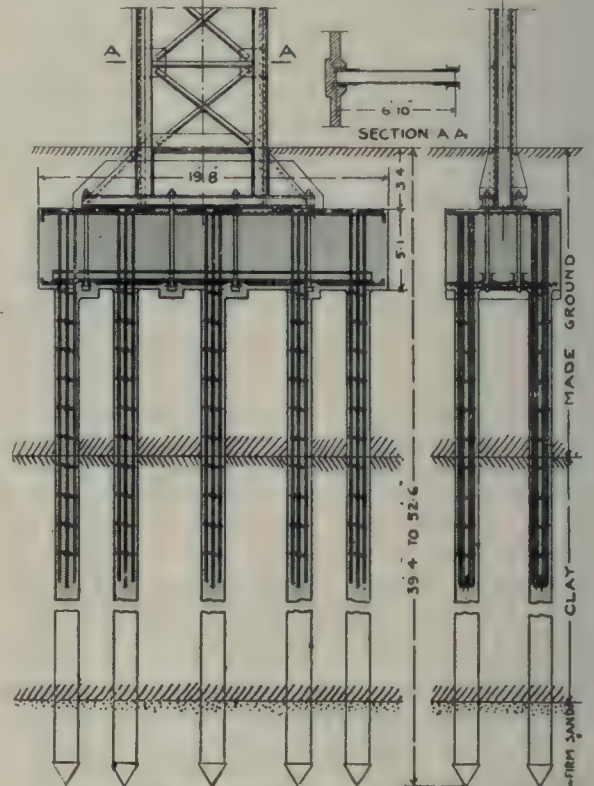
Plaster board absorbs the small amount of excess moisture in the base and finish coats of plaster, keeping the water away from the frame work, and on

account of the absence of the wood lath the use of plaster board removes the very element that is largely responsible for plaster cracks, as gypsum either in the board or plaster coat does not contract or expand and is stainproof.

Considering all the good features of gypsum products from a fire-retardant standpoint, its low cost and the extent to which the material is found, it is evident that gypsum will plan an enormous part in the building construction of the country.

Foundations for Engineering Workshops at Hamburg

The new shipbuilding yard of the Vulcan Company at Hamburg includes numerous buildings, one of the most interesting from the architectural standpoint being that devoted to the construction of engines and boilers. These buildings cover an area of more than 61,000 square feet, and consist of bays about 263 feet long by 66 feet wide. Owing to the exposed position of the shops and to the fact that the soil consisted of made ground to the depth of from 16 feet to 20 feet, care was taken in designing the foundations to insure exceptional strength.



Foundations for Workshops at Hamburg.

By the sections reproduced herewith it will be seen that the main columns are provided with an extended base securely bolted down to a massive concrete footing, reinforced by channel bars, the footing being supported partly by the ground and partly by a group of ten reinforced concrete piles driven through made ground and clay to a bed of compact sand at a depth of from 39 feet 4 inches to 52 feet 6 inches below surface level. The whole of the concrete work is in monolithic connection and the construction is further bonded by extension of the vertical bars from the piles to the upper surface of the concrete footing. The flooring of the workshops is formed by reinforced concrete beams and slabs, over which a surface of wood paving is laid.



One of the Smaller Canals in the C. P. R. Irrigation Block

Irrigation Developments at Calgary

Energetic Prosecution of the Canadian Pacific Railway's Great Scheme—Constructional Features and Other Details of the System

Reports received from the Canadian Pacific Railway indicate that the company's irrigation operations in the vicinity of Calgary are being pushed forward with great energy. Some thousands of men and teams are employed in the three sections of the irrigation block and the huge system is developing rapidly. In the western section, which comprises 1,039,620 acres, 370,000 acres have been brought under irrigation, and of its total area, both irrigable and non-irrigable, less than five per cent. remains unsold. In the western section 1,600 miles of canals and ditches have been constructed and in addition to this there are several hundred miles of smaller ditches constructed by farmers to distribute the water over their farms. The structures consisting of headgates, spillways, drops, flumes, bridges, weirs, etc., are numbered in thousands, and in their construction ten million feet (board measure) of timber and four thousand cubic yards of reinforced concrete were used. The water for the irrigation of this system is diverted from the Bow river at a point about two miles below the city of Calgary. From there it is carried south and east through a main canal 17 miles in length, 60 feet wide at the bottom and 120 feet wide at the water line, designed to carry water to a depth of 10 feet. This main canal delivers the water to a reservoir, for which a natural depression in the ground has been utilized, and where by the aid of a large earth dam a body of water three miles long, half a mile wide and 40 feet deep had been created. From the reservoir the water is distributed to the land by a system of 250 miles of secondary canals and 1,300 miles of ditches. Altogether in the western section ten million cubic yards of earth have been excavated.

The system to serve the eastern section of the irrigation block is a very extensive one and renders necessary the building of a large number of struc-

tures, the details of which are being worked out with all possible care. The section comprises 1,155,224 acres, of which 440,000 are to be rendered irrigable. Most of this land is of a gently rolling character and is susceptible of good drainage. It is the intention of those in charge of the work to make use of reinforced concrete or other permanent material in all important structures. The estimated mileage of canals and ditches to serve this portion of the block is as follows: main canal, 5 miles; secondary canals,



Main Canal and Head-Gates in the C. P. R. Irrigation Block

475 miles; distributing ditches, 2,020 miles; total, 2,500 miles.

The earth that it will be necessary to remove in connection with the construction of the above mentioned canals and ditches will amount to over twenty million cubic yards, the whole of which is now under contract. The structures, numbering thousands, will include drops, head gates, siphons, bridges, etc., and to a large extent will be built of reinforced con-

crete. The largest of these structures will be the big dam at Bassano. (See Contract Record, April 19, 1910).

The central section of the irrigation block contains 901,737 acres, of which it is proposed to irrigate about 70,000 acres. The preliminary surveys have been completed, and the non-irrigable parts are being disposed of. The irrigable lands in this section will be served through an enlargement of the system already constructed to serve the western section of the block.

Method of Gauging Voids in Sand and Aggregate in Concrete

A simple method of determining the voids in sand and broken stone or gravel for concrete, involves the use of a galvanized dust bin and a weighing machine available up to 500 lb. The procedure is as follows:

- (1) Weigh bin empty; denote weight by W .
- (2) Weight bin full of water; denote weight by W_1 .
- (3) Weight bin full of dry sand or aggregate; denote weight by W_2 .
- (4) Weight bin full of sand or aggregate and water; denote weight by W_3 .

$$\text{Then the cubic contents of bin is: } C = \frac{W_1 - W}{62.4}$$

$$\text{and the volume of voids is. } V = \frac{W_1 - W_2}{62.4}$$

$$\text{The percentage of voids in the sand or aggregate is: } P = \frac{C}{V}$$

The foregoing method, which has been largely adopted by the Aberthaw Construction Company, of Boston, is said to be accurate, convenient and rapid.

Standard Specifications for Tests of Drain Tile and Sewer Pipe

These specifications were recommended by the Engineering Experiment Station of the Iowa State College, and adopted by the Association of Iowa Cement Users, the Iowa Brick and Tile Manufacturers' Association, the Iowa Drainage Association and the Iowa Engineering Society.

Specifications for Standard Absorption Tests

1. Specimens.—The specimens shall be each approximately three inches square, and shall extend the full thickness of the pipe wall, with the outer skins unbroken.

2. Number of Test Specimens.—Five individual tests shall constitute a standard test, the average of five, and the result for each specimen, being given in the report of the test.

3. Drying Specimens.—Each specimen shall be dried in an oven or by other application of artificial heat, until it ceases to lose further appreciable amounts of moisture when repeatedly weighed.

4. Brushing Specimens.—All surfaces of the specimens shall be brushed with a stiff brush before weighing the first time.

5. Weighing.—The specimens shall be weighed immediately before immersion, on a balance or scales capable of accurately indicating the weight within one-tenth of one per cent.

6. Water for Standard Test.—The water employed in the standard absorption test shall be pure soft water, at the air temperature of a room which is artificially heated in cold seasons of the year.

7. Immersion of Specimens.—The specimens shall

be completely immersed in water for a period of 24 hours.

8. Re-weighing.—Immediately upon being removed from the water, the specimens shall be dried by pressing against them a soft cloth or a piece of blotting paper. There shall be no rubbing or brushing of the specimen. The re-weighing shall be done with a balance or scales capable of accurately indicating the weight within one-tenth of one per cent.

9. Calculation of Result.—The result of each absorption test shall be calculated by taking the difference between the initial dry weight and the final weight and dividing the remainder by the initial dry weight.

Standard Tests of Bearing Strength

1. Specimens.—The specimens shall be unbroken, full sized samples of the pipe to be tested. They shall be carefully selected so as to represent fairly the quality of the pipe.

2. Number of Specimens.—Five individual tests shall constitute a standard test, the average of the five and the result for each specimen being given in the report of the test.

3. Drying.—The specimens shall be dried by keeping them in a warm, dry room for a period of at least two days prior to the test.

4. Weighing.—Each dried specimen shall be weighed on a reliable platform scale just prior to the test.

5. Bedding of Specimen for Test.—Each specimen shall be accurately marked, with pencil or crayon lines, in quarters, prior to the test. Specimens shall be carefully bedded above and below in sand for one-fourth of the circumference of the pipe, measured on the middle line of the tile wall. The depth of bedding above and below the tile at the thinnest point shall be equal to one-fourth the diameter of the pipe, measured between the middle lines of the tile walls.

6. Top Bearing.—The top bearing frame shall not be allowed to come in contact with the tile or with the test load. The upper surface of the sand in the top bearing shall be carefully covered with a heavy, rigid top bearing, with lower surface a true plane, made of heavy timbers or other rigid material capable of uniformly distributing the test load without any appreciable bending. The test load shall be applied at the exact centre of this top bearing in such a way, either by the use of a spherical bearing, or by the use of two rollers or rods at right angles, as to leave the bearing free to move in both directions. In case the test is made without the use of a machine, and by piling on weight, the weight may be piled directly on a platform resting on the top bearing, provided, however, that the weight does not touch the top frame holding the sand, and provided, further, that the weight is piled in such a way as to insure uniform distribution of the load over the top surface of the sand.

7. Frames for Top and Bottom Bearings.—The frames for the top and bottom bearings shall be composed of timbers so heavy as to avoid any appreciable bending by the side pressure of the sand. The frames shall be dressed on their interior surfaces. No frames shall come in contact with the tile during the test. A strip of soft cloth may be attached to the inside of the upper frame on each side along the lower edge to prevent the escape of sand between the frames and the tile.

8. Sand in Bearings.—The sand used for bedding the tile at top and bottom shall be washed sand which

has passed a No. 8 screen. It shall be dried by keeping it spread out thin a warm, dry room.

9. Application of Load.—The test load shall be applied gradually and without shock or disturbance of the tile. The application of the load shall be carried on continuously, and the tile shall not be allowed to stand any considerable length of time under a load smaller than the breaking load.

10. Calculation of the Bearing Load.—The total breaking load shall be taken as equal to the total top load, including the weight of top frame, sand for top bearing, top bearing timbers, etc., plus five-eighths of the weight of the pipe. This total load shall be divid-

ed by the length of the pipe in feet so as to give the bearing strength per linear foot of pipe.

The modulus of rupture for drain tile and sewer pipe shall be computed from the results of the standard test for bearing strength, according to the following rule:

Divide the bearing strength per linear foot by 12, multiply the quotient by the radius of the middle line of the tile wall expressed in inches, and divide this product by the square of the minimum thickness of the tile wall at top or bottom, also expressed in inches. This quotient will be the modulus of rupture of the pipe expressed in pounds per square inch.

The Development of Bridge Construction

Influence of Public Opinion on Current Design—Progress Made in the Use of Concrete—Notes on Arch Analysis

By Frank P. McKibben

Never before in the history of bridge engineering has the influence of public opinion been so noticeable as at the present time and the interest shown by the public in this important branch of construction is very gratifying, especially to those engineers who have labored unceasingly to have bridges regarded from the artistic as well as from the utilitarian standpoint. Public opinion is now demanding not only that bridges shall be made better but that they shall be more suited to and expressive of their purposes and environments. Although great advances have been made in the status of bridge engineering there is still room for improvement, for it is often impossible to make communities realize that a bridge is something more than merely a means of crossing an opening. They are not willing to make the additional appropriations necessary to secure artistic bridges, even though the structures may occupy such conspicuous positions as to require more impressive and finer treatment than some public buildings upon which vast sums are expended to secure pleasing architectural effect. How common it is to see post office buildings, for example, beautifully designed and well constructed, but placed in such surroundings as to lose the intended effect, while nearby may be a bridge in a location of magnificent possibilities, but upon which no attempt has been made to display grace or beauty. Let the public fully realize that when a bridge is built without making it architecturally beautiful a splendid opportunity for civic improvement is lost. In the past the one great difficulty in securing pleasing structures has been that appropriations for bridges have generally been so small as to exclude all but the more utilitarian requirements, but fortunately more recent awakenings of civic pride are resulting in great improvements.

A beautiful arch bridge is a wonderful structure. There is something inspiring about it. And engineers must do all in their power to have the public realize this and to appreciate the beauties that can be created by proper and simple combinations of common materials of construction. Symmetry, grace, simplicity and truthfulness are essential elements in a bridge possessing architectural merit. Truth is a basic element, and when one material is disguised to represent another, or when a part is made to appear as if performing a certain function when in reality it is per-

forming quite a different one, the result is a dismal failure.

Strides Made by Concrete

The most remarkable development in bridge construction during the past quarter of a century has been the progress made in the use of concrete, either alone or reinforced with steel. When it is considered that only 22 years ago the first reinforced concrete arch bridge was built in Golden Gate Park at San Francisco, and that from this small span of only 35 feet to the recently constructed arch span of 320 feet in New Zealand, is a tremendous step, it is evident that progress has been truly wonderful. Concrete, like stone, is best suited to resist compressive stresses, and it can be readily molded into any desired form or size, and it is therefore not surprising that when concrete came into use as a bridge material it should have been used in the arch form. It was a comparatively easy change from the stone arch that had been the standard arch form for many centuries to the concrete monolithic or voussoir arch of similar outline. But it was soon realized that concrete in combination with steel has a distinct individuality of its own and hence important changes were made in the form of construction, resulting in the use of lighter structures of more pleasing design and appearance. The constant tendency has been towards the elimination of redundant material. The use of arch ribs, with the variation in size and shape thereof to conform to different classes of loads, or the use of solid arch rings upon which rest columns or cross walls to support the roadway above, approaches the design so commonly adopted for arches with steel ribs and in this respect represents a decided departure from and improvement upon the solid arch ring with its superimposed earth fill, which was until recently the standard form of masonry arch construction.

The most recent type in reinforced concrete highway bridge construction consists of a flat deck on which the roadway is placed, the deck in turn being supported by columns or cross walls resting on a solid arch ring or upon ribs. These ribs are usually rectangular in cross section, although those of circular form would give a more pleasing appearance, but would be more costly and more difficult to build. Unless the ribs are very wide they should be braced to

prevent lateral displacement under stress. Much can be said in favor of this open spandrel construction except for very short spans or for spans of small rise where the old method of placing the roadway on earth filling retained between longitudinal side walls is better. In the absence of such limitations, however, the open spandrel construction results in a great saving of weight of superstructure, with consequent diminution in size of foundations and often also in a more pleasing design. For railroad bridges the column and rib type has not been adopted, but open spandrels with cross walls on solid arch rings are of frequent occurrence.

Analysis of Arches

Arch analysis—that is, the determination of forces and stresses acting upon and within the arch—is an interesting and beautiful application of mathematics and mechanics, and it is doubtful if in the whole category of engineering design a more enticing field for study can be found. The insertion of three hinges in the arch makes the solution more nearly determinate, and in case of slight settlement of foundations the stresses within the arch ring remain unchanged. In addition to this advantage, hinges relieve the ring from temperature stresses, since as temperature of the arch changes the crown rises or falls with almost perfect freedom. For arches of small rise the advantage of hinges are so notable that their use will undoubtedly become more common, especially if some form be devised which can be economically constructed. For analysis of hingeless arches the elastic form theory should be employed because of temperature stresses which are usually large and which can be computed only by this method.

Little progress can be reported in short span steel bridges, in fact concrete beams or arches are so admirably adapted to short span construction that steel is hardly its own in this field. But for long spans steel easily leads. Great progress is now being made in the manufacture of alloy steels, and the time is not far distant when record breaking spans of steel will be built.

No notable advances have been made recently in the type employed for long steel spans, but many wonderful structures similar to those tried and not found wanting are now being erected. The cantilever and the suspension forms are the two kinds commonly used, although there is also an increasing tendency to employ steel arches of considerable length. The Quebec bridge failure has had the effect of temporarily throwing the cantilever type of truss into some disrepute, but engineers must not let the pendulum swing too far, because the cantilever has certain well defined advantages which should not be completely ignored simply on account of one failure of its truss members. Lamentable as was this failure, it has been the cause of inaugurating a searching investigation into methods of design that are founded upon empirical knowledge, and much good is being derived therefrom. Resulting from the influence which the Quebec bridge failure had upon the engineering world there is a tremendous desire on the part of experimenters to discover new laws underlying the action of structural materials and to verify experimentally methods of design which until recently were accepted as being sufficient for all cases that might arise in practice.

One hesitates to predict what developments science may bring forth in bridge engineering, but it is probable that for the next decade progress will be made along three lines, the perfection and increased use of

alloy steels, the production of structural shapes which are free from objectionable details of fabrication, and finally the combination of steel and concrete into a composite structure in which the steel will afford great strength and the concrete will be a protection against corrosion and against other destructive elements.

Concrete Construction in its Relation to Lighting and Heating Efficiency

Two phases of the concrete construction problem which are not often given due emphasis are those of the relation of this building material to the efficiency of lighting and heating a factory building. In discussing the subject of mill building construction at the annual convention of the National Association of Cement Users, Mr. L. C. Watson, of the Aberthaw Construction Company, took occasion to point out the very important bearing which the material of construction has on these two factors.

It is quite usual for owners in order to increase the efficiency of artificial lighting in mills to whiten the ceilings and walls in order to get the maximum reflection. A recent investigation showed that whitening in general held much better on concrete than it does on wood, so that it is possible to get much better reflection after the whitening has been on for some time and therefore requires less artificial light than in the case with mill construction. Of course, with flat slab mushroom type floors there is a further advantage in the lack of beams to obstruct the light.

A Through Reinforced Concrete Arch Bridge

E. A. Gast, deputy county surveyor, Hamilton County, Ohio, describes this unusual type of bridge in the Engineering News. An interesting statement is to the effect that two estimates were made for this bridge, one of steel girder construction, estimate being \$11,000, the other of reinforced concrete construction, the estimated cost of which was \$8,600. The County Commissioners decided upon the latter. The bridge, which is near Cincinnati, consists of two hingeless reinforced concrete arch ribs, built entirely above the roadway, the thrust being cared for by tension steel in the plane of the floor tied thoroughly around the steel in the ribs. The roadway is suspended from the ribs by nine hangers of reinforced concrete, the steel rods hooked around rib reinforcement above and floor rods below, taking all the stress. Drawings and photographs illustrate the text, which goes into the details of construction and cost.

Cost of Reinforced Concrete Pipe

In a paper before the Indiana Engineering Society, W. P. Moore, city engineer of Mishawaka, Indiana, in describing the reinforced concrete pipe, 36 in. in diameter, which was used for 3,480 lin. ft. of sewer, states that the approximate cost per linear foot, was \$4.16. The excavation for the trench was sand and gravel, and the average cut 10 feet. The pipe was furnished to the contractor by the Jackson Concrete Pipe Company at a cost of \$1.80 per linear foot, and the charges per foot for labor and material for joints were: labor, \$2.25; cement, sand and gravel for joints, 9 cents; water for flushing trench, 2 cents.

New Type of Bridge

"Tubular architrave" is the type of concrete bridge invented by John A. Lynch, a civil engineer at Spokane, Wash., who has just received advice from Washington, D.C., that the United States patent has been granted. The invention is the result of three years' work. Patents have been applied for in Canada, England, France, Germany, Austria-Hungary, Russia and other countries. A company capitalized at \$500,000, is being organized in Spokane.

C. P. Bohland, bridge expert on the staff of the Great Northern Railway Company, who examined the plans and models recently, gives these points of advantage to the new structure over the present type of steel and concrete bridges:

"Saves enormous volumes of concrete as compared with concrete bridges of all other types; cost of construction reduced by the use of sliding form; owing to design a more permanent and a stronger structure is obtainable; cost of maintenance is less, being built on cantilever principles; the cost of placing false work is reduced; excels steel structures in moist of mountainous climates by reason of saving cost of occasional painting and deterioration of structure; for railroad use the ties will lay on a ballast which takes up all vibrations, thus eliminating the crystallization which would otherwise take place in the steel and reinforced concrete; concrete is least affected by variations in temperature; will present an artistic appearance."

A. Palmer, a construction engineer at Spokane, who was one of a party of six experts at a series of tests, thus describes the strength of the Lynch type:

"The advantage is gained by the tubular architrave bridge being made integral and by making same integral, a combination of cantilever and arch effect is obtained in the span, and owing to the advantages in shape and design, being tubular and round, one counteracts the other, thereby transforming what would horizontal thrust to vertical shear.

"The advantages of vertical shear stress over the horizontal thrust is that the live or dead load is taken care of at its immediate location where there is vertical shear, while in horizontal thrust it is transferred throughout the entire structure, thereby making a severe strain on the bridge, especially in case of a live load, such as, for instance, a heavy freight train.

"Another strong feature of the tubular architrave design which can not be obtained in any other design and which is made possible in the tubular architrave bridge because of its being made integral, and in the spring of the arch being round, is that it naturally forms an arch which is arched against the natural arch being held in place by the cantilever effect of the design.

"This effect, which is a special advantage to the design, is obtained by making integral what was once made separate and by changing the shape of same, thereby obtaining a greater amount of strength.

"Another strong advantage which is gained owing to the shape of the design and by the structure being built integral is that owing to the top of the main arch being in the shape of an inverted arch with the ballast placed therein and the load being placed on top of the ballast, the bearing is naturally diverted to the bottom of the fill, thereby lowering the neutral axis in the arch and placing the greater amount of

same in compression than could be obtained in any other way."

The test referred to was made with models of the Lynch and the Standard types of concrete bridges. The former had a cross section in the arch of 5 5/16 inches and the latter 10 1/2 inches cross section, Affidavits by six local men who witnessed the test declare that the old style of concrete bridge collapsed under eight sacks of cement, while the tubular architrave bridge collapsed only after 37 full sacks had been heaped upon the arch.

Digging Ditches with Dynamite

The method employed in the use of dynamite for making a small ditch, say three feet deep, four feet wide at the top and one foot at the bottom, is to place a cartridge of powder, 60 per cent. strength, in holes three feet apart, placed in the line of the proposed ditch case, being used to get the cartridge all the way down. About in the middle of the line one hole is selected as the priming charge hole, which is loaded with two or three cartridges of powder, in one of which is placed a blasting cap with fuse attached. When the charge is to be under water waterproof fuse should be used, and after crimping the blasting cap tightly, soap or tallow (not oil) should be smeared on the joint to keep the water from entering the blasting cap and damaging it. The fuse is lighted, the operator retires to a safe place and when the charge explodes the shock of the explosion is communicated to the adjoining charges, which in turn pass it along the whole line of holes, whether the line be straight or curved, exploding practically instantaneously. This method may be used in making ditches up to a thousand feet or more in length. In swampy ground, overgrown with brush and vegetation of all kinds, where a ditching machine would be almost helpless, the dynamite method is practically the only practicable way of digging ditches.

One effect of blasting a ditch with dynamite is to crack up for a considerable distance on each side of the ditch the impervious subsoil which always underlines swampy land, so that the water will drain into the ditch through the crevices. One of the great advantages of a dynamited ditch is that there is no levee along the ditch, no bank higher than the field. The material blasted out of the ditch is spread evenly over the fields and not in a bank along the sides. The surface water from the field can drain directly into the ditch.

A wider ditch or a canal can be dug by loading dynamite into several lines or holes parallel to each other. These holes may be spaced 18 inches to 2 feet apart each way. If a canal 12 feet wide is required, from 6 to 8 rows of holes would be necessary with one cartridge of 50 per cent. or 60 per cent. dynamite at the bottom of each. The priming hole would be placed in the middle hole in the centre line. A canal dug in this manner would probably require a little trimming up as some of the material blasted out would be likely to fall back into the ditch. It would be better not to try to fire too many holes at first, but gaining knowledge and experience as to the charges required, it would be possible to adjust the charges so that no trimming would be necessary.

When this occurs, the ditch can be cleaned out perfectly after it has partly filled with water by ex-

ploding charges of a half cartridge of 50 per cent. or 60 per cent. dynamite every two or three feet along the bottom of the ditch under water.

In dry soil it is not always possible to explode a long line of holes with one blasting cap. It then becomes necessary to use an electric fuse in each charge and after connecting up all the fuses with leading wires to a blasting machine, fire electrically. It is, however, comparatively seldom that a ditch is driven through dry ground, and in muck, gumbo and in swampy heavy soil often under water, ditching with dynamite is by far the quickest, easiest and most economical method yet devised.

In Southeastern Missouri, miles of ditches have been dug by dynamite in the past few years, and thousands of acres of land reclaimed thereby.—The Contractor.

Uninformed Critics

Apropos the recent disastrous fire in the Asch building, New York city, as a result of which nearly 150 lives were lost, comments have appeared in the daily press of a character in many instances indicating not only a total lack of knowledge but a regrettable tendency to place wholesale blame on the designers of buildings without regard either to facts or figures, says the American Architect.

Among these ignorant and unjust opinions that have found their way into print have been noted several referring to the matter of fire-escapes. A writer in one of the New York dailies sneeringly attributed the loss of life largely to the reluctance of architects to place necessary fire-escapes on the exteriors of buildings because of their marring effect on the architecture of a street. The author then inquires with fine dramatic effect whether architecture or human life is to receive greatest consideration. Of course, comments of this character are, ordinarily made under great stress of mind and should not be taken too seriously, and yet they are liable to create an impression that is as inaccurate as it is unjust. In this particular instance, for example, it has been generally conceded by those who have made a close examination of the premises that exterior fire-escapes as constructed were of practically no value and, moreover, that no possible number would in this case have been of sufficient aid to the occupants of the building to have prevented great loss of life.

However, as to the exterior fire-escape, it is at best but a cheap and inefficient substitute for the fire-tower or fire-escape stairway enclosed in brick walls. It is undeniably one of the most offensive features, architecturally, that can be placed upon a building, but unfortunately even an acceptance of it adds but little to the safety factor. There seems practically no valid reason for its continuance. It is perfectly feasible to construct stair-towers, affording real means of exit and escape in every instance, and at the same time avoid the disfigureing effect of the outside skeleton structure of steel and iron that is neither a part of the building nor an independent construction.

It is true that such a change would probably result in slightly diminished rentable space procurable by the improvement of a given plot, but such a con-

sideration cannot be weighed where the question of adequate protection of life is concerned.

Undoubtedly, the time is not far distant when enactment of law will require the fireproof enclosed stairway or tower, but there is no reason apparent why architects should await such enactment before making adequate provision in their plans for the protection of the lives of those who in all probability will be required to occupy the buildings they are planning. An owner should also feel the moral responsibility which falls upon him and an architect would seem to be derelict in his duty who did not make sure of an owner's full realization of such responsibility.

As we have had occasion to remark previously, means of fire prevention are of even greater importance in certain classes of buildings than means of escape from fire that has been permitted to start. But in every case and notwithstanding every precaution that may have been taken to prevent fire, the fire-exit tower enclosed in fireproof walls affords a measure of safety not to be wisely dispensed with.

Fuel briquets from street rubbish have been experimented with at Amsterdam, Holland. Hitherto the rubbish has been assorted and the paper, rags, metals and glass sold to dealers. The city authorities, according to a recent United States consular report, are now considering converting the street sweepings into combustible briquets for heating boilers. At Southwark, London, the refuse is crushed to a powder and sold as manure. At St. Ouen, France, the power thus made, with the addition of combustible substances, is converted into a cheap fuel. At Amsterdam experiments were made in combining the pulverized rubbish with coal tar from the gas works and pressing into briquets; the results are said to have been successful. The quantity of material available for this purpose is about 140,000 tons yearly. By installing a briquet plant at an estimated cost of \$200,000 it is believed that the briquets can be sold at a profit of \$20,000.

Separator for Concrete Wall Shuttering

An ingenious and at the same time very simple type of separator for concrete wall moulds consists of a concrete tube made in standard lengths of 4 in., 5 in., 6 in., and 8 in., each having a $\frac{7}{8}$ -in. diameter hole from end to end, giving ample clearance for a $\frac{3}{8}$ -in. bolt, passed through the tube and the timbering on each side. The separators are moulded of good quality concrete, and after the wall has been built they are left in place and become an integral part of the structure. The holes can be allowed to remain open for the support of temporary scaffolding, and afterwards closed by cement mortar. An advantage claimed for the new form of separator, in addition to its general convenience, is that no rust streaks are caused, as is sometimes noticed where iron separators are employed.

Fire broke out recently in the stock room of the E. B. Eddy Company, Hull, Quebec, and burned three million matches. The blaze is supposed to have originated from spontaneous combustion. The room being constructed of cement and being absolutely fireproof, the blaze was allowed to burn itself out.

Principles of Practice for Pile Driving

Adopted by the American Railway Engineering and Maintenance of Way Association—An Enumeration of the Most Approved Methods of Procedure

1. A thorough exploration of the soil by borings, or preliminary test piles, is the most important prerequisite to the design and construction of pile foundations.

2. The cost of exploration is frequently less than that otherwise required merely to revise the plans of the structures involved, without considering the unnecessary cost of the structures due to lack of information.

3. Where adequate exploration is omitted, it may result in the entire loss of the structure, or in greatly increased cost.

4. The proper diameter and length of pile, and the method of driving, depend upon the results of the previous exploration, and the purpose for which they are intended.

5. Where the soil consists wholly or chiefly of sand, the conditions are most favorable to the use of the water jet.

6. In harder soils containing gravel the use of the jet may be advantageous, provided sufficient volume and pressure be provided.

7. In clay it may be economical to bore several holes in the soil with the aid of the jet before driving the pile, thus securing the accurate location of the pile, and its lubrication while being driven.

8. In general the water jet should not be attached to the pile, but handled separately.

9. Two jets will often succeed where one fails, in special cases a third jet extending a part of the depth aids materially in keeping loose the material around the pile.

10. Where the material is of such a porous character that the water from the jets may be dissipated and fail to come up in the immediate vicinity of the pile, the utility of the jet is uncertain, and used to test the final rate of penetration.

11. A steam or drop hammer should be used in connection with the water jet, and used to test the final rate of penetration.

12. The use of the water jet is one of the most effective means of avoiding injury to piles by overdriving.

13. There is danger from overdriving when the hammer begins to bounce. Overdriving is also indicated by the bending, kicking or staggering of the pile.

14. The brooming of the head of a pile dissipates a part, and in some cases all, of the energy due to the fall of the hammer.

15. The weight of the drop of the hammer should be proportioned to the weight of the pile, as well as to the character of the soil penetrated.

16. The steam hammer is more effective than the drop hammer in securing the penetration of a pile without injury, because of the shorter interval between blows.

17. Where shock to surrounding material is apt to prove detrimental to the structure the steam hammer should always be used instead of the drop hammer. This is especially true in the case of sheet piling which is intended to prevent the passage of water. In some cases also, the jet should not be used.

18. In general, the resistance of piles, penetrating soft material, which depend solely upon skin friction, is materially increased after a period of rest. This period may be as short as fifteen minutes, and rarely exceeds twelve hours.

19. In tidal waters, the resistance of a pile driven at low tide is increased at high tide on account of the extra compression of the soil.

20. While a pile penetrates muck or soft, yielding material, and bears upon a hard stratum at its foot, its strength should be determined as a column or beam; omitting the resistance, if any, due to skin friction.

21. Unless the record of previous experience at the same site is available the approximate bearing power may be obtained by loading test piles. The results of loading test piles should be used with caution, unless their condition is fairly comparable with that of the piles in the proposed foundation.

22. In case the piles in a foundation are expected to act as columns the results of loading test piles should not be depended upon unless they are sufficient in number to insure their action in a similar manner, and they are stayed against lateral motion.

23. Before testing the penetration of a pile in soft material where its bearing power depends principally, or wholly, upon skin friction, the pile should be allowed to rest twenty-four hours after driving.

24. Where the resistance of piles depends mainly upon skin friction it is possible to diminish the combined strength, or bearing capacity, of a group of piles by driving additional piles within the same area.

25. Where there is a hard stratum overlying softer material through which the piles are to pass to a firm bearing below, the upper stratum should be removed by dredging or otherwise, provided it would injure the piles to drive through the stratum.

26. Timber piles may be advantageously pointed in some cases to a 4-inch square at the end.

27. Piles should not be pointed when driven into soft material.

28. Shoes should be provided for piles when the driving is very hard, especially in riprap or shale, and should be so constructed as to form an integral part of the pile.

29. The use of a cap is advantageous in distributing the impact of the hammer more uniformly over the head of the pile, as well as to hold it in position during driving.

30. The specification relating to the penetration of a pile should be adapted to the soil which the pile is to penetrate.

31. It is far more important that a proper length of a pile should be put in place without injury than that its penetration should be a specified distance under a given blow, or series of blows.

A monument commemorating the work of Dr. Alexander Graham Bell, inventor of the telephone, will soon be erected in his birthplace, Brantford, Ont. It is expected to have the formal celebration on Dominion Day, 1912.

A roof construction diagram just to hand from the Barrett Manufacturing Company, New York, shows very clearly the increased cost of constructing steep roofs as against those of flat surfaces. It also shows the rise or pitch of roofs in inches and degrees. The reverse side of the diagram contains the Barrett specifications for felt, pitch and gravel or slag roofing.

Building Trades Active at Vancouver

**Daily Announcements of Important New Work—The Wage Schedule
— Labor Conditions Satisfactory — Progress at North Vancouver**

Office of the Contract Record,
Vancouver, May 18, 1911.

The announcement of plans for new and costly buildings is a daily occurrence. Increasing population demands the erection of more and more dwelling houses. Practically whole streets are being built up weekly in the suburban districts. Go where you will you will be in sight of new buildings in course of erection or nearing completion. The season of out-door work is now in full blast. The street car company is laying tracks, hundreds of men are busy on cement pavements, walks and sewers, and the slogan of pro-

The section known as Strathcona is being cleared, and already there are over 100 dwelling houses being built and nearing completion. Lots 50 x 132 sell here for \$3,000.

The new building at 28 Hastings street, near Carrall street, will be converted into an hotel by D. Burns, at a cost of \$30,000. Extra partitions will enable the installing of 98 bedrooms.

Building at Cedar Cottage is very active and cottages are in big demand. The new \$10,000 school house is nearly finished.

Hastings street (east end) between Victoria Drive and Nanaimo street, will be widened at a cost of \$43,200.

The borrowing power of the city for public works next year will exceed \$7,000,000.

The "Arts and Crafts" building (50 by 120 feet), will be erected on the east side of Seymour street, between Dunsmuir and Seymour streets, at a cost of \$70,000, by Marriott & Fellowes, the Norton-Griffiths Steel Construction Company being the contractors. The foundations are for a ten-storey structure, but only four storeys will be put up this year.

Following are the different wage schedules prevailing among the building trades of Vancouver: Carpenters and joiners receive 56¼ cents an hour, or \$4.50 a day of eight hours; structural iron workers, 56¼ cents an hour, or \$4.50 a day of eight hours; cement workers, 75 cents an hour, or \$6 a day of eight hours; electricians, 50 cents an hour, or \$4 for eight hours; steam engineers, 50 cents an hour, or \$4 a day; elevator constructors, 50 cents an hour or \$4 a day; lathers, piece work. Laborers: Plasterers, 50 cents an hour, or \$4 a day of eight hours; bricklayers, \$3.50 a day; general, \$2.80 a day. Painters, 56¼ cents per hour, or \$4.50 a day of eight hours; plumbers, \$5 a day of eight hours; plasterers, 75 cents an hour, or \$6 a day; shingles, piece work; sheet metal workers, 56¼ cents an hour, or \$4.50 a day; tile-layers, 68 cents an hour, or \$5.50 a day; machinists, 45 cents an hour, or \$3.60 a day of eight hours; marble-cutters and stone cutters, 75 cents an hour, or \$6 a day; steam engineers (donkey engines), \$4.50 a day (after May 1st).

The Saturday half-holiday is universally observed or the 44 hour week in Vancouver.

It may safely be stated that Vancouver is not only a commercial metropolis but is rapidly approaching the status of an industrial centre. It is estimated that the population of Greater Vancouver has increased 25,000 since last year. This would place the present population of the city at 145,000.

Active preparations are being made by the Imperial Car, Ship Building and Dry Dock Corporation, Limited, for the establishment of their new industry. The corporation has

no less than 4,800 property lots and a mile and a half of water frontage. It is now spending \$50,000 on clearing the land. The proposed shops will cover five acres and will involve an expenditure of over half a million dollars, the details being as follows: car shops and machinery, \$350,000; sea wall and grading site, \$50,000; construction work, \$65,000; engineering and contingencies, \$35,000. Between 500 and 600 men will be employed at the works. The company has secured an option on a group of ten claims of valuable iron deposits, located within ten miles of the town sites and shops. It also has a clay deposit which will supply the needs of the town site for many years. The capitalization of the Imperial Car Co. is \$20,000,000. Judge Arthur, of Seattle, is president and ex-Mayor Douglas, of Vancouver, vice-president.

The carpenters' strike seems to have petered out. All the union men have to work on other jobs, and their places in many cases have been filled by non-union men,—new arrivals. The reports to the Builders Exchange from large contracting concerns show that they had practically all the men required at \$4.25 for eight hours. The rate asked by the union is \$4.50. The association of contractors are seeking closer working arrangements with other organizations and interests who have not worked with them in harmony heretofore, so that in future the city may not be affected by the conditions demanded by the unions. Also they have decided not to figure on work where strict clauses are included in the contract, tying their hands as to the employment of labor.

Building Inspector C. N. Jarrett recently received figures from Seattle, Wash., showing that for no month this year had Seattle's building permits exceeded \$1,000,000. The returns for the two cities for the four months, Jan.-April, are given as follows: Vancouver, \$5,793,650; Seattle, \$2,636,890.

Final arrangements have been completed at Ottawa for the government subsidy of \$200,000 for the Second Narrows bridge, Vancouver. This structure will be a railway and vehicular traffic bridge, owned jointly by the municipalities of Vancouver and North Vancouver, which have contributed \$350,000. The Dominion and Provincial governments have pledged \$200,000 each. Construction will proceed at once. The engineers have taken soundings and prepared plans, which will soon be accepted and approved.

It is announced that the Vancouver, Westminster & Yukon Railway Co. will proceed with its connecting railway lines, one on the north shore of Burrard Inlet and the other through Hastings townsite (now the east end of Vancouver city). When completed this railway will be the connecting link between the G. T. P. railway and the Great Northern. Fort George, the G. T. P. junction, is 525 miles northeast of Vancouver. The railroad from this point to North Vancouver will not be constructed until the main line has been completed.

North Vancouver

North Vancouver is progressing apace. The city was incorporated in 1907 with a population of about 1,500; today it has 8,000 inhabitants and is still growing. Among the projects in sight may be mentioned the large sawmill of the North Vancouver Lumber Company and the buildings and plant of McDougall-Jenkins, Limited, which will

involve an expenditure of \$150,000. Much development work is planned in other industries along the water front.

The city council have decided to spend \$750,000 on public works. This will insure much activity in street paving and sewer construction for some time. At present a thousand laborers are employed on sewer work.

According to a dispatch from Edmonton, Alta., construction work has at last been started "on the long-hoped for railway from Edmonton that will tap the far-famed Peace River country, and give transportation facilities to the last free heritage of the Anglo-Saxon race." The contract for 50 miles of the line has been awarded by the C. N. R. to the Northern Construction Company.

Close Figuring at Ottawa, Ont.

Competition for a Good Sized Contract Awarded Last Week—No Labor Troubles—Supply Market Normal

The industrial situation in the Capital got over the first of May without any serious difficulty. The only obstacle that presented itself was with regard to the mason and bricklayers' helpers. When these trades went onto the 8-hour day schedule their assistants were forced to work only eight hours as well. As their agreement with the contractors came to an end on the first of May, they demanded that the rate of pay be raised up from 25 cents to 28 cents an hour. It will be noticed that the 25 cents an hour for a nine-hour day was \$2.25, and that the increase to 28 cents for an eight-hour day brings them in \$2.24. The wages of the helpers who work nine hours a day remain 25 cents an hour as usual. Carpenters' wages remain the same, from 30 cents to 35 cents an hour, and a few at even lower rates.

Close Figures on a City Contract

Mr. Thomas McLaughlin has been awarded the contract for the West End drainage excavation. The award of this big contract attracted considerable attention. Mr. McLaughlin tendered \$62,188 for the excavation, not including the rock. The tender for rock was at \$4.75 a cubic yard. The engineers' estimate for the rock was 31,000 cubic yards and thus the total for it was \$147,250. Accordingly the total contract was \$209,438. Mr. Roderick Brewder tendered entirely in a lump sum for \$209,404. This did not fulfil the requirements of the advertisement, which provided that the price for rock should be particularized. Under the circumstances the Board of Control declared the tender irregular. Another feature of the tender of Mr. McLaughlin was the very low price asked for earth excavation and the very high price asked for rock. The Union Construction Company, whose total tender was some \$33,000 higher, tendered \$165,475 for the earth excavation and only \$2.50 per cubic yard for the rock. While Mr. McLaughlin's tender for the rock excavation was \$4.75, as compared with the Union Construction's \$2.50, yet his price on the earth was so low as to bring his tender well under his competitors' bids. There is therefore a great deal dependent on the accuracy of the estimate on rock made by the City Engineer. If the estimate of rock is high Mr. McLaughlin's tender is correspondingly low, while on the other hand, if it is low, Mr. McLaughlin will get the \$4.75 a cubic yard for all in excess of the 31,000 cubic yards. The City Engineer, however, considers that his estimate is low and that therefore it will be the city that will get the long end of the bargain.

The Dominion Government has agreed to grant \$80,000 towards the erection of an overhead bridge across the Rideau Canal at Bank street. It is estimated that the entire cost will be about \$150,000. A by-law will be sub-

mitted to the electorate to decide whether the city will provide the remainder of the money required. It would be a reinforced concrete bridge.

Mr. Hiram Robinson has decided to make his commercial building on Queen street six storeys instead of three, as was first intended. It will be semi-fireproof and will cost about \$70,000. James Mather is the architect and Holbrook & Sutherland are the general contractors.

Another large building for which tenders will be called very soon is the big addition to John M. Garland & Sons' warehouse on O'Connor street. This building will be of reinforced concrete and will cost about \$45,000. A. Le B. Weeks is the architect.

Tenders will probably be called next week for the large departmental building to be erected by the Government on Mackenzie avenue. The specifications are in the hands of the printers and the plans are practically complete.

Prices of building materials remain very nearly the same. An advance is noted in hardwood flooring of the birch and maple variety. What formerly ranged from \$40 to \$50 a thousand feet is now being sold for \$43 to \$55. There is a great demand for this kind of flooring and most of the new residences are up-to-date in this respect.

New Y. M. C. A. at Lethbridge, Alta.

The new Y. M. C. A. building at Lethbridge, Alta., has just been completed by the contractors, Messrs. Smith Bros. & Wilson, of Lethbridge, Regina and Saskatoon. The



The New Y. M. C. A. at Lethbridge, Alta.—Contractors, Smith Bros. & Wilson.

building is 60 by 100 feet in dimensions and is four storeys high. It is considered the most up-to-date and best equipped building of its kind west of Toronto. It contains a large swimming pool and shower baths, bowling alley, reading rooms, reception rooms, billiard rooms, class rooms and gymnasium. There are 43 dormitories in all. The material used in the construction of the building was Bedford Indiana stone trimmings and No. 1 red pressed Calgary brick throughout for facing. The inside finish is oak and British Columbia coast fir, all finished in the early English style, which, together with the rich burlapping and panel work, is productive of a most artistic appearance. Mr. D. W. F. Nichols, of Winnipeg, was the architect.

The town of Campbellford has placed an order with the Canadian General Electric for a gas producer generating plant of the following description:—Two Premier gas engines of 172 and 344 h.p., and two gas producers. These to be used with one 100 and one 200 K.W.A.C. belted generator, 3 phase 60-cycle and 2,300 volts. The plant has to be delivered and in running order by Sept. 1st.

Canadian City Engineers

M. P. Blair, St. Boniface, Man.

The city engineer of St. Boniface, Man., Mr. M. P. Blair, is a native of Ireland, and was born on February 14, 1882. After spending the first seven years of his life in the Emerald Isle, he left the Old World for the New and went to Detroit, where he remained for one year. Afterwards he was educated at the Chicago public schools and high schools, the North Western University and the Lewis Institute, Chicago, also the Wesleyan University of Bloomington, Ill.

His first professional experience was obtained with the Chicago, Milwaukee and St. Paul Railway, by whom he was employed for one year as chainman. Afterwards he was employed for two years by the United States War Department on the Topographical Survey for Deep Water Way between Chicago and St. Louis. On the latter undertaking his work consisted in taking topography for one foot contours, and sounding the Illinois river; he was also in charge of tertiary triangulation and assistant on secondary triangulation. His next experience was obtained in



City Engineer Blair, of St. Boniface, Man.

charge of the local improvements at Kennelworth, Ill., where he remained for one year. Afterwards, for two years, he was with the Illinois Central Railway on construction and location in Mississippi, Tennessee, Kentucky and Indiana, attaining the position of resident engineer. For a year he was resident engineer for the C. P. R., and for six months assistant city engineer for the city of St. Boniface. He has been city engineer of that municipality for the last three and a half years.

City Engineer Blair is an associate member of both the Canadian and American Societies of Civil Engineers. He also holds membership in the American Waterworks Association, the National Geographical Society and the Canadian Cement Association.

bor, Ont., in addition to the wharf work previously awarded them at that point. The new order is for wooden crib structures below water with reinforced concrete superstructures. This makes the total amount of wharf for which the Canadian Pacific Railway Company have awarded this company contracts at Victoria Harbor, approximately one and one-quarter miles.

Personal News and Notes

Mr. W. J. Francis, of Montreal, arrived at Moose Jaw, where he will furnish a report on the water supply.

Mr. A. Webster has resigned his position as secretary of the Board of Trade at Calgary, and will go into business on his own account in builders' supplies.

Congratulations to Mr. E. H. Keating, of Keating & Breithaupt, Toronto, upon his election as a member of the council of the Institute of Civil Engineers of Great Britain.

The Electric Railways Construction Company has approached the city of Vancouver with a proposition for the joint construction of an electric railway through Stanley Park, about eight miles.

Mr. F. D. Baillairge, city engineer of Quebec, will shortly pay a visit to Toronto to inspect paving work in that city. He will be accompanied by the mayor and the chairman of the roads committee.

The St. Lawrence Bridge Company, of Montreal, who were awarded the contract for the superstructure of the Quebec bridge, are now arranging for the establishment of an assembling plant at the site of operations.

The Alberta Pressed Brick Company, Limited, is Calgary's latest manufacturing concern. Mr. J. F. Farrier, of Bonham, Texas, the company's representative, arrived in the city recently from Vancouver for the purpose of locating a suitable site for the new concern and to superintend the erection of the plant.

Labor disputes are at an end in Calgary this year, an amicable settlement having been reached between the labor unions and the Builders' Exchange. The following wage schedule is in force: bricklayers, 65 cents; carpenters, 50 cents; painters, 45 cents; plumbers and steamfitters, 57 cents. The last named trade has signed up a 2-year agreement and the wage next year will be 60 cents.

Mr. C. C. Schneider, of New York, a former president of the American Society of Civil Engineers, succeeds Mr. Charles Macdonald, of Gananoque, Ont., on the commission of engineers for the Quebec bridge. Mr. Macdonald, it will be remembered, only accepted a place on the commission upon the condition that he be allowed to retire upon the signing of the contract. Under the present constitution of the commission of three, Mr. Monsarrat will be chief engineer in charge of construction, devoting his whole time to the work, and Messrs. Modjeska & Schneider, consulting engineers.

Mr. H. B. Muckleston, who was recently appointed assistant chief engineer of the irrigation department of the C. P. R. at Calgary, is a native of Kingston, Ont. He was educated at Port Hope, Ont., and the Royal Military College, Kingston, from which seminary he graduated as a medallist in June, 1894, taking honors in mathematics, civil engineering, artillery and construction. His early professional experience was obtained with the Westinghouse Electric Company at Pittsburgh, Pa., with whom he remained from 1894 until 1896. In 1897 he engaged as rod-

The John S. Metcalf Company, Limited, have received from the Canadian Pacific Railway Company a contract for about one-third of a mile of wharves at Victoria Har-

man on the Crow's Nest Railway of the C. P. R. The following year he was leveller on the C. P. R. survey at Vancouver. From 1899 to 1902 he fulfilled the duties of assistant engineer on British Columbia government survey work, afterwards accepting the appointment of resident engineer for the C. P. R. at Revelstoke, B.C. In 1903 he was appointed assistant engineer of the C. P. R. irrigation department at Calgary. Two years later he was appointed division engineer and in 1907 chief division engineer of this department. Quite recently he was appointed assistant chief engineer. Since 1907, the date of his appointment as chief division engineer, he has had charge of practically the whole technical side of the irrigation system, including design, location, surveys and construction.

Acadia Coal Companies' Power Plant at Stellarton, N. S.

The Canadian General Development Company, Limited, of Montreal, has in charge the installation for the Acadia Coal Company at Stellarton, N.S., of an extensive electrical power plant. Work has already been commenced on the central generating station which will have an initial capacity of 3,000 k.w. and an ultimate capacity of 6,000 k.w. Two units of 1,500 k.w. each, are being installed by the Canadian General Electric Company, Limited and the Allgemeine Gesellschaft. These generators will be connected with steam turbines. Messrs Babcock & Wilcox, Limited, have the contract for installing boilers, stokers and a coal and ash handling plant.

The installation of the two electrically driven hoisting engines is being studied out and the contracts for these will be placed shortly. The hoisting of coal by means of electric engines will be a new departure in the history of mining engineering in Canada and there are few such installations in America. The compressors, fans, pumps, etc., will all be electrically operated. All the work above described is to be completed this year and the total cost is estimated at about \$400,000.

Alexander Allaire, M. E., Montreal

Mr. Alexander Allaire, manager of The Foundation Company, Limited, is of French descent, was born and educated in Brooklyn, N.Y., and is to-day an enthusiastic Canadian. Although only a year a resident of Canada he is greatly impressed with the progressiveness here. What has surprised him most are the possibilities looming up before this young country and the magnitude of the work to be done along manufacturing, construction and other technical lines. Canada, he says, has already reached national greatness and is destined to occupy a still more prominent place in the industrial world.

Mr. Allaire was educated at the Stevens Institute of Technology, Hoboken, N.J., one of the oldest engineering institutions in the United States. "They worked us hard there," he says, looking back over his school days, "but I suppose it was for our good." He graduated from this college as a mechanical engineer in 1901. The next four years were spent in practical, mechanical work in connection with engines, compressors, and other heavy machinery. Two years of this period were spent in the steel works of Pittsburgh, and other large manufacturing centres.

Five years ago, after having had a varied experience in construction work, Mr. Allaire joined The Foundation Company in the United States. About half of the directors of that company are Canadians, some of whom went across the line several years ago when business was at a low ebb in this country. Home ties are ever the strongest,

and with the return of prosperity at home these gentlemen naturally turned their attention to some promising Canadian contracts that were offering. Being successful with these undertakings it was decided, a little over a year ago, to start an independent Canadian company, which should have the facilities of the American firm and also benefit by its experience. A federal charter was obtained and Mr. Allaire, who has been for some time superintendent of The Foundation Company's operations on tunnels, mining



Alexander Allaire, M. E.,
Manager of the Foundation Company, Limited, Montreal.

shafts, sea walls, water power and caisson work, was selected as manager of the Canadian Company, with offices in the Bank of Ottawa Building, Montreal.

Among the important works carried out by The Foundation Company, Limited, during the first year of the company's operations, may be mentioned: the foundations for the C. P. R. Windsor Station extension; the foundations for the double tracking of the C. P. R. bridge across the St. Lawrence, between Lachine and Caughnawaga; river piers and towers for the Canadian Light & Power Company in the St. Lawrence; the foundations for the Dominion Express Building; piers in Toronto bay for the Hydro-Electric Commission; and reinforced concrete work for the Queen City Oil Company, of Toronto.

The Edgar Allen American Manganese Steel Company, Chicago, Ill., have sent us a pamphlet containing an enumeration of the various kinds of manganese steel castings manufactured at their works at Chicago Heights, Ill., and New Castle, Delaware. We are also indebted to this firm for an informative booklet entitled, "Manganese Steel and its Application to Ceramic Industries," this being a paper read before the 25th annual convention of the National Brick Manufacturers' Association of Louisville, Ky., by Mr. G. W. Kneisly, of the Edgar Allen Company.

Mr. Geo. H. Lang, of the architectural firm of Lang & Major, Calgary, Alta., returned recently to that city after a business trip extending as far east as Chicago.

Our Vancouver correspondent informs us that the London company which is to build a dry dock at Roche Point for the Vancouver Dry Dock & Shipbuilding Company, has increased its capitalization \$1,500,000. The contract for the construction of the big dry dock has been let to a Newcastle-on-Tyne firm, who will ship it in sections to British Columbia.

A Story of Progress from the Queen City

The Early History and Subsequent Development of the John Inglis Company's Business — A brief description of the present plant

Industrial development in the city of Toronto has been so rapid in every department of trade during recent years that it requires something almost phenomenal in the way of progress to attract more than passing attention. The records of the past may not always hold good in this competitive age, however, and there must be occasions when it is interesting, and at the same time profitable, to study surpassing achievement. While every industry is having a fair share in the upbuilding of the Dominion, we cannot but reflect—and it is a stimulating thought—that the "Contract Record" is serving the interests of those practical, progressive men who constitute the very backbone of this Canada of ours. Without dealing further in generalities, however,

works. The firm was known at this date (1881) as Inglis & Hunter. With the retirement of Mr. Hunter in 1889 the style of the firm was changed to John Inglis & Sons. In 1903 the company was incorporated as The John Inglis Company, Limited.

The active directors are Mr. Inglis, president, and Mr. Campbell Reaves, vice-president and secretary-treasurer. Mr. Reaves became identified with the firm in 1901. The progress made by the company in recent years is sufficient proof of the enterprise and executive ability of those at the helm.

Since obtaining their charter the company have devoted themselves systematically to the extension of their plant and



Boiler Shop at the Works of the John Inglis Company, Limited. This building is replete with the most Modern Equipment and is 400 by 70 feet in dimension. It is especially adapted for the Heavier Class of Work.

we will turn to an outstanding example of progress and to a firm whose name is a synonym for "Standard" in the various lines in which it is engaged: the John Inglis Company, Limited, of 14 Strachan avenue, Toronto.

A detailed description of these various lines would provide us with sufficient copy for several issues; indeed it would be superfluous at that, for the trade from the Atlantic to the Pacific has become well versed in the pumping machinery, power engines, marine engines, boilers, penstocks, heavy plate work, air compressors, hydraulic machinery and many other lines bearing the stamp of the Inglis concern.

The business of the John Inglis Company was established in Guelph, Ont., more than half a century ago, by the late Mr. John Inglis. It was carried on under his direction and with several partners until the year 1881, when the firm removed to Toronto, where they acquired extensive property on Strachan avenue, the location of their present

the development of their business. The present capacity of their works and the facilities provided, together with the wide market that has been found for the Company's products, attest their success in both particulars.

The accompanying views of the plant convey an altogether inadequate idea of the resources of the John Inglis Company and a few brief particulars may be of interest.

The first addition to the plant was a steel and brick boiler shop 200 feet long. This building had not been completed a year before it was found necessary to build an extension of 100 feet, to take care of the increased business in this department. The building was again enlarged in 1908 and the shop is now 400 feet long. It is fully equipped with cranes and modern tools of every description and is especially adapted for heavy work.

The machine shop, which is 200 feet by 100 feet, is of steel and brick construction, and was completed in 1909.



A section of the Machine Shop at the Works of the John Inglis Company, Limited.

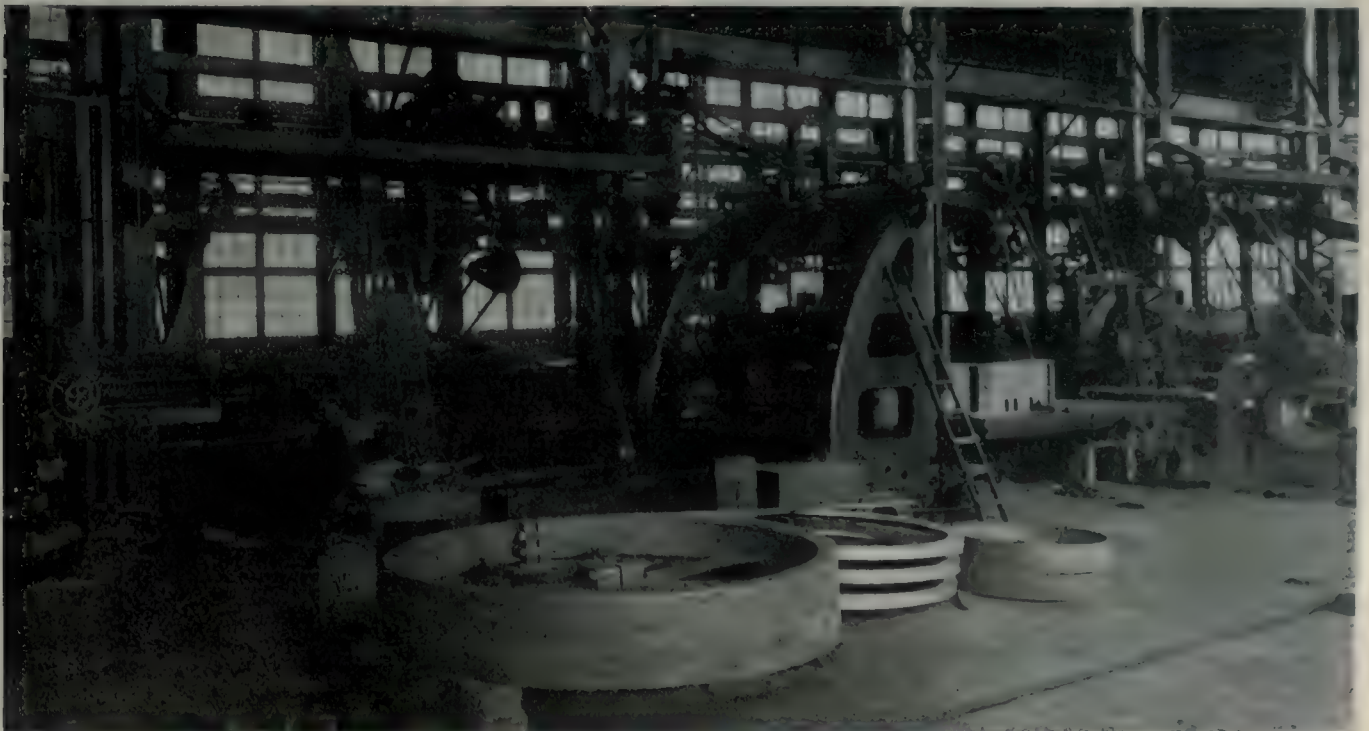
It is equipped with electric cranes and is replete with modern tools of all kinds. This shop is excellently adapted for the manufacture of the Inglis Company's specialties and is considered one of the most up-to-date on the continent.

In addition to these buildings a new pattern shop, storage, blacksmith shop and boiler plant have been built in the last three years, so that all of the plant acquired by the present company has been rebuilt with the exception of the foundry, plans for which are now under consideration.

During the last ten years there have been noteworthy changes in the product of the firm. In the engine depart-

ment, pumping machinery, heavy type and marine engines have been substituted for the lighter Corliss engines and mill machinery. And in the boiler branch of the business a line of penstocks, heavy tanks and furnace work has been added to the regular boiler business previously carried on by the company.

Among the most recent orders completed in the machine shop are a fifteen million Imperial gallon pumping engine for the city of Toronto (a description of which we hope to publish in a later issue); a six million Imperial gallon pumping engine of similar design for the city of Edmonton.



Another view of the Machine Shop, conveying some idea of the Modern Equipment of which the John Inglis Company make a Feature in all Departments.



Wheel Casing under construction.

and the engines and machinery complete for the steamer "Rapids Prince," built for the Richelieu & Ontario Navigation Co.

In the boiler shop, while boiler work has been plentiful, the larger contracts have been with the power development companies. Penstocks, wheel casings, etc., have been furnished recently for the Canadian Niagara Power Co., the Canadian Light & Power Co., and the Ontario Power Co. Similar contracts have also been made for the Shawinigan and Kamanistiquia power developments.

From the brief particulars we have given above it will be seen that so far as plant and equipment are concerned the company are in a position to obtain the very best results in the manufacture of their various lines, which we have already enumerated in part. Concerning the management it need hardly be added that the quality and reliability of



Another view of the John Inglis Company's boiler shop.

the goods manufactured and the business-like methods employed at the plant have made the name of the John Inglis Company, Limited, what it is to-day.

Montreal Notes

The Dominion Bridge Company is preparing to close portions of Second and Third avenues at Lachine for the extensions of its shops and yards. A number of houses will be demolished to make room for the expanding industry, and new workmen's homes will be erected in the vicinity.

Leonard & Frere have taken out a permit for the erection of two six-storey residence buildings of the second class description in Laurier Ward. This means that new

buildings of the same class as the Mountain View apartments, which were recently destroyed by fire, are being permitted to be erected in a Montreal ward under the by-laws existing in the town of St. Louis before it was annexed to the city. In fact, the proposed buildings will be one storey higher than the Mountain View and contain accommodation for six families in each.

The committee of experts appointed to revise and re-draft the Montreal building by-laws have reported to the chairman of the committee, Alderman Clement, that they cannot complete their work by June 1, the date specified when the appointments were made. Messrs. Francis and Venne, architects, who have been working on the new regulations tendered their resignation, but the Aldermen declined to accept them and decided to extend the time for the completion of the revision to the month of September. Meanwhile all kinds of objectionable buildings are being erected in various parts of the city. A proposal that one expert should take up the work alone, devoting his whole time to it, was made by Alderman Ward, his idea being that one man could quickly dispose of the matter if the remainder of the committee were required to devote only the time necessary for consultation and approval, but this was not approved by the rest of the committee.

Negotiations are under way for the amalgamation or working arrangement between a number of important wholesale hardware dealers in Montreal. Messrs. Jenkins & Hardy, financial agents, of Toronto, and Mr. E. W. McCarthy, of New York, are among the promoters of the deal. It is said that western capital is behind the project to a considerable extent and that probably some large western dealers will be drawn into the merger before it is consummated. A gentleman who is in a position to know, when interviewed by a representative of the Contract Record, said there was nothing definite to be stated as yet, but frankly admitted that negotiations were under way.

Considerable criticism has been levelled at the amendment to the city charter which provided that street paving should be done at the cost of fronting proprietors, instead of at the expense of that city at large, as has been the custom in the past. Strong opposition to work being done under the new conditions has been raised by the proprietors in a large number of streets. A report from the City Hall shows that out of 54 streets in which work was proposed to be done this season opposition was offered by proprietors in thirty of them. It is thought, however, that some of this opposition will be withdrawn or modified and it is now expected that work will be proceeded with on some 25 streets as soon as the contracts can be let. The paving programme for the city as originally recommended by the city controller's would amount to over 11 miles of paving of different kinds being laid.

The E. & T. Fairbanks Company at Sherbrooke, Que., has built a three-storey brick factory to be used in the manufacture of the scales contracted for by the Montreal Harbor Board. The company was already doing a very fair business in Sherbrooke, but found that extended factory space was needed to cope with the extra work involved in getting out the work for the harbor board.

"The Proper Treatment for Floors, Woodwork and Furniture," is the title of an attractive booklet issued by S. C. Johnson & Son, Racine, Wis., in which they describe the advantages which are secured by the use of their excellent variety of artistic wood finishes. The booklet is attractively illustrated in colors and will appeal strongly to any who are interested in the matter of securing the best results along these lines.

Conditions and Prospects at Winnipeg

Critical Observations on the Situation and Outlook—Municipal Activity —The Labor and Supply Markets—Progress on the Big Work

Winnipeg, May 20, 1911.

Winnipeg's building did not get away to the flying start that was anticipated a month ago, and it is rather difficult to trace the influences which have been at work. There is probably no part of Canada where weather conditions have so great an influence on building operations as in the west, and this is probably one of the considerations. The spring opened most favorably for seeding, but for weeks following the seeding there was every indication of continued dry weather. If this had continued retrenchments in expenditures would have been an absolute necessity, in view of the shortage of last year's crop. But the general rains of the past week have relieved the situation wonderfully, and now the country as a whole can get along nicely until July without further soaking rains.

Then, too, the banks have probably been a factor. Conservative business men have been of the impression that the real estate situation in Winnipeg is not all that can be desired. While they are loth to suggest the fateful word "boom," they will confess that the speculation now in progress is headed that way. The banks have recognized this and are tightening up quietly. Should there be a break at this juncture it would materially affect a large amount of really good inside property, which many consider is being held at excessive values.

There are thousands of acres of land in the vicinity of the city which are being exploited as suitable for suburban residential property, some of which is out of all reason, for even the most optimistic cannot contend that a subdivision eight miles from the city and extending back a couple of miles from existing car lines will be valuable in the immediate future. Nevertheless there is a lot of this class of stuff being placed on the market.

In defence of this it is pointed out that building operations outside the city limits are booming and that densely populated suburbs have grown up two and three miles out. Then, too, the city has completed arrangements for a boulevard connecting much of this with the business section.

In St. Vital there is a great amount of building in progress. The Carter, Halls, Aldinger Company are making good progress with the new Agricultural College buildings, though they have been delayed by the railway company, which has not yet laid down the material track which connects with the C. N. R. The excavation is progressing rapidly and within a week or more the foundations should begin to take form. The government has made arrangements with the municipality for the laying of an asphalt pavement from the city limits south past the college site, and the city will make the connecting link on their section of the Pembina highway.

Much Paving Work in Prospect

Road building will be an important feature of the season's work in the vicinity of Winnipeg. The municipality of Assiniboia is planning for paved roads on both sides of the Assiniboine river from the city to Headingly, a distance of fourteen miles. Westrumite or some similar material will be used. In St. Vital there is the roadway already mentioned, and one on the east side of the Red river for about ten miles. To the north, Kidonan is planning for roads parallel to the river, and within a very short time an adequate road to Transcona will become an absolute necessity.

The Bank of Montreal building is making seemingly slow progress, the front elevation having been delayed by the non-arrival of material. Three walls have been completed and a large section of the tile roof is now in position. Last week a couple of carloads of stone were delivered and now the contractors are proceeding with the front. A section of the cornice has been placed, and it is of a most massive construction. It will be one of the finest buildings in the city, in point of architecture and solidity of design.

The Lyall-Mitchell Company have completed the sub-basement work on the new Bank of Commerce, and are now bringing forward the foundation walls. It is stated that all of the stone has been cut and is ready to be delivered on the job as soon as the preliminary steel work has been finished. The fate of the building to the south, part of which collapsed into the excavation for the bank when the frost was out, is still in doubt. An effort is being made to get permission for the company to repair it, but strong objections are being raised.

There were rumblings of labor troubles early in the season but these have almost subsided. The marble workers and structural steel men started strikes but these have been settled without serious disturbance to the situation. There was not sufficient work in sight for either class of men to make the position dangerous to general conditions at any time, and the other trades did not join in the movement.

Good Stocks of Material

The material market is in good shape. Good supplies of brick were carried over from last fall, and the weather has been most favorable to getting at work early in the yards this spring. The steel men, too, have their work well in hand, despite the tremendous amount of railway work which is planned. Their plants have all been increased within the last few years, and the western market has induced considerable competition. Lumber is coming in rapidly and there were considerable stocks in store when the season started. The yards are all exceedingly busy with deliveries, permits having been taken out for a large number of residences this spring. Plans have been prepared and permits issued for many apartment blocks.—L. H. S.

The Good Roads Improvement Company, of Cincinnati, have sent us a copy of an instructive booklet called "Road Bitumens; their Scientific Use and History." The Good Roads Improvement Company were pioneers in the scientific treatment of roads with petroleum bitumen, and it is most interesting to read of the developments which led up to the production of Asphaltolene. This material is made in three kinds. Complete specifications for any of the three methods will be furnished on request. The specifications or formulae used in the manufacture of Asphaltolene are not only the result of six years' practical experience in using and applying to roadways asphalt bitumens, from the crude state to the highest perfection yet attained, but are also based upon the experience and experiments, and published reports of the United States Agricultural Department, and the engineering and scientific discussions and papers of the American Society of Civil Engineers.

Contracts Department

News of Special Interest to Contractors, Engineers, Manufacturers and Dealers in Building Supplies.

Information for insertion in these columns is invited from Architects, Contractors, Engineers, etc.

Waterworks, Sewerage and Roadways

Bridgetown, N. S.

A stone crusher has been purchased. A roller may be purchased. H. Ruggles, clerk.

Brandon, Man.

It is probable that the matter of a new water supply will be considered shortly.

Calgary, Alta.

The City Engineer's Department are preparing plans, etc., for a 6-foot concrete trunk sewer.

The city commissioners are preparing a second by-law for paving this year; about 30,000 square feet of pavement.

Contractors Messrs. Davison & Westaway will commence street grading at La Grange, a suburb of the city, for the American Colonization Co. in a few days.

Cardston, Alta.

Engineer McArthur in his report on the installation of waterworks system here estimated the cost at about \$27,000. Mayor Hammer.

Edmonds, B. C.

It is expected that tenders will be called shortly for a number of the roads which will be provided for out of the \$300,000 by-law recently passed by the ratepayers. In a few instances it is expected that the work will be done by day labor.

Estevan, Sask.

On June 2nd two by-laws will be submitted to the ratepayers, \$5,000 for waterworks extensions and \$18,000 for cement sidewalks. L. A. Duncan, secy-treas.

Fort William, Ont.

Tenders are called until July 1st for the sale of municipal pumping and electrical generating plant. John Wilson, city engineer. Advertisement in "Tenders and For Sale Department" of this issue.

Fort Qu'Appelle, Sask.

Tenders addressed to Wm. Thomson, sec-treas., will be received until May 31st for construction of about 15,000 sq. feet of cement sidewalks.

Hensall, Ont.

On May 29th two by-laws to raise \$16,000 for installation of waterworks will be voted upon. R. Bonthron, clerk.

Hamilton, Ont.

Tenders addressed to Geo. H. Lees, will be received until May 25th for construction of about 12 sewers.

Halifax, N.S.

The different reports of the board of works for water and sewer extension and street pavement, involving an expenditure of many thousands of dollars, were passed. The most important work was the Cobourg Road sewer, which the engineer stated would cost about \$98,000.

Middleton, N. S.

This municipality contemplates the expenditure of about \$4,000 this summer on a sewerage system. J. A. Gates, clerk.

Moose Jaw, Sask.

Tenders addressed to W. F. Heal, city clerk, will be received until May 29th for the laying of about 41,083 sq. yds. of pavement; also the laying of about 206,061 sq. feet of concrete sidewalks and 46,366 lin. ft. of curb and gutter, also 1056 sq. yds. of wood block crossing. J. M. Wilson, city engineer.

Minnedosa, Man.

A tender addressed to G. Trevor Turley, clerk, will be received until June 6th for construction of granolithic walks here, about 35,000 feet. Specifications etc. at the town clerk's office.

Montreal, Que.

Tenders addressed to the Board of Commissioners will be received until June 29th for furnishing and installing pumping machinery, blower and cranes for the filtration plant here. L. N. Senecal, secretary.

The city council have authorized the calling for tenders to the amount of \$2,500,000, which is divided up as follows: \$500,000 for sidewalks, \$720,000 for public improvements, \$677,000 for water mains, and \$616,000 for sewers.

Tenders addressed to the Board of Commissioners will be received until May 29th for supply of general supplies and various materials required for the different departments of the municipal service during the year 1911-1912, such as stone, lead pipe, pig lead, cement brick, vitrified clay pipes, spikes; also for purchase of scrap iron, steel, brass, copper, etc. L. N. Senecal, secretary.

North Bay, Ont.

On May 29th two by-laws will be voted on, \$45,000 for sewerage purposes and \$100,000 for waterworks. W. M. Flannery, clerk.

Pointe Claire, Que.

Tenders addressed to J. L. Vital, secretary-treasurer, will be received until June 1st for construction of permanent sidewalk, four feet wide, from the western boundary to the eastern.

Richmond, B.C.

Municipal council has a scheme on hand to macadamize and put in thorough good order the roads from Steveston to the Lulu Island bridge, so as

to form a connecting link with Granville street. Thus, when the work is completed, there will be an excellent highway from Steveston right into Vancouver.

Sault Ste. Marie, Ont.

Tenders are called until June 5th for construction of Section "M" of the sewer system. W. H. Munro, mayor; W. F. Grant, C.E., town engineer. Advertisement in "Tenders and For Sale Department" of this issue.

Tavistock, Ont.

The by-law authorizing the borrowing of \$20,000 for a system of waterworks was carried. F. W. Farncomb, consulting engineer. Noted in issue of May 10th.

Tenders are called until June 14th for waterworks supplies and labor. F. W. Farncomb, consulting engineer, 64 Bank of Toronto Chambers, London. Advertisement in "Tenders and For Sale Department" of this issue.

Thorold, Ont.

The report on the new pavement and sewerage scheme was submitted by Mr. Chipman, consulting engineer. Mr. Casey, town solicitor, was instructed to prepare a by-law to cover expenditure involved.

Toronto, Ont.

Tenders addressed to G. R. Geary, chairman, board of control, will be received until May 26th for repairing etc., of the 6-foot steel conduit lying between the intake and the tank, etc.

Firms tendering on 72-inch steel pipe, who can supply same earlier than is called for in specifications, will favorably influence the decision of the board. For further particulars see advertisement in "Tenders and For Sale Department" of this issue.

West Lorne, Ont.

This municipality has authorized a delegation to report on the waterworks system in surrounding towns.

AWARDED

Calgary, Alta.

Commissioners recommend an order be placed with the British Columbia Refining Co. for 100 tons grade paving asphaltum at \$16 per ton f.o.b. cars at Port Moody, B.C. Freight charges will bring the cost up to \$25.20 per ton.

Chilliwack, B.C.

R. H. Love, Chilliwack, was awarded contract for cement sidewalks here, \$1,117. Other prices ranged from \$1,158 to \$1,489. I. B. Croly, C.E., engineer.

Fort William, Ont.

The following tendered for supply of cement, sand and gravel, delivered on work:

Cement:

Twin City Sand Co'y., Fort William, \$160½, (accepted); J. J. Flanagan, Fort

William, \$161½; W. S. Piper, Fort William, 162; Fyfe Hardware Co'y., Fort William, \$163.

Sand and Gravel:

James Tonkin, Fort William, \$119, (accepted); Twin City Sand Co'y., Fort William, \$135; Mount McKay & Kekabeka Ry. Co'y., Fort William, \$125.

Moncton, N.B.

The tender of F. & I. Lewis for clearing reservoir site was accepted, \$105 per acre; extra plowing and harrowing, \$15 per acre; allowance of \$50 for lumber.

North Toronto, Ont.

The following tenders were received for the three sections of sewage installations:

(1) The work from the southerly limits of the town to Eglinton avenue; (2) from Eglinton avenue north to Victoria crescent and Glenwood avenue; (3) north from Glenwood avenue to the town limits.

No. 1 contract (Davisville)—Messrs. George Crowe & Son, Trenton, \$87,000; Campbell & Lattimer, Port Hope, \$106,408; John F. Connolly, Toronto, \$107,846; Thos. R. Allison & Co., Toronto, \$108,013.80; Ryan & Reilly, Philadelphia, \$118,360.

No. 2 contract (Eglinton)—F. F. Fry, Toronto, \$53,570.80; John F. Connolly, \$63,852; the J. H. McKnight Construction Co., Ltd., \$67,628.66; Thos. R. Allison & Co., \$74,897.80.

No. 3 contract (Bedford Park).—James Reid & Co., Brantford, \$56,157; the McKnight Construction Co., \$62,825; Lorenzo & Marshall, Dunnville, \$65,780; Thos. R. Allison & Co., \$79,787. The following tenders were recommended for acceptance:—Messrs. George Crowe & Son, Trenton, \$87,000, to complete the work in 7½ months; No. 2, John F. Connolly, Toronto, \$63,852, to complete the work in 7½ months; No. 3, James Reid & Co., Brantford, \$56,157, to complete the job in five months.

Ottawa, Ont.

The contract for construction of the west end drainage scheme has been awarded to Thos. McLaughlin, \$209,438.

Owen Sound, Ont.

John Cross will supply the pipe for the sewer work being done here, \$1,569. R. McDowall, town engineer.

Perth, Ont.

The tenders received for sewers to be built this year were as follows:—Thompson & Donahue—rock, cu. yd., \$5.25, earth \$1.20, hardpan \$1.40, manholes \$45, catch basins \$4, 8 in. pipe 26c., 6 in. pipe 21c. W. J. Rabb—rock, \$4.70, earth 60, hardpan \$1.00, backfilling in all cases 35c, manholes \$38, lampholes \$10, catchbasins \$14, 6 in. sewer pipe 17c, 6 in. junctions 45c, 6 in. bend 40c, 8 in. pipe 22c, 8 in. junctions 75c, 8 in. bends 65c. Gaul & Girouard—rock \$3.90, earth 60c, hardpan \$1.40, manholes \$60, lampholes \$5, catch basins \$5, 6 in. pipe 18c, 8 in. sewer pipe 25c, y branches 75c, tunnelling under C. P. R., cost of work plus 10 per cent.

Regina, Sask.

The tender of the Red Wing Sewer Pipe Company, amounting to \$3,700, was accepted; that of the Regina Machine & Iron Works for manhole covers

and catch basin covers at \$3.10 per 100 lbs. was accepted.

The commissioners advised the placing of an order for waterworks supplies with Bissett & Loucks for gate valves amounting to \$175.05, and with the Empire Manufacturing Company for an initial order of brass goods viz.: 40 one-inch main cocks, 40 ¾-inch main cocks, 12 ½-inch main cocks, 40 ¾-inch curb cocks, 12 ¾-inch curb cocks and six four-way branches. (Adopted). James Robertson & Company will supply 10,000 lbs. of three-quarter inch 10 lb. lead pipe at \$5.03¼ per cwt.; 1,000 lineal feet of two-inch galvanized iron pipe at \$15.60 per 100 feet; 400 lbs. of spun oakum at \$3.60 per cwt.; the total amounting to \$723.98 f.o.b. Regina. The amount of the alternative tender from James Ashdown & Company for the above material was \$745.00. The tender for nut washers submitted by A. McPherson & Son was accepted. The firm agreed to supply 4,500 three-quarter inch track bolts and 10,000 one-inch track bolts for \$123.52, which was \$21.49 lower than any other tender.

Smith's Falls, Ont.

The Madison Williams Foundry Co., Lindsay, have secured the contract of supplying the turbine and pumps for the waterworks. The pump will have a capacity of two million gallons, and will weigh thirty-seven thousand pounds.

Railroads, Bridges and Wharves

Cornwall, Ont.

It was decided to build concrete bridge across the creek at Augustus, Fifth and York streets, in accordance with plans of engineer W. H. Magfood. The opening will be eight and a half feet and four feet high, with a bevel approach. It was decided to proceed at once with the building of the new cement walk on the North side of Fifth street, between Pitt and Cumberland streets.

Fort William, Ont.

Owing to the changes necessary regarding the reinforced concrete subway, tenders will not be called as soon as contemplated. John Wilson, city engineer.

Fredericton, N. B.

Tenders are called by Public Works Department, for the building of Indian-town bridge. Plans at above department, at D. McLaughlin's, Chatham, and Renous Bridge Lumber Co., Renous Bridge, Northumberland county.

Lethbridge, Alta.

The Board of Trade will probably petition the government for two bridges over the river at Diamond City and at Twelve-Mile coulee. J. L. Man-waring is interested.

Tenders are under consideration for an overhead bridge at Lethbridge for the C. P. Ry., 350 ft. steel span, two 60-ft. girders and 450 ft. timber approaches. Estimated cost, \$80,000.

Montebello, Que.

Tenders will be received until June 12th, 1911, for the construction of a wharf at Montebello, Labelle County, P.Q. Plans at the offices of J. L. Mich-

aud, district engineer, St. James street, Montreal; on application to the local postmaster, and at the office of R. C. Desrochers, secretary department of public works, Ottawa.

Rivers, Man.

Tenders addressed to James R. Shanks, chairman bridge committee, Wheatland P.O., Man., will be received until June 15th for supply, erection, etc., of masonry abutments; a 90-foot steel span, 16-foot roadway, steel stringers, for a bridge over the Little Saskatchewan river, one and one-half miles from here. Copies of drawings, etc., at the office of the above, and also at the office of the chief engineer, department of public works, Winnipeg. Bridge plan No. 243.

Toronto, Ont.

Tenders are called until June 5th for construction of a reinforced concrete arch bridge over a branch of the Highland Creek etc. Barber & Young, engineers, advertisement in "Tenders and For Sale department" of this issue.

AWARDED

Calgary, Alta.

Contract for piers and abutments at 8th street west, Sudbury, amounting to about \$17,500, has been awarded to J. J. Davis & Co., Calgary.

Edmonton, Alta.

Phelan & Shirley have the contract for grading the approach to the C. P. R. high level bridge from the Strathcona side. The contract calls for the removal of about 58,000 cub. yds. of earth.

Fredericton, N.B.

The contract for building the Benjamin river mouth bridge at Colburn parish, Restigouche County, has been awarded to Mr. A. E. Smye, of Alma, Albert County, \$4,600. The contract for the Babcock bridge at the parish of Salisbury, Westmorland County, has been awarded to Mr. A. D. Murray of Penobsquis, \$3,200.

Quebec, Que.

The contract for the construction of bridge over the St. Charles river, has been signed by Mayor Dronin and Mr. Francis Lemoine, representing the firm of F. Lemoine & Son, Montreal \$156,200; work to be completed on 1st of April, 1912.

Toronto, Ont.

The contract for completion of the C. N. R. from here to Ottawa via Belleville has been awarded to Messrs. J. P. Mullarkey, Montreal; A. Sinclair and E. Mackenzie, Toronto.

Public Buildings, Churches, Schools, etc.

Baddeck, N.S.

Tenders addressed to D. J. McIntosh, P. P., will be received until May 31st for installing a hot water heating system, etc., in the Presbytery.

Brandon, Man.

The school board have an option on property east of the Normal School site as a future sight for a new collegiate.

Brockville, Ont.

Tenders addressed to B. Dillon, architect, will be received until May 31st

for erection of an additional storey of the south wing of the General Hospital, B. Dillon, architect.

Burnaby, B.C.

Tenders are called by Public Works Department, Victoria, until June 12th for erection of prison-farm building here. Drawings, etc., at the offices of Hugh A. Hodgson, Esq., rooms 309-309A Cotton building, Vancouver; Government Agent, New Westminster, and at the department of public works.

Brocket, Alta.

Tenders addressed to J. D. McLean, secretary, Department of Indian affairs, Ottawa, will be received until June 15th for construction of a grain elevator on the Crows Nest Branch of the C. P. R. here. Plans, etc. at the office of the "Advertiser," Macleod, the "News," Pincher Creek, "The Albertan," Calgary, and at the Indian Agency office, Brocket, Vancouver, B. C.

Calgary, Alta.

A permit was granted to St. Paul's congregation for their new church, \$35,000.

The city commissioners will have erected in the near future a Henan & Froude incinerator.

The congregation of St. John's Church have decided to enlarge their present quarters.

Mr. Lang, architect, 229A 8th avenue east, is preparing plans for two 4-room schools of solid brick with stone trimmings. Estimated to cost about \$23,000 each.

Camrose, Alta.

Tenders will soon be called for carpentry and plumbing for the Scandinavian college for Alberta. Work on excavation has commenced.

Cranbrook, B.C.

Plans are being prepared by Mr. J. J. O'Gara, architect, for the brick addition to St. Eugene Hospital.

Edmonton, Alta.

Sherman & Loughhead of Calgary are planning to erect an up-to-date theatre here.

Fort William, Ont.

Tenders are being called until May 25th by G. H. Williamson, gen. sec'y. Y. M. C. A., for the purchase and removal, within ten days of acceptance of tenders, of buildings on lots 64 and 65 East Archibald street.

Gananoque, Ont.

Tenders addressed to R. C. Desrochers, secretary, Department of Public Works, Ottawa, will be received until May 31st for addition to Post Office building. Plans etc. on application to the caretaker local post office, and at the above Department.

Grand Mira, N.S.

Tenders addressed to D. J. Rankin, P. P., will be received until June 3rd for the painting of the exterior and interior of the Glebe House, the exterior of church and also for the painting of the exterior of the churches at French road and Garabus.

Guelph, Ont.

The plans of Architect W. A. Mahoney, of this city, and those of Mr. Stewart of Hamilton, for erection of county jail were favorably considered. Estimated cost, \$20,000.

Halifax, N. S.

Tenders are called until May 31st by Public Works Department for fittings for post office. Plans, etc. at this Department, and at the office of Mr. D. A. Hewitt, architect, Custom House, Halifax.

Tenders addressed to the Commissioner of Public Works will be received until May 27th for construction of the laboratory of mining engineering to be erected in the rear of the N. S. Technical College. Plans etc. at the above college, at Registrar of Deeds offices at Sydney, Truro, Amherst, Windsor, Yarmouth and at office of town clerk.

New Glasgow

The city engineer was authorized to report on the construction of a garbage incinerator.

London, Ont.

The plans submitted for the new court house were adopted and tenders for the improvements to cost about \$25,000 will be called at once. City Architect, Mr. Nutter.

Medicine Hat, Alta.

A permit has been granted to the Western Baptist church, \$40,000.

It is stated that W. Roper Hull will erect here an up-to-date theatre shortly.

Tenders addressed to Gordon & Helliwell, architects, will be received until May 25th for erection of a parish building for St. Anne's church, Dufferin street.

Tenders addressed to R. G. Geary, Board of Control, will be received until May 30th for supply and erection of portable sectional screens, counters and office fixtures in the Main Corridor, city hall. Plans etc. at offices of the Property Department.

An opera house, with stores and offices, 125 x 130, brick and stone, is being erected for W. R. Hull Calgary. Tender for excavation has been let to A. P. Burns at 40 cents. As far as can be learned building will be carried on by day labor. Estimated cost, \$75,000. Plans not completed.

Montreal, Que.

Tenders addressed to the board of commissioners, will be received until May 31st for demolition of the wings of the Smallpox hospital and the reconstruction of the present main building and a wing or extension in connection with the same. Plans, etc., obtained from Messrs. Marchand & Haskell, architects, 164 St. James street. L. N. Senecal, secretary.

Minnedosa, Man.

The public building here to be erected by the government will be a combined post office and drill hall. Estimated cost, \$20,000.

New Westminster, B.C.

Competitive plans will be asked for erection of two new schools, one at Lulu island and another at Sapperton.

Niagara Falls, Ont.

Tenders addressed to George Mortimer, secretary public school board, will

be received until May 29th for erection of additions to the Barker street public school. A. E. Nicholson, architect, St. Catharines.

Ottawa, Ont.

The location of the new departmental block for which specifications have been prepared, has met with opposition.

Tenders addressed to R. C. Desrochers, secretary, department of public works, Ottawa, will be received until May 30th, for the fittings for Census Branch. Plans, etc., at office of above.

Port Arthur, Ont.

The C. N. R. has given the Sailors' Institute a site for building on the water front near the foot of Park street. Sketches for the new building have been drawn up by F. Urry, architect, and forwarded to the Sailors' Mission Board in Toronto. Estimated cost, \$30,000.

Prince Rupert, B. C.

The First Presbyterian Congregational will erect their church at an estimated cost of \$25,000. Pastor, Rev. F. W. Kerr.

Prince Albert, Sask.

Competitive plans are called for an eight-roomed school house to cost about \$35,000. Particulars on application to C. O. Davidson, secretary.

Regina, Sask.

Tenders will be called about June 1st for addition to Victoria school. Estimated cost, \$50,000. Architects, Sharon & Darrach.

Tenders will be called about June 1st for addition to Albert School here. Architects, Storey & Van Egmond. Estimated cost, \$30,000.

Stettler, Alta.

A new fire hall and town clerk's office will be built here this summer.

South Vancouver, B. C.

The Mountain View Methodist church will be built of brick. Contract is stated to have been let.

St. Charles, Man.

Tenders addressed to Frank Ness, sec.-treas., will be received until May 27th for erection of brick veneer Municipal Hall. Plans etc. at office of the above or at the office of Messrs. Hooper & Hooper, architects, 313 McIntyre block.

Saskatoon, Sask.

A campaign to raise \$100,000 for Y. M. C. A. building has been commenced.

The by-law for hospital extension and involving an expenditure of \$185,000 will be voted upon on May 25th.

Storey & Van Egmond were authorized by city council to prepare plans for erection of a new machinery hall for the fair grounds.

Tenders addressed to W. P. Bate, secretary school board, will be received until May 25th for erection of the school. Plans etc. at office of D. Webster, architect, No. 4, Kempthorn block.

The building committee, composed of F. A. Blain, G. H. Clare, A. Smith and W. Moser, have asked Brown & Valance, architects, Montreal, to submit further plans for the new \$100,000 Presbyterian church.

Mr. F. P. Martin is the architect for the erection of the Baptist church to

be erected here. It will be constructed of twin city brick with heavy cut stone trimmings. The following are members of the building committee: C. I. Greene, J. Wheaton and W. A. Elliott.

South Vancouver, B. C.

Tenders for erection of new municipal hall are being called. Plans prepared by Engineer Harvie call for a building 50 feet x 80.

St. Catharines, Ont.

The plan of Mr. A. E. Nicholson, architect, for the 8-room school was accepted by the board. The plans call for red brick with white terra cotta trimming. Thirteen plans were submitted.

St. John, N.B.

F. Neil Brodie, architect, has been instructed by the Provincial Tuberculosis Commission to prepare plans for the necessary changes in the building donated by Mrs. J. C. Jorden, of Boston, for a sanitarium. The building is situated at River Glade, N.B.

Plans are expected here during the next week or ten days for the new theatre to be erected by the Keith Syndicate on King Square, this city. While nothing can be learned of the details it is known that the building will be on an elaborate scale with a specially attractive front.

Teeswater, Ont.

Tenders addressed to W. Case, secretary, will be received until June 1st for erection of a brick school for S. S. No. 2, Culross.

Thamesville, Ont.

Plans for the new town hall were approved by a meeting of citizens.

Toronto, Ont.

St. John's Anglican congregation will build a new parish house to cost \$15,000 to the east of the church.

Tenders addressed to W. C. Wilkinson, secretary-treasurer, board of education, will be received until May 29th for enlargement of the following schools: Fern avenue, Ogden and Roden. Advertisement in "Tenders and For Sale Department" of this issue.

Trenton, Ont.

The Carnegie Library by-law was carried.

Vancouver, B.C.

Tenders for the Lord Tennyson school are to be called for as soon as plans are completed.

As decided by the ratepayers last January the school trustees will start at once the erection of a new school house, costing \$65,000, on Victoria drive. Plans and specifications have been decided on.

The Knights of Pythias have a project well under way for the erection of a temple in Vancouver. It will cost in the neighborhood of \$100,000. A fifty foot site has been secured on the east side of Howe near Smythe.

Victoria, B.C.

Plans will soon be submitted to city council, it is stated, for an up-to-date swimming bath on Dallas Road.

The city engineer, purchasing agent, and Alderman Okell, have been author-

ized to report on the purchase of a new incinerator plant.

It is probable that the plans of C. E. Watkins, architect, will be accepted for the new high school. They call for a 4-storey reinforced concrete building with basement.

West Toronto, Ont.

The Davenport Road Methodist church will erect a school house to cost about \$10,000. Tenders will be called shortly.

Wetaskiwin, Alta.

Tenders addressed to R. C. Desrochers, secretary, will be received until June 6th for construction of public building here. Plans etc. at office of J. E. Cyr, supt. of public buildings for Manitoba, Winnipeg, Man., W. T. Molard, clerk of works, Regina, Sask., and at the local post office.

Winkler, Man.

The time for receiving tenders for erection of 4-roomed brick school here has been extended until June 1st. B. Louven, chairman.

Wynward, Sask.

The plans of W. W. LaChance, architect, Saskatoon, have been accepted for the erection of proposed new school here. Estimated cost, \$15,000.

AWARDED

Amherst, N.S.

The town of Amherst has signed a contract with the Victor Wood Working Co. for a new 12-room brick and cement school to cost \$46,500. Nelson Fage has a sub-contract for mason's work. Leslie F. Fairn, architect, Aylesford, N.S.

Annapolis Royal, N.S.

Contract for brick and granite church for the Methodists of Annapolis Royal, N. S., has been let to J. F. Bent, of Middleton, N.S., \$12,000. Leslie R. Fairn, architect, Aylesford, N.S.

Battleford, Sask.

The Municipal Light, Heat & Power Co., Brandon, Man., have the contract for hot water heating of the public building here.

Calgary, Alta.

Tenders were let to I. McDarmid & Co., of Winnipeg, for the B. C. Land and Irrigation Department Building. Contract price for building complete, \$103,000. There were eight tenders for the job. Messrs. Hodgson & Bates are the architects.

Campbellton, N.B.

Mr. J. Medley Belyea, West St. John, has been awarded the contract for erection of new Presbyterian Church, \$30,000.

R. Mooney & Sons, St. John, have been awarded the contract for erection of Masonic Hall, \$9,000.

Messrs. Lutz & Cripps, Sussex, N.B., have the contract for erection of modern 14-room cement and brick school, \$49,000. Architect, Leslie R. Fairn, Aylesford.

Charlottetown, P.E.I.

The contract for erection of Zion Presbyterian Church and Sunday School combined, brick and stone, has been awarded to J. M. Clark, Summerside, P.E.I., \$31,985. Other tenderers were

B. D. Buntley, Charlottetown, \$34,395; H. & S. Lorne, Charlottetown, \$34,800; Chas. McGregor, Charlottetown, \$38,461. Murdoch Macleod, secretary, building committee.

Cornwall, Ont.

The House of Refuge for the counties of Stormont, Dundas and Glengarry, will be built at Cornwall by Mr. Alex. Cameron, of Alexandria. Tender calls for a two-storey building of concrete blocks, with basement. The main building will be 132 x 40.

Edmonton, Alta.

The contract for erection of brick stock pavilion has been awarded to Hanson & Dunlop by the Exhibition Association, \$67,000 approximately. \$112,000 total.

Gretna, Man.

The contract for erection of school here has been awarded to W. J. Harris, 198 Horne street, Winnipeg, Man., \$17,547. C. Wahn, secretary-treasurer.

Kitsilano, B. C.

The contract for the new Catholic Church in Kitsilano, which the Oblate Fathers intend to erect, has been awarded to Campbell & Wilkie. The price is \$38,000, which does not include heating and plumbing. Work will be started immediately. Father Tavernier, O. M. I., lately superior at Mission City, will be in charge of the new church.

Merritt, B. C.

Mr. William Cooper has been awarded the contract for the erection of a new school building here.

Michel, B. C.

The contract for the erection of a large one-room school at Michel has been awarded by the provincial minister of works to George A. Watson, \$5,060.

Montreal, Que.

The Protestant Board of School Commissioners are having an addition made to their Victoria school, St. Luke street. The extension will provide a gymnasium. The contract for the plumbing, heating and ventilation, amounting to \$6,450, has been awarded to D. A. Bethune. The general contract, apart from this, amounts to \$22,922, which will be shared in by the following sub-contractors: J. H. Hutchison, masonry; Structural Steel Co., Ltd., steel work; J. N. W. Morrison, carpentering; Roebing Construction Co., concrete; R. G. Hamilton, plastering; Campbell & Gilday, roofing; Montreal Architectural Iron Works Co., iron; Montreal Electric Co., Limited, electric wiring; G. E. Blackwell, painting and glazing.

Mr. P. Lessard, contractor, has taken out a permit for the erection of a combined fire and police station for the town of Outremont to be situated on St. Just Avenue. The estimated cost is \$22,000. Hutchison, Wood & Miller are the architects. Work has already been commenced on the foundations. The superstructure will be of brick and stone.

Orangeville, Ont.

The contract for electric wiring and fixtures for postoffice here has been awarded to Hall & Dollyery Elec. Co., Toronto.

Regina, Sask.

The contract for erection of public library has been awarded to Wilson & Wilson, Regina, \$50,000.

Vancouver, B. C.

E. J. Ryan was awarded the contract for the erection of the proposed new theatre, at 965 Granville street, for the Dominion Theatre Co., Ltd. The contract price was \$48,000. Parr & Fee are the architects.

The contract for the two-storey eight-roomed school building at the corner of Sixth avenue and Bayswater street has been awarded to Messrs. John Watson & Brothers, the amount being \$50,000.

Wolfville, N. S.

A. W. Allen & Son, Middleton, have contracted for erection of Baptist church here, brick with stone trimmings, cost about \$40,000. Architect, C. B. Chappell, Charlottetown, P. E. I.

Winnipeg, Man.

The contract for the Brooklands' school has been awarded to John Dolner, the contract price being \$43,000.

S. B. Ritchie's tender for the building of new Science and Arts building at the exhibition grounds, to take the place of the old main building destroyed by fire last fall, was accepted.

Residences**Aylesford, N.S.**

Four or five cottages and two or three stores will be erected here this season in the burned area.

Calgary, Alta.

Tenders were called until May 20th for erection of an apartment house on Fourth street west. Plans etc. at office of the architect, F. J. Lawson, Norman Block.

Messrs. Lang & Major, architects, have prepared plans for a solid brick, with stone trimmings, apartment house, 50 x 80 feet, on 17th avenue, for I. Reid. Tenders closed the 23rd inst. Estimated cost, \$40,000. I. Reid, Esq.

Campbellton, N.S.

Architect Leslie R. Fairn is preparing plans for cottage and stable for Geo. L. Pearson, Esq., of Paradise, N.S. Tenders will close on May 26th. Cost, \$3,800.

Leslie R. Fairn, architect, has prepared drawings for a modern residence for Judge McLatchy.

Gull Lake, Sask.

Pease Waldon Company, Winnipeg, have been awarded the construction of the 8-room school house, \$35,000. Other amounts tendered not including heating, were from \$21,925 to \$28,600.

Medicine Hat, Alta.

Hon. W. T. Finlay will erect a new and handsome residence on the site of the old one.

Saskatoon, Sask.

The building committee of Knox Presbyterian Church, composed of F. A. Blain and others, have decided to go ahead with the erection of the new manse.

Victoria, B.C.

Plans have been prepared by Max Umbrick, Seattle, for an apartment

house, 3-storeys, to be built for a Seattle syndicate on Government street. It is stated that ground will be broken for the foundation before June 15th.

Tenders will be received until May 25th for erection of a building for A. E. Todd, corner of Langley, Courtney and Wharf streets. Thos. Hooper, architect.

AWARDED**Middleton, N.S.**

Contract for cottage and stable for W. F. C. Parsons, M.E., Middleton, N.S., has been let to J. F. Bent of that place. Cost, \$4,500. Leslie R. Rainn, architect, Aylesford, N.S.

Torbrook, N. S.

J. H. Hicks & Sons, Bridgetown, has been awarded contract for building 12 cottages here for Canada Iron Corporation Co., total cost, \$7,000; to be finished Aug. 1, 1911.

Business Buildings and Industrial Plants**Amherst, N. S.**

The saw, planing and lath mills of the Rhodes Curry Company, Limited, were destroyed by fire on the 16th inst. Estimated loss, \$25,000.

Almonte, Ont.

In the fire of the 16th inst. the losses approximated as follows: McAdam block and store, \$40,000; Patterson block, \$10,000; Davis block, \$5,000; Hopkins, \$15,000.

Brantford, Ont.

Building permit has been issued to M. H. Robertson, for brick store on Erie avenue, \$4,750.

Belleville, Ont.

The council have granted a free site, etc., to the Allard Platinum & Mining Company, who are to install a \$10,000 plant. A by-law to that effect will be submitted to the ratepayers.

Calgary, Alta.

Tenders were called on the 15th inst. for a 6-storey store and office building. Messrs. Lang & Major, architects.

The Bank of Montreal is going to make an addition to their present building.

Messrs. Hodgson & Bates have got out sketch plans for a bank building at Oakville for the Bank of Montreal to cost about \$4,500.

Chatham, Ont.

The Chatham Cement & Tile Works will commence to build two factories in the southwest district at once.

Edmonton, Alta.

The site for the new warehouse for Petrie & Co., Toronto, has been secured and tenders called. Estimated cost, \$20,000. Work will start on award of tenders. James Henderson, architect.

Fort William, Ont.

Tenders are being called for the excavation work in connection with erection of block of stores under contemplation by R. A. Rutan, Port Arthur, and Temple Godman, London, Eng.

High River, Alta.

Messrs. Hodgson & Bates, architects, Calgary, are preparing plans for a solid

brick and stone facing building for the Bank of Montreal here. Size of building, 40 x 58. Estimated cost, \$7,500. Tenders will be called for in a few days.

Ingersoll, Ont.

The Morrow Screw Company have under consideration extensions to their plant if certain civic privileges are granted. Estimated expenditure, about \$150,000. J. A. Coulter, president.

London, Ont.

A building permit was issued to McClary Company for their extension, \$18,000.

Medicine Hat, Alta.

Tenders are being called for the new block for the Medicine Hat Printing & Publishing Company, Limited. W. T. Williams, architect.

Tenders for erection of extensions to Cosmopolitan Hotel will probably close May 27th. Plans, etc., were ready on May 20th. W. S. Williams, architect. Noted in last issue.

Moose Jaw, Sask.

Tenders will be called for in a few days by Mr. Bunyard, the architect, for 3-storey warehouse for Massey-Harris Company. Mr. George Forsyth, manager, Saskatchewan branch.

Montreal, Que.

It is stated that J. C. Wilson & Co., paper manufacturers, have under consideration the erection of a fireproof building on the corner of St. Alexander and Laguachetiere streets. Plans are being prepared by Messrs. Ross & McFarlane, architects.

Orillia, Ont.

Messrs. Cavana & Watson have under consideration the erection of a brick block on the corner of Mississauga and West streets. They have not yet fully decided whether they will erect the building this year.

Ottawa, Ont.

Tenders addressed to P. E. Ryan, secretary, Commissioners of the Transcontinental Railway, will be received until June 14 for erection of station and other buildings required along the line of the Transcontinental Railway in New Brunswick, Quebec, Ontario, etc. Plans etc. obtained at the office of Gordon Grant, chief engineer, Ottawa, and at the district offices at St. John, Quebec, North Bay and St. Boniface, Man.

Preston, Ont.

The Car & Coach Company will enlarge their plant.

Regina, Sask.

It is reported that Thomas Ryan & Company, of Winnipeg, will erect a five-storey warehouse here.

The Thomas Ryan & Company, boot and shoe dealers, will erect a 5-storey building here on South Railway street and Smith. Local manager, Mr. Stevenson.

Tenders will be called about June 1st for 5-storey office building for the Dominion Trust Company, estimated cost, \$70,000. Architects, Messrs. Storey & Van Egmond.

Stettler, Alta.

The C. N. R. will build a fine station here in the near future.

St. John, N.B.

Plans are being prepared by Architect F. Neil Brodie for a three-storey brick building to be located at the corner of Union and Brussels streets. The building will have in it three stores and five tenements.

Toronto, Ont.

The Massey-Harris Company proposes to enlarge their works, necessitating the construction of tunnels and overhead bridges which has been granted by the council.

Victoria, B.C.

The B. C. Electric Railway Company have purchased $6\frac{1}{4}$ acres of land on the Burnside road on which a building for general utility purposes will be erected.

The preparation of plans, etc., for the enlargement of the Empress Hotel has been authorized by Sir Thos. Shaughnessy, president of the C. P. R. Estimated cost, about \$200,000.

Vancouver, B.C.

The Merchants Exchange Hotel, the oldest hotel in the city, has been closed and the block will be remodelled into a modern office building, at the corner of Seymour and Hastings street, one block east from the post office.

The Canadian Fairbanks Company, Limited, have under consideration the erection of a business building here, which, it is reported, will cost about \$250,000. H. J. Fuller, Montreal, president. The Munro Steel and Wire Works of Winnipeg, are looking for a building site. Jas. Munro, manager.

Winnipeg, Man.

The Central Garage, Water street, was destroyed by fire on the 18th inst. Loss on building, \$25,000.

Plans for new Sterling Bank on Portage avenue, have been changed to admit of nine storeys, 118 feet in height. The construction will be brick and terra cotta, instead of stone. Chisholm & Sons, architects.

The Confederation Life Association, head office Toronto, will erect a 10-storey building on the site of its present building, 467 Main street. D. McDonald, western manager. J. W. Gray, architect, Toronto.

AWARDED**Calgary Alta.**

Work has begun on the addition to Pryce Jones Building. Messrs. Archibald & Co., got the tender, for \$150,000. The addition is 80 x 100 feet, 3 storeys and basement. Messrs. Hodgson & Bates, architects.

Messrs. Givin & Co., Winnipeg, have secured the contract (60,000) to build a 6-storey warehouse for Messrs. Nicholson & Bain, at the corner of 11th avenue and 5th street west.

Chatham, Ont.

Moore & Stephens and W. Robertson have the contract for the building for the Chatham Malleable Iron & Steel Manufacturing Co.

Middleton, N. S.

The contract for erection of Royal Bank of Canada has been awarded to A. W. Allen & Son. It will be brick with granite finish; cost, about \$10,000; work to commence at once; K. G. Rea, architect, Montreal.

Port Arthur, Ont.

W. F. Fortune will soon begin the erection of a large brick veneer residence on Arthur street. R. Halton, architect. Estimated cost, \$10,000.

Port Arthur, Ont.

The city council has had preliminary sketches drawn for a second store house 33 ft. x 97 ft., on Front street. Estimated cost, \$5,000

Regina, Sask.

The contract for erection of warehouse for Great West Saddlery Company, Winnipeg, to Wilson & Wilson, \$15,000.

Walkerville, Ont.

Wills & Gray, Limited, Toronto, have been awarded the contract for the erection of a reinforced concrete factory building for Messrs. Walker & Sons.

Winnipeg, Man.

Permits were issued to H. Gooderham for brick residence, \$22,000; architect, J. D. Atchison; contractors, Davidson Bros; also for apartment building on Westminster avenue for Albert Johnson, \$60,000.

Power Plants, Electricity and Telephones**Alvinston, Ont.**

Tenders are called until May 31st for construction of telephone system into the township of Brooke etc. H. R. Carruthers, secretary, Advisory Board. Advertisement in Tenders and For Sale Department of this issue.

Bassano, Alta.

Turbines are being installed in the dam now being built by the C. P. R. Irrigation company which it is estimated will develop 28,000 h.p.

Calgary, Alta.

The Alberta Electric Railway bill will be a distinct advantage to Calgary in that this city will, during the next three years have a complete electric railway line between Medicine Hat and Banff, with Calgary as the main seat of operations. This railway will be operated by the Alberta Electric Railway company recently incorporated; capital, \$10,000,000. Work will commence on the proposed new road at once. This section of the line will be 79 miles in length.

Hamilton, Ont.

The Dominion Power and Transmission Co. are considering the construction of an electric line to Galt. Mr. Hawkins, manager.

Moose Jaw, Sask.

The \$35,000 by-law for extension to electric light system will be submitted on the 26th inst.

Tenders addressed to W. J. Carter, secretary-treasurer Chester Rural Telephone Co., will be received until June 1st for construction of telephone line north from Moose Jaw and easterly about 28 miles. Poles supplied f.o.b. Moose Jaw.

Nelson, B.C.

It is stated that application will be made on June 16th for a license to use 6,300 cubic feet of water per second for

power purposes from the Kootenay river at Granite, four miles below Nelson. The proposed works are a dam, canal and power house. A. L. McCulloch, mining engineer, Nelson, is interested; W. F. Teetzel, water commissioner for this district.

Nictaux Falls, N. S.

The Canada Iron Corporation, Montreal, have under construction in connection with their iron mines at Torbrook a washing plant to cost \$75,000, and an electric water power plant to cost about \$70,000. E. M. Archibald, Nictaux Falls, engineer.

Saskatoon, Sask.

The electric light plant by-law for \$25,000 will be submitted on the 25th inst.

Victoria, B.C.

The city is calling for tenders for 300 electric light standards for street lighting purposes. The new standard is of the same design as that now in use in Vancouver and New Westminster. The standard already in use here, one which a number of the members of the council approve of and prefer to that in use in the mainland cities, costs some \$24 each more than the latter. It is with the object of ascertaining just what the new standard will cost that tenders are being asked.

AWARDED**Moncton, N.B.**

R. W. Whelpley, Moncton, has been awarded the contract for excavating the main pipe line for the natural gas between the wells and Moncton.

Mosoe Jaw, Sask.

Somerville and Ilson, Regina, have the contract for construction of rural telephone line at \$56 per mile.

Niagara Falls, Ont.

Hendrick H. Leach & Co., it is stated, have been awarded the contract to build an extension of the Niagara Falls, Welland & Lake Erie Ry. through Welland. The line will connect Niagara Falls, Welland and Port Colborne, with branches to Port Dover on Lake Erie, and to Ft. Erie on the Niagara River, opposite Buffalo. C. J. McLaughlin, Toronto, Ont., is interested.

Ripley, Ont.

The contract for construction of municipal system has been awarded to W. H. Lytle, Peterborough, \$4,400.

Swift Current, Sask.

The contract for installation of eleven miles of rural telephone has been awarded to Chas. Wilson, this city.

Miscellaneous**Belleville, Ont.**

Tenders addressed to R. C. Desrochers, secretary, department of public works, Ottawa, will be received until May 26th for dredging required here. Specifications obtained on application to the above mentioned.

Berlin, Ont.

On May 31 two by-laws will be submitted to the burgesses, \$7,400 for street railway track extensions, and \$15,000 in aid of the Berlin and Waterloo Hospital Trust, A. H. Millar, town clerk.

(Continued on page 66)

Tenders and For Sale Department

CITY OF LONDON, ONT.

ENGINEERING DEPARTMENT

Applications are invited by the city council for the position of Assistant City Engineer of London. Such applications must be enclosed in plain envelopes and marked Assistant City Engineer, and filed with the city clerk not later than five o'clock on Thursday, June 1, 1911. A full statement of qualifications and references must also be enclosed.

S. BAKER,
City Clerk.

21-21

Steam Shovels

We own and have for sale near Buffalo, N.Y., two Vulcan 75-ton 2½-yard steam shovels; late model, with new extra large boilers and in excellent condition; also one 70-ton. These will stand most rigid inspection and we are offering them at unusually low prices. Confer with us.

WILLIS SHAW MACHINERY CO.,
39 So. La Salle Street,
Chicago, Ill.

City of Prince Albert

TENDERS

Sealed tenders addressed to the City Commissioners will be received until noon on Wednesday, the 31st day of May, 1911, for the following:—

- (a) Extensions to Water and Sewerage Systems:
- 12-in. Cast Iron Sewage Pumping Main, 2,365 lin. ft.
 - 10-in. Cast Iron Water Main, 2,906 lin. ft.
 - 8-in. Cast Iron Water Main, 1,034 lin. ft.
 - 6-in. Cast Iron Water Main, 8,798 lin. ft.
 - 24-in. Storm Sewer (Vitrified Pipe) 1,300 lin. ft.
 - 18-in. Storm Sewer (Vitrified Pipe) 1,650 lin. ft.
 - 8-in. Storm Sewer (Vitrified Pipe) 928 lin. ft.
 - 12-in. Sanitary Sewer (Vitrified Pipe) 3,580 lin. ft.
 - 10-in. Sanitary Sewer (Vitrified Pipe) 440 lin. ft.
 - 8-in. Sanitary Sewer (Vitrified Pipe) 7,648 lin. ft.
 - Manholes, 35.
 - Catch basins, 28.

- (b) Construction of Concrete Sewage Pumping Station No. 2.

- (c) Supplying and erection of two Electrically driven Centrifugal Sewage Pumps and Motors.

Plans and specifications (see (a) and (b)) may be seen at the office of the City Engineer. Sec. (c) will be forwarded on application and will be on file at the office of Canadian Engineer, Builders' Exchange, Winnipeg, after May 15th.

Marked cheque payable to Secretary-Treasurer of the City of Prince Albert must accompany each tender as follows:

- Section (a)—\$2,000.
- Section (b)—\$200.
- Section (c)—\$200.

The lowest or any tender not necessarily accepted.

ANDREW HOLMES, Mayor.
C. O. DAVIDSON, Secretary-Treasurer.
F. A. CREIGHTON, City Engineer.
CITY COMMISSIONERS.

Dated at Prince Albert, Sask.,
May 8th, 1911.

Street Paving

Sealed tenders marked "Tenders for Paving," will be received by the undersigned up to 12 o'clock noon of Monday, May 29th, for paving in the Town of Waterloo. Tenders are invited for various kinds of pavements.

Patent pavement tenders are to be accompanied by full specifications.

Pavements to be constructed approximately 13,500 square yards.

Marked cheque for five per cent. of amount of tender must accompany each bid.

The lowest or any tender not necessarily accepted.

FORD S. KUMPF,
Town Clerk.
Waterloo, May 12, 1911. 20-21

Tenders Wanted

Tenders will be received by the Council of the Township of Hullett up till 2 p.m. on Saturday, the 27th of May, for the building of a steel bridge 100 feet, between abutments, 16 ft. roadway with cement floor on the River Maitland, about 7 miles north of Seaforth. Also for the building of cement abutments to support said bridge. And also for the building of one cement abutment at Wallace's Bridge near Summerhill in said Township.

The lowest or any tender not necessarily accepted.

Specifications for the cement work can be seen at the Clerk's Office.

JAMES CAMPBELL,
Clerk Tp. Hullett,
Londesboro P.O.

20-21

City of Prince Albert

Tenders for

POWER WORKS

Sealed tenders will be received until 8 p.m., Tuesday, June 13th, 1911, by the Corporation of the City of Prince Albert, Province of Saskatchewan, for the construction of Dam and Headworks and Canal and Power Station Foundations, being portions of the proposed Hydro-Electric Power Development, on the North Saskatchewan River, at La Colle Falls, (distant 25 miles east of the city).

Tenders are invited on each separately, and must be plainly marked on the outside of envelopes, and addressed to the Secretary-Treasurer, City of Prince Albert, Saskatchewan.

Each tender must be accompanied by an accepted bank cheque, for \$5,000, payable to the Secretary-Treasurer, which cheque will be returned to the bidder, unless he fail to execute a contract, should it be awarded to him.

The successful bidder, on each of the works, will be required to execute a Bond, in the sum of \$40,000, for the faithful performance of the contract.

The City reserves the right to reject any or all tenders.

The plans and specifications will be on file, and may be seen on and after May 23rd, 1911, at the City Hall, Prince Albert; office of "Canadian Engineer" at Winnipeg; office of "Canadian Engineer," Montreal, or at the offices of the Engineers, C. H. & P. H. Mitchell, Traders Bank Building, Toronto, Ont.

ANDREW HOLMES, Mayor.
C. O. DAVIDSON, Secretary-Treasurer.

Prince Albert, Sask.,
May 9th, 1911. 20-22

Contractors' Material IN CANADA

Brown Locomotive Crane, 10-ton capacity, at 14 feet. Overhauled.

Canadian Rand New Giant Rock Drill, No. 431, tripods and weights.

Ingersoll "Little Giant" Rock Drill, No. 31, tripods and weights.

Cooper No. a Small Rock Drill, with tripod.

6 x 4 American Steam Pump, Valve, piping and elbow.

New Size B Pulsometer Pump.

30 h.p. Upright Boiler, 46-in. x 10-in., Complete.

Screen for stone crusher, 24-in. x 6 ft.

Have you anything to sell? Write us.

THE MALES COMPANY,
82 Perin Bldg., Cincinnati, O.



Tenders

For

72-inch Steel Pipe

Intending tenderers for the supply of 72-inch steel pipe are hereby notified that delivery of pipe earlier than that called for in specifications will influence Board of Control when awarding contract.

G. R. GEARY, (Mayor),
Chairman Board of Control.

City Hall, Toronto, May 20, 1911. 21-21

Tenders

For

Waterworks Supplies, Etc.

TAVISTOCK, ONTARIO,

Sealed tenders addressed to the town clerk will be received up to 12 o'clock noon on Wednesday, June 14, 1911, for waterworks supplies and labor as follows:

Approximately 2,250 feet of 8-inch, 2,550 feet of 6-inch and 2,100 feet of 4-inch cast iron water pipe, about 7 tons of special castings, about 16 hydrants, valves, etc. Also excavating for, laying and covering above pipe. One steel elevated tank.

Conditions and forms of tender, plans and specifications may be seen at the office of either of the undersigned.

Lowest or any tender not necessarily accepted.

F. W. FARNCOMB,
Consulting Engineer.

64 Bank of Toronto Chambers, London, Ont.

J. G. FIELD, Village Clerk.

Tavistock, Ont. 21-23

BOARD OF EDUCATION

Tenders Wanted

Sealed tenders addressed to the secretary-treasurer of the Board will be received until

MONDAY NOON, MAY 29th, 1911

for enlargement of the following schools:

FERN AVENUE

OGDEN

ROEEN

Plans and specifications may be seen and all information obtained at the office of the Board, City Hall. Each tender must be accompanied with an accepted bank cheque for 5 per cent. of the amount of tender or its equivalent in cash.

The lowest or any tender will not necessarily be accepted.

W. W. HODGSON, W. C. WILKINSON,
Chairman of Committee. Sec.-Treas.

Toronto, Ont., May 22. 21-22



Department of Railways and Canals

Ontario—St. Lawrence Canals Murray Canal

Sealed tenders addressed to the undersigned and endorsed "Tender for Dredging Murray Canal," will be received at this office until 16 o'clock on Wednesday, May 31.

The specification and form of contract to be entered into can be seen on and after Friday, May 12, at the office of the Chief Engineer of the Department of Railways and Canals, Ottawa, and at the office of the Resident Engineer of the Ontario-St. Lawrence canals, Cornwall, at which places form of tender may be obtained.

Parties tendering will be required to accept the fair wages schedule prepared or to be prepared by the Department of Labour, which schedule will form part of the contract.

Contractors are requested to bear in mind that tenders will not be considered, unless made strictly in accordance with the printed forms, and in the case of firms, unless there are attached the actual signature, the nature of the occupation, and place of residence of each member of the firm.

An accepted bank cheque for the sum of \$1,000 made payable to the order of the Minister of Railways and Canals must accompany each tender, which sum will be forfeited if the party tendering declines entering into contract for the work at the rates stated in the offer submitted.

The cheque thus sent in will be returned to the respective contractors whose tenders are not accepted.

The cheque of the successful tenderer will be held as security, or part security, for the due fulfilment of the contract to be entered into.

The lowest or any tender not necessarily accepted.

By order,

L. K. JONES,

Secretary.

Department of Railways and Canal,

Ottawa, May 10, 1911.

Newspapers inserting this advertisement without authority from the Department will not be paid for it.

21-21

Tenders

For Telephone System

Tenders will be received up to noon on Wednesday, May 31st, 1911, by the secretary of the Advisory Board of The Brooke Municipal Telephone System for the construction of a system of rural telephone lines in the township of Brooke and adjoining townships.

Plans and specifications and all particulars may be obtained by application to the secretary at Alvinston, Ontario.

H. R. CARRUTHERS,

Secretary Advisory Board.
Alvinston, Ont. 6-6, 21-21

Tenders

For

Waterworks Supplies, Etc., Ridgetown, Ont.

Sealed tenders addressed to the Town Clerk will be received up to Thursday, the 1st day of June, inclusive, 1911, at 8 o'clock p.m., for Waterworks supplies and labor as follows:

Approximately 2,600 ft. of 8 inch, 6,400 ft. of 6-inch and 3,700 ft. of 4-inch cast iron water pipe, about 8 tons of special castings, about 35 hydrants, valves, etc. Also excavating for, laying and covering pipe. One steel elevated tank.

Conditions and forms of tender, plans and specifications may be seen at the office of either of the undersigned.

Lowest or any tender not necessarily accepted.

F. W. FARNCOMB, Consulting Engineer,
64 Bank of Toronto Building,
London, Ont.

D. COCHRANE, Town Clerk,
20-21 Ridgetown, Ont.

City of Fort William, Ont.

SALE OF MUNICIPAL PUMP- ING & ELECTRICAL GENER- ATING PLANT

Tenders in bulk or in part will be received by the city clerk, addressed to the Chairman of Utilities Committee, on or before the 1st day of July, 1911, for the sale of the following equipment:

2 Duplex Compound Northy Pumps, High pressure cylinder, 14 in. diam; low pressure cylinder, 20 in. diam; pump cylinder, 11 in. diam; stroke cylinder, 15 in. diam. Capacity of each, 600 gallons per minute.

1 tandem compound engine—cylinders 21 in. x 46 in., and 40 in. x 46 in.

1 engine 20 in. x 46 in. with counter shafting pulleys and belting complete.

1 Westinghouse revolving field 600 kw., 2 phase, 60 cycles, 2400 volt generator with exciter, switchboard, etc.

1 royal electric 180 kw., 183 cycle, 2400 volt, generator with exciter, switchboard, etc.

The above equipment has been thrown out of use by hydro-electric power and water gravitation system, but would be suitable for a town of 5,000 population.

Machinery can be inspected at any time at the city power house, Fort William.

The successful tenderer must be prepared to have lots awarded to him cleared from the site before he 1st day of September, 1911.

For further information apply at city engineer's office.

JOHN WILSON,

City Engineer.

May 17, 1911.

21-23

TOWN OF SAULT STE. MARIE

Ontario

Sealed tenders addressed to W. H. Munro, mayor, will be received by C. J. Pim, town clerk, up to 5 p.m. Monday, June 5, 1911, for the construction of Section "M" of the sewer system. The approximate quantities are as follows:

1. 4,000 lineal feet of 18 in. tile sewer.
2. 2,000 lineal feet of 15 in. tile sewer.
3. 4,500 lineal feet of 12 in. tile sewer.
4. 2,000 lineal feet of 10 in. tile sewer.
5. 4,400 lineal feet of 8 in. tile sewer.
6. Number of Manholes, 45.
7. Number of catchbasins, 67.

Plans, specifications and Form of Tender may be seen at the office of town engineer on or before May 22, 1911.

A marked cheque for the sum of \$1,000 must accompany each tender.

The lowest or any tender not necessarily accepted.

W. H. MUNRO,
Mayor.

W. F. GRANT, C.E.
Town Engineer.
21-22



Department of Railways and Canals

Ontario—St. Lawrence Canals Rapid Flat Canal

Sealed tenders addressed to the undersigned and endorsed "Tender for Improving Lower Extreme to Lock No. 24," will be received at this office until 16 o'clock on Friday, June 9th.

Plans, specifications, and Form of Contract to be entered into can be seen on and after this date at the office of the Chief Engineer of the Department of Railways and Canals, Ottawa, and at the office of the resident engineer of the Ontario—St. Lawrence Canals, Cornwall, at which places form of tender may be obtained.

Parties tendering will be required to accept the fair wages schedule prepared or to be prepared by the Department of Labour, which schedule will form part of the contract.

Contractors are requested to bear in mind that tenders will not be considered, unless made strictly in accordance with the printed forms, and in the case of firms, unless there are attached the actual signature, the nature of the occupation, and place of residence of each member of the firm.

An accepted bank cheque for the sum of \$9,000.00 made payable to the order of the Minister of Railways and Canals must accompany each tender, which sum will be forfeited if the party tendering declines entering into contract for the work at the rates stated in the offer submitted.

The cheque thus sent in will be returned to the respective contractors whose tenders are not accepted.

The cheque of the successful tenderer will be held as security, or part security, for the due fulfilment of the contract to be entered into.

The lowest or any tender not necessarily accepted.

By order,

L. K. JONES,

Secretary.

Department of Railways and Canals,

Ottawa, May 19th, 1911.

Newspapers inserting this advertisement without authority from the Department will not be paid for it.

21-22

Tenders Wanted

Tenders for all trades in connection with summer repairs to the separate schools for the Separate School Board for the city of Toronto will be received till 5 p.m., **Wednesday, May 31st**, at the office of the Board, 24 Duke street. Tenders to be addressed to Joseph Cadaret, chairman of the sites and building committee, and to be accompanied by a cheque for 10 per cent. of the amount of tender.

Specifications may be seen at the office of the architect, Charles J. Read, 404 Confederation Life Building, Toronto, Ont. 21-21

Town of Oshawa, Ontario

Concrete Sidewalks

Tenders will be received up to noon of the 3rd day of June, 1911, for the construction of 24,000 square feet (more or less) of cement concrete sidewalks on streets in the above town. Specifications and further information may be obtained at the office of the Town Engineer, Town Hall, Oshawa.

FRANK CHAPPELL,
Town Engineer.

Oshawa, Ont., May 20, 1911.

21-22

TOWN OF ESTEVAN

Province of Saskatchewan

Notice to Contractors

Sealed tenders will be received by the Secretary-Treasurer of the Town of Estevan up to 8 p.m. on **Tuesday, June 6th, 1911**, for the following works:—

- A.—Laying about 2,000 feet of water mains.
- B.—Laying about 2,500 feet of sewer.
- C.—Constructing about 85,000 square feet concrete walks.

The lowest or any tender not necessarily accepted.

For further information apply to the undersigned.

M. H. KING, Esq., L. A. DUNCAN, Esq.
Mayor. Secretary-Treasurer.
CHIPMAN & POWER, Engineers,

TOWNSHIP OF SCARBORO

Tenders

For Reinforced Concrete Arch Bridge

Tenders will be received by the undersigned up to twelve o'clock noon of **Monday, June 5, 1911**, for the construction of a reinforced concrete arch bridge of 20 ft. span over a branch of the Highland Creek, on the highway between lots 18 and 19, concession 2, township of Scarboro.

Plans and specifications may be seen and all necessary information may be obtained at the offices of the undersigned, 57 Adelaide street, east, Toronto.

The lowest or any tender not necessarily accepted.

BARBER & YOUNG,
Scarboro Township Engineers.

Toronto, May 19, 1911.

21-22

Positions Wanted

Advertisements under this heading one cent a word per insertion. Box No. ten cents extra

POSITION WANTED—As Superintendent or walking boss on railroad or other construction work, by experienced man who can furnish excellent references. Apply Box 271, Contract Record, Toronto, Ont.

Miscellaneous

Advertisements under this heading two cents per word per insertion.

WANTED—A large American manufacturer wants a good representative supply house in main cities of Canada to handle their line of A.C. and D.C. Watt Hour Meters. A good proposition. Address E. J. Macintyre, care Electrical News, 220 King street west, Toronto. 6-6, 19-20

Miscellaneous

(Continued from page 63.)

Edmonton, Alta.

Tenders for fire department apparatus and equipment addressed to the city commissioners, will be received until **June 2nd**. Specifications at the office of the chief, Fire Hall, No. 2 Fourth street.

East Kildonan, Man.

Tenders addressed to Alfred Jackson, Suite 3,522, Main street, secretary-treasurer, will be received until **June 1st** for supplying the material and construction of 860 feet 5-ft. wire fence and 1,100 feet 3-ft. 6-in. wire fence, with cedar posts. Specifications with above.

Fort George, B.C.

The board of trade is urging the immediate establishment of some system of fire protection for the town.

London, Ont.

Tenders addressed to the city clerk will be received until **May 31, 1911**, for: painting and repairs to combination wagon, No. 2; painting and repairs to old hook and ladder truck; new buggy; two Taylor and Forbes' 16-inch Lawn mowers; chief's auto—tenders for auto to submit specifications and print of their respective autos. Ald. H. Ashplant, chairman No. 3 committee.

Medicine Hat, Alta.

The question of providing an auto fire-fighting apparatus is receiving the attention of council.

Moose Jaw, Sask.

On May 26th four by-laws will be submitted as follows: \$28,000, city's proportion of cement sidewalks; \$35,000, extension of electric light system; \$7,500, city's share of cost of ornamental street lighting standards; \$170, permanent pavements, etc. Total, \$240,500.

Newmarket, Ont.

Tenders for drawing and perhaps supply of gravel are received until **June 1st** by F. W. Keily.

Tenders addressed to W. C. Widdifield, solicitor for vendor, will be received until **June 1st** for purchase of timber, consisting of hemlock, maple, black, birch, elm and some cedar.

Ottawa, Ont.

Tenders are called by Public Works Department until **May 31st** for dredging Murray Canal. Advertisement in "Ten-

ders and For Sale Department" of this issue.

Tenders addressed to L. K. Jones, secretary, will be received until **June 9th** for improving lower entrance to Lock No. 24, St. Lawrence, Rapide Flat Canal. Advertisement in "Tenders and For Sale Department" of this issue.

Toronto, Ont.

Recent building permits include: John Drake, two pr. semi-det. 2-storey brick dwellings, Herman, \$8,000; L. Rolstein, one pr. semi-det. 2-storey and attic brick dwelling, east side Keele, \$7,000; J. Bollons, one pr. semi-det. 2-storey and attic brick dwellings Hewitt, \$6,000; A. Chisholm, 2-storey brick stores and offices, 1685-7 Dundas, \$15,000; Dodge Mfg. Co., 3-storey brick storage warehouse, Pelham, \$26,000; E. E. Valey, 2-storey and attic brick dwelling, opposite Nina, Lyndhurst, \$7,000; Grimshaw Bros., three pr. semi-det. 2-storey brick dwellings, Woodbine ave., \$11,400; L. Rolstein, one pr. semi-det. 2-storey and attic brick dwellings, east side Keele, \$6,000; W. B. Isbister, one pr. semi-det. 2-storey brick dwellings, Dufferin street, \$4,000; R. C. Bustard, two pr. semi-det. 2½-storey brick dwellings, St. Clair, \$12,000; Ontario Dock Co., 2-storey gal. iron freight shed, foot of York st., \$15,000; Thompson & Mitchell, one pr. semi-det. 2-storey brick dwellings, Montrose, \$4,400; Mr. Hayhow, one pr. semi-det. 2-storey and attic brick dwelling, 282-4 Ossington, \$4,800; E. G. Switzer, one pr. semi-det. 2-storey and attic brick dwelling, Hewitt avenue, \$5,000; R. S. Smith, one pr. semi-det. 2-storey brick dwellings, northeast corner Queen Q Triller, \$4,500; L. A. Beatty, one pr. semi-det. 2½-storey brick dwellings \$5,000; G. Fordyce, one pr. semi-det. 2-storey and attic brick dwellings, Brighton, \$4,800; E. Elliott, two pr. semi-det. 2½-storey brick dwellings, Manning avenue, \$9,000; S. W. Joseling, 2-storey brick dwelling, Tyndall ave., \$4,500; Hedley & Bradford, one pr. semi-det. 2-storey brick dwellings, Margueretta, \$4,000; A. Mundy, one pr. semi-det. 2-storey brick dwellings, Perth, \$4,000; Bingham & Patterson, two det. 2½-storey brick dwellings, Wright avenue, \$6,000; Adath Israel Congregation, 2-storey brick synagogue, 50 Centre avenue, \$9,000; Copland Brewing Co., 1-storey brick warehouse, 311 King street east, \$6,500; D. Muirhead, 2 pr. semi-det. 2-storey brick dwellings, Logan avenue, \$7,600; Norman Seagram, 2-storey and attic brick addition to dwelling, 217 St. George, \$10,000; Bell & Brown, two pr. semi-det. 2-storey brick dwellings Hwrman, \$6,000; G. M. West (in trust) one pr. semi-det. 2-storey and attic brick dwelling, Logan avenue, \$4,400; Hayes & Coldwell, two pr. semi-det. 2½-storey brick dwellings, Strathcona, \$7,600; E. C. Berkinshaw, 2½-storey brick dwelling, west side Russell Hill road, \$6,500; John Edwards, one pr. semi-det. 2-storey brick dwellings, west side Perth, \$4,000; J. A. Scythes, 2-storey and attic brick dwelling, near Marmaduke, Indian road, \$4,000; C. Locke & Son, two pr. semi-det. 2½-storey brick dwellings, south side College, \$10,000; J. Singer, one pr. semi-det. 2-storey brick dwellings, 198 John street, \$4,800; H. Graham, one pr. semi-det. 2½-storey brick dwellings, 212-212½ Delaware, \$5,000.

Contract Record

A Weekly Journal of
Building, Contracting, Engineering, Public Works
Municipal Progress, Advance Information

PUBLISHED EACH WEDNESDAY BY

HUGH C. MACLEAN, LIMITED

HUGH C. MacLEAN, Winnipeg, President.

THOMAS S. YOUNG, General Manager.

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Telephone Main 2362

MONTREAL Telephone Main 2299 B34 Board of Trade
WINNIPEG - Telephone Garry 856 - 404 Travellers' Bldg.
VANCOUVER - Tel. - 26 Crowe & Wilson Chambers
CHICAGO - - - - - 4059 Perry Street
LONDON, ENG. - - - - - 3 Regent St., S.W.

SUBSCRIPTION RATES

Canada and Great Britain, \$2.00 U.S. and Foreign, \$2.50

Vol. 25

May 31, 1911

No. 22

Crop Prospects Excellent—Trade Buoyant

The excellent crop prospects in Western Canada are having a stimulating effect upon the building trade in all sections. The volume of general trade is showing a steady increase and there is a feeling of greater confidence in all departments. The favorable outlook naturally causes great activity in business. Money is in greater demand than ever and a shortage for the fall season is prophesied. Real estate activity is on the increase and big deals are announced from all parts of the country. From the present indications it would seem reasonable to assume that 1911 will make new records in construction, municipal work, general development and immigration. Few labor troubles are noted and stocks of supplies are plentiful in the principal centres.

In the east a good volume of business is maintained and there is noteworthy activity in residential and commercial building. The extensive schedules of municipal work in the larger cities tends to stimulate other branches of trade and the building industry is the first to feel the benefit. The demand for the principal commodities used by builders is well sustained. Brick has been in demand at Toronto, Ottawa and other points, and there has been a strong call for sewer pipe and cement from municipal contractors. Prices remain normal, however, with fair supplies in prospect. At Montreal, cement is in good demand and is quoted in car lots, f.o.b., Montreal, at \$1.35 to \$1.40 per barrel of 350 pounds, bags extra. At Toronto, the quotation for car lots is \$1.70 a barrel, a cut of 15 cents being made, however, in the case of larger purchases. City dealers are asking \$1.90 for smaller parcels. At Toronto, red and buff pressed brick are selling for \$18 delivered, and \$17 at the works. Wire cut bricks for foundation work remain unchanged at an average of \$11. At both Toronto and Montreal there is an active demand for lumber with little variation in price, however. At

Toronto there is a good movement in hemlock, which is held firmly at \$17.50 to \$18. Spruce flooring in car lots is worth \$22 to \$24; British Columbia shingles, \$3.30; pine, \$32 to \$40 a thousand; southern pine dimension timber, \$30 to \$45; common stock boards, \$28 to \$33; cull stocks, \$20. Steel goods are notably buoyant in all sections of Ontario. An upward trend is looked for in paints and oils.

Industrial expansion at Toronto continues apace. The latest instance is the projected extension of the Massey-Harris Company's works by the erection of a large storage warehouse and other improvements that will run into many thousands of dollars and give employment to an additional 500 to 700 employees.

The City of Vancouver in the Limelight

The city of Vancouver seems to have a prize assortment of ignoramuses in its aldermanic department. In this respect it is something like Victoria, Regina, Winnipeg, Toronto,—in fact all other Canadian cities. We have just noted an account of a meeting of the board of works of Vancouver, in which one of the worthy aldermen of that progressive city took it upon himself to enlighten the city engineer with a sample of his rhetoric, which, according to the local press, was such as to be described only by dashes. The dissension, if such it can be called, occurred because the newly appointed city engineer, Mr. Fellowes, desired more time to investigate certain work which had been recommended for one of the wards. The alderman expressed the opinion that the sooner the engineer learned that he was the servant of the public the better it would be for him. We would suggest that the sooner the public discovers its error in placing ignorant, uninformed men in representative positions, the more satisfactory returns it will obtain from its expenditures and the more enthusiastic its "servants" will be in its behalf.

Municipal engineering continues to attract a few good men, but we wonder how long it will continue to do so. The thought occurs to us that when such cities as Vancouver, Victoria, etc., advertise for a city engineer, they should include in the list of qualifications desired:—the hide of a rhinoceros.

Toronto Makes Another Blunder

The city council of Toronto has again distinguished itself. After showing some intelligence in engaging Capt. Leslie to raise the broken section of the intake and bring it to shore, and when this arduous work, beset with many peculiar difficulties, had been practically completed after eleven weeks' persistent toil, the council decided that Capt. Leslie was not equal to the job and ignominiously fired him. A few days later Capt. Leslie brought the intake to shore and received the congratulations of everybody—except the council.

Capt. Leslie has an excellent record extending over 30 or 40 years. During this time he has been entrusted with a great deal of salvage work for Lloyds, of London, England, and other well known corporations. He it was, it will be remembered, who raised the Allan liner, Bavarian, which sunk in the St. Lawrence river a few years ago and which had practically been abandoned by everybody else, and it was Capt. Leslie who, in 1898, raised the wrecked Cornwall bridge for the New York & Ottawa Railway Company. But it would take too long to give

his record. The point is that he has been eminently successful in his undertakings and that after coming to Toronto and succeeding on a particularly thankless piece of work, he is stigmatized by the city council as inexperienced and incompetent.

The Toronto city council is quick to detect any blunder, or fancied blunder, on the part of its engineering department. Certain of its members seem to labor under the impression that they have some special call to distinguish themselves in this way. The question is whether they would not be better employed in cultivating a little horse sense; in learning the danger of trying to apply a smattering of knowledge and less experience to really difficult problems, and in appreciating a good man when they get one.

Honor to Whom Honor

Mr. A. S. Johnson, editor of the "Cement World," of Chicago, writes us in reference to an article entitled, "Who Invented Portland Cement?," published on page 53 of our issue of May 10. According to Mr. Johnson, the I. C. Johnson mentioned in our article has very recently retracted all claims to having been either the original inventor or the manufacturer of Portland Cement and our correspondent assumes rightly that the technical press in the United States and Canada will be only too pleased to ascribe the honor where it properly belongs, namely to Joseph Aspdin, of England. No one, he says, would dispute the fact that Portland cement, as it is now manufactured, has been an evolution, but this fact affords no reason why a man who has been dead for more than half a century should be stripped of his laurels. Mr. Johnson concludes by referring us to an article in the February, 1911, issue of the "Cement World," which is based on data secured recently in England by careful, personal research.

Clay Products and Printer's Ink

It is pretty thoroughly demonstrated now that the right way to promote brick and other clay products is through the exploitation of knowledge, says the Clay-Worker. The clay manufacturing trade itself has known to the qualities of its material and the comparative ease with which it can be used in place of flimsy material, but until this knowledge is widely exploited it is not doing the good it should. It is making other people, the general public, know these things that does good for the industry. That is why proper promotion consists in exploiting knowledge.

This is true with almost everything in the way of merchandise offered the public, and of practically all forms of advertising. The best and most lasting advertising is that which consists in exploiting knowledge. One may by catchy phrases and misrepresentation build up a temporary trade and gain a passing advantage, but real good of the permanent kind only comes from a basis of knowledge. Knowledge of a thing and presented in such a way as to appeal. In other words, the use of facts, attractive facts, if you have them, but facts none the less.

There are two sides to this thing of exploiting knowledge. One is that knowledge is the only rational basis, knowledge of facts for the permanent upbuilding of the trade, and the other is that a knowledge of any kind or of anything is not of material value until this knowledge is exploited and made public.

To make a great study in scientific research is of itself important to the world only when the knowledge is exploited. That is the way it is with the knowledge and new facts developed in connection with the brick and clay products business. The way to promote the industry and to insure its growth is to exploit all this knowledge and get it before the public. Through the use of printer's ink, through talking and through every means calculated to properly exploit knowledge that is of value and use to the public and will contribute to the progress of these products.

The Brick Manufacturer and the Contractor

One excellent result of the movement in the different building centres for the promotion of brick and other clay products has been to bring in closer touch the brick manufacturers and the contractors and builders. They get together for a common purpose and work together shoulder to shoulder to promote the use of brick and other building materials in this class and in so doing they cultivate a closer acquaintance and better harmony generally. This is of itself so beneficial that if nothing else had been accomplished it would be worth the time and effort expended in the promotion of brick products. In other words, this is an indirect result that like the side issue in connection with many an undertaking gives promise of amounting to more in the end than any other one thing in connection with the movement.

It is perfectly logical that the brick manufacturer and the contractor and builder can work together for each other's mutual benefit and progress, but it has been a fact too often in the past that instead of working together in harmony they have been in the attitude of antagonizing each other. The antagonism is unreasonable and uncalled for and will never result in good for either. It promises to be all wiped out now and a general effort made at promoting brick products. It may and probably should result eventually in more mutual gatherings of brick producers and brick users for the sake of keeping in touch and keeping acquainted. Even with or without the brick promotion business this is an idea that should be fostered and encouraged, this getting together of the men that make the brick and the men that put them into the walls. It is a thing that will not only help the progress of the brick business, but will make life pleasanter, easier and more worth while to the brick manufacturer and to the building contractor.

The Science of Management

Frank B. Gilbreth, the well known New York contractor, began life as a bricklayer. This trade had stood still for 4,000 years. Pharaoh's workman at Thebes and Gilbreth's workman at New York used the same kind of bricks, the same composition of mortar, the same motions on the part of the workman. Gilbreth began to use his mind on the processes of trade. "What is the first motion I make?" he asked himself. "I take a step to the right. Is that necessary?" To eliminate that step, he needed only to bring the pile nearer to his hand. "What is the second motion?" he enquired. "I stoop and pick up a brick. That means lowering and raising 200 pounds two feet. Need I do that?" Bring the pile up to one's hand by some mechanical means, and the workman need not stoop. "What is the next pro-

cess?" he enquired again. "I look the brick over, so that I may get no chipped surface on the outside. How can I eliminate that?" The answer to this third problem was the answer to all. Gilbreth, counseled by his wife, devised first an adjustable scaffold and then a carrier for bricks. Cheaply paid helpers arranged bricks and mortar in the carrier. The materials, all inspected and sorted, came up to the workman at his waist level. He could take up brick and mortar with one simultaneous motion of both hands. In brief, Gilbreth reduced the number of motions in laying a brick from eighteen to five or six.

While testing his improvement, Gilbreth made the first step toward adjusting the inevitable differences between scientific management and union labor. He was putting up a building in Boston. The Bricklayers' union there, as elsewhere, has a "maximum scale." No member of the union may set more than a certain number of bricks each day. Gilbreth saw the leaders. "If I can't have the bricks laid my way, I'll make my building of reinforced concrete" he said. "At this rate, bricklaying promises to become a lost art. If you will waive your maximum, I will give your men \$6.50 a day instead of \$4.50, and I won't overlook them, either." The union agreed. This was a twelve-inch wall with two kinds of bricks and "drawn joints." The best record for that class of work had been 120 bricks an hour to the man. In the last half of the job Gilbreth's gang, working under teachers on the new method, laid 350 an hour to the man.

Specializing in Architecture

The general idea of specializing has apparently taken firm hold of the public mind. In accordance with present-day belief we find employers of men, whether lay or professional, thoroughly imbued with the notion that in order to receive services of greatest efficiency specialists must be consulted. No doubt there is reason for a large measure of this feeling. A surgeon who is repeatedly performing a certain type of operation must necessarily acquire a high degree of skill in its performance. In like manner, a lawyer devoting all of his professional efforts to the conduct of cases involving certain questions of law would naturally be looked upon as possessing knowledge and experience that would render his services of greater value to interests that required advice regarding similar questions than would be those of a general practitioner.

It is questionable, however, if this same theory is capable of broad and general application. For example, can an architect who has designed a great number of buildings of a given class or type be confidently looked to for the most successful solution possible of any given problem belonging to that class, if we consider the matter broadly? It is obvious that the specialist, barring some unusual circumstances, would furnish a plan well-nigh perfect in its practical workings. In all probability the mechanical excellence of the building would be greater than could be expected with any degree of certainty from one less experienced; but how might architectural growth be affected if we admit an age of specialists? Is not the architecture of the specialist's building in danger of partaking in character rather too much of its numerous predecessors belonging to the same class? Would there not be a tendency toward utilizing what had been found to fairly meet the requirements in num-

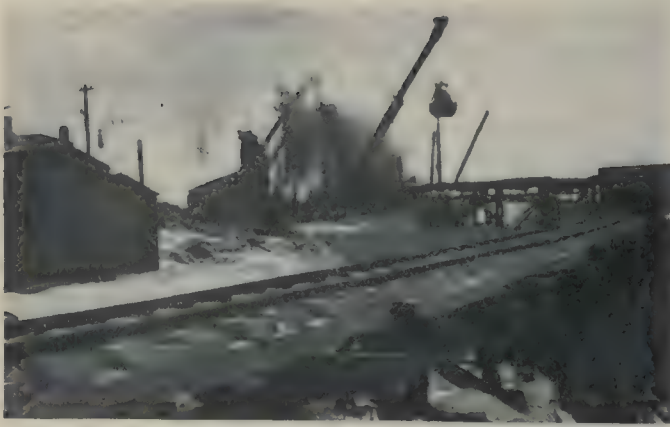
erous previous instances rather than to study and develop something new, which, while involving some element of experiment, might prove the key to real progress? It would seem possible that the tendency toward specialization so much encouraged by the general public might be, in the case of architecture, in a sense opposed to development. Moreover, it is by no means certain that architects in general relish the thought of becoming known as specialists. It has not been conclusively shown that they are ready as a profession to acknowledge that, because some members may perhaps have a considerable knowledge of theatre building requirements, they are less competent to plan a bank building; or that their knowledge of domestic architecture is any hindrance to a successful solution of the office building problem. Judging from such expressions as we have been able to secure, it seems probable that accidental circumstances and the public demand have had more to do with the making of architectural specialists than any peculiar fitness, inclination or purpose on the part of the architect.

It will, perhaps, be argued in some quarters that one man cannot make himself familiar with the requirements of all the various types of buildings. As a matter of fact, the underlying principles of design and construction are not different for the various classes. The differing requirements are principally those of plan and equipment, none of which are of such great complexity as to be impossible of mastery by an architect of wide general experience, giving his mind to the subject even for the first time. The mechanical features also are not so totally unlike in the various types of buildings. Sanitary equipments, heating and ventilating plants, lighting, elevators, all of these subjects are perfectly familiar to the architect of any building and his knowledge of them would probably be sufficient to readily enable him to adapt them to the peculiar or special requirements of the building under construction.—American Architect.

Some pessimists are inclined to think that labor-saving devices are invented by persons endowed with a large and active hookworm. In one case at least laziness was at the back of an important invention. It was a lazy switchman who hit on the idea that made the distance signal possible. In 1846 a switchman who had to attend to two station signals some distance apart, decided to save himself the trouble of walking to and fro between them by fastening the two levers together by a long piece of wire. A broken iron chair served as a counterweight. The wire ran on into his hut, and there he sat nightly and worked the two signals without setting foot outside. This went on until he was found out, and reprimanded, and promoted.

The province of British Columbia will make a special effort to secure the construction of the war ships that are to be stationed on the Pacific coast. These vessels will comprise four cruisers and six torpedo boats. The designs were prepared by the British Admiralty. It will probably be some time before the contracts are let.

Vice-president Whyte, of the C. P. R., looks for a record breaking crop this year. His estimate for the three prairie provinces is 200,000,000 bushels.



Stone crushing plant in operation at Valleyfield



Seventy-ton Bucyrus shovel digging rock in winter

The Deepening of the Beauharnois Canal

Particulars of Interesting Work at Valleyfield, Que.—Large Amount of Pumping Required During Excavation—A Specially Designed Foot Valve

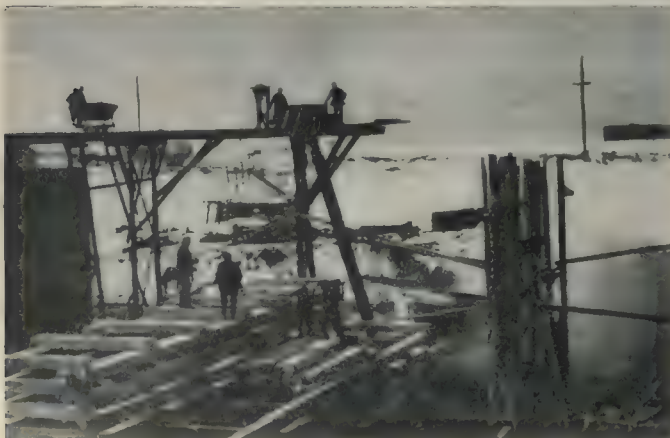
The passing of this month marks the completion of the deepening of the Beauharnois Canal at Valleyfield, Que., for the Canadian Light and Power Company's project. The work has been in progress for the past year. In this time approximately two hundred thousand yards of earth and seventy-five thousands yards of rock have been dug out of the bed of the canal by Messrs. Fraser Brace & Company, of Valleyfield and New York city, the contractors for this section of the work.

A new intake structure to control the admission of the water from Lake St. Francis into the canal has been built at the entrance. Beside the four Tainter Gate openings, there is a boat-gate opening of 50 ft. wide and 34 feet deep for the admission of boats into the canal while the power plant is in operation. At the intake, provision has been made for future enlargement of the plant by the construction of extra piers and cribs.

There were no unusual features in connection with the works, except the large amount of pumping required to unwater the excavation. The upper part of the old Beauharnois canal had never been unwatered, and the local people were almost unanimous in declaring that the unwatering was an impossibility.

By the construction of a heavy cofferdam, 500 ft. in length, the waters of Lake St. Francis were successfully cut off. The water remaining in the canal was drained away through the town sewers by means of centrifugal pumps. The unwatering of the excavation required the constant working of five 12 in. and three 10 in. belt driven centrifugal pumps. The motive power is electricity purchased from the Montreal Cotton Company of Valleyfield, special transmission line having been run across the canal to furnish the 500 h.p. required.

Operations were continued all winter. The only difficulty experienced with the pumping was with regard to the freezing up of the priming lines and the idle pumps. Small auxiliary steam plants at each pumping station were used to keep a small supply of hot steam blowing through the pumps when not running. Pipes exposed to the weather were wrapped in heavy felt for protection. This was found to be quite sufficient for the severest weather as long as the water in the pipes was in motion. Early in the work, direct-connected centrifugal pumps were used, but the experience of the contractors disclosed that these were not suitable for the constant work, because the conditions of the work made it impossible



Concreting and crib construction at new intake



Rear view of gate piers

to install anything but temporary foundations for the pumps.

A serious difficulty encountered was in the foot-valves of the large pumps. Eventually, the contractors designed a special foot valve, which they had made up in Valleyfield, and which they are now using on all pumps. These differ essentially from any foot



Constructional view of operations from top of mixer

valves on the market. They are so light and inexpensive that spares are kept constantly in all of the pumping stations. Some of the pumps lifting to a height of 39 feet are being driven at a speed of 520 revolutions a minute. The speed was raised in order to increase the output of the pumps without adding



Five belt-driven pumps in the Valleyfield canal

to their number. It, of course, required the installation of much larger motors than are usually required for the same pumps.

The engineers for the Canadian Light & Power Company are Messrs. J. G. White & Company, of

New York City. Their local representative is Mr. Jos. D. Evans, resident engineer, who covers the entire work between Valleyfield and Cote St. Paul. His section includes six miles of canal work and the power house, and attending structures at St. Timothee, and the steel tower transmission line between St. Timothee and Cote St. Paul, as well as the substation at Cote St. Paul. The power house work is being done by Mr. Geo. W. Nicholson of Montreal. A large amount of very difficult culvert work on the canal has been carried out during the past winter under the direct supervision of Mr. Evans.

The accompanying illustrations are from the progress pictures of Messrs. Fraser & Brace & Company's work at Valleyfield.

Completion of Big Dam in Alberta

There has just been completed at Namaka, Alta., the great dam which has been constructed by the Southern Alberta Land Company, and which stands at the head of the huge irrigation canal which will bring into cultivation no less than 416,000 acres of land. The building of the dam, which, according to all accounts, is entitled to rank among the great engineering feats of the West, was under the direction of Mr. A. M. Grace, chief engineer of the Southern Alberta Land Company, and the contract for the work was carried out by the Carter-Halls-Aldinger Company, of Winnipeg, with Mr. D. Stillwell as superintendent of construction. The intake consists of two concrete spill dams which raise the Bow river to a height of 11 feet. These dams are capable of taking care of a flood of 120,000 cubic feet per second. The flood record of the river at Calgary is 54,000 cubic feet per second. These two spill dams are separated by an island two miles in length and 1,800 feet wide. They are connected with a high embankment equal in length to the whole island, thus keeping the water from making a new channel for itself through the island. The structure itself is of solid concrete and contains five steel gates, each of which weighs nearly two and a half tons.

Concrete walls in wet ground were made watertight by the use of steel plates in the recent construction of the sewage-pumping station at East St. Louis, Ill. As the pump floor is several feet below the level of the normal ground saturation, great precautions were taken against inflow of water. The foundation slab, 7½ ft. thick, was waterproofed near the middle with asphaltum and waterproofing compounds mixed with the cement. In the side walls, from a level below this waterproofing layer, steel plates were placed at a distance of 1 ft. from the back face. They were riveted into a complete shell as placed, and the joints painted with asphaltum.

The city of Montreal will expend one million dollars in paving work this season. Mr. Geo. Janin, chief engineer for the municipality, is asking for an appropriation of nearly four million dollars, of which one million is for pavements, half a million for sidewalks and the balance for sewers, drains, water mains and similar work.

Among recent incorporations at Winnipeg we note that of the Canada Building Supplies Company, Limited, organized primarily to handle various building lines manufactured by the firm of Francis Ritchie & Sons, Limited, Belfast, Ireland.

Notes on Concrete Sidewalk Construction

A Branch of Municipal Work in which Progress has been Slow—Practical Suggestions looking to Improvement in Contracting Methods

By J. B. Landfield

The field that I have to deal with—street concrete work—is not a large one, but it is none the less of sufficient importance to justify attention and study. The laying of sidewalks and crossings and the building of concrete curb and gutter have not kept pace with other branches of concrete work in point of development, and there has been a general tendency to regard them as rather inferior branches that required little technical ability or experience. The reason for this is not far to seek. With the great progress of structural concrete work the larger contractors found their hands full of work that gave them better returns with less effort, and therefore sub-let sidewalk work that came to them, or declined it altogether. At the same time the foolish struggle for cheapness on the part of shortsighted municipalities as well as individuals, brought into the field hundreds of untrained and ignorant contractors who counted their own time the same as that of their laborers and who undertook sidewalk work at prices far below what an intelligent and honest contractor, who cared for his reputation, would think of doing it for.

One result of this was the general impression that anybody could do street concrete work and that this branch of work did not deserve the technical study that was being given to other lines. The other result was that the country from one end to the other abounds in rotten sidewalk and curb and gutter work, large quantities of which will have to be relaid. I can count out to you several cities in which such work has caused concrete to fall into disfavor and to-day natural stone is used almost exclusively. It is up to us to change this condition of affairs and we can best do so by improving the methods in use and by educating the public to pay a fair price for good and honest work.

Suggested Methods

The suggestions I have to make as to the methods of sidewalk work are two in number. One has to do with the consistency of the top coat, and the other with the manner of finishing the surface. On the question of consistency of the top coat the book authorities are divided or non-committal. One book says put in the top coat fairly dry while another advises making it about as thin as mortar. A third gives the wise advice not to mix it too wet or dry. What is the best practice and why? I have given this subject a good deal of study and wide observation, and as a result I am going to offer for your consideration a method that will astonish many of you. I shall preface this by stating my opinion that 90 per cent. of all sidewalk men put in their concrete, and especially the top coat, entirely too wet. It is frequently argued that by so doing the top coat bonds better with the foundation course, but as a matter of fact this reason is fallacious. On the other hand a mortar-like top is apt to show a different degree of construction in setting from the foundation course, and when it is troweled in finishing, neat cement is flushed on the top and forms a thin brittle surface

that is likely to scale off in time. Besides this if your work has not been timed just right your finishers have to wait until the surface is dry enough for finishing or surreptitiously sprinkle dry cement on it to take up the superfluous moisture. The manipulation of concrete surfaces for finishing should take place at once before any portion of the particles have commenced to crystalize. To disturb them by troweling a half hour later is to invite hair-cracks and crazing.

The method I have to suggest consists in putting in a top coat with only a little water in it and then tamping it to bring sufficient moisture to the surface for immediate finishing. This not only makes a fine bond with the foundation course and gives you a dense closely-grained top, but it insures you against checking and crazing. I have heard it objected that this method would add to the cost, but when the contractor tried it he found that it was cheaper to pay for a little more tamping than to have finishers waiting around for the surface to dry out, especially when they were drawing extra pay after quitting time.

The tamping of the stiff top coat is closely connected with the other subject of which I wish to speak, the method of finishing the surface. This consists of two operations, striking off and floating. When the top coat has been tamped and the surface is just right for finishing, we take a piece of angle iron with a handle at either end to use as a strike-off stool. One man on each side of the walk grasps this by the handle and they proceed to strike off the surface with a sort of sawing motion, each in turn bringing his end forward so as to prevent the surplus material being brushed off at the side. With a little practise they become very proficient in this and they consume but little time. In fact this method of striking off facilitates floating to such an extent as to make a considerable saving. Of course the surface may be struck off when wooden forms are used, but the side rails are frequently rough and uneven and the stakes are a hindrance. With steel forms the method works to perfection, for the strike-off stool moves easily along and the resulting surface is absolutely even.

The floating of the surface is a point on which there are many opinions. I presume that a majority of sidewalk men to-day finish their work with a trowel, but I am inclined to consider this bad practice. A few years ago in many cities a smooth glassy finish on a walk was greatly admired, and to produce this it was necessary to use a steel trowel and to use it vigorously. In fact the general tendency when a trowel is employed is to use it too much, and over-troweling flushes neat cement to the surface and forms a thin hard coating that seems all right at first, but which afterwards scales off. Furthermore the glassy finish on a sidewalk is neither good looking nor practical. There is constant danger of slipping on it. To avoid this they used to stipple the surface where there was any considerable grade, but can you picture to yourself anything uglier than a stippled walk?

Improved Practice—and Otherwise

The improved practice is to strike off the surface as described, and then finish it with a wooden float. A large number of concrete men use this method now, but the practice ought to become universal. As soon as the walk is floated the surface should be lightly brushed with a dampened brush. The result is a handsome even surface on which there is no danger of slipping and which in appearance excels the best natural stone. In making the top coat it is very desirable to use a certain amount of crushed granite or some other similar material with your sand in order to make a more durable surface and at the same time avoid the dirty yellowish color that common sand frequently gives. Of course it is of the highest importance to see that the sand is clean and free from any trace of loam as this is certain to make "soft spots" which soon show wear.

I cannot leave the subject of finishing without calling attention to two practices that disfigure the walks in many cities. One of these is the custom of marking off the walk into small blocks, say 18 ins. to 2 sq. yd. Sometimes a line is run about 6 ins. from the edge on each side, making a sort of border. The men that have their walks laid in this manner of course have no realization of how ugly they look. The best looking walk is that laid in regular squares that correspond with the width or nearly so. A 5 ft. walk laid in blocks 5 ft. sq. without any fancy work or curlicues is handsomer than any possible variation. Of course a 4 ft. or 6 ft. walk may be equally well laid in blocks 5 ft. long, instead of 4 ft. or 6 ft. but the point I wish to make is that in walk building simplicity spells beauty. A few cities still retain the custom of making sidewalk blocks in 2 ft. and 2½ ft. sizes in the shop and then laying them, but this never makes a job that maintains its good appearance for any great length of time. For this the walk must be laid on the spot.

The other practice is one for which engineers are frequently responsible, and that is the custom of crowning the surface of the walk. Happily this practice is not very prevalent. The two main reasons why it is bad to lay sidewalks with a crown are first that one-half the drainage is on the wrong side, that is, away from the gutter, and secondly that they are particularly ugly at points of intersection on account of the hollow left. A crown on a cross walk, if not too high, is very desirable and preferably it should be slight in the centre of the walk and rather steep at each side, where the road material banks up against it. Another clever steel form has been made for the construction of crosswalks, which operates on the same principal as that already described. The division plates are convex on one side and the strike off is made not on the side rails, but following the division plates as guides.

Some English Data on Resurfacing Macadam

The following data for the resurfacing of main roads through an urban district in the Lake District of England were given in a recent issue of The Surveyor by M. C. Watson, surveyor, to the Ambleside Urban District Council. The roads are located about five miles from a railway station and have to bear a very heavy through carting traffic all the year round, and in the summer months have

to withstand probably a heavier coach and motor traffic than those of any other part of the country, besides a service of heavy motor buses to and from the station. The stone used is from the council's quarries, and is known as a blue limestone. It is of a very varying nature and difficult to break, the price paid for quarrying being 36 cts. per cu. yd. The following refers to work done in January. The weather was wet with spells of frost. The length of road rolled was 930 lin. yds.; the superficial area, 4,500 yds. The cost was as follows:

	Per Sq. Yd., Cts.
Stone, 300 cu. yds. at 96 cts.....	6.40
Binding	.26
Scarifying, 39 hours at 7d.	.12
Roller drivers' wages, 21 days at \$1.20, including getting up steam but not scarifying. The actual time rolling being about 7 hours per day	.56
Manual labor	.68
Team labor, including hauling rough stone from quarry to depots to be broken, greatest distance 2 miles, also watering	2.40
Fuel, 60 cwt. smokeless coal, including carting, at 45 cts. per cwt.	.60
Total	11.02

This gives a cost of 53 cts. per lin. yd., or \$943 per mile for a road approximately 5 yds. wide; the average width of roadway being 7 yds., one cubic yard of stone covering about 15 sq. yds. Number of yards rolled per day was 44 lin. and 214 super. The following relates to work done in February. The weather was wet and there were spells of frost. The length of roadway rolled was 648 lin. yds.; the superficial area was 4,500 sq. yds.

	Per Sq. Yd., Cts.
Stone, 366 yds. at 96 cts.	7.80
Binding	.28
Scarifying, 36 hours at 14 cts.	.12
Roller driver's wages, 16 days at \$1.20, actual time rolling about 8 hours per day	.42
Manual labor	.82
Team labor, also watering (work nearer to depots) ..	1.30
Fuel	.60
Total	11.34

This gives a cost of 78 cts. per lin. yd., or \$1,390 per mile for a road average 7 yds. wide. The actual width of the roadway in this case was 13 yds. One cubic yard of stone covered about 12 super. yds.; number of yards rolled per day, 40 lin. and 280 super.; the slight increase in cost over the first figures due to extra metal put on some parts of the road. Nothing has been allowed in the above figures for depreciation of roller, or for the driver's wages when not able to roll on account of frost—which amounted to 28 days out of 65—wear and tear of tools and carts, or for horse keep, and so forth. A cause of considerable trouble in winter time is the way in which horses are shod in this district. On the first signs of frost the horses are fitted with block shoes, capable of holding four sharps in each shoe, and this class of shoe is used throughout the winter—frost or no frost. The result is that great damage is done to the roads through the loosening of the metal.

Victoria Harbour Terminals of the C.P.R.

Extent and Importance of the Operations now in Progress—Noteworthy Features of the Work—Methods of Construction Employed

Contractors: John S. Metcalf Company, Limited.

While most people are aware that the Canadian Pacific Railway is doing development work for a new lake terminal at Victoria Harbour, Ont., the extent of the construction operations at that point is not realized to many.

A slip-way, 600 feet wide and 3,000 feet long, is being dredged, with a channel from deep water in Georgian Bay. The channel and the slip-way are excellently protected by the numerous neighboring islands and the points of the main land.

The terminal may be said to be divided into two portions. One side of the slip-way has been reserved for the grain terminal and what was formerly Maple Island has been transformed into a peninsula by very extensive filling between the main land and the island. On the island, a 2,000,000 bushel reinforced concrete grain elevator has been constructed and provisions have been made for an ultimate grain storage capacity capacity of 10,000,000 bushels at the terminal. The elevator consists of two steel marine towers travelling on wheels along the wharf, for unloading vessels, a 2,000,000 bushel reinforced concrete storage elevator, and a shipping elevator with a car loading capacity of 200 cars in ten hours. A power plant of 1,000 kw. capacity, using Babcock & Wilcox water tube boilers, and Westinghouse—Parsons turbines, furnishes power for the present elevator, with

train, screened and washed in a plant built for that purpose on the island, and conveyed from the screening plant to storage bins over four mixers. The illustration shows the concrete walls in course of construction, and the general lay-out of the gravel conveying and concrete mixing plants.

On the side of the slip-way, opposite to the grain terminal, the package freight and passenger terminal is being constructed. The principal buildings of the freight terminal are a flour shed, 800 feet long, and a freight shed 700 feet long, with provisions for future extensions. The frame-work of these buildings is of steel, with concrete end and fire walls, and wooden roof and floor. Each building is somewhat less than 100 feet wide, and one storey in height. A view is given of the flour shed in course of construction, showing the steel work.

Practically the entire extent of land on this side of the slip-way was made by train fill. The foundations of the flour and freight sheds are on piles driven into the fill. At the centre end of the slip-way the passenger station will be located. Other buildings at the terminal will include round-house, machine shop, coal pockets, ice-house, ships' laundry, Y. M. C. A. building, etc. It is anticipated that, beginning with the present summer, the passenger vessels of the C. P. R. now running between Owen Sound and Fort



Panoramic View of the Work, looking South

reserve capacity for future additions and for lighting of the terminal.

The concrete elevator was constructed by the use of moving forms jacked up on threaded rods, which were left imbedded in the concrete as the wall grew in height. Gravel for the concrete was brought in by

William will run to Victoria Harbour instead of Owen Sound.

Not the least important part of the work on the terminal are the wharves, of which some one-half mile is approaching completion. About a mile additional is still to be built. A portion of the wharves



Flour Shed : Building South and Wall. Doors Piled Inside of Shed.

consists of concrete cribs, but the greater part will be wooden cribs. All wharf tops will be of reinforced concrete.

A new town is springing up adjacent to the Victoria Harbour terminal and the post office of the new town has been officially named Port McNicoll in honor of the First vice-president of the railroad.

The flour and freight sheds were designed by the engineering department of the Canadian Pacific Railway, who also arranged the general terminal lay-out. The designing engineers for the grain terminal and the wharf construction were the John S. Metcalf Company, Limited, of Montreal and Chicago.

The John S. Metcalf Company, Limited, have completed the construction of the first unit of the

in its operation except in emptying cement bags and trimming, following the deposit of the material by the mixer. Dump cars, loaded with gravel by a locomotive crane at a dock in the suburbs of Detroit, are drawn to place by an electric motor car, and their contents dumped between the rails of the track under construction. A car loaded with cement bags is then run over the gravel pile and the cement deposited. A concrete-mixer plant, mounted on wheels, and provided with a scoop, is run forward and a shovelful of the cement and gravel mixture scooped up, raised, and discharged into a five-cubic yard hopper above the mixer, from which a charge of two cu. yds. is delivered to the mixing-drum. While the material is being mixed the machine is run back to the point of



Elevator Completed

grain terminal, of 2,000,000 bushels capacity, and they are now at work building wharves, flour shed and freight shed. The flour shed was practically completed on May 1st., and the freight shed will be available for this summer's business.

Mr. G. G. Ommaney is resident engineer in charge for the Canadian Pacific Railway.

The concrete-mixing plant used in connection with the roadbed work of the Detroit United Railway is so arranged that there is no manual labor at any stage

delivery and a batch of concrete is dropped between the rails and leveled off to the correct height by lowering a leveling-board at the rear of the machine and running forward slowly. Trimming and final leveling is done by a gang of three or four men who follow behind the mixer. The capacity of the mixer is about 180 cu. yds. in 10 hours, or, counting in the time of transfer from line to line, repairs, etc., about 300 cu. yds. in 24 hours. The entire cost of the plant for concreting, including the mixer, crane, 27 dump cars, two motor cars, gravel dock, and miscellaneous tools, is approximately, \$57,000.

Noteworthy Developments in Construction

The Wolle Method of Making Reinforced Concrete Poles Described— Concrete Standpipes — Old Wire Rope used in Reinforcing Timbers

Poles of reinforced concrete for both high and low-tension electrical current are finding an increasing demand in Germany, and Mr. Karl Roessle, in a recent number of "Beton und Eisen," describes these used for the "Hohenzollern-Sportpalast," a large skating rink in Berlin. Because of the decay of wooden poles, the high price of iron poles and the constant attention required for their maintenance, the management decided to employ reinforced concrete. The simplicity of the system used, the Wolle, made it possible to cast all poles in wooden forms at the site of the work. Both the fabrication and the erection were accomplished without the use of machinery, and the cost was comparatively small, being about one-half that of iron poles. The poles were lightened by adopting a tapered section, reducing the size from about 1.2 x 1.8 ft. at the bottom to 0.46 x 1 ft. at the top, and, at equal distances for the greater part of the length, holes were cut through which not only reduced the weight, but also presented less surface for wind pressure in the direction of the smallest resisting moment.

The height of the poles, which curved over at the top, was about 44.3 ft., of which 8.2 ft. was in the ground, which brings the arc light about 32.8 ft. from the ground surface. Heavy signs, suspended between posts, increased the bending moment at the ground level. Therefore, a flat iron plate of rectangular cross section, about 3 x 3½ ft., was placed on either side between the ground and the pole extending from the surface of the earth downward. The greatest difficulty experienced was in placing the conduits in which to run the electric wires. The poles were erected by means of wooden shear-legs 29.5 ft. in length, and, although the total weight of each pole was approximately 9,259 lb., they were raised without injury when but 14 days old.

† Concrete Standpipes

It is interesting to know that the first stand pipe erected in this country was that at Little Falls, N. J., in 1889. To date there have been 53 built in this country and abroad. Of these, thirteen have been erected in New England, which would indicate that engineers and water companies here have more faith in this type of construction than in any other part of the world.

The Aberthaw Construction Co. have built two large standpipes and a tank, the smaller, 40 ft. in diameter and 70 ft. high, at Westerly R. I., and the larger at Attleboro, Mass., 50 ft. in diameter and 100 ft. high to water level.

The Attleboro standpipe was designed on the basis that the hoops take the entire load with the unit stress in the steel of 13,500 lbs. per sq. in. In order not to have the bars too close together, 1½ in. diameter bars were used in two rows, from the bottom of the standpipe to a height of 61 ft. From 61 ft. to 81

ft. a single row of 1½ in. diameter bars were used. From 81 ft. to 100 ft. the bars were 1⅝ in. diameter. In the upper 15 ft. of the height, the section of steel was kept constant, although the hoop stresses from the water were constantly diminishing to the top.

The walls of the standpipe started with a thickness of 18 ins. at the bottom and tapered to a thickness of 8 ins. at the top.

In order to space the reinforcing bars an exact distance apart, 4 in. channels with ⅜ in. punched holes through both flanges were used. The channels were set upright at intervals of about 15 ft., c. to c., a ¼ in. rod was passed through the holes, and the hoops were rested directly on the ends of these ¼ in. rods, which are then bent up to secure the hoop firmly. From the height of 61 ft. to the top, 3 in. channels were used for spacers. The floor of the standpipe was 12 ins. thick and met the wall with a curve whose radius was 5 ft. The top surface of the floor was reinforced with ¼ in. square twisted bars 6 in. on centres each way. The foundation consisted of a slab about 18 ins. thick but under the walls of the standpipe the depth of this slab was increased to 4 ft. for the width of 5 ft. A concrete curb 3 ft. high and 12 ins. thick was built around the outside of the bottom.

A gate-house enclosing various valves was erected at one side and access to the interior of the standpipe could be obtained through a passage in the same. The roof was Guastavino tile dome, suitably ventilated.

Method of Splicing Bars

The method using in splicing the ends of the bars together may be of interest. These bars were obtained long enough so that three would reach entirely around the circumference with a lap of 40 diameters at each joint. Two wire loop clips were then used at each splice to insure the bars being held firmly together. By actual test at the Watertown Arsenal these clips alone were found sufficient to secure the full working stress of the bare bars.

From our experience with this standpipe and the one we erected at Westerly later, I believe the addition of considerable vertical reinforcement in the lower 8 or 10 ft. of the standpipe wall would assist very materially and perhaps entirely obviate the formation of a horizontal crack in the lower few feet of a standpipe. The walls under water pressure must increase in circumference. At the bottom of the standpipe, however, this increase in diameter cannot take place owing to the rigid connection of the wall with the floor. It is apparent then, that unless precautions are taken, either by the use of very low stresses in the hoops or by the addition of vertical steel bars, there may be a distinct movement back and forth on some joint in the standpipe. That this movement is present is further indicated by the fact that when a standpipe has been kept full of water for some time the leakage through these joints almost entirely dis-

† Abstract of paper read before the Boston Society of Civil Engineers by Leonard C. Wason, President of the Aberthaw Construction Company, of Boston, Mass.

appears, but on emptying and refilling the standpipe the little dams formed have apparently been broken down as the leakage again occurs as vigorously as at first.

In the Westerly standpipe we endeavored to take care of this by increasing the amount of steel. At the lowest foot the stress is 6,000 lbs. per sq. in. This stress was increased 1,000 lbs. for each foot in height, until we reached a maximum stress of about 12,500 lbs. per sq. inch. No vertical steel, however, was used and on filling the standpipe we found that with a maximum head of water that a small line of dampness occurred in a horizontal joint about $3\frac{1}{2}$ ft. above the floor of the tank. This damp place was nearly 30 ft. long.

Quite different methods were used in erecting the Attleboro and Westerly standpipes. In the case of the former, a large tower of pine timbers, properly braced, was erected. On the top of this were placed two bul-wheel derricks. Concrete was handled in a bottom dump bucket swung to the position desired by the derricks, dumped into boxes and shovelled into the wall. Wooden forms were used.

At the Westerly standpipe, the plant consisted of a simple concrete mixer fed by wheelbarrows. The mixed concrete was delivered to an ordinary elevator hoisted to a hopper erected on the elevator tower where it was dumped, and from which it was fed into wheelbarrows and shovelled into place. Steel forms were used.

Steel and Concrete Pipes in Sewerage Work

Combination steel and reinforced concrete pipes were used by MM. Coignet and Bonna in constructing the sewerage works of Paris at Acheres sixteen to eighteen years ago. In the extension of these works the same type of pipe is still being used. As described in the "Transactions" of the Concrete Institute, of Great Britain, they are made in sizes from 12 in. to about $3\frac{1}{2}$ ft. in diameter, and consist of a thin steel tube lined inside and out with concrete reinforced with circumferential and longitudinal bars. One of the larger pipes laid about seventeen years ago was cut out and removed four years ago in order to put in a junction. It was found that the steel was practically clean and that the concrete was lying close against it. There were slight traces of rust on part of the inner reinforcement, but the rusting action, it is stated in the above publication, seemed to be dormant. Nothing has been spent on repairs to the reinforced concrete during the sixteen years or so it has been in service and investigations made about a year ago on pipes in place showed that the steel and concrete are free from deterioration. A modification of this pipe, which is known as the Bonna pipe, has been used on two rising mains of the Paris sewerage system, which are under a maximum head of about 56 ft. These mains are each about 6 ft. in diameter, with steel shell about 0.15 in. in thickness, which forms the inner lining. In these pipes concrete is placed inside the shell, the strength being contributed solely by the outer reinforced concrete casing, which is 4 in. thick and is reinforced in the conventional manner. All these pipes were molded in a pipe yard and laid after curing, the joints being made by a sleeve similar in construction to the pipes themselves. The large rising mains were made in sections each 8.2 ft. long.

Electrically operated rock drills are used on a rock-drilling scow employed in the harbor of Trieste. According to the "Genie Civil," power is supplied to each drill by an electric motor which is geared to a crankshaft. This effects the compression of a helical spring once in every revolution by means of a connecting rod. The energy thus stored when suddenly released causes the downward blow. The average number of blows per minute is 380 and the stroke 2 1-3 in. The holes can be driven at angles up to 15 deg. from the vertical and the drill rods can be fed down so as to give holes 6.5 feet deep and 3.2 in. in diameter. These are driven in moderately hard limestone at the rate of $3\frac{1}{4}$ feet per hour.

Anchor bolts in bridge abutments were pulled out of the concrete, and not broken off at its surface, in the overturning of steel trusses in the Meadow Valley washout on the San Pedro, Los Angeles & Salt Lake Railroad. The bolts used were the standard $1\frac{1}{4}$ x 36-in. round, with horizontal notches. The flood which displaced the bridges rose 8 feet above the rail. In every case failure of the anchorage was in this manner, according to Mr. J. G. Van Zandt, who gives some details of the action of this flood of the last year in the "Railway and Engineering Review." He observes that this seems to point to the need of a more secure anchorage of bolts than that is generally provided according to current practice.

Old wire rope is used in certain French mines for reinforcing old timbers, especially the cap pieces of sets. In the "Engineering and Mining Journal" Mr. Louis Bourdoire states that the old rope is stretched longitudinally around the timber, the ends being held fast between the roof and the top of the cap piece so they can not slip. When a timber starts to bend under the weight of the roof part of the tension is taken up by the wire cable, enabling a miner to put in additional supports before a fall occurs. The ends of the cap pieces are tapered and grooved deep enough to receive the rope and prevent any part of it projecting beyond the bearing ends of the timber pieces.

Embankment protection is secured in many cases on the Missouri Pacific Railroad by a foundation mud-cell mattress consisting of two tight layers of brush with about 1 ft. space between, the dike being built on top. This form is used in place of the standard mattress, where the water does not contain so much sediment as to cause sinking before the dike is stated. No rock or riprap is used.

Timber flume bottoms, rapidly worn away by the scour of gritty material, were protected during a part of the work on the Denny Hill regrade in Seattle, Wash., by white-iron lining plates. The rapidly moving waste water, carrying the hydraulically excavated material down 3 and 4 per cent. grades in the flumes, wore away unprotected planks in a couple of weeks, and also quickly wore out a floor of 6 x 6 12-in. blocks protected by studding with 20-penny nails, which was tried as a substitute. This led to the adoption of the iron plates, 24 x 34 in., and $\frac{1}{2}$ in. thick, with a crown of $\frac{1}{4}$ in. in the middle to spread the material and prevent centre scour. This subjected the side boards to more severe service, and to meet it, triangular strips, readily renewed, were nailed in the angle between the bottom and the sides.

Efficient Maintenance of Rural Highways

Strengthening Weak Road Foundations—Care in Steam Rolling— The Economy of Tar Macadam as a Road Surfacing Material*

The question of the efficient and reasonably economical maintenance of rural highways is one of much complexity, presenting many difficulties, not the least of which is that of inducing the road authorities and finance committees to adopt the broad and far seeing policy on which the just combination of efficiency and true economy depends.

The lack of proper or adequate foundation structure, which is one of the pronounced features of most of the rural highways in the kingdom, presents an important initial difficulty, and one which (in view of the far greater strain that practically all roads are now subjected to, by reason of the rapid growth of mechanically propelled traffic) will become from year to year more important, and at the same time less easy of solution.

It has many times been said that one cannot expect to maintain a road unless such road has a good foundation. This is a very attractive and guileless proposition, yet practical road engineers have to get along as best they can in this connection, maintaining in good condition, year after year, roads the chief characteristic of which is the lack of the very foundation said to be indispensable for satisfactory maintenance.

The practical road engineer realizes that it is economically impossible to refound even a small proportion of the badly founded roads which already exist, and that he must take them for what they are and make the best of them. It is here that there has been and still is a large field for the exercise of ingenuity in supplying on the surface of an existing road an element of strength which, in some measure at all events, takes the place or serves the function of the foundation which ought to be there, but isn't.

Strengthening Foundations

One of the methods adopted by the author to increase the strength of a weak road foundation is to excavate along each side or shoulder of the road to a depth-varying from 10 to 15 ins. and about 15 ins. in width, packing into these excavated side trenches good chalk flints or other suitable hard material of gage varying from 6 ins. downwards to 3 ins., to be afterwards well rolled down. This method not only serves in some measure to underdrain the road, but by strengthening the "shoulders" of the road prevents lateral "spread," and appears to prevent that collapse of the road centre or crown which is so characteristic of many weak roads.

The question of steam rolling is not without interest, and the author considers that, generally speaking, steam rollers for country work should not exceed 8 tons in weight, and even at this weight should be carefully used for the purpose for which they are intended; i. e., consolidating the road metal, not rolling it to destruction.

The manner and extent to which some rollers are misused or overused must be a source of joy to steam-

roller makers and granite merchants. It will, however, be conceded that the former are, in these latter days, deserving of some measure of sympathy. They must have had a good time in some respects when some "genius" propounded the idea of fixing spikes on the driving wheels of the roller for scarifying purposes. It is now, however, becoming generally recognized that it is not essential or even desirable for the proper repair of an existing road to tear it to pieces by means of a scarifier. Of course, in some cases a moderate amount of shallow scarifying is desirable to improve the cross section of a road where the crust is of ample thickness.

The necessity for a thorough remodelling of the method of road repair and maintenance—which may be said to be the outcome of the revolution in use to which roads are being and will be subjected—has given birth to many ideas and has resuscitated others. Very numerous and diverse are the new binding materials which have been suggested—even sugar and treacle have not escaped attention. The consensus of practical opinion, however, appears to point to bituminous products of various kinds as affording a range of materials readily available applicable as a binder or flux for use with an aggregate ordinary road stone.

Value of Tar Macadam

There can be little doubt that properly prepared tar macadam forms one of the best, most practical, and ultimately economical preparations for road surfacing work. Considerable difficulty in its use has hitherto been found when the tarred material had to be carried long distances to the point of the user. The author therefore views with satisfaction the probability that this difficulty is being overcome. It is now possible to purchase or hire machines which have been specially designed to perform the operations of screening, drying, and tar coating the road stone at the depot or on the roadside, thus greatly facilitating the use of local materials or of such particular description of road stone as the surveyor prefers to use, and even of such suitable old material as may be scarified from an existing road surface.

Four years ago the author laid down experimental stretches of road in various parts of England on the following lines: Upon a cushion $\frac{3}{4}$ in. thick of tar mastic or binder, composed of $\frac{1}{2}$ -in. gage clean granite chippings mixed with Tarvia (12 gals. to 1 ton of chippings), was laid a two-stone thickness of 2-in. gage clean broken granite. This was lightly rolled down into the mastic, and when the aggregate was just "placed," not consolidated, by means of a 6 or 8 ton roller, the surface was dressed with hot liquid Tarvia, using 1 gal. to 3 or 4 sq. yds. Over this was sprinkled and brushed in a small quantity of the above described mastic or matrix, sufficient being used to fill the surface voids, and the whole was then rolled to a consolidation, a few dry chippings being used in order to prevent the matrix sticking to the roller wheels. The result is a compact, resilient, and waterproof surface, which is still in good condition

* Paper by Arthur Gladwell Engineer Eton Rural District Council, presented at the Second Irish Road Congress, Dublin, Ireland, April 19 21, 1917.

and has only required a top dressing of Tarvia and chippings once since it was laid. The extra cost of this work over the ordinary water-bind work with the same description of aggregate was 6 cts. per sq. yd., which has been more than saved in maintenance alone in 1½ years. Ordinary water-bound work on the same road has required renewal every third year. The work above described shows no real signs of wear, and will only require an occasional top dressing to carry it on for many years.

It is also easy to patch this class of work: indeed, so simple is the operation that the road man who has it to do is in danger of losing interest in his work.

From the point of view of the advocates of mud binding the only disadvantage of this class of work is that one cannot get any mud off it for use as binding elsewhere.

The author firmly believes in the value of surface dressing of roads with good dehydrated tar, but only as a temporary expedient and only on roads having a good surface. In his opinion it is more economical in the long run to incorporate in the structure of a road crust a certain definite quantity of bituminous binder than to use the same quantity (by recurrent applications) on the surface only.

Art in Brickwork

In the very great furore that has been aroused by the wide and judicious advertising of matt brick the great serviceability of dry press brick has at times been obscured, says the Clay Worker. Some would argue that a rough brick should be used under any and all conditions, for the sake of the artistic effect which their intelligent use unquestionably produces, but this stand often is not well taken. For instance, it seems that in the downtown district of a large and smoky city, where after two or three years all brick look much alike, it is a mistake to endeavor to obtain a wall tone resembling that of a Persian rug. The grime of the city soon reduces the warm color of the drawing-room to the full monotone of the factory. This is especially true of the rough face brick, which readily catch the dirt. Besides which, matt brick are the result of an attempt to approximate the rough brick which were popular for town and country use in which are reflected the thousand and one marvelous achievements of modern engineering science, is to perpetuate the anachronism of applying fifteenth century methods to twentieth century conditions.

The strictly utilitarian office building of to-day requires clean-cut perfection in all its appointments, and is none more than in its facing material. The same thing can be truly said of apartment buildings in crowded sections of the city—in fact, of any building of considerable proportions in closely built districts.

Automatic vacuum street cleaners are the latest innovation under consideration in Toronto. These machines have met with some success in Austria, and a number of cities in the United States are experimenting with them. Street Commissioner Harris, of Toronto, who has been making the enquiries, admits that the vacuum principle of cleaning can only be applied successfully to pavements having an absolutely perfect surface. We would like to see Mr. Harris trying to operate a cleaner of this type on sections of College, Queen, King, Dundas and other well known thoroughfares in the Queen City. If this proposition is intended for a joke it is ill-timed.

The Origin of Portland Cement

"What's this?" asked the City Editor, glaring at the reporter. "Here you have in your storey 'The wall was built of Portland cement.' After this, cut out the word 'Portland.' We don't want to advertise any particular brand of cement."

"I thought it meant Portland, Me., where it's made."

"It is none of your business to think anything. You are wrong, besides. It means Portland, Ore., and the West must pay for all its advertising in this sheet, or I'll know the reason why."

Grout instead of bituminous filler for brick pavements is recommended by Mr. Samuel Whinery, consulting engineer, in his preliminary report to the commission on city expenditures, Chicago. It is pointed out that the advantage of the bituminous filler lies in the fact that the streets may be thrown open to travel as soon as the filler cools and hardens, which will be well within 24 hours. If the grout filling is used, the street must be closed until the cement sets hard enough to withstand the travel—from 4 to 7 days. Notwithstanding this, the grout filler, in Mr. Whinery's opinion, is so superior and so increases the useful life of the pavement that it should be used, except in the case of busy streets, where closing of traffic would work a hardship.

This is the name of a new book on foundations recently issued by the MacArthur Concrete Pile & Foundation Company, 11 Pine street, New York. After briefly touching upon the various aspects of the problem of attaining permanent and reliable piling foundations, the method of forming the pedestal pile is fully described and illustrated with drawings showing the various steps in the process of bulging out an enlarged base some 3 feet in diameter at the bottom of the stem or column. Actual photographs of piles of this type excavated for inspection are shown.

The succeeding chapters discuss briefly the general nature of pile foundations, how they support their load, considering both a single pile and group piles, at the same time comparing the carrying capacity of a pile of the pedestal type with piles of other shapes. In this respect a synopsis of the most recent data on bearing strength of soils as well as frictional resistance of soil, is given. A chapter is then devoted to the additional carrying capacity provided by the broad base of the pedestal pile, some five tables being given, in which it is shown that the broad base adds to the total carrying capacity of a hundred per cent. or more. The maximum carrying capacity of a pedestal pile, as determined by the safe compressive strength of the concrete forming the stem or column of the pile, is then considered. Succeeding chapters discuss reliability, permanence and stability of pedestal piles, and then there are given photographs and particulars of a number of tests.

A dispatch from London, Eng., records the death of John Passmore Edwards, a great English publicist and philanthropist. Early in life the late Mr. Edwards, who was the son of a Cornish carpenter, went to London with the proverbial shilling. Afterwards he amassed a fortune. Among his enterprises were the founding of the "English Mechanic" and the "Building News." Twice he declined the honor of knighthood.

Mr. Thos. Catterall, who has been president of the Victoria, B.C., Builders' Exchange since 1907, has retired from that office and Mr. J. W. Bolden has been elected in his stead.

The Importance of Detail in Contracting

Many Contractors Losing Considerable Profit Owing to Leakages in Material, Labor and Equipment—Cases in Point from Actual Experience

By Daniel J. Hauer

Much thought and attention are always given by contractors to all the important features of the large job. They decide whether steam shovels shall be used and how many trains will be needed to serve a shovel, or whether some other style of excavator be used. For the concrete work an elaborate plant is designed, and so on for all the various kinds of work done. This is as it should be, and those who plan the best and equip their jobs with good plant should make a handsome profit, if their prices are right, but much money is lost, or if the contract shows a profit, much money that should be made is not made, owing to the lack of attention to details.

To a great extent the details of carrying on a job are left to the various foremen employed. They are supposed to know how to handle the various problems that arise and the routine work economically, but in most cases they do not. If they did, they would not be foremen very long, but would quickly become superintendents or even contractors. Employers seem to overlook this very important fact. The ordinary foreman must be given close supervision if the best results are to be obtained. If the foreman shows marked ability he is quickly promoted.

Some Interesting Cases from the Writer's Experience

This is illustrated by the story of one of the most prominent railroad officials of the United States. As a young man he was appointed as engineer in charge of maintenance on a section of the southern road that was ballasted mostly with sand and mud. Over the whole system the roadbed was rough, but as soon as the train reached the section kept up by this young man the difference was so great that everyone noted it and inquired the reason. The answer was "Blank is in charge here." This piece of roadbed was soon known over the entire system, and Blank's promotion to superintendent, general manager, vice-president and so on up the ladder of success was rapid, and it was only a few years before this old section of the roadbed under a new man was like all the rest of the sand ballasted track. Numerous examples of this kind could be named.

Much money is wasted for the lack of attention to many details of construction work. Recently the writer has been watching the erection of a skyscraper in one of our large cities, paying special attention to the hauling of the structural steel. This work is done by teams of from four to ten horses with heavy trucks. A four-horse team is worth about \$1.50 an hour on this job. Day after day from two to six teams will be found waiting near the building to be unloaded. These waits vary from a few minutes to several hours. One day five teams were kept waiting two hours each. Thus this one item was a clear loss of \$15, enough to be a handsome profit on these teams' work for a day. This one item of waste on this job which is not finished has been more than enough to pay a handsome salary to a man who may have prevented it.

In tearing down a large building to make room for the tallest office building in the world, the writer noticed that in tearing up the flooring from floor joists, that they were thrown into several piles by a gang of laborers, who afterwards picked up this flooring and carried it to one side

of the building and passed it down to the ground to be again piled, and afterwards loaded onto wagons to be carried away. Thus the flooring was piled twice. Once should have been sufficient, and the chances are that the work could have been so arranged that little if any of this flooring needed to be piled, which would have meant the saving of much money on the job. The same thing may be said of bricks torn out of old buildings. They are generally handled oftener than they should be. Every turn of the brick costs money, and it is money that really benefits no one.

This is especially so in bricklaying, and a well known eastern contractor has spent much time devising a system of brick laying that saves many motions in that ancient art, and some of the work previously done by bricklayers is performed by men who are paid smaller salaries. Thus he has made it possible to have a bricklayer do twice the amount of work that he would previously do, without working any harder, thus making it possible to pay these artisans a larger daily wage.

No other class of construction work has attracted the attention of engineers and contractors during the past ten years, as much as concrete, yet in spite of all the thought and study of concrete experts, money is wasted every day both on large and small jobs. When mixing concrete by hand men are allowed to handle their shovels in the same manner as they do in shoveling dirt, yet if the proper kind of a board is used for mixing and the men are taught to handle their shovels the right way, one and two turns of the mass can be saved, allowing from 25 to 30 per cent. more work being done with the same amount of labor.

Only recently the writer had his attention called to the manner in which the materials were being handled on a large concrete job. The plant installation is a large one, and a very large quantity of concrete is mixed each day, yet the cement house is right up against the battery of mixers, the sand is stored beyond the cement house and stone is all handled over the sand supply. A system of cableways is used to handle the sand and stone. Thus we find that the 4.5 cubic feet of cement which makes up a cubic yard of concrete is handled the shortest distance. The 12 cubic feet of sand needed is handled over the cement, while the 26 cubic feet of stone which make up a yard is handled over the sand and cement. It is evident from this that time, labor and power is being wasted, and a larger output could have been obtained by having the stone storage closer to the mixers.

The same waste becomes patent in other details of concrete work. Crude and clumsy forms are used and held in place by twisted wire and props which interfere with economical work, when methods could be used that save both labor and materials.

Methods of Handling Earthwork

Almost every construction job has some excavation work connected with it. Nearly every man feels that he is competent to handle earthwork, yet nothing is more difficult. The writer's experience is that the more one has to do with earth excavation and the more study one gives to the subject, the harder it seems to solve problems of excavation. The last word will never be said or written on this subject. A common mistake frequently made in con-

nection with earthwork is in the style of shovel used. In the United States the short handled shovel is used almost exclusively. These are either square or round pointed shovels. Many contractors seem to think it is a matter of indifference as to which is used. Each, however, is suited for a different class of work. The square pointed shovels should be used for earth, while the square pointed shovel should be used for earth and rock together. A man working in average earth will do more work with a square pointed shovel than with the round points, while the latter go under rocks and hold their load in rock material better than the square pointed shovel, owing to the decided curve given to the bowl of the shovel, while the square pointed shovel is much flatter. It is for this reason that the same size square pointed shovel will hold much more dirt than the mud covered shovel.

For handling loose sand a large, flat, square pointed shovel should be used or else a small sized scoop. Coal should never be shoveled with anything but a scoop shovel. If stiff clay is to be spaded in order to save picking, which can sometimes be done, then a real spade should be used as it will cut a large chunk much wider than the blade of the spade, while if spading is done in soft material the best tool is a wide square pointed shovel. Naturally, though, a shovel not being built as strong as a spade, will not last as long, as spading quickly weakens a shovel in the centre, just below the handle.

A short handled shovel should be used when men are worked in close quarters, or the distance to cast the material is short, or the height to which it is to be raised is small. Under other conditions a long handled shovel should be used. A man will do much more work with it than with a short handled shovel. For casting earth any distance it is done much easier and also in throwing dirt to any height. The writer has seen an able-bodied workman throw dirt out of a pit 18 feet deep. This shows what can be done with a long handled shovel, but it is not economical to throw dirt to such a height. This should have been done in two stages. The writer has also seen a man cast earth from a berm ditch into a low railroad bank at the rate of 27 cubic yards per day, which is exceptional work, but such a yardage could not have been handled with a short handled shovel, even by the same man.

Fallacy of the Long-handled Shovel

Many contractors believe that a long handled shovel is a "lazy man's tool," but it is not so. Any tool in a lazy man's hands is a poor tool, but it is the foreman's place to see that the workman handles his tools properly and that he works at a good pace. Often the men will object to using the long handled shovels. This is especially so of Italians. In Italy, very few short handled shovels are used, the long handles prevailing, and Italian laborers are really used to them, yet they must at times be forced to use long handled shovels, preferring the short ones, as they believe they will do less physical work, which is wrong, for with less body fatigue they will handle more material with the long handled shovel. All of these assertions can be readily proven by any contractor by experimenting with the two kinds of shovels for a few days.

In using steam shovels the mistake often made is that the crew in the pit is not large enough. The pit crew cannot be kept constantly at work, and as it looks bad so see men standing around idle, this crew is often made too small. However, when the shovel is to be moved forward every man should work at top speed so as to get the shovel digging again as soon as possible. Thus one or two extra men, although idle at times, might save 10 or 12 minutes' time in moving in a day. This, with a two-yard dipper, would mean from 60 to 70 cubic yards of extra material moved in a

day, three or four times as much need to make these two men pay for their wages.

Steam shovels are often used in rock excavation, and do good work, yet there are times when it is more economical to go over the rock with the shovel, stripping it of all the earth and loose rock that can be readily handled by the shovel and then putting in a derrick car, equipped with heavy chains, derrick skips and grab buckets to handle the solid rock after it has been blasted.

Many steam shovels are to-day equipped with small air compressors and plug drills for breaking up boulders when they are encountered. Recently the writer has seen boulders that had to be broken moved in front of the shovel, near to the loading track so that they could be drilled for blasting. This is a mistake, as it prevents the shovel from working while the drilling is being done. The boulder should be placed on the other side of the shovel, so that loading can go on without interruption.

Breaking up Boulders

Much money is lost and wasted in breaking up boulders as done by the ordinary foreman. He seems to think the only thing to do is to get rid of the boulder quickly. This is important, when the boulder is either blocking the work of a steam shovel or a gang of men, but otherwise the cost of breaking up the boulder should be considered as well as the length of time in which to do the work. There are six methods of breaking up boulders: (1) by means of fire and water; (2) by means of dropping heavy weights on the boulders; (3) by means of sledge hammers; (4) by "block holing," that is, drilling a hole in the boulder and breaking it with a charge of explosives; (5) by "mud capping," that is, by placing the charge of explosive on top of the boulder and covering it with mud; (6) by "undermining," that is, placing the charge of explosives under the boulder in a bed of mud, so as to confine the charge as much as possible. Of these various methods only two are used to any great extent, namely, "block holing" and "mud capping."

(1) The method of using fire and water is economical in some cases, but naturally its use is limited. When timbered land is being cleared up and water can be readily obtained much money can be saved by this method of breaking up surface boulders over any other. The boulder, however, must not be partly buried in the ground, as it will not heat enough to break, but will only crack. In digging cellars in towns and cities the few boulders encountered can be broken up by heating them with waste lumber and then dashing water on them. A little practice soon allows one to gauge how hot the stones must be to break well. The writer has used this method and has kept costs of the work.

(2) The method of breaking boulders by means of dropping heavy weights upon them can only be used when a derrick locomotive crane or cableway is used. The weight is raised to a height of 20 to 30 feet over the stone and by means of a trip is dropped onto the boulder. Thus, this body of iron, weighing from 1,500 to 3,000 pounds, striking the rock a sudden blow, breaks it up so that it can be handled. Boulders of from one-half to three cubic yards can be broken in this manner by one or two blows of the weight. This method of breaking boulders can be used to advantage on city work where a derrick is used on the excavation, and is of especial use for quarry work. Besides these places it can be utilized in heavy rock cuts and trenches, where a cableway, derrick, locomotive crane or other hoisting device is used.

(3) Breaking boulders by means of sledges is as old as the world, as it has always been done. It is economical for boulders up to a cubic yard in size, but for larger boulders it takes too much time, and the use of explosives will be cheaper. Sledges should not be too heavy and those

weighing from 12 to 16 pounds will do better work than heavier ones. It is the quick, rapid stroke that causes the disruption rather than a slow blow. For small men 12 to 14 pound hammers should be used, but for a large man a 16-pound hammer is about the right size. A man should always hit the stone with the rift as it breaks much easier. When many stones are to be broken and the boulders are large enough, two men working together and striking at the same place will do better work than one man working alone.

(4) Block holing boulders is a well known method of breaking them up. A hole from a few inches in depth to a foot or eighteen inches should be drilled in the rock and the explosives placed in the hole. If the entire charge can be placed in the hole more efficient work is done by the explosives, but frequently it is cheaper not to drill the hole so deep and place some of the charge on top of the hole, covering it well with mud. Boulders of all sizes can be broken up in this manner, but for the smaller sizes, say a cubic yard or less, sledging and other methods should be used, as they are more economical.

(5) The "mud capping" of boulders is used more generally by foremen than any other method. It is easier and entails less labor than the other five ways, but it is the most expensive, as the amount of explosives needed is excessive. For these reasons it should seldom be used except when work is being tied up by the presence of several boulders. Then a few sticks of dynamite should be placed on top of the boulder, plenty of mud placed on the dynamite to cover it well and the fuse lighted.

Undermining Quick and Economical

(6) The last method of breaking boulders by "under mining" is but little used, although it is both quick and economical. In this case the charge is placed under the boulder and mud placed around the dynamite, after which it is fired. This method cannot be used when the ground on which the boulder is lying is soft or made up of loose material, as the force of the explosive will dig up the dirt and not break the boulder. A rock of a given size can be broken up with just half the charge by "undermining" that is needed for "mud capping," and the labor cost is but little more. The rock is not only broken up better but parts of it are often blown out of the excavation. The writer has broken up and moved boulders containing 50 cubic yards or more by this method. Every contractor should teach this method to their foremen.

The writer has used all of these methods of breaking up boulders and has kept detailed cost of the various methods, having from time to time published records of some of his costs.—The Contractor, Chicago.

Trade Brisk at Calgary

Calgary, May 25th, 1911.

Building operations are in full swing here and every trade is taxed to its utmost capacity. The civic authorities are daily setting out work that runs into six figures. During the year it is expected to carry out over 40 miles of water and sewer construction and at present nearly a thousand men are engaged upon this work under Superintendent J. Wilson. Mr. Gardiner, the superintendent of public works, who is a regular western hustler, has some 350 men working on grading and excavation for two subways. Superintendent McCauley, who is another busy man, expects to see 40 miles of track down this year. Three hundred men are at work on this construction at the present time. A network of electric light lines is being placed overhead in all parts of the city, this work being in charge of Mr. O'Brien. Conduits are going down where permanent paving is being constructed. Calgary has aptly been termed

a city of mushroom growth. It seems but yesterday that it was a cowboy town and to-day it is a modern city possessing a street car service with twenty miles of track, and having concrete sidewalks, twelve miles of sewers, five miles of electric conduits and twenty miles of boulevards. A large staff of men will be put to work this season on improvements in the parks and on some twenty miles of boulevards, Superintendent Iverson having charge.

Montreal Notes

The work of building the new concrete pier at St. Helen's Island, opposite Montreal harbor, has been commenced.

The Canadian Development Company is making good progress with the dredging of the widened section of the Lachine canal in the vicinity of the Atwater bridge.

The Railway Signal Company of Canada has been awarded a contract for the signalling apparatus to be used in the new union station at Winnipeg, now being built for the G. T. P. and the Canadian Northern railways.

The Railway Commission held a session lasting over three days in Montreal, recently, but little definite result was reached through their deliberations. Most of the important matters were deferred for further hearing in the near future.

The Canadian Metal Seal Company, with an authorized capital of \$300,000 and having its headquarters in Montreal, has been incorporated in the name of the following persons: J. W. Blair, F. J. Laverty, G. Dutaud, advocates; G. Dunlop and A. Brennan.

A claim for \$21,512 damages is being made by the Bishop Construction Company against the Canadian General Development Company for not accepting the delivery of 18,000 tons of stone and 9,000 cubic yards of sand for the widening of the Lachine canal, and that the delivery was not accepted in accordance with the contract.

The Montreal city council has voted the following sums for public works in the city for which tenders will shortly be advertised: for sidewalks, \$500,000; for public improvements in the new wards, \$720,000; for water mains, \$677,000; for sewers, \$616,000; total, \$2,513,000. There is, in addition, \$1,000,000 available for street pavements.

Chief Tremblay has submitted his report upon the inspections which the fire captains have made of all the apartment houses and the moving picture shows in the city. In regard to the apartment houses, the chief states that "in nine cases out of ten the houses are not provided with proper or sufficient protective apparatus against fire, and in many cases there are no fire escapes at all."

Messrs. Byers & Anglin, building contractors, of Montreal, recently gave an informal banquet to their foremen and the members of their inside and outside staff, numbering about 30 persons. Both Mr. Byers and Mr. Anglin spoke interestingly on the history of the firm and its future policy towards its employees, emphasizing the desirability of cordial co-operation between the various departments. The event is likely to be an annual one with this company.

With the exception of 100 tons of steel for the sixteenth storey of the tower, the steel superstructure of the Windsor Street Station and office building has now been completed. So far about 5,000,000 pounds of steel have been erected, and the steel work has reached a height of 105 feet above the pavement at the corner of Windsor and St. Antoine streets. The tower is in reality a large office building, so that the C.P.R. will have the highest business building in the city. The outer stone facings have now reached the main floor level.

The Hassam System of Street Paving

The building of roads is one of the most important problems confronting civic and municipal engineers in any new country. If this is true in rural sections it is much more so with regard to the construction of urban thoroughfares. Numberless experiments have been carried out and an infinite number of materials have been employed in the endeavor to find a roadbed that would be at the same time suitable for all kinds of traffic, impervious to climatic changes, sanitary, and, as near as possible noiseless.

The Hassam process of laying pavements for vehicular traffic is one that appears to combine, in a high class degree, the above mentioned qualities. This system has been adopted in a number of leading cities of the United States and also in Canada, notably at Vancouver, B. C., under the name of the Hassam Paving Company of British Columbia, and the Canadian Hassam Paving Company at Montreal. The Canadian Hassam Company was incorporated in June, 1910, by Letters Patent of the Dominion of Canada. It has the exclusive control of the Hassam patents for the Provinces of Quebec and Ontario. The manager of this company is Mr. Charles M. Edwards, a resident of Montreal.

Two kinds of pavement are laid under this process. One is known as compressed concrete and is intended for

poured upon the crushed stone until the grout flushes to the surface when it is again rolled forcing the grout absolutely into all voids and eliminating all air bubbles from the mass.

Upon the top of the pavement thus prepared is placed a thin layer of pea stone which is thoroughly spread and rolled or compressed even and smooth over the entire surface—the pea stone layer to have sufficient thickness to insure the complete filling of the voids in the surface.

The Hassam compression process, it is claimed, forces into the concrete twenty per cent. more stone than any other known method of concrete construction, thereby giving it a wearing and supporting strength nearly equal to that of solid stone itself.

The thickness of the pavement is not less than six inches from the sub-grade to the finished grade of the street.

All street pavements are easily cleaned both by flushing with water and by sweeping. The frequent application of water to some, however, is very detrimental to the binder, quickly rotting it out and leaving large holes in the streets, which constantly increase in size. Water, standing in such hollows, holes or cracks, rapidly makes them larger. The Hassam pavement is unaffected by either rain, snow or frost or other climatic conditions. It is non-absorbent non-permeable. It is of the same density and of the same



Sample of "Hassam" removed from the Oregon Hassam Paving Company's Work at Portland, Ore., by Mr. D. W. Taylor, City Engineer.

medium and light traffic. The other is a granite block pavement laid on a compressed concrete foundation. This, while intended for the heaviest traffic is comparatively noiseless, and has a fairly smooth surface so that it can be used very satisfactorily in residential sections. The Hassam process is covered by United States, Canadian, French, British and Belgium patents.

The Hassam compressed concrete pavement is constructed by spreading, upon a well rolled and compacted sub-grade excavated to the proper depth, about 8 ins. of broken stone passing through rings from 1 in. to 2½ ins. in diameter. The stone is then thoroughly compacted by a heavy road roller and the voids reduced to a minimum. This bed of compressed stone, after being brought to the desired profile of the finished pavement, is grouted by the use of a Hassam patent grout mixer (which ensures the absolute uniform mixture and distribution of the ingredients), with a grout consisting of two parts of sand to one or more parts of the best Portland cement, the amount of grout varying according to the density of the stone. This is



Rough Stone in the Foreground; Machinery used in Laying Paving Materials, and the Finished Roadway in the distance.

smooth, level surface at all times. It may be oiled for dust laying without injury. Concrete being a monolith and a nonconductor of sound, this pavement, although hard, is less noisy than most hard surface pavements. In cold or wet weather its surface is not so smooth and glassy as to cause horses to slip or fall; the horse's hoof falls squarely on the gritty surface giving the animal confidence in its footing and it travels without danger. By the very nature of its component materials compressed concrete is comparatively inexpensive and can be easily and cheaply repaired.

In laying the Hassam granite block pavement the foundation, as in all paving work, is of first importance. The foundation of the Hassam granite block pavement is made of the same material and laid by the same process as the concrete pavement; that is to say, upon the foundation described above is placed 1½ of clean sand and upon this sand cushion the granite blocks are laid as closely as possible with joints broken by a lapse of at least two inches. The size of the stones or blocks to be used for the surface

is of great importance. This has varied from large flat flag stones several feet square to the modern small cleanly-riven block of about four inches to $4\frac{1}{2}$ inches high, $3\frac{1}{2}$ to $4\frac{1}{2}$ inches wide, and 6 to 12 inches long. When such blocks are laid by modern methods and Hassam machinery all tendency to tilting out of alignment is eliminated and if the quality of the bond is correctly proportioned to the quality of the stone insuring the even wearing of both, abrasion on the edges of the blocks is reduced to a minimum.

Granite when found in its clearest and best statur and texture seems to lend itself the best of any known rock to the problem of paving. The blocks once laid are supported by sprinkling clean pea stone over them and brooming the joints full with wire brooms. The surface of the pavement is then made even and true by rolling with a steam roller weighing about six tons or by compressing with tampers of not less than seventy-five pounds' weight so as to bring all blocks of uniformly even and smooth surface. After such rolling or compressing the surface is flushed with a grout to ensure the perfect blending of the ingredients. This pavement made of absolutely the best and longest lived materials known is, at the same time, almost as smooth as asphalt. It can be swept or flushed as clean as any so-called smooth pavement since there are no interstices to catch or hold filth of any nature. For obvious reasons a granite block pavement costs more than one built of compressed concrete, the latter being about the cheapest first class pavement that can be constructed.

Canadian Railroad Development

E. A. Studer, formerly at Wesley, Ia., is now located at Swift Current, Sask., where he has a contract on the Canadian Pacific Railway, the work being located six miles south of that place.

The Grand Trunk Pacific Railway, (B. B. Kelliher, chief engineer, Winnipeg, Man.) will shortly call for bids for the erection of a new station in Quebec. Bids for the railway work shops to be erected at Quebec will also be asked.

The Dominion Power & Transmission Company, Limited, Hamilton, Ont., is making a survey for an electric railway line from Hamilton to Galt. The present Hamilton & Brantford line will be constructed, connecting with John Patterson's Hamilton, Guelph & Watloo Railway, if that road is built.

Three shipments of over 30,000 tons of steel rails have been received on the Pacific coast for use in the construction of the Canadian Northern Pacific Railway, from Port Mann to the North Thompson river, and two other shipments of about 20,000 tons of steel are on their way to Vancouver.

The Acme Construction Company, Toronto, Ont., has been awarded the contract for constructing the proposed electric railways of the People's Railway Company, from Guelph to London, Ont. It is proposed that the line eventually will connect Toronto with Detroit, and form the backbone of a network of interurban lines extending from Collingwood and Owen Sound to Goderich, Port Huron and Port Stanley.

Announcement has been made that the Grand Trunk Pacific extension from Halifax, N.S., to Prince Rupert, B.C., will be completed within the next three years. This line will connect two ports that are open to navigation throughout the year, and also will tap a huge wheat belt. It is expected that next month the Grand Trunk Pacific will begin regular train service from Fort William to the foothills of the Rocky Mountains, a distance of 4,500 miles.

The Canadian Northern Railway is reported to have secured the Jesuit College site on Bleury street at Montreal

as a location for terminals. It has been known for some time that the Canadian Northern Railway was looking for a suitable central site, and from time to time reports were spread that they had secured one. To reach the new site on Bleury street it will be necessary for the company to tunnel under the mountain. The cost of the new terminal and the entrance to it will involve the expenditure of \$2,000,000 to \$3,000,000.

The Canadian Northern Railway has completed surveys for the line by which it will secure its own route from Port Arthur, at which point it will be linked up with the western portion of its system. The projected route of the Canadian Northern will take it through the Algonquin National Park region, along the great clay belt of Ontario, the Temagami Reserve and thence across the territory north of Lake Superior. It is understood that work will be started this year, and the line will be completed in about three years. The line between Ottawa and Montreal is already under way.

Tenders will be called in June for the construction of the first 120 miles of the Hudson Bay Railway from The Pas. The route of the second half of the line will depend on whether Port Nelson or Fort Churchill is chosen as the terminus. It is altogether likely that the former will be selected, but no definite decision will be announced until the reports of the engineering and hydrographic surveys, now being made, are completed. By next year it is expected that work will be started from the eastern terminus of the line and construction will be vigorously pushed to completion by 1914. Another section of the eastern half of the line will be contracted for this summer. The road will be built under the direct supervision of the Railway Department.

The Canadian Northern Railway has awarded the contracts for the completion of its Toronto-Ottawa line to J. P. Mullarkey, Montreal, Que.; A. Sinclair, Toronto, Ont., and Evan Mackenzie, Toronto. Mr. Sinclair will complete the section between Toronto and Belleville. Mr. Mackenzie will perform the grading and timber work on the 20-mile section between the 180th mile post to the 200th mile post. Mr. Mullarkey will construct the rest of the road between the 164th and the 180th mile posts and between the 200th and the 250th mile posts. He will also do the track laying and ballasting on Mr. Mackenzie's section. Mr. Mullarkey in all will build 66 miles. His portion of the road starts at Sydenham. The contract of Mr. Mullarkey covers the grading, fencing, track laying and ballasting. Work will be put under way on these contracts at once.

A resolution is to be introduced into the House of Commons, by the Minister of Railways, providing for an extension of the terms as specified in the act of last session whereby the government might acquire branch lines in the Maritime Provinces as parts of the Intercolonial system. Under that act it was provided that no branch line could be taken over unless the board of management reported that the road was in good condition, and practically up to the standard of the Intercolonial. It has since then been found by the report of the engineers who examined these roads that very few of them are up to the required standard, and under the conditions of last year's legislation very few, if any, of them could be leased. Under the resolution it is proposed to give the governor in council power to take over some 13 branch lines in New Brunswick and Nova Scotia, aggregating 643 miles.

The appointment of an assistant city engineer at Hamilton, Ont., is under consideration.

Building in Brandon, Man., is reported brisker than it has ever been before at this season of the year. A feature of the situation is the activity in residential work.

Personal Mention

Mr. Wm. McPhail, manager of the Bitulithic & Contracting Company, Limited, has arrived at Regina, where his firm has some good sized paving contracts.

Mr. Fred Stearns, architect, has opened an office in the Bogue Building, Windsor, Ont. He has been commissioned to prepare plans and supervise the rebuilding of the plant of Mr. C. H. Crane, of Detroit. Mr. Stearns is from Detroit.

Messrs. E. & W. S. Maxwell are the architects for a recreation pavilion to be erected in connection with the Hospital for the Insane, at Verdun. Messrs. Quinlan are the contractors.

A. E. Nicholson, of St. Catharines, Ont., was the successful architect for plans for a new 8-roomed school at Welland, Ont. The building will be of red brick, with white terra cotta trim.

Mr. Wm. Cross, C. E., of the Dominion Public Works Department, has left for Edmonton, Alta., where he will report upon the possibilities of the Saskatchewan river. Mr. Cross was formerly superintendent of waterworks at Calgary.

W. C. Baillairge, city engineer of Quebec, accompanied by the mayor and other officials, left that city recently for Boston and New York for the purpose of investigating various street paving. The city has been authorized to spend \$400,000 on permanent road improvements.

Commissioner McPherson, of Regina, states that excellent labor conditions prevail in that city and that good men are available for all departments of civic work. Noteworthy improvement is found in the class of immigrants arriving in that city.

At Calgary, recently, Mr. Norman S. Rankin, chief of the publicity department of the Canadian Irrigation and Colonization Company, delivered an interesting lecture on "Home Building in Western Canada" before a meeting of the Overseas Club.

Among those who were in attendance at the First International City Planning Congress at Philadelphia, Pa., were Mr. Richmond Unwin, the well known city planning expert, of London, Eng., and Mr. Thos. H. Mawson, landscape artist, and lecturer in the University of Liverpool. Mr. Unwin, who is known as the author of "Town Planning in Practice," was scheduled to deliver two addresses on city planning at Montreal and Mr. Mawson to address the board of trade and civic guild at a luncheon at the National Club last week.

Mr. Burton Stewart, of the Norton Griffiths Steel Construction Company, has returned to Vancouver after a two months' trip to England. Mr. Stewart was accompanied on his return by the Hon. Francis Grosvenor, who will join the Griffiths Company and establish his residence in Vancouver. Mr. Grosvenor is no stranger in British Columbia. He is a well-known metallurgist, a graduate of the Royal School of Mines, and formerly occupied responsible positions in the laboratory of the Trail smelter and the Hall mines smelter at Nelson. He is a cousin of the Duke of Westminster, one of the richest men in the world.

The city of Victoria, B.C., has engaged Mr. Warren Rodney, formerly of Winnipeg, to supervise the extensive paving work which is to be carried out this season by the Canadian Mineral Rubber Company, of Toronto. The salary is \$175 a month. Mr. Rodney is now spending a vacation in Southern California. This position, it will be remembered, was offered Mr. Astley, superintendent of construction for the city of Winnipeg, who declined but recommended Mr. Rodney, who has had long experience on asphalt work in Winnipeg.

Mr. G. W. Volkman, of Ottawa, vice-president and general manager of McArthur, Perks & Company, Limited,

left Montreal recently for England, for the purpose of conferring with the president of the company, Sir Robert Perks, concerning their various enterprises on this side of the Atlantic. These include the construction of four concrete docks for the Port of Havana Docks Company (Sir Wm. Van Horne, president) and the extension of the harbor works at Buenos Ayres at an estimated total expenditure of \$27,500,000. When Sir Robert Perks was in Montreal some months ago, he said that when he first began work there, the city of Buenos Ayres had but 250,000 people, and now the figure is no less than 1,300,000, and the port is advancing in commercial importance by leaps and bounds. In fact, the first works were hardly completed when ships from all parts of the world were lying three deep at the wharves, hence the decision of the Argentine Government to spend an additional sum of \$25,000,000 to make their port equal to the best in the world. The supervision of the work at Buenos Ayres will be undertaken by a partner of Sir Robert Perks. The work awarded to the Canadian firm, according to the details published in our issue of May 3, will amount to about \$6,000,000.

The city of Vancouver has decided to appoint an expert to consult with the city engineer, Mr. Fellowes, regarding the proposed sewerage system.

Plans have been prepared and preliminary arrangements completed for the erection of the new C. P. R. hotel at Calgary, Alta. This will ultimately be thirteen storeys high, although at present it is only proposed to complete eight storeys.

The merits of the Engberg electro-hydraulic valve, manufactured by Engberg's Electric and Mechanical Works, St. Joseph, Mich., and for which the John McDougol Caledonian Iron Works Company, Limited, Montreal, are the exclusive agents for Canada, are set forth in an interesting booklet just to hand. The "Engberg" is operated by a hydraulic cylinder, which is supplied by water from either side of the gate and always from the side where the pressure is the highest. The regulating valve consists of a flat valve which is operated by a piston. The piston is moved by releasing the pressure on either side by means of small poppet valves which are raised from their seats by an armature and magnet. No waterworks system having a standpipe or reservoir, can afford to be without this valve, a most valuable adjunct, increasing the effectiveness when fire pressure is desired and permitting a reduction in the cost of maintaining ordinary domestic pressure.

Lethbridge Builders' Exchange

We are indebted to Mr. E. Power, secretary of the Lethbridge Builders' Exchange, for the following particulars concerning the constitution of that body. The Exchange has now been organized about a year and a half and the membership at present is 55. The headquarters are in the Oliver Block on Fifth street, Lethbridge. The Lethbridge Exchange is affiliated with the Alberta Provincial Exchange, which is composed of the Calgary, Edmonton, Lethbridge and Medicine Hat Exchanges, and which works under the jurisdiction of the Canadian National Association of Builders. At the convention of the provincial body in Calgary last February, Mr. J. H. Goode, of Lethbridge, was elected vice-president, and the secretary of the Lethbridge Exchange, Mr. E. Powers, secretary. The 1911 directorate of the Lethbridge Exchange is as follows: President, E. T. Broad; vice-president, H. J. Goode; directors, A. Smith, R. Leader, W. H. Holt, and A. H. Diseth; treasurer, R. Virtue; secretary, E. Power.

Canadian City Engineers

Mr. Dosithe Chene, Hull, Que.

Mr. Dosithe Chene was born at Hull, Que., in 1885. After following a course of study in the local schools he secured a position as draughtsman with a well known firm of architects in Ottawa, Messrs. Burritt & Meredith, with whom he obtained a good practical knowledge of architecture. He matriculated at Laval University, Montreal, in 1905, and was admitted to the Ecole Polytechnique, from which in 1909 he graduated with distinction in civil engineering and chemistry, taking honors in his last three years' study. During the year of his graduation he was employed upon several important undertakings for the Dominion government and in the following year, 1910, he was appointed engineer to the city of Hull. In November of last year he visited Paris for the purpose of studying bacteriology at the Pasteur Institute. In Paris he obtained



City Engineer Chene, of Hull, Que.

a certificate as a duly qualified bacteriologist. In the French capital, also, he made extensive observations in the municipal laboratory in connection with sewerage and the purification of water supplies, profiting considerably by the knowledge gained in these departments. During the short time that he has held office at Hull he has already originated a number of improvements in the waterworks system.

At the monthly meeting of the Edmonton board of trade, the report of the civic planning committee was presented by Mr. C. Lionel Gibbs. Among the committee's recommendations were the regulation of secondary street plans, the establishment of a civic square for the erection of public buildings and the partial control of private property development. The report was adopted by the board of trade and the committee will continue its work of mapping out a definite plan of civic improvements.

At the annual meeting of the Cement Products Exhibition Company, held recently in Chicago, Mr. E. M. Hagar, president of the Universal Portland Cement Company, was elected president; Mr. Norman D. Fraser, president of the Chicago Portland Cement Company, vice-president; and Mr.

J. McDaniel, sales manager of the Chicago Portland Cement Company, secretary-treasurer. The year's transactions showed a surplus of about \$3,000 after the settlement of all accounts in connection with the New York and Chicago cement shows. A general feeling of satisfaction was expressed and it was felt that the benefits of the shows to the cement industry were such that they should be continued upon the same basis as in the past.

Trade Notes and Items of Interest

Mr. L. O. David, city clerk, and Mr. Wm. Robb, city treasurer, of Montreal, will retire at the end of the present year.

The Dominion and European Inspection Company have opened new head offices at 318 Lagauchetiere street, Montreal.

Professor Orton, of Ohio University, has submitted to the Edmonton board of trade a comprehensive report upon the clay resources of Alberta.

At the annual meeting of the Civic Improvement Society of Sherbrooke, Que., Mr. F. S. Morey was elected president and J. H. Brice, secretary.

The Sooke Lake survey, which resulted in such a mix-up at Victoria, B. C., is now completed and Mr. C. H. Topp, the ex-city engineer, has submitted a bill for \$3,100.

Dr. Todd, the well known landscape architect, left Montreal recently for Victoria, B.C., where he will make a report on the laying out of certain districts in that section.

A party of Boston business men, members of the Massachusetts Real Estate Exchange, will arrive in Montreal on June 6th. to look over the harbour improvements in that city.

Plans for the new C. N. R. station at Regina have been received at the C. P. R. offices in that city. The building will be 316 by 63 feet, three storeys high, with one-storey wings on each side.

According to an announcement made recently in England by Mr. Chas. M. Hays, the time is not far distant when the G. T. P. will establish a steamship service across the Pacific ocean from their western terminus at Prince Rupert.

Among the representatives of the city of Toronto who attended the City Planning Convention in Philadelphia were City Engineer Rust, and Messrs. J. C. Hynes and W. B. Armstrong, of the Guild of Civic Art.

Mr. Wm. Jno. Cooke, a well known contractor, of Montreal, Que., died last week in that city. The late Mr. Cooke, who was 75 years of age, had been engaged for nearly 50 years in the Montreal contracting field.

The city of Hamilton, Ont., will engage an expert consulting engineer to report on its water supply. Messrs. Jno. Kennedy, of Montreal, Willis Chipman, Toronto, and E. H. Keating, Toronto, have been invited to submit terms.

Sir Thos. Shaughnessy, president of the C. P. R., has authorized the preparation of plans for an addition to the Empress Hotel at Victoria, B.C. The estimated cost of the work is nearly \$200,000.

The Trades and Labor council of St. John, N. B., intends to ask the provincial government and the city authorities to have the fair wage clause inserted in all contracts given out by them.

The Canadian Pacific Railway has received from the Austrian State railways a contract for the supply of a number of observation cars for use on the Austrian State lines. The cars will be shipped direct to Austria by way of Trieste.

The Canadian Northern is planning an expenditure of no less than \$30,000,000 for the establishment of terminals at Montreal. Negotiations are now in progress between the Mackenzie-Mann interests and Hon. G. P. Graham, Minister of Railways.

Among recent incorporations at Ottawa is that of the Western Canal Company, which proposes to construct a canal from a point on Rainy Lake, just east of Fort Frances, to a point five miles west of the foot of the Long Sault Rapids on the Rainy River. The capital is \$2,000,000.

The St. James Hotel at the corner of St. James and Cathedral streets, Montreal, one of the best known hosteleries in the city, is to be demolished to make way for the terminals which the G. T. R. propose to erect at Bonaventure station.

Renewed activity is reported in the building trades at Halifax, N.S., and the outlook is stated to be exceedingly bright just now. The season has not been remarkable for any large contracts, so far, but several big undertakings are on the tapis. Generally, 1911 is expected to be a record year for the city.

The city of Lethbridge, Alta., is looking for a city engineer. The qualifications desired are experience in paving and sewer construction and railroad work. It is reported that the city is prepared to pay from \$5,000 to \$6,000 to the right man. City Engineer Jones, of Brantford, has been invited to send in an application.

Messrs. T. Aird Murray, Willis Chipman and J. G. Sing, of Toronto, and Mr. I. Randolph, of Chicago, the experts engaged recently by the city of Toronto to report upon the water supply, have prepared plans for a second intake pipe, which will be of steel, six feet in diameter, encased in concrete, and reinforced by metal. It will be about 3,200 feet in length.

According to Mr. W. G. Brownlee, manager of transportation for the G. T. R., who was in Toronto last week, several million dollars will be expended by the G. T. R. in the province of Ontario this year. One of the items on the list is the construction of a roundhouse at Midland. The operations of the company, Mr. Brownlee said, were being retarded greatly by the scarcity of labor.

At Winnipeg, Man., many structural iron workers are still on strike. They are asking for 50 cents an hour for a nine-hour day and they also want closed shop. The Dominion Bridge Company is willing to agree to the new scale, but insists upon an open shop. The Hamilton Bridge Company and the Canada Foundry Company will agree neither to the scale nor the question of closed shop.

The city of Vancouver was inundated recently with a rush of railway contractors from the other side of the border anxious to bid on the C. N. R. construction work between Hope and Kamloops. The contractors, according to the information to hand, were "accompanied by their respective adherents consisting of sub-contractors and shift bosses, scores of whom are stopping at the downtown hotels eagerly awaiting the award."

Between five and six tons of asphalt will be shipped into Edmonton from the north country before July, 1910, according to A. Voilette, manager of the Ft. McKay Oil and Asphalt Company. The asphalt is being shipped into Edmonton for the purpose of making a test of its qualities for pavement purposes on one of the city streets. Some weeks ago the city council accepted the offer of J. K. Cornwall, M.P.P., and Mr. Voilette, to pave a portion of one of the city's streets at the company's expense this season.

W. G. Gillett, a well known contractor, and proprietor of the marble quarries at Kaslo, B.C., hopes soon to be shipping to Vancouver and other large coast cities. Mr. Gillett has the contract for the marble for the facings of the court house at Grand Forks, B.C., for which over 200 tons will be required. There should be a good market for the Kaslo product seeing that the only marble quarries at the coast are on Vancouver Island and that these are closed down at present.

In a fire which occurred at the Montreal city waterworks, the plans for the enlargement of the aqueduct and the filtration plant were damaged by water and smoke and narrowly escaped total destruction. The damage to the building is estimated at \$3,000 and to the stock between \$5,000 and \$6,000. Some of the materials and instruments belonging to the draughtsman were also damaged. The city has an insurance fund amounting to over \$60,000, which, of course, will amply cover the loss.

A strike of two hundred structural steel workers on G. T. P. bridge construction is reported from Calgary, Alta. If the strike continues it will hamper the building operations of the G. T. P. and the Canadian Northern, there being many large bridges in course of construction along these lines. The sheet metal workers of Calgary have threatened the Builders' Exchange with a strike unless it concedes an advance of 7½ cents an hour before June 1. The carpenters are stated to have signed up an agreement for a minimum scale of 50 cents.

A shortage of cement is reported from Regina and Edmonton. In the former city a number of contractors are tied up owing to their inability to secure this material. At Regina the situation is said to be quite serious, the city being unable to secure supplies of cement required in the street railway construction, and the builders, also, are being handicapped in their operations. According to enquiries, other western cities are also badly in need of cement. Orders have been placed for large quantities, but there are indications of an uncomfortable delay.

According to a recent dispatch from Edmonton, Alta., building operations in that city have been held up for the last week owing to a shortage of supplies. Complaint is made in the city concerning the inadequate number of commission houses in the city. There is said to be far too much subletting and that Edmonton contractors are compelled to do business through agencies in Calgary, with the inevitable result that they get left. No improvement is looked for, it is stated, until supply houses are induced to locate in Edmonton, thus making the city independent of the Calgary agencies.

Good progress is being made on the construction of the C. P. R. high level bridge between Edmonton and Strathcona. A dispatch from Edmonton, dated May 15th, records the completion of the North river pier. The contractors are now busy on the south pier, which has already been built up to a height of about 30 feet above the water level. Excavations are being made for the pedestals that will support the steel bents of the bridge, and the concrete piles are being driven. All the steel work on the structure will be erected from the Strathcona end.

The Sterling Blower Company, of Hartford, Conn., have favored us with a copy of their catalogue, No. 114, devoted to Sterling slow speed, low power exhausters. These exhausters represent many years' experience in the successful installation of exhaust systems and are designed to meet the most exacting requirements. The Sterling Blower Company claim that in comparative tests with other machines, theirs have shown a higher efficiency, ranging from 10 to 25 per cent. Full particulars will be furnished on request.

Contracts Department

News of Special Interest to Contractors, Engineers, Manufacturers and Dealers in Building Supplies.

Information for insertion in these columns is invited from Architects, Contractors, Engineers, etc.

Waterworks, Sewerage and Roadways

Brandon, Man.

The report of the committee on paving recommending asphalt blocks was adopted by the council.

The city council adopted the report of the special committee recommending the adoption of asphalt blocks for street pavement.

Biggar, Sask.

Tenders are called until June 13th for trenching, etc., supply c. i. water mains, etc., hydrants, pump machinery, compressed air storage tank, erection of power house; construction of concrete reservoir. F. McArthur, consulting engineer, Yorkton, Sask. Advertisement in "Tenders and For Sale Department" of this issue.

Cardston, Alta.

The citizens here are considering seriously the installation of a gravity waterworks system.

Calgary, Alta.

New tenders for asphalt paving will be called.

The city engineer's staff is getting out estimates for grading to the extent of about \$18,600, paving, \$232,117.56, concrete sidewalks, \$60,000.

Tenders are called until June 13th for construction of 6-ft. diameter concrete trunk sewer about 12,000 ft. long for the city of Calgary, W. D. Spence, city clerk. Advertisement in "Tenders and For Sale Department" of this issue.

Carmangay, Alta.

Carmangay is arranging to have estimates for the cost of a plant to supply the town with water and electric lights, both systems can probably be installed for less than \$20,000. It is proposed to erect a pumping station on the bank of the river near where the present electric light plant stands.

Cranbrook, B.C.

A by-law to install a sewer system in Cranbrook carried yesterday 155 to 77, fourteen more than the three-fifths necessary. J. Haddin, C.E., of the John Galt Engineering Co., Winnipeg, prepared plans.

Estevan, Sask.

Tenders addressed to L. A. Duncan, secretary-treasurer, will be received until June 6th for laying about 2,000 feet of water mains; laying about 2,500 feet of sewer; constructing about 85,000 sq. ft. concrete walks. Chipman & Power, engineers, Toronto and Winnipeg.

Edmonton, Alta.

Tenders for 10-ft. trunk sewer are as follows:

W. Manders, \$201,068, \$172,004.20; per ft., \$53.89, \$45.62.

Rigby, Hyland & Plymmer, \$255,081, \$250,310.50; per ft., \$73.90, \$72.45.

Breckenridge, Galt, Eng., Co., and Davison & Westaway, \$318,111, \$267,938.80; per ft., \$87.60, \$72.35.

Connell W., \$224,144, \$251,056; per ft., \$62.90, \$61.08.

Prairie construction Co., \$275,811; per ft., \$76.04.

W. Manders, \$179,816, \$171,259.46; per ft., \$50.36, \$47.82.

Fairville, N.B.

Tenders addressed to J. King Kelley, county secretary, 108 Prince William street, St. John, will be received until June 6th for construction of sewerage system for Fairville. Engineer, G. C. Murdoch, 74 Carmarthen street, St. John. None of the tenders received before quoted on masonry work.

Fotr William, Ont.

Tenders are called until June 1st for clearing and grading certain streets. City Engineer, John Wilson.

Goderich, Ont.

Tenders are called until June 10th for furnishing and laying of about 12,800 lin. ft. of storm sewers, building man-holes, catch basins, etc. N. G. Cameron, mayor; L. L. Knox, town clerk. Advertisement in "Tenders and For Sale Department" of this issue.

Humboldt, Sask.

Tenders addressed to Robt. Telfer, chairman board of works, will be received until June 3rd for construction of 21,000 sq. feet of cement sidewalks, contractor to furnish material, do filling and excavation, etc.

Lancaster, N. B.

The provincial board of health endorsed the application of this municipality for a sewerage system; also that of Moncton for extension of sewerage system.

London, Ont.

Tenders addressed to chairman and members of No. 2 committee will be received until June 1st for construction of sewers on Elias street and others. Plans, etc., with Geo. W. Wright, city engineer.

Moose Jaw, Sask.

Tenders are called until June 19th for sewer and water extensions, laying and supply of pipe. J. M. Wilson, city engineer; W. F. Heal, city clerk. Advertisement in "Tenders and For Sale Department" of this issue.

Montreal, Que.

Tenders addressed to the board of commissioners will be received until June 2nd for construction of asphalt, cement concrete sidewalks during the season. L. N. Senecal, secretary.

Tenders addressed to the board of commissioners, city hall, will be received

until June 8th for supply and delivery of about 7,000 tons of c. i. pipe. L. N. Senecal, secretary.

North Bay, Ont.

Tenders are called until June 17th for construction of about 100,000 sq. feet of concrete sidewalks and crossing. T. N. Colgan, commissioner. Advertisement in "Tenders and For Sale Department" of this issue.

Ottawa, Ont.

Tenders addressed to N. J. Ker, city engineer, will be received until June 1st for construction of asphalt pavement on Somerset street and King Edward avenue.

Regina, Sask.

Considerable paving is being planned for this year to be completed this fall. City Commissioner McPherson is preparing a report.

Southampton, Ont.

The by-law to expend \$7,500 to extend the water-works system here was carried.

Sydney, N.B.

Tenders will probably be called for the large amount of paving contemplated after the next council meeting on June 1st.

South Vancouver, B. C.

One thousand feet of one-inch pipe at \$6.20 per hundred feet, and two Mueller tamping machines and pressure record gauges were ordered for the waterworks department.

Stettler, Alta.

A petition asking for the installation of a sewerage system, was recently submitted to the municipal council. Engineer's plans and specifications and an estimate of cost will be obtained.

Sheho, Sask.

Tenders addressed to the secretary-treasurer will be received until June 15th for construction of about 5,000 sq. feet of concrete sidewalk. Specifications at the office of the above or at the office of the consulting engineer, F. McArthur, Yorkton.

Sudbury, Ont.

Mr. Willis Chipman, C.E., Toronto, estimates the cost of extending the sewerage system, so as to intercept and prevent all pollution of Ramsay Lake, at \$47,000. In the meantime the matter has matter has to go to the Provincial Board of Health for its sanction.

Saskatoon, Sask.

The installation of the mechanical water filtration plant will be installed by the Roberts Filter Manufacturing Company, Philadelphia, \$55,890; others

tendered as follows: Bell Filtration Co. of Canada, Toronto, \$56,950; Pittsburgh Filter Mfg. Co., Pittsburgh, Pa., \$58,120; New York Continental Jewell Filtration Co., New York, \$56,845; Geo. H. Archibald & Co., Winnipeg; Laurie & Lamb, Montreal, \$50,575. Geo. T. Clark, city engineer.

Thorold, Ont.

The council instructed the town clerk to communicate with Mr. Chipman in regard to his supervision of the proposed sewers.

Toronto, Ont.

Tenders addressed to the chairman, board of control, will be received until June 6th for construction of asphalt pavement; asphalt block pavements; bitulithic pavements; gradings; concrete curbs; concrete walks; sewers.

Three tenders were received for the work of completing the repairs of the present intake, all on a percentage basis. Mr. Thos. Davies, if allowed to use the city plant, would do the work at cost, plus 12½ per cent. Miller, Cummings, and Robertson, who would use their own plant, want cost and 20 per cent; while Capt. Leslie would rent the city plant, do the work at cost and 15 per cent. Referred to the city engineer for report.

The following tendered on intake pipe:

	Pipe Joints.	
	per ft.	etc.
Marine Signal Co.	\$21.00	\$2,685
Drummond McCall Co. . .	20.00	4,750
Polson Iron Works . . .	19.45	3,822
John Inglis Co.	18.80	3,875
Canada Foundry Co. . . .	17.75	3,643
Drummond McCall & Co., of Montreal, did not tender for rivetted steel, but for lapwelded pipes which would be laid down here in lengths running about six pipes to 155 feet 9 inches. The International Signal Co., of Ottawa, submitted the lowest tender for joints and intake branch. The details of the Canada Foundry Company's tender, which was recommended for acceptance, were as follows: 72-in. pipe, per foot, \$17.75; expansion joints, \$475; intake branch, \$1,750; flexible joints, \$1,418. Its price for quick delivery was as follows: 72-in. pipe, per foot, \$20.75; joints, etc., \$4,300.		

Victoria, B. C.

The \$300,000 by-law for extensions to sewer system was carried.

Wilmer, B. C.

A waterworks company for this village is being organized.

Wilkie, Sask.

This municipality have under consideration the installation of a complete waterworks system.

Welland, Ont.

Tenders are called until June 10th for pumping house, foundations, etc. R. Cooper, chairman water commissioners; Wm. Kennedy, designing engineer, Montreal. Advertisement in "Tenders and For Sale Department" of this issue.

The following figures on cost of various pavements were submitted by town Engineer Black:

Creosoted wood block, sq. yd., \$3.61 to \$93.86.
Bitulithic, \$2.30 to \$2.70.
Sheet asphalt, \$2.50 to \$3.65.
Vitrified brick \$3.50 to \$4.65. Mr.

Cooper informed the meeting that he could have this put down at \$2.32 to \$2.48.

Asphalt block, \$2.50.

These figures include grading and concrete base.

Herbert J. Bowman, C. E., has reported on a proposed system of better roads throughout Welland county. He recommends one hundred and thirty-four miles of roads at a cost of three hundred and seventy-five thousand dollars. A by-law will be submitted at the June session of the county council.

Winnipeg, Man.

Tenders addressed to the chairman, board of control, will be received until June 2nd for supply of labor and materials required in erection of Pump House at Well No. 8. Plans, etc., at office of the city engineer, M. Peterson, secretary.

In the discussion on paving of the proposed highway south of the Assiniboine and the Portage avenue road as far west as Headingly, a distance of nine miles, the following information was brought out: As to the cost, one tender has been received to lay a pavement with Westrumite, 24 feet wide with a concrete base. With cement curb and gutter this would cost \$29,500 a mile and other incidentals would bring up the cost to \$30,000. Another offer, although not official, is for Rocmac, which would cost \$15,000 a mile.

There will be a meeting of the council as soon as the intention of the government is found out and investigations into the cost made. A by-law will be submitted, tenders called for and the contract awarded in the shortest possible time. Frank Ness, secretary-treasurer, Mun. of Assiniboia.

AWARDED

Harristown, Ont.

The contracts for waterworks here were awarded as follows: Gartshore-Thomson, P. & F. Co., Hamilton, for cast iron pipe; Kerr Engine Co., Walkerville, for hydrants and valves; Hunter Bridge & Boiler Co., Kincardine, for water power; Jas. Robertson Co., Toronto, for lead; Geo. B. Moogk, Weston, for excavation and pipe laying; Bowman & Connor, engineers, Toronto and Berlin.

Moncton, N. B.

The following tenders for supply of water pipe were awarded:

Sumner Company's tender for Londonderry pipe for the twenty-inch main amounting to \$58,447.50, was accepted. The same firm's tender for valves at a cost of \$1,612.38 was also accepted. The city engineer was instructed to proceed with the construction of the foundation for the dam and tenders for clearing the pipe line are to be called at once.

Port Hope, Ont.

The tenders for the construction of the cement sidewalks were received as follows:

W. G. Gibson, 9c.
W. J. Arithistle, London, 9c.
Helmer & Winstanley, Morrisburg, 9½c.
Tartlithic Paving & Construction Co., Chatham, 9½c.
Campbell & Lattimore, 9¾c.
L. E. Hall, Port Hope, 10¼c.
Curran & Clement, Oillia, 10¾c.

Concrete Construction Co., Guelph, 10 9/10c.

Maple Leaf Artificial Stone Paving Co., Simcoe, 11c.

W. B. Robinson, Brighton, 12c.

W. G. Gibson was given the contract.

South Vancouver, B. C.

Messrs. Shacht & Company were awarded the contract for grading from King Edward to Fifty-first avenue at \$19,734, work to be completed in nine weeks from May 29.

La Place Brothers' Construction Company were successful in their tender of \$9737 for grading Main street from Thirty-fourth to Fifty-first avenues. The work is to be done in ten weeks. The same time limit is imposed upon D. Philpott, who was given the contract for grading Westminster road from Knight to Beatrice street for \$6115. The contract for concrete sidewalk and granite curbing on Commercial street was awarded to Hall and Boyer at 68 cents for lineal foot for the concrete and \$1.5 for the granite.

South Vancouver, B. C.

The contract for the supply of hydrants to the municipality was let to the Terminal City Iron Works.

Strathcona, Alta.

Manley Construction Co. were awarded the following: excavations for the east end trunk sewer and laterals, for \$29,763.08, an additional price of \$3.50 per cubic yard to be paid for any sandstone or bedrock having to be removed; extensions to present water and sewer lines, \$12,085.48. This last tender was over \$2,000 less than the next lowest. For the east end sewer lines the tenders were as follows: A. Mills, Strathcona, \$45,859.92, Hulbert and Wilson, Strathcona, \$40,403.45; Manley Construction Co., Edmonton, \$29,763.08.

Figures for the extensions to present lines were: A. Mills, \$18,705.92, divided as follows: For sewer lines, \$11,167.27; for water mains, \$7,538.65. Hulbert and Wilson, \$18,385.85, divided, sewer lines, \$10,847.20 and water mains, \$7,538.65. D. Alton and W. Gray, \$14,398.96, divided, sewer lines, \$8,741.32, water mains, \$5,657.64. This firm attached a price of 40c. per foot in depth for excavation of manholes. The Manley Construction Co., quoted \$12,085.48 for the total work, divided, sewer lines, \$6,269.95, water mains, \$5,815.53.

Toronto, Ont.

The contract for repairing the broken intake pipe was awarded to Messrs. Miller, Cumming & Robertson.

The Canada Foundry Company was awarded the contract for the supply of six-foot rivetted steel pipe for the proposed new intake, at \$20.75 per lineal foot.

Railroads, Bridges and Wharves

Avonport, N. S.

The Dominion Atlantic Railway is starting the erection of a steel bridge over the Gaspereau river between Avonport and Horton Landing, N. S. It is supposed that the C. P. R. is directing the operations and is to take over the D. A. R. in a few weeks, but no information can be obtained here.

Ayr, Ont.

Tenders addressed to T. Hall, reeve, Ayr, will be received until June 5th for

construction of substructure of reinforced concrete bridge in Tp. of North Dumfries. Plans, etc., at office of the above. Engineer in charge, E. O. Fuce, Galt.

Calgary, Alta.

Tenders addressed to S. E. Beveridge, Young Block, Bow River Bridge Company, Ltd., P.O. Box 1650, Calgary, will be received until July 1st for the three 100-foot span steel traffic bridge, with timber approaches.

Fort William, Ont.

Tenders are called until June 30th for construction and supply of materials in connection with reinforced concrete subway. John Wilson, city engineer. Advertisement in "Tenders and For Sale Department" of this issue.

Kingston, Ont.

The council will purchase Cataragui bridge in order that negotiations may be opened with the Dominion Government for the erection of a new one.

Montreal, Que.

It is announced that the C. N. R. will at once ask for tenders for the construction of the section of their main line around the north shore of Lake Superior, extending from Stillwood, a point forty miles west of Sudbury, to Port Arthur, a distance of about 550 miles.

St. John, N. B.

It is stated that the public works department, Ottawa, will call for tenders within a few days for very extensive harbor works, totalling about \$5,000,000.

The Department of Public Works will call for tenders for extensive improvements in the harbor at St. John, N. B. The plans include a dry dock and a shipbuilding plant, and the construction of berths for three G. T. R. steamers. The Department likewise purposes to ask for tenders for the construction of additional wharf accommodation at Champlain market, Quebec, to be used in connection with the G. T. P. System.

Saskatoon, Sask.

Tenders are called until June 15th for construction of substructure for 19th street subway. Advertisement in "Tenders and For Sale Department" of this issue.

AWARDED

Dauphin, Man.

Contract for the steel superstructure for Wakefield and Burrows Avenue Bridges, file 1-8, was awarded to Farrelly Brothers, of McCreary, Manitoba, \$4,791 for the two spans. The other tenders were as follows: Dominion Steel Bridge Co., Winnipeg, \$4,294 for material only; Dickson Bridge Works Co., Campbellford, Ont., \$4,813, material and labor; Algoma Steel Bridge Co., Winnipeg, one tender, \$5,275, material and labor; Algoma Steel Bridge Co., Winnipeg, one tender, \$4,975, material and labor. J. W. Johnston, secretary-treasurer.

Quebec, Que.

The following sub-contracts have been let by Messrs. O'Brien & Doheny, head contractors for the 56 miles of the Quebec & Saguenay Railway now under construction, to the following:

Messrs. O'Brien & Martin, Messrs. Ryan & McDonald, Messrs. Doheny &

Thomson, Mr. D. R. McDonald, Mr. F. C. Jackson, Messrs. Gagnon & Massicotte, Mr. Jas. McDonald, Mr. J. O. Neill, Messrs. Mitchell & Sutherland, Messrs. Irvine & Morrison, Mr. J. H. Stewart.

Public Buildings, Churches, Schools, etc.

Ayton, Ont.

W. A. Mahoney, architect, Guelph, is preparing plans and specifications for school here.

Amherstburg, Ont.

This municipality has decided to have a Carnegie Library. A site has been purchased.

Belleville, Ont.

The council granted the \$35,000 asked by the board of education for the new school.

Brandon, Man.

The school board have secured a full block just east of the Normal School site on which it is the intention to build a new collegiate in the near future.

Building permit was recently issued to Provincial Government Asylum for building of brick, \$532,878.

Brownsville, Ont.

Tenders are called until June 10th for erection of public school here. J. W. Hopkins, secretary P. S. board; Taylor & Taylor, architects, Hope Chambers, Brantford. Advertisement in "Tenders and For Sale Department" of this issue.

Cainsville, Ont.

The Baptists have organized with the intention of building a church in the near future. Rev. C. H. Emerson is the pastor.

Camrose, Alta.

Tenders will soon be called for carpentry and plumbing for the Scandinavian College for Alberta. It is expected that the college will be open by October 18th.

Chatham, Ont.

At a recent meeting of the board of education it was decided to advertise for plans for the new school to be submitted on or before June 15th. The advertisement will call for tenders for an 8-room building, to be increased to 12 rooms when desired. Estimated cost, \$20,000.

The council voted the board of education \$32,000 towards the erection of a new 8-room public school.

Cranbrook, B.C.

Tenders addressed to R. C. Desrochers, secretary, department of public works, Ottawa, will be received until June 12th for construction of public building here. Plans, etc., obtained at offices of Mr. Wm. Henderson, resident architect, Victoria, B.C., at the post office, Cranbrook, and at this department.

Calgary, Alta.

Building permit was issued to Wesley Methodist Congregation for church here, brick and stone, \$50,000. J. B. Gunn & Co., contractors.

Messrs. Lawson & Fordyce, architects for the First Presbyterian Church have

secured the services of Messrs. Allen & Collins of New York, specialists in building of that kind. Mr. Collins is expected to be in Calgary shortly to meet the board. Estimated cost of the building, \$130,000.

Durham, Ont.

W. A. Mahoney, architect, Guelph, is preparing plans for remodelling the Methodist Church here.

Durham Centre, N. B.

Tenders addressed to I. McNair, secretary, building committee, will be received until June 8th for erection of spire to the Presbyterian church, Riverview.

Edmonton, Alta.

Preparations of plans for new Masonic Temple were authorized at a meeting of the shareholders recently. Estimated cost of structure, \$150,000. President, W. G. Ibbitson; secretary-treasurer, C. E. McManus.

Fort William, Ont.

Tenders were called until May 29th for erection of 4-room school on McIntosh street. Hood & Scott, architects, Murray building.

Fergus, Ont.

A meeting has been called for June 1st of representatives of the councils of Peel, West Garafraza, Eramosa, Nichol, Elora and Fergus, to consider the advisability of establishing a joint isolation hospital for the municipalities named.

Glance Bay, N.S.

The Infectious Disease Hospital at Glance Bay was totally destroyed by fire on the 24th inst. Loss about \$6,000.

Guelph, Ont.

W. A. Mahoney, architect, Guelph, is calling for tenders for jailer's residence here.

Tenders are called until June 6th for erection of jail and jailer's residence here. W. A. Mahoney, architect; T. J. Moore, city clerk. Advertisement in "Tenders and For Sale Department" of this issue.

Humboldt, Sask.

This municipality will have a \$25,000 hospital.

Hardieville, Alta.

Plans for a new 2-room school from local architects are called until June 5th.

Hamilton, Ont.

A site with 125 feet frontage on Barton street east has been purchased for a club house for the Daughters of the Empire. Mrs. Crerar, Mrs. Sutherland and Mrs. Nesbitt are interested.

Ingersoll, Ont.

Tenders addressed to R. C. Desrochers, secretary, Department of Public Works, will be received until June 5th for interior post office fittings.

Kingston, Ont.

Tenders on the proposed new building, post office, new R. M. C. dormitories and new school are all held up pending the settlement of the labor troubles.

Lethbridge, Alta.

Tenders are called until June 30th for erection of Catholic church here. Plans etc. at office of E. Power, 324 6th street south.

Montreal, Que.

Tenders addressed to the board of commissioners, will be received until June 8th for construction of bath in St. Ann's Ward. Plans, etc., may be obtained from Mr. A. Piche, architect, No. 52 Victoria Square, Montreal.

Moose Jaw, Sask.

The Y. W. C. A. have commenced a \$50,000 building campaign.

Napanee, Ont.

Tenders addressed to the secretary, board of education, will be received until June 12th for heating, ventilating and plumbing of Central Public School, etc.

Netherhill, Sask.

Tenders addressed to R. A. Scott, sec.-treas., S. D., No. 2,659, will be received until June 12th for construction of brick school house. Specifications obtained from above.

Nelson, B. C.

Tenders addressed to the Director of Contracts, Department of Militia and Defence, Ottawa, will be received until June 15th for construction of rifle range here. Plans, etc., obtained at the office of the District Officer Commanding Military District No. 11, Victoria, B.C., the Director of Engineer Services, Headquarters, Ottawa, and the Officer Commanding 102nd Regiment, Nelson, B.C.

Orillia, Ont.

The plans for the proposed boathouse and pavilion in Couchiching Beach Park, prepared by Mr. W. H. Croker, were approved, and the chairman of the Parks Committee was authorized to call for tenders.

Ottawa, Ont.

A. Le B. Weeks, architect, is calling for tenders for the new Congregational church.

The Roman Catholic Church convent and presbytery at St. Cecil de Masham, seven miles from Wakefield, was destroyed by lighting. Estimated total loss, \$57,000.

Port Arthur, Ont.

Excavation has commenced on the new Government fish hatchery. N. McDougall is in charge. The building will be of concrete and frame.

Pembroke, Ont.

The plans for the Carnegie public library are being submitted for approval to Mr. Carnegie. Secretary Library Board, Mr. John Reeves, Pembroke; architect, F. C. Sullivan, Ottawa. Estimated cost, \$15,000.

Peterborough, Ont.

Tenders are called until June 5th for completing the 3rd storey of the King Edward school; for completing the present system of steam heating in same; for supplying a new system of steam heating and plumbing for the building to be used as a collegiate institute. G. H. Thompson, secretary, board of education.

Regina, Sask.

A Jewish synagogue will be erected here shortly, a site having been secured. Mr. Abramson, Montreal Fur Works, is interested.

Tenders are being called for addition to Albert school. Storey & Van Egmond, architects.

Richmond, B.C.

This municipality is considering the question of erecting a new municipal hall, for which a site at Brighthouse is proposed.

Saskatoon, Sask.

At a special meeting of the building committee of Christ Church congregation, it was decided to adopt the plans for the proposed church drawn in 1906 by Chas. E. Cordery. A campaign to raise \$120,000 has been started. Messrs. Thompson, Daniel and Colthurst have been appointed architects.

Tenders were called until May 22nd for erection of the addition to Machinery hall; dining hall; poultry house at the exhibition grounds. A. Leslie, city clerk.

Tenders were called until May 27th for erection of St. Thomas Presbyterian church. Architects, Storey & Van Egmond.

Tenders addressed to W. P. Bate, secretary, Box 1106, will be received until June 3rd for erection and installation of plumbing, heating and ventilation of the new Alexandra and Victoria schools. Plans, etc., at office of architect and at the Builders' Exchange, Winnipeg. David Webster, architect, Room 4 Kempthorne Block, Saskatoon.

Tenders addressed to John Spicer, secretary building committee, 21st street, Saskatoon, will be received until June 3rd for erection of new Third Avenue Methodist Church. Plans, etc., at offices of the above. J. N. Semmens, architect, 903 McArthur Building.

Tenders addressed to W. P. Bate, secretary, were received until May 25th for erection, exclusive of plumbing, heating and ventilation, of school here. David Webster, architect, No. 4, Kempthorne Block.

Sherbrooke, Que.

The Roman Catholic Commissioners have purchased 14 lots in Bellevue Park, on which it is understood that a new school will be erected at once.

St. John, N. B.

Tenders addressed to F. Neil Brodie, architect, will be received until June 7th for mason work, carpentry, heating and plumbing and glazing in connection with the work of remodelling the contagious diseases hospital. Plans, etc., at office of above.

The city engineer and T. M. Burns, secretary, board of health, were appointed to report on an incinerator plant.

Saltcoats, Sask.

Tenders will be received until June 20th for \$15,000 debentures, issued for town hall and fire apparatus. C. E. Boake, secretary-treasurer.

St. Thomas, Ont.

Architect John R. Findley is preparing plans for a new schoolhouse for school section No. 11, Aldborough.

Tenders for the painting of the Collegiate Institute, Manitoba and Myrtle

schools are called until June 5th. J. T. Finlay, architect. A. MacPherson, chairman building committee.

Stellarton, N. S.

A committee has been appointed to select a site for the new post office for which \$4,000 has been voted.

Sydney Mines, N.S.

Tenders addressed to C. F. McKinnon, P. P., will be received until June 8th for erection of an addition to Convent school here.

Souris, Man.

The school by-law was carried. Estimated expenditure, \$35,000. Architect, Thos. Sinclair, Brandon.

Strathcona, Alta.

The library board have accepted the offer of Mr. Carnegie of \$15,000 for erection of library here.

Trail, B.C.

The by-law to raise \$25,000 for erection of new school here was carried.

Swan Lake, Man.

The by-law to raise \$8,000 for consolidated school purposes has been carried.

Toronto, Ont.

Tenders are called until June 8th by Public Works Department for the plumbing, heating and electric wiring required at No. 5 Queen's Park. Plans, etc., at above department. Advertisement in "Tenders and For Sale Department" of this issue.

Tenders addressed to J. Cadaret, chairman sites and building committee, will be received until May 31 by the separate school board, 24 Duke street, for trades in connection with midsummer repairs to the separate schools. Specifications at office of the architect, C. J. Read, Confederation Life Building.

Vancouver, B.C.

Mr. J. M. McLuckie has a permit for a seven-storey business block on Pender street. The building will have a frontage of 52 feet, the estimated cost being \$70,000.

The by-law for \$156,000 to be spent on additional school expenses was carried; also that to expend \$30,000 for alteration of market building.

A new girls' school to be known as St. Margaret's will be erected on the corner of Belmont avenue and Fort street. Miss M. Barton, principal.

F. M. Rattenbury, provincial architect, is preparing plans for the new library block.

Winnipeg, Man.

Tenders addressed to M. Peterson, secretary, board of control, will be received until June 16th for supply of labor and materials required in the erection of an incinerator in Ward 7. Plans, etc., at office of city engineer.

The congregation of St. Matthew's church have decided to purchase a new site for their church on corner of Maryland and Livinia avenue.

Tenders are being called for erection of sanatorium, 4-storey and basement, 54 x 85 feet, fireproof, brick, stone and reinforced concrete. Estimated cost, \$70,000. P. C. Samwell, architect.

Tenders were called until May 29th for erection of addition to Nurses'

Home. Plans, etc., at office of Mr. J. D. Atchison, architect, Bank of Toronto Building. J. M. Cosgrave, business manager.

The board of control decided to submit a by-law at the next election asking for authorization for the building of a city hall annex on the site of the present market building, the said annex to ultimately form part of the complete new city hall. The competitive plans which will be called for will be for the whole new city hall, including the annex, but only the annex would be erected next year, the idea being to build the main hall a few years later. The total cost of the new buildings is variously estimated at from \$1,000,000 to \$2,000,000, of which the annex would cost probably half a million.

Weyburn, Sask.

Plans have been prepared for the new school. They show a building 70 ft. long and 80 ft. deep, steam heating and probably mechanical ventilation. Estimated cost, \$20,000. F. Rooney, is interested.

Wynyard, Sask.

Plans of the proposed new school house submitted by W. W. LaChance, Saskatoon, have been approved and instruction given to proceed with construction. Estimated cost, \$15,000.

AWARDED

Kamloops, B. C.

Robert Mackay has been awarded the contract to erect the new hospital, \$100,000.

Montreal, Que.

Messrs. Seguin & Guindon, 928 St. Catherine East, have been awarded the contract for the postal station "C," corner St. Catherine and Plessis streets. Mr. Joseph Perrault, architect, 2106 Park avenue, \$94,000.

Ottawa, Ont.

The public school board has awarded the contract for metal ceilings at Glasgow school to McFarlane and Douglas for \$300, the lowest tender. The other tenders were Dunning's Sheet Metal Works, \$500, McKinley and Northwood, \$608. In the addition to the Mutchmor Street school, T. C. James was awarded the contract for the masonry, brick and concrete work for \$28,500. The other tenders were, G. A. Grain, \$32,000 and A. Garvock, \$32,453. Taylor and Lackey were awarded the contract for the carpenter work for \$9,990. The other tenders were A. G. Marshall, \$10,220, J. and C. Low, \$10,600, Alex. Christie, \$11,826, T. A. Shore, \$13,899. John Carnochan was awarded the contract for roofing for \$375; the contract of painting and glazing was awarded to W. J. Carson for \$2,250. The other tender was John Strang and Son for \$4,350. Thomas Brethour got the contract for plastering for \$1,749. A. Bowan and Sons tendered \$2,150. McKinley and Northwood got the plumbing for \$3,881. M. M. O'Connell tendered \$4,298, J. R. McLennan, \$4,400 and Currie and Livock, \$4,557. Donnelly and Company get the electric work for \$1,889. J. A. Ellacott tendered \$2,486. Sheldons, Limited, are awarded the contract for the ventilation for \$1,713. Eadie-Douglas tendered \$1,942. The galvanized iron work is awarded to Dunning's Sheet Metal Works for \$1,400. McFarlane and Douglas, Limited, tendered \$1,-

547 and McKinley and Northwood \$1,718. Terrano Flooring Company of Canada gets the flooring for \$1,351; J. R. Smith, the closet partitions for \$373 and the International Marine Signaling Company, the boilers for \$1,273.

Strathcona, Alta.

The contract for the building of the new \$75,000 post office in this city has been relet to Piggot and Son, contractors, of Hamilton, Ont., the next lowest tender to the late Wm. Garson, of Calgary.

Saskatoon, Sask.

The contract for the new Saskatoon Club building goes to Hogan Marr, for a sum in the neighborhood of \$23,000.

South Vancouver, B. C.

The contract for erection of municipal hall was let to Wm. Loudon, \$12,000 on condition that only union labor will be employed and that it be completed ten weeks from the date of signing.

Winnipeg, Man.

The general contract for erection of Central Y. M. C. A. has been awarded to Hazelton & Walin, Union Bank Building, \$308,000; Mitchell Gray Electric Company got the contract for electric work, \$18,000. Associated architects, Jackson & Rosencrans, and J. H. G. Russell.

Residences

Brockville, Ont.

Tenders are called until June 8th for erection of residence for Dr. W. H. Woodrow. Dimensions of building, 50 ft. x 20 ft. Shingle and stucco construction.

London, Ont.

Tenders addressed to A. L. Dent, Woodstock, will be received until June 2nd for erection of brick residence for A. L. Dent. Plans, etc. upon application to Messrs. Knott & Sangster, Masonic Temple Building, London, or at the office of Taylor & Taylor, architects, Brantford.

Montreal, Que.

Tenders are about to be called by Messrs. Saxe & Archibald, architects, Montreal, for the construction of a residence on Metcalf avenue, Westmount, for Mr. Richard Egan. Estimated cost, \$14,000.

Magrath, Alta.

Tenders addressed to E. E. Carver, L.R.I.B.A., 201 Sherlock Building, will be received until May 30th for erection of residences for the Bank of Montreal. Plans, etc., at offices of the above.

Port Arthur, Ont.

Tenders will probably be called about June 1st for residence for D. S. Cranston. Architect, Mr. Chapman; estimated cost, \$4,000.

St. Catharines, Ont.

The larger manufactories here are considering an organization by which homes for employees may be built.

Summerside, P. E. I.

Tenders will shortly be called for the manse for the Presbyterian church. Estimated cost, \$4,000. Architect, Mr.

Chappell, Charlottetown. Thos. E. Ramsay, chairman building committee.

AWARDED

Regina, Sask.

The contract for erection of residence for Mr. J. F. Anderson, of Tracknell, Anderson & Co., has been let to W. G. Dand, \$10,000.

Winnipeg, Man.

The contract for a new apartment block on the corner of Rosedale ave. and Pembina street, Fort Rouge, for J. Munroe, of Brandon, has been awarded to MacKissock & Thomas. Wm. Fingland is the architect. Cost about \$20,000.

Business Buildings and Industrial Plants

Amherst, N. S.

The Rhodes-Curry Company will rebuild that part of their plant destroyed by fire recently. The new buildings will be fireproof, of steel and concrete. N. Curry, president.

Coquitlan, B. C.

The Canada Pacific Steel Company is reported to have purchased a 200-acre factory site at Pitt Meadows. Contracts it is stated, will be directly given for erection of suitable buildings and the machinery purchased in Europe.

Calgary, Alta.

Tenders are called until June 1st for alterations and additions to the Bank of Montreal here. Hodgson, Bates, & Butler, architects, The Grain Exchange.

The purchase of 97 acres for industrial sites will be recommended to council by the new industries committee of the city council.

Architect McIlroy, 118 A., 8th ave. west, is preparing plans for a business and apartment block in East Calgary to cost about \$25,000, for J. A. & D. M. Carson.

Elora, Ont.

The by-laws to assist the Elora Furniture Company and the T. E. Bissell Company towards further extensions were carried.

Edmonton, Alta.

A six-storey hotel in the east end, occupying a frontage of 66 feet, is to be erected during the summer and fall by a company organized by Robert F. Klein, proprietor of the Grand View hotel, McDougall avenue, at a cost of \$85,000. Plans, etc. will be called and specifications for the construction of the hotel.

Fredericton, N. B.

The N. B. Foundry plant was destroyed by fire on the 28th inst. Estimated loss about \$50,000. Messrs. McFarlane, Thompson & Anderson, owners.

Fennie, B. C.

It is reported that a saw mill costing \$400,000 is to be constructed opposite Baynes, on the Kootenay river. A company is also reported incorporated with a capital of \$20,000,000, which will include all the mill properties above the point at which the big mill is to be erected.

Guelph, Ont.

W. A. Mahoney, architect, is preparing plans, etc., for a large factory, 60 ft. x 300 ft., 4-storers, for Independent Tire Company; also preparing plans for alterations and additions to the Brown-Lee block for an up-to-date office building, including all modern conveniences in the way of elevators, vaults, etc.

The council have recommended the granting of the request for fixed assessment by the Colonial Whitewear Company, in return for which a factory to cost about \$20,000 will be erected.

High River, Alta.

Tenders are called until June 1st for erection of branch building for Bank of Montreal here. Noted in last issue.

Ingersoll, Ont.

The by-law fixing the assessment of the John Morrow Screw Company in return for which an additional plant to cost about \$150,000 will be built, was carried.

Kemptville, Ont.

The sawmill and cheese box factory owned by Messrs. Shaw & Earle were destroyed by fire on the 24th inst.

Lethbridge, Alta.

The Gordon Nail Works, of St. John, N. B., it is stated, will locate here. The plant will start with a capacity of about 90,000 kegs of nails per annum. M. L. McDonnell and J. J. Gordon are interested.

Montreal, Que.

Peloquin's Hotel at Back River was destroyed by fire on the 26th inst. Loss, about \$75,000.

Moncton, N.B.

The Burton Saw Company, of Vancouver, have entered into negotiations with the council here with regard to their location here. J. Burton and W. H. Wilson, representatives.

Medicine Hat, Alta.

The Alberta Glass Co. is being organized in Calgary for the purpose of building and operating a glass factory at Redcliffe, five miles from here. The organizers are A. E. Cross, manager of the Calgary Brewing Co., and associates of Calgary. Capital, \$160,000.

North Bay, Ont.

Tenders will be received by the Young Co., Ltd., for erection of large brick and mill constructed warehouse. For further information address J. Francis Brown, architect, Toronto.

Ottawa, Ont.

A. Leb. Weeks is calling for tenders for the addition to the J. M. Garland and Sons warehouse.

Orillia, Ont.

J. H. Robertson, architect, will prepare plans for the additions, etc., to the plant of the National Hardware Company.

Port Arthur, Ont.

Mr. John Stirrett, of Hymers, has applied to council for permission to erect a sash and door factory in conjunction with his mill.

The Hewison Contracting Company, this city, formerly Stewart Hewitson & Co., have begun the excavation for the building for the Port Arthur Wagon

Works Co., Ltd. Building will be 400 feet x 100 wide, part one-storey and part two-storey. Tenders will be called shortly.

Perth, Ont.

W. Fry Colwill, architect, Guelph, is preparing plans for erection of a factory for the Perth Carpet Mills Company. R. Dodds, Guelph, is interested.

Port Arthur, Ont.

The Finnish Co-operative Trading Co. will soon begin the erection of brick veneer store at corner of Bay and Second streets. The building will be 435 x 100 ft., two storey, and basement. Frederick Urry, architect. Estimated cost, \$10,000.

Quebec, Que.

The Dominion Corset Company and Carbello Carriage factory were damaged on the 28th inst. Estimated loss, about \$250,000.

Regina, Sask.

Tenders were called until May 30th for the several trades required in the erection of 3-storey addition to the Alexandra hotel. Sharon & Darrach, architects.

Tenders were called until May 25th for erection of business block on Eleventh avenue for the Western Trust Company. Materials needed, steel, marble, elevator, stone, etc. Estimated cost, \$80,000. Sharon & Darrach, architects.

Shediac, N.B.

Tenders addressed to R. A. Frechet, Moncton, N.B., will be received until May 31st for erection of building. Plans, etc., at parish priest's house and at house of the above.

St. Catharines, Ont.

The by-law to grant concessions to the Yale Townes Lock Company in return for which a large factory will be erected, was carried.

Simcoe, Ont.

Tenders are called until June 1st for the trades, except plumbing, heating and wiring, required in erection of store here. Plans, etc. at the office of the H. S. Falls Co. of Simcoe, Ltd., and at the office of Burke, Horwood & White, architects, Toronto.

Trenton, Ont.

The Jules Motor Company are stated to be seriously considering the location of their plant here.

Vancouver, B. C.

Building permit was granted to J. M. McLuckie for a 7-storey business block on Pender street, \$70,000.

Victoria, B.C.

Plans are being made and very shortly tenders will be called for by the Grand Trunk Pacific Company for the erection of a large building on its site on Wharf street. Capt. C. H. Nicholson, manager G. T. P. Steamship Co. The amount involved in the big undertaking is \$300,000.

Vancouver, B.C.

The shipping sheds at the Heaps lumber mill in Burrard Inlet were destroyed by fire recently.

The demolition of the one-storey building on the Jonathan Rogers property on Granville street, extending from Pender street to the lane behind

the Bank of Commerce, is to commence on June 1, in preparation for a commencement on the construction of the large new ten-storey block which Ald. Rogers is to build on the site at a cost of \$500,000.

Wynyard, Sask.

The flour mill owned by Geo. Spearman was destroyed by fire on the 26th inst. Total loss, \$20,000.

Welland, Ont.

A building site has been purchased here for the Canadian branch of the Imperial Mfg. Co., of Warren, Pa. Construction of factory, 50 x 62, will be commenced at once. Herbert & Geo. Hesch will be in charge. Industrial commissioner, B. J. McCormick.

Winnipeg, Man.

The Union Trust Company will erect an 8 or 10-storey block corner of Main and Lombard streets. W. W. Evans, manager.

The Hudson Bay Company will erect a fireproof garage of reinforced concrete between York and Broadway on Garry street. Woodman & Carey submitted the design.

The "Free Press" Publishing Company have purchased a building site on Carlton street. Plans for the new building will be prepared at once. Excavation on the new site will commence next month, and the construction will be proceeded with as rapidly as possible. The building will have a frontage of approximately 75 feet, widening to 90 feet in the rear, 30 feet being reserved for future extensions. While the plans are not yet prepared, it is expected that the building will be of steel, concrete and stone—the last probably of the native variety. The building will be thoroughly fire-proof in its character.

AWARDED**Brandon, Man.**

The contract for the International Harvester Company's fine new five-storey warehouse has been awarded to the Carter, Hall and Aldinger company of Winnipeg, for \$54,000. The building is to be of mill construction, with brick walls.

Chatham, N.B.

The Chatham Tile and Cement Co. have let the contract for the building of their new factory on Richmond street west to W. M. Drader. Construction will be begun at once.

Ft. William

The C. P. R. has let contract for new freight offices to be erected near No. 3 dock to Mr. McDiarmid. The building will be of brick. Estimated cost, \$12,000.

Montreal, Que.

Mr. Huberdeau is the contractor for a 4-storey factory to be constructed on Dowd street for Mr. A. P. Rolland. Estimated cost, \$50,000. Architect, Mr. A. H. Lapierre.

Moncton, N.B.

The Rhodes-Curry Company, of Amherst, have been awarded the contract for the addition to the office building of the Intercolonial Railway at Moncton. It will cost \$100,000.

Ottawa, Ont.

James Mather, architect, has awarded the contract for the carpentering work

(Continued on page 64)

Tenders and For Sale Department

Town of Oshawa, Ontario

Concrete Sidewalks

Tenders will be received up to noon of the 3rd day of June, 1911, for the construction of 24,000 square feet (more or less) of cement concrete sidewalks on streets in the above town. Specifications and further information may be obtained at the office of the Town Engineer, Town Hall, Oshawa.

The lowest or any tender not necessarily accepted.

FRANK CHAPPELL,
Town Engineer.

Oshawa, Ont., May 20, 1911.

21-22

Tenders

For the Construction of a Reinforced Concrete Subway

Sealed and endorsed tenders addressed to the Chairman of the Utilities Committee will be received at the office of the City Clerk up to 5 o'clock p.m., June 30th, 1911, for the construction and supply of all materials in connection therewith.

Plans, specifications and forms of tender may be obtained at the office of the City Engineer, Fort William; the office of the Contract Record, 220 King street west, Toronto; Canadian Engineer, 62 Church street, Toronto, or Builders' Exchange, Winnipeg.

The lowest or any tender not necessarily accepted.

JOHN WILSON,
City Engineer.

City Engineer's Office,
May 16th, 1911.

22-24

Tenders

For

Waterworks Supplies, Etc

TAVISTOCK, ONTARIO,

Sealed tenders addressed to the town clerk will be received up to 12 o'clock noon on Wednesday, June 14, 1911, for waterworks supplies and labor as follows:—

Approximately 2,250 feet of 8-inch, 2,550 feet of 6-inch and 2,100 feet of 4-inch cast iron water pipe, about 7 tons of special castings, about 16 hydrants, valves, etc. Also excavating for, laying and covering above pipe. One steel elevated tank.

Conditions and forms of tender, plans and specifications may be seen at the office of either of the undersigned.

Lowest or any tender not necessarily accepted.

F. W. FARNCOMB,
Consulting Engineer.

64 Bank of Toronto Chambers, London, Ont.

J. G. FIELD, Village Clerk.

Tavistock, Ont.

21-23

Bucket Crane

FOR SALE—One full circle, self-propelling, modern 10 to 15-ton capacity Browning size No. 1 Locomotive Crane, standard gauge, 4-wheel truck, 38 ft. steel boom, 8 x 10 engines, equipped to handle Clam or Orange Peel. Will furnish with or without bucket. Attractive price, fine condition, quick delivery. Inspection here.

WILLIS SHAW MACHINERY CO.

39 So. LaSalle Street, Chicago.

CITY OF SASKATOON

Sub-Structure for 19th Street Subway

Sealed tenders, addressed to the City Commissioners, Saskatoon, and endorsed "19th Street Subway," will be received up to twelve o'clock noon on Thursday, June 15th, 1911, for the above.

All information may be obtained from M. H. McLeod, Chief Engineer, Canadian Northern Railway, Winnipeg, or from George T. Clark, City Engineer, Saskatoon.

The lowest or any tender not necessarily accepted.

JAMES CLINKSKILL,

W. B. NEIL,

City Commissioners.

E. M. SNELL,

Saskatoon, Sask. May 23, 1911.

22-23



To Contractors

Sealed tenders endorsed "Tender for Plumbing, etc.," addressed to the undersigned will be received at this Department until noon on Thursday, June 8th, 1911, for the Plumbing, Heating and Electric Wiring required at No. 5 Queen's Park. Plans and specifications can be seen at this Department.

An accepted bank cheque payable to the order of the Hon. J. O. Reaume, Minister of Public Works for five per cent. of the amount, and the bona fide signatures and addresses of two sureties, or the bond of a Guarantee Company, approved by this Department, must accompany each tender. Cheque will become forfeit to the Crown in the event of the successful tenderer refusing to carry out the work within ten days after the acceptance.

The Department will not be bound to accept the lowest or any tender.

By order,

H. F. McNAUGHTEN,

Secretary Public Works, Ontario.

Department of Public Works, Ontario,

Toronto, May 27th, 1911.

Newspapers publishing this advertisement without authority will not be paid for it. 22-22

BOARD OF EDUCATION

Tenders Wanted

Sealed tenders addressed to the secretary-treasurer of the Board will be received until

MONDAY NOON, MAY 29th, 1911

for enlargement of the following schools:

FERN AVENUE

OGDEN

RODEN

Plans and specifications may be seen and all information obtained at the office of the Board, City Hall. Each tender must be accompanied with an accepted bank cheque for 5 per cent. of the amount of tender or its equivalent in cash.

The lowest or any tender will not necessarily be accepted.

W. W. HODGSON, W. C. WILKINSON,
Chairman of Committee. Sec.-Treas.

Toronto, Ont., May 22.

21-22

City of Fort William, Ont.

SALE OF MUNICIPAL PUMP- ING & ELECTRICAL GEN- ERATING PLANT

Tenders in bulk or in part will be received by the city clerk, addressed to the Chairman of Utilities Committee, on or before the 1st day of July, 1911, for the sale of the following equipment:

2 Duplex Compound Northy Pumps, High pressure cylinder, 14 in. diam; low pressure cylinder, 20 in. diam; pump cylinder, 11 in. diam; stroke cylinder, 15 in. diam. Capacity of each, 600 gallons per minute.

1 tandem compound engine—cylinders 21 in. x 46 in., and 40 in. x 46 in.

1 engine 20 in. x 46 in. with counter shafting pulleys and belting complete.

1 Westinghouse revolving field 600 kw., 2 phase, 60 cycles, 2400 volt generator with exciter, switchboard, etc.

1 royal electric 180 kw., 133 cycle, 2400 volt, generator with exciter, switchboard, etc.

The above equipment has been thrown out of use by hydro-electric power and water gravitation system, but would be suitable for a town of 5,000 population.

Machinery can be inspected at any time at the city power house, Fort William.

The successful tenderer must be prepared to have lots awarded to him cleared from the site before the 1st day of September, 1911.

For further information apply at city engineer's office.

JOHN WILSON,
City Engineer.

May 17, 1911.

21-23

Tenders Wanted TOWN OF NORTH BAY TOWN OF SAULT STE. MARIE

Ontario

Bulk and separate tenders for all or any of the several branches required in the erection and completion of a proposed Public School Building to be built at Brawnsville, Ont., will be received up till noon, **Saturday, June 10th, 1911.**

All tenders shall be sealed and marked "Tender" and addressed to J. W. Hopkins, Esq., Secretary Public School Board, Brawnsville, Ont.

Plans and specifications may be obtained upon application to the secretary, or seen at the office of Taylor & Taylor, architects, Hope Chambers, Brantford, Ont.

The lowest or any tender not necessarily accepted.

Dated June 23rd, 1911.

22-22

TOWNSHIP OF SCARBORO

Tenders

For Reinforced Concrete Arch Bridge

Tenders will be received by the undersigned up to twelve o'clock noon of **Monday, June 5, 1911,** for the construction of a reinforced concrete arch bridge of 20 ft. span over a branch of the Highland Creek, on the highway between lots 18 and 19, concession 2, township of Scarboro.

Plans and specifications may be seen and all necessary information may be obtained at the offices of the undersigned, 57 Adelaide street, east, Toronto.

The lowest or any tender not necessarily accepted.

BARBER & YOUNG,

Scarboro Township Engineers.

Toronto, May 19, 1911.

21-22

City of Prince Albert

Tenders for

POWER WORKS

Sealed tenders will be received until 8 p.m., Tuesday, June 13th, 1911, by the Corporation of the City of Prince Albert, Province of Saskatchewan, for the construction of Dam and Headworks and Canal and Power Station Foundations, being portions of the proposed Hydro-Electric Power Development, on the North Saskatchewan River, at La Colle Falls, (distant 25 miles east of the city).

Tenders are invited on each separately, and must be plainly marked on the outside of envelopes, and addressed to the Secretary-Treasurer, City of Prince Albert, Saskatchewan.

Each tender must be accompanied by an accepted bank cheque, for \$5,000, payable to the Secretary-Treasurer, which cheque will be returned to the bidder, unless he fail to execute a contract, should it be awarded to him.

The successful bidder, on each of the works, will be required to execute a Bond, in the sum of \$40,000, for the faithful performance of the contract.

The City reserves the right to reject any or all tenders.

The plans and specifications will be on file, and may be seen on and after **May 23rd, 1911,** at the City Hall, Prince Albert; office of "Canadian Engineer," at Winnipeg; office of "Canadian Engineer," Montreal, or at the offices of the Engineers, C. H. & P. H. Mitchell, Traders Bank Building, Toronto, Ont.

ANDREW HOLMES, Mayor.

C. O. DAVIDSON, Secretary-Treasurer.

Prince Albert, Sask.,
May 9th, 1911.

20-22 22-23

Sidewalk Construction

Sealed tenders, endorsed "Tender for Sidewalks," and addressed to the Commissioner of Works, will be received up till noon on **Wednesday, June 7th, 1911,** for the construction of approximately 100,000 square feet of Concrete Sidewalks and Crossings.

Plans and Specifications may be seen, and form of tender obtained on application to the undersigned.

A marked cheque for \$500 must accompany each tender.

The lowest or any tender not necessarily accepted.

T. N. COLGAN,

Commissioner of Works.

North Bay, Ont., May 22, 1911.

22-22

Contractors' Material
IN CANADA

Blacksmith drill (power or hand) 10-in. swing.
Leonard Engine (Ball Aut. High Speed).
Sturdevant Steel Fan 35-in. diameter, 12½-in. outlet.

Two Beatty 1-yd. dredges.

One Beatty ½-yd. ditching dredge.

No. 6 Austin crusher, with screen, new 1907, used half time.

No. 5 Champion crusher, also screen.

Eight Steam Drills and one air drill.

50 h.p. Portable steam boiler.

Thirty tons 20 and 25 lb. relaying rails.

Have you anything to sell? Write us.

THE MALES COMPANY,

82 Perin Bldg., Cincinnati, Ohio.

VILLAGE OF BIGGAR
SASKATCHEWAN

Sealed tenders marked Tender No. 1, Tender No. 2, Tender No. 3, Tender No. 4, Tender No. 5, Tender No. 6, Tender No. 7, will be received by the Sec.-Treas. of the Village of Biggar, Sask., up till noon, **Tuesday, June 13th, 1911,** for the following:

Tender No. 1.—Trenching, laying and back filling for cast iron water mains, hydrants, valves, etc.

Tender No. 2.—For supplying cast iron water mains and specials.

Tender No. 3.—For supplying hydrants, valves and valve boxes.

Tender No. 4.—For supplying and installing all pump machinery.

Tender No. 5.—For supplying and installing a compressed air storage tank.

Tender No. 6.—For erection of a power house.

Tender No. 7.—For the construction of a concrete reservoir.

An accepted cheque equal to five per cent. of the amount of tender must accompany each tender.

Plans and specifications can be seen at the offices of the Secretary-Treasurer of the Village of Biggar, Sask., or the Engineer, Yorkton, Sask., or copies can be had from the Engineer on receipt of a marked cheque for \$10, which cheque will be returned on return of the plans and specifications.

F. McARTHUR,

Consulting Engineer,

Yorkton, Sask.

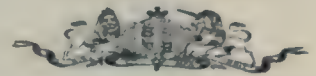
Sealed tenders addressed to W. H. Munro, mayor, will be received by C. J. Pim, town clerk, up to 5 p.m. **Monday, June 5, 1911,** for the construction of Section "M" of the sewer system. The approximate quantities are as follows:

1. 4,800 lineal feet of 18 in. tile sewer.
2. 2,900 lineal feet of 15 in. tile sewer.
3. 4,500 lineal feet of 12 in. tile sewer.
4. 2,900 lineal feet of 10 in. tile sewer.
5. 4,400 lineal feet of 8 in. tile sewer.
6. Number of Manholes, 45.
7. Number of catchbasins, 67.

Plans, specifications and Form of Tender may be seen at the office of town engineer on or before **May 22, 1911.**

A marked cheque for the sum of \$1,000 must accompany each tender.

The lowest or any tender not necessarily accepted.

W. H. MUNRO,
Mayor.W. F. GRANT, C.E.
Town Engineer.
21-22

Department of Railways and Canals

Ontario—St. Lawrence Canals
Rapide Flat Canal

Sealed tenders addressed to the undersigned and endorsed "Tender for Improving Lower Extreme to Lock No. 24," will be received at this office until 10 o'clock on **Friday, June 9th.**

Plans, specifications, and Form of Contract to be entered into can be seen on and after this date at the office of the Chief Engineer of the Department of Railways and Canals, Ottawa, and at the office of the resident engineer of the Ontario St. Lawrence Canals, Cornwall, at which places form of tender may be obtained.

Parties tendering will be required to accept the fair wages schedule prepared or to be prepared by the Department of Labour, which schedule will form part of the contract.

Contractors are requested to bear in mind that tenders will not be considered, unless made strictly in accordance with the printed forms, and in the case of firms, unless there are attached the actual signature, the nature of the occupation, and place of residence of each member of the firm.

An accepted bank cheque for the sum of \$9,000.00 made payable to the order of the Minister of Railways and Canals must accompany each tender, which sum will be forfeited if the party tendering declines entering into contract for the work at the rates stated in the offer submitted.

The cheque thus sent in will be returned to the respective contractors whose tenders are not accepted.

The cheque of the successful tenderer will be held as security, or part security, for the due fulfilment of the contract to be entered into.

The lowest or any tender not necessarily accepted.

By order,

L. K. JONES,
Secretary.Department of Railways and Canals,
Ottawa, May 19th, 1911.

Newspapers inserting this advertisement without authority from the Department will not be paid for it.

21-22

TOWN OF GODERICH

Storm Sewer Extensions

Sealed tenders will be received by the Town of Goderich, addressed to the Town Clerk, until 4 p.m., Thursday, June 15th, 1911, for the furnishing and laying of approximately 12,800 lineal feet of storm sewers, building manholes, catchbasins, etc. Plans and specifications may be seen and all information obtained at the Town Clerk's office.

The lowest or any tender not necessarily accepted.

L. L. KNOX, Town Clerk. M. G. CAMERON, Mayor.
Goderich, Ont., May 27, 1911. 22-23

Notice to Contractors

Sealed tenders endorsed "Tender for Pumping House Foundations, etc.," addressed to R. Cooper, Chairman of Water Commissioners, Welland, Ont., will be received until noon of Saturday, June 10th, 1911, for Excavation, Concrete Foundations, etc., for waterworks power house.

Plans and specifications may be seen at the office of R. Cooper, Chairman of Water Commissioners, Welland, Ont., and at the office of the designing engineer, Wm. Kennedy, Jr., Y.M.C.A. Building, Montreal, Que. 22-22

CITY OF CALGARY
ALBERTATenders
FOR TRUNK SEWER

Sealed tenders marked "Tender for Trunk Sewer" will be received by the undersigned up till noon on Tuesday, June 13th, 1911, for the construction of a six-foot diameter concrete trunk sewer about Twelve Thousand feet (12,000 ft.) long for the City of Calgary.

Each tender must be accompanied by an accepted bank cheque for \$500 payable to the City Treasurer, which will be returned to the bidder unless he fails to execute a contract, should it be awarded to him.

The successful bidder will be required to execute a bond in the sum of Thirty Thousand (\$30,000) for the faithful performance of the contract and a guarantee of maintenance for one year after the contract is completed.

The City reserves the right to reject any or all tenders.

Plans and specifications can be seen at the office of the City Engineer at Calgary; the office of the Contract Record, Toronto; office of Canadian Engineer at Winnipeg, and the Engineering Record, 289 West 39th street, New York.

W. D. SPENCE, City Clerk. 22-23

Positions Wanted

Advertisements under this heading one cent a word per insertion. Box No. ten cents extra

POSITION WANTED—As Superintendent or walking boss on railroad or other construction work, by experienced man who can furnish excellent references. Apply Box 271, Contract Record, Toronto, Ont.

Positions Vacant

WANTED—Salesman for Plumbing and Heating business. Apply stating references and experience. Box 277 Contract Record, Toronto, Ont.

Miscellaneous

Advertisements under this heading two cents per word per insertion.

WANTED—A large American manufacturer wants a good representative supply house in main cities of Canada to handle their line of A.C. and D.C. Watt Hour Meters. A good proposition. Address E. J. Macintyre, care Electrical News, 220 King street west, Toronto. 6-6, 19-20

Business Buildings and Industrial Plants

(Continued from page 61)

for M. Drazin's building to O. Rose and John Carriers.

Toronto, Ont.

The Haileybury Construction Co. have been awarded the contract for the construction of a passenger station at Matheson.

Vancouver, B. C.

The Norton Griffiths Steel Construction Company has been awarded the contract for the construction of a large filter house for the B. C. Sugar Refining Company. The contract price is understood to be \$80,000 and work will be started immediately.

Victoria, B. C.

The contract for construction of telephone building for the B. C. Telephone Company has been awarded to J. L. Skene & Co., \$65,000. Thos. Hooper, architect.

Winnipeg, Man.

MacKissock and Thomas have been given the contract for a block in Rosedale to cost \$20,000. William Findland is architect.

Power Plants, Electricity and Telephones

Brandon, Man.

A by-law for \$25,000 for the purpose of laying rails for the street railway on the streets to be paved will be submitted. City Engineer, Speakman.

Biggar, Sask.

Tenders are called until June 13th for erection of power house here. F. McArthur, consulting engineer. For further information see advertisement in "Tenders and For Sale Department" of this issue.

Calgary, Alta.

Tenders for feeder voltage regulators were as follows: Type I. R. T., C. G. E., 60 cycles, 300 amp., hand operated, \$1700; motor operated, \$1825; Canadian Westinghouse, 60 cycles, 200 amp., 38 k. v.a., hand operated, \$1245; motor operated, \$1530. Type I. R. S.; C. G. E., 60 cycles 300 amp., hand operated, \$875; motor operated, \$1,000; Can. Westinghouse, 59 k.v.a., 300 amp., 60 cycles, hand operated, \$2150; motor operated, \$2430. Automatic motor operated type; C. G. E., \$1950.

Edmonton, Alta.

The proposition of a municipally owned gas plant will be placed before the ratepayers shortly.

Galt, Ont.

By-law to authorize the expenditure of \$25,000 for the extension of the Hydro-electric system was carried.

Grand Coulee, Sask.

Tenders addressed to E. C. Vallance, secretary-treasurer, will be received until June 10th for erection of six miles of the Sunrise Telephone Company; also to string wires for 2 3/4 miles on the L. D. line; line to be built and completed according to government rules and regulations.

Tenders
For Jail at Guelph

Whole or separate tenders will be received by the undersigned up till Friday, June 9th, for the erection of jail and jailer's residence in the City of Guelph, County of Wellington.

Plans and specifications may be seen at the office of the architect, W. A. Mahoney, Telephone Building, Guelph, or at the office of the Contract Record, 220 King street west, Toronto.

Lowest or any tender not necessarily accepted.

T. J. MOORE, City Clerk, Guelph, Ont. 22-23

CITY OF MOOSE JAW
Sask.

Sewer and Water Extensions

Sealed tenders endorsed "Contract 37 or 38," as the case may be, will be received by the City of Moose Jaw addressed to the undersigned City Clerk until 8.30 p.m. on Monday, June 19th, 1911.

Any tender received after the above stated time will be declared informal.

Contract 36.—The laying of approximately 7,900 lineal feet of 24-inch Trunk Sewer.

Contract 37.—The laying of approximately 16,832 lineal feet of sanitary sewer of varying sizes and approximately 19,197 of water main of varying sizes.

Plans and specifications may be seen at the City Engineer's office.

Contract 38.—The supply of approximately:
236 lineal feet of 24-in. c.i. pipe.
358 lineal feet of 18-in. c.i. pipe.
6787 lineal feet of 12-in. c.i. pipe.
4689 lineal feet of 10-in. c.i. pipe.
3598 lineal feet of 8-in. c.i. pipe.
4905 lineal feet of 6-in. c.i. pipe.
Also special castings.

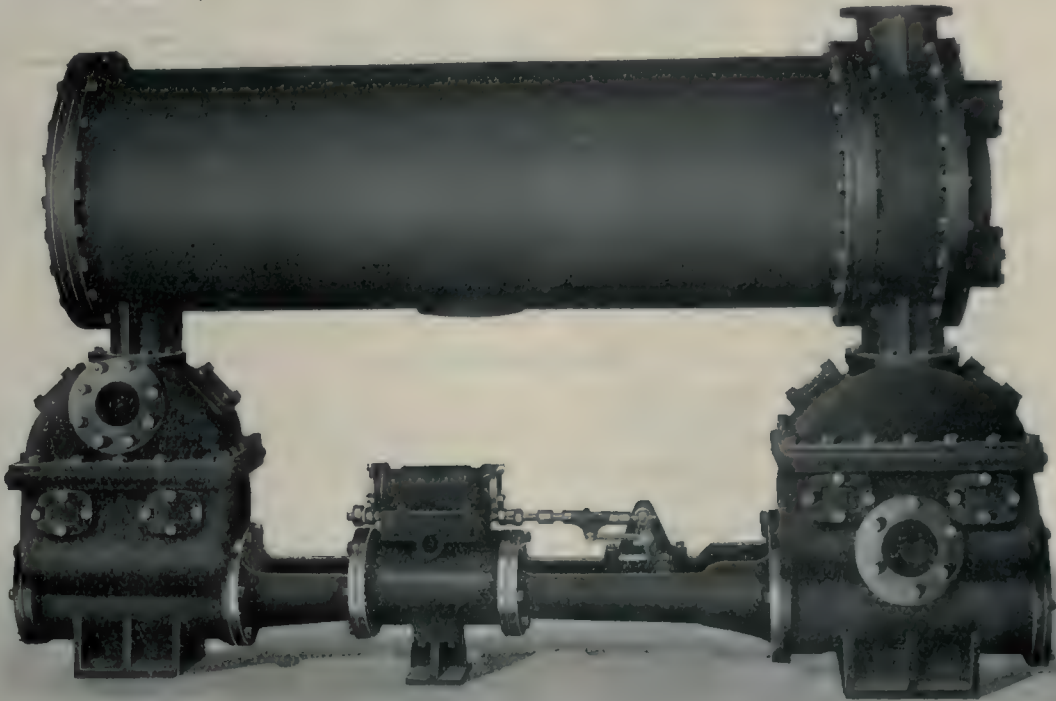
Contract 39.—The supply of approximately:
6710 lin. ft. of 24-in. vitrified tile pipe.
526 lin. ft. of 18-in. vitrified tile pipe.
4582 lin. ft. of 10-in. vitrified tile pipe.
11506 lin. ft. of 8-in. vitrified tile pipe.
150 lin. ft. of 6-in. vitrified tile pipe.
Also junctions, bends, etc.

Specifications for 38 and 39 may be obtained from the City Engineer's office upon application.

The lowest or any tender not necessarily accepted.

J. M. WILSON, City Engineer, Moose Jaw, Sask.
W. F. HEAL, City Clerk, Moose Jaw, Sask. 22-23

Condensors



Condensor built by The John Inglis Co., Limited

BOILERS, ENGINES, PENSTOCKS,
Water Towers, Steel Tanks, Heavy Plate
Work, Condensors, Air Compressors, Pump-
ing Machinery, Special Machinery of all kinds

Let us Submit Prices.

The **John Inglis Company**

Engineers and Boilermakers

Limited

14 Strachan Ave., TORONTO, Canada

Lindsay, Ont.

A by-law submitting the agreement between the town and the Light, Heat & Power Company regarding the purchase of the local power plant will be submitted to the people. The purchase price of the private plant is \$30,000.

Middleton, N.S.

The electric lighting plant here will be constructed this summer. 100 h.p. steam boiler and engine will be installed. Ratepayers have voted appropriation. Estimated cost, \$15,000.

Minnedosa, Man.

Tenders addressed to H. F. Maulson, P. O. box 369, Minnedosa, will be received until June 15th for construction of the power station foundation and penstock and the spillway and intake structures. Plans, etc., at office of Messrs. Taylor, Colwill, barristers, Portage la Prairie; and at the office of the secretary of the company, Minnedosa.

Nanaimo, B.C.

A communication was received by council from Messrs. Stewart and Rogers, of Victoria, offering to install a tramway system in the city without a bonus from the council, to commence construction within four months from date of franchise and to complete the same within a period of twenty-four months. Referred to the council tramway committee. A similar proposition has also been submitted by another syndicate.

Orillia, Ont.

The municipal generating plant at Ragged Rapids will be enlarged by the erection of a new dam and power house some 1,500 feet down stream from the present generators. Mr. W. K. Greenwood is town engineer.

St. Mary's, Ont.

A charter has been secured from the Dominion Parliament by the Imperial Traction Company for the construction along the Hydro-electric route, of an electric railway from Hamilton to Stratford and London with extensions to Sarnia and Niagara Falls.

Stettler, Alta.

The town council have retained the J. Galt Engineering Company as engineers on the proposed electric lighting system.

Saskatoon, Sask.

The city engineer reported on the street railway, presenting the following figures for a system of 5,700 lineal feet of double track, permanent construction; 14,700 lineal feet of single track, permanent construction, and for 29,280 lineal feet single track, temporary construction. The permanent construction would be of eighty pound high tee rails, pine or fir ties, on six inch concrete, the whole embedded in concrete half way up the web of the rail, the balance taken up by paving block. The temporary construction would be of 70 pound rails on No. 1 tamarac ties with gravel ballast.

The required equipment would be 12 single track cars, two sweepers, one sprinkler and one truck car. The estimate is based on the assumption that power could be had from the new power house by putting in more machinery. The cost of power installation is based on a 400 kilowatt generator, 750 h.p. engine and 500 h.p. boiler. The cost would be as follows: Track and overhead

work, \$301,000; cars and equipment, \$75,000; power installation, \$30,000; car barn and repair shops, \$20,000; engineering and contingencies, \$25,000. Total \$451,000.

A supplementary report will be issued when more information is received.

Victoria, B.C.

Tenders for 200 standards of the New Westminster type for the cluster lighting system have been received by the city at the following prices: Hutchinson Bros., New Westminster type, \$42 each; Seattle type, \$46; an alternative standard, \$44; the present type already installed with slight modifications, \$54; B. C. Foundry & Engineering Company, \$78; Shackey King Company, New Westminster, \$43. Referred to City Electrician and H. M. Fullerton, chairman electric light committee.

AWARDED**Guelph, Ont.**

P. H. Secord & Sons, Limited, of Brantford, are the successful tenderers for the construction of the St. Patrick's Ward extension of the Radial Railway Company.

Miscellaneous**Moose Jaw, Sask.**

Four by-laws, providing for the expenditure of \$240,500 for public improvements, carried. W. F. Heal, city clerk.

Ottawa, Ont.

The following permits have been issued recently. Victor Realty Co. dwelling, Cameron street; R. A. Kemp, builder, \$3,000; Thomas Clarey, dwellings, Centre street, \$4,500; J. P. Band, dwellings, Ella street, \$5,700; Sunnyside avenue, \$5,700 and Daly avenue, F. A. Booth, builder, \$8,000; A. Tracy, apartments, Gilmour street, \$15,000; Cephus Ross, dwelling, Carling avenue, F. Stata, builder, \$5,000; Thomas Rochon, dwelling, St. Andrew street, N. Poirier and Sons, builders, \$3,000; R. C. Church, stone addition, St. Patrick street, N. Poirier and Son, builder, \$10,000; J. W. Mooney, dwelling, Monkland avenue, W. H. George, architect, Alexander, Campbell and Eamon, builders, \$6,500; Philip Lennon, dwelling, Arlington street, \$7,000; O. Pommerville, apartment house, Cooper street, Murphy Brothers, builders, \$9,300; Russell Brownlee, dwelling, 4th avenue, James Brownlee, builder, \$3,000; Stewart McClenaghan, addition, J. P. MacLaren, architect, George Roy, builder, \$4,000; R. J. Arthurs, dwelling, Brighton avenue; J. Cummings, builder, \$2,000; Thomas Lowry, dwelling, Frank street, \$2,500; W. O. Byrnes, dwelling, Archibald street, \$3,000; O. B. Shortly, dwelling, J. A. Ewart, architect, Alex. Robertson and A. Richards and company, builders, \$8,000; Charles Ogilvie, residence, C. J. Burritt, architect, C. and W. H. Lester and Ferguson, \$7,000; James S. Wilson, dwelling, Chapel street, \$3,500; James Hill, dwelling, O'Connor street, \$5,000.

Jobidon & Gravel, contractors, Quebec, are stated to have assigned.

Martin & Johnson, sash door manufacturers, Vancouver, are stated to have dissolved.

New Companies

J. Lefebvre, Limited, Montreal, Que., capital, \$100,000, incorporated to carry on business as general contractors. Incorporators, C. P. Lefebvre, manufacturer, agent; J. Lefebvre, contractor, both of Montreal.

Otis Quarries, Limited, Montreal, Que., capital, \$50,000; incorporated. Incorporators, K. R. Otis, quarry master; J. A. Lamarche, K.C., both of Montreal. and De Gaspé Beaubien, civil engineer, Outremont, Que.

Canadian Electric Welding Company, Limited, Montreal, Que., incorporated, capital, \$500,000. Incorporators, G. V. Cousins, E. G. Penny, barristers, both of Montreal, Que.

The National Paper Company, Limited, Montreal, Que.; incorporated; capital, \$100,000. Incorporators, E. B. Busteed and C. Lane, Advocates, both of Montreal.

Prince Rupert Hydro-Electric Company, Limited, Montreal, Que., capital, \$5,000,000. Incorporators, O. B. MacCallum, and G. V. Cousins, advocates, Montreal.

Canadian Metal Seal Company, Limited, Montreal, incorporated; capital, \$300,000. Incorporators, J. W. Blair, F. J. Lavery and G. Dutaud, advocates, all of Montreal.

Factory sites, Limited, Montreal, Que., incorporated, capital, \$200,000. Incorporators, F. Roy, K.C., J. H. Dillon, advocate, both of Montreal.

Business Notes

Kavanagh & Saunderson, plumbers, Montreal, are stated to have dissolved.

A winding-up order has been granted to the Nominique Pulp Wood supply Co., Montreal.

W. J. Pierson, Fort William, contractor, is stated to have assigned to A. N. Thompson.

Manager Wilford Phillips, of the Winnipeg Electric Street Railway, has notified the city engineer of the materials ordered for extensions of the street railway lines this year. The material ordered will lay about eight miles of track. 80 pound rails will be used throughout.

The B. C. Gazette gives notice of the incorporation of the following companies: John K. Miller Company, Limited, capital, \$3,000, incorporated to carry on the business of wholesale and retail sheet-metal workers; Fort George Trading & Lumber Company, Limited, capital, \$200,000; The Coast Construction and Investment Company, Limited, capital, \$50,000; New Ladysmith Lumber Company, Limited, capital, \$400,000; Canadian Construction Company, Limited, capital, \$30,000; Davis Brothers Electric Company, Limited, capital, \$10,000; Snowden-Bidlake Logging Company, Limited, capital, \$50,000.

MacLean Daily Reports

The only systematic method yet devised for reporting BUILDING AND ENGINEERING projects from their inception to completion. Ask us for Rates and Specimen Reports.

220 King Street West

TORONTO

Contract Record

ESTABLISHED 1896

A Weekly Journal of
Building, Contracting, Engineering, Public Works
Municipal Progress, Advance Information

PUBLISHED EACH WEDNESDAY BY

HUGH C. MACLEAN, LIMITED

HUGH C. MacLEAN, Winnipeg, President.

THOMAS S. YOUNG, General Manager.

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Telephone Main 2362

MONTREAL Telephone Main 2299 B34 Board of Trade
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VANCOUVER - Tel. - 26 Crowe & Wilson Chambers
CHICAGO - - - - - 4059 Perry Street
LONDON, ENG. - - - - - 3 Regent St., S.W.

SUBSCRIPTION RATES

Canada and Great Britain, \$2.00 U.S. and Foreign, \$2.50

Vol. 25

June 7, 1911

No. 23

Much Ado About Nothing

Since the city of Victoria awarded a contract for some 600,000 square yards of paving to the Canadian Mineral Rubber Company of Toronto, it has received a number of so-called "protests." Particulars of some of these have duly come to hand. One concern enters into quite a rigmarole concerning the developments which led up to the organization of the company, and the nice things it had hoped to accomplish since that time. Details are even given of the modus operandi of the company's representatives among the ratepayers. The illogical conclusion is made in the protest under discussion that the company, having maintained a representative in Victoria since last July, advertised in the city, etc., should have received at least a fair share of the work. The company is strengthened in this conviction because of the fact that it invited the city council to inspect other work which it is carrying on in Vancouver. Unfairness is charged on account of alleged lack of investigation.

We cannot think that protests of this kind accomplish the desired effect. Such a letter, published in the local papers, has a whining tone about it that would better befit the disgruntled congregation of a country church. There is an atmosphere of futility about it that does not strengthen contracting interests as a whole.

As a matter of fact the Canadian Mineral Rubber Company, the successful tenderers for the contract at Victoria, not only submitted the best possible figures, but they were backed by the strongest recommendations from Winnipeg and other places where their work is considered a standing memorial to their ability.

Where there is close competition and consequently some difficulty in deciding between two contractors it is certainly only fair to have the work of each inspected, but otherwise the city is under no obligation to do so, and in any case it has a free hand to reject the lowest or any other tender, upon the

recommendation of its engineer. Had the Canadian Mineral Rubber Company been a United States concern there might have been some reason in the protest, seeing that Canadian contractors are totally excluded from the American field, but this is a Toronto company, doing business on sound principles and strictly Canadian lines.

Competition is essential to trade, and so long as we are beaten in a square deal there is no cause for complaint. It is far better, and more effective, to wait for the odd occasion,—which inevitably comes, when somebody tries to put it over us, and then make a great shout. Besides, it leaves a more abiding impression.

Standard Specifications for Reinforced Concrete

The standard building regulations for reinforced concrete adopted by the Canadian Cement and Concrete Association and published in the annual report of that body, fill a long felt want in the Canadian construction field. Their presentation at this time is particularly opportune and doubtless they will receive due recognition at the hands of the civic authorities of Toronto, Montreal, Vancouver and other cities, where defects in the existing codes have done so much to hamper building development. In the proposed revision of the Toronto by-law we would strongly recommend that they be incorporated, with perhaps a few modifications to conform with the organization of the city architect's department. These specifications are based upon those adopted by the National Association of Cement Users, which are regarded as a standard on the other side of the border. The Canadian regulations are designed to serve the best interests of the Canadian field and inasmuch as they are the outcome of exacting investigations extending over more than a year, it may be safely asserted that the best possible practice will be insured by their adoption.

The special committee of the association which brought in the report was composed of Messrs. Peter Gillespie, J. A. Jamieson, Gustave Kahn and C. R. Young.

The Selling End of Contracting

In any mercantile business the most important part is what is generally termed "the selling end," says our Chicago contemporary. The Contractor. Without sales a business cannot live. It is very true that if materials for manufacturing or goods for sale are not purchased properly, the most competent salesman cannot make a business pay. If the manufacturing end of a business is not run properly, even should the selling end be efficient, the business cannot be made profitable, but almost any business man will tell you the hard part of his business is to keep his sales up to a standard and improve on that standard.

A contractor is to some extent a manufacturer and a seller of a certain class of goods. He is the builder or manufacturer of engineering structures, he is a buyer of materials, machinery and supplies, and these, with the labor hired, are made into structures. A contractor does not have these completed structures except in a few cases of some classes of buildings, for sale, but he is always anxious to sell his ability to make them, and the organization that will produce any kind of an engineering structure for which he can contract. Thus there is a selling end to the con-

tracting business, yet few contractors have conducted their business in the past as though this feature merited much consideration.

Very few contractors have ever advertised their business or attempted any systematic methods of obtaining contracts. The practice has been to give close attention to any contracts obtained, so as to do satisfactory work and make money on the job. Then, when new jobs were heard of, every effort is put forth to obtain some of them. These jobs are heard of either by chance or through the technical papers, or possibly through some reporting company. In most cases the contractors are unknown to the owners. On public work this is seldom of importance but for private work it may mean much.

Most public work is advertised. Most of this advertising is through the local newspapers and the technical journals. The law governing public lettings generally provides that the contract must go to the lowest possible bidder, or all bids must be rejected.

Many private corporations keep lists of contractors, from whom they ask bids. Others, who may not do much construction, make up special lists from whom bids are asked, or they allow any contractor asking permission to estimate, to submit a proposal. Some few corporations call upon a contractor and by a simple agreement as to general terms and prices, allow the contractor to do their work. Some contractors seem to secure a large number of contracts by these haphazard methods, but many contractors are frequently out of work or seldom have more than one job on hand.

There should be few contractors who cannot run more than one job. Even if their capital is limited, it is possible to do several jobs at one time, as every contract obtained is an additional asset. Thus it is seen that most contractors pay but little attention to the selling end of contracting. Yet there is no reason why it should not be considered as much as the operating part of contracting.

There are several ways that a department organized for this purpose could obtain results. First, all information gathered from the various technical and contractors' papers could be indexed and followed up by letters and personal calls. Then a judicious campaign of advertising could be carried on. Advertisements could be placed in the engineering and contractors' papers and also in the daily papers when work is to be confined to given localities. In such advertisements, just to publish the company's name and address with a photograph of some work done will hardly do much good. Tell something of the contracting company, the class of work they do, the fact that contracts are finished without disputes, and that they are completed on time. Show how money has been saved to clients. If certain classes of work are made a specialty, enlarge on the ability to do this work better than other contractors. If a certain form of contract is used, explain it and its merits. From time to time give lists of various contracts satisfactorily completed. In other words, say something in the "ads" that will attract special attention to the company. It may not be possible to trace direct results to all such "ads" but the publicity will make the company well known and materially assist in landing contracts.

Another method of advertising is to issue attractively gotten up books or pamphlets well illustrated, descriptive of work done in the past. These can be

distributed among engineers and owners, who may have construction work to do.

A third method of advertising is to send circulars through the mail to those who may have jobs to let. This, if consistently followed up, brings returns.

Another method, used by an eastern contractor, is to employ a man who is really his solicitor. This man keeps posted on work to be let and keeps in touch by correspondence and personal calls on all officials and owners who have to do with the letting of work. He need not be an engineer or have had experience as a contractor, although both of these are to be preferred, but he should be a man of attractive appearance, able to put up a good sensible talk on construction work, and he should have the ability to impress those to whom he is talking.

This solicitor has nothing to do except to obtain work, and he is paid a drawing account and a commission, on the profit made on all jobs he obtains. This method is proving a success and jobs have been obtained that would not otherwise have been heard of by the contractor.

Thus, this contractor has his construction department, his engineering department (which has charge of all estimating and engineering work), his financial department and his selling department. With a well balanced organization of this kind he is becoming one of the best known contractors in his locality.

An Attractive Publication

Portland Cement on the Farm is the title of an attractive book just issued by Alfred Rogers, Limited, 28 King street west, Toronto, agents for the independent cement companies. This book is most artistically bound, is printed on heavy India tint paper and contains 128 pages replete with excellent illustrations. It contains practical directions which may be used by the farmer at little expense in permanent fireproof concrete. It tells the farmer of the many forms of construction to which cement is particularly adapted in his work, at the same time giving him details of the most satisfactory methods of construction from the ground up. There are illustrations of farm houses, barns, outbuildings and a kinds of improvements in concrete. Ample justice is done to the possibilities of the material in every department and the book is one which should be of interest not only to every farmer but to every cement worker in the country. The cost quotations given in this book are an interesting feature. The estimates have been made at approximately one-third over market prices for the various independent brands of cement. This leaves a cost margin for transportation and makes the estimates applicable to any locality in Canada. The Rogers brands of cement are the Crown, Hercules, Imperial, Maple Leaf, National, Saugeen, Sterling, Sun and Superior.

One million one hundred thousand dollars a month is the record of new buildings so far this year at Winnipeg, the total to date exceeding five and half millions. These figures do not take into account any buildings in the immediate suburban districts, of which there is an unusual development this year. An authoritative statement of the activities in new buildings in the principal cities of the three western provinces has given \$50,000,000 expenditure as the minimum.

Progress of Quebec Bridge Construction

The Practical Problems of the Work and How they have been Solved to Date—Criticism of the Accepted Design

Special to the Contract Record

The work on the foundations for the new Quebec bridge is in full swing and is being pushed energetically by the contractors, Messrs. M. P. & J. T. Davis. As stated in the Contract Record of May 3, 1911, the new span is to be 1,800 feet in length. The axis of the bridge remains as in the original structure. The new north main pier will be 65 feet farther out into the river than the old pier, while the new south main pier will be correspondingly 65 feet nearer the south shore. Owing to the change in length of the anchor arms, the location of the north anchor pier will be 50 feet south of the existing pier and an intermediate pier will be built between it and the abutment, which remains in the same position as originally. The new south anchor pier will be 80 feet south of the original one.

Owing to the severe climate of Quebec the work

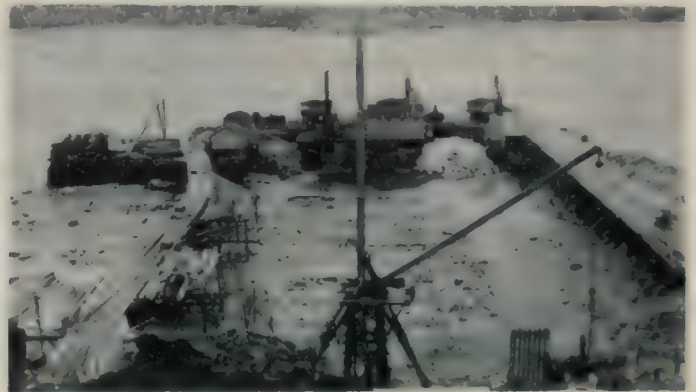
will be sunk this season for the foundation of the north main pier.

These caissons are identical, each 85 feet x 60 feet in dimensions, and will be placed end to end, 10 feet apart, one each side of the bridge centre line. They are built of 12 in. x 12 in. Georgia pine and are up to the standard of modern practice in caisson foundations. The cutting edge is British Columbia fir, 30 x 30 ins., and instead of a steel shoe it will rest on an oak wearing timber 12 in. x 6 in. This wearing timber can be replaced when injured much more readily than a steel shoe which becomes badly twisted by blasting. The corners of the caisson are protected by steel shoes.

The working chamber of the caisson is 8 feet in height and is divided into four large compartments by solid bulkheads with doors for intercommunication.



View from south side showing old south main pier; in the background the plant on north shore.



Plant at north shore. Anchor pier in background.

for 1910 was stopped in November and the only work done during the winter was the widening of the rock cut on the north side which necessitated a removal of 20,000 cubic yards of solid rock. About the middle of March work was begun at Sillery on the two new caissons for the north main pier, and as soon as the river was free from ice, in April, work was commenced at the bridge site on both the north and south sides.

On account of the difficulties encountered in the sinking of the north caisson in 1910, the masonry plans have been changed by the board of engineers. A huge caisson, 180 ft. 6 ins. x 95 ft. 6 ins., was built early in 1910, as described in the Contract Record of Sept. 7, 1910. This caisson was put in place and about 8 feet of concrete deposited on the deck where the caisson became strained and developed leaks which caused the work to be stopped. The concrete was blasted out and the caisson towed to the dry dock at Levis and repaired. This caisson remained in the dry dock all the winter. After the additional repairs now being made are completed, the caisson will be sunk for the south main pier. It will be towed to the bridge site and put in place, and will remain there all summer, while two new caissons building at present

Each compartment is subdivided again by a truss or skeleton bulkhead of timber with diagonal truss rods. The roof of the air chamber is 3 feet thick, well caulked and braced to the walls by 12 in. x 12 in. knee braces.

Above the deck is the crib, consisting of three longitudinal rows of timber and seven rows of transverse timbers, all 12 in. x 12 in. The caisson is strengthened by six truss rods of 2½" of steel running diagonally from the wall under the longitudinal bulkhead and up to the other wall. The walls of the caisson are caulked and then sheathed with 6 ins. of spruce to protect the caulking. These caissons are being built at Sillery and will be launched on the high tides about this date.

Bridge Site

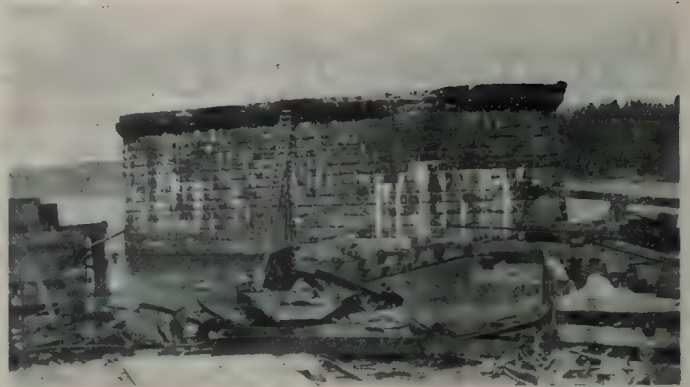
At the bridge site, on the north side, preparations are being made for the caissons. The air compressor plant has been overhauled and put in shape for the sinking of the caissons. A great part of the pile platforms was removed in the autumn to prevent damage by the ice. This is now being replaced. The work on these platforms is being pushed at top speed. Two pile drivers are being worked day and night. The



Pointe a Pizeau. Two caissons for north main pier.

contractor has installed an electric plant to light the work at night. The platforms will completely surround both caissons and will carry the material tracks and derricks for handling the concrete. Six stiff leg derricks are being erected, three on the south and three on the north side of the caisson.

The swift current and great rise of the tide necessitate great precautions and the caisson will be



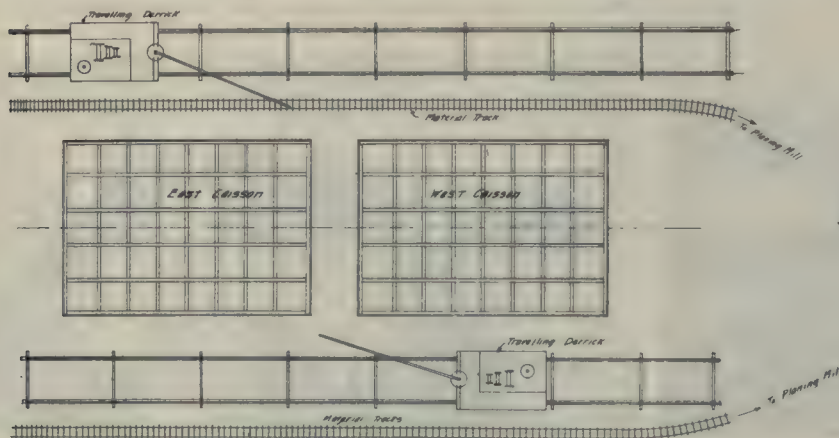
South main pier.—Note coping broken by falling steel.

elevator, the full car hauling up the empty one. The contractor has also installed an elevator for other material, this being operated by a 3-drum hoist.

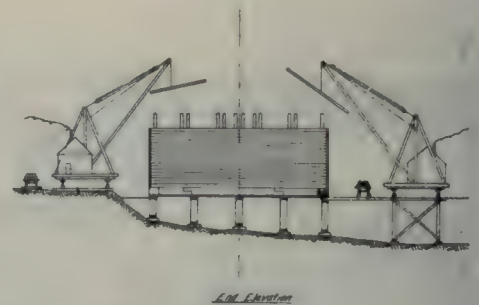
The old anchor pier, which is to be replaced by a larger structure has been taken down and the stone is being re-cut for the new pier.

South Side

The south side of the river is also the scene of



Sketch showing method of handling material in construction of north caissons.



anchored by steel cables to "dead men" placed about 900 feet up and down stream respectively.

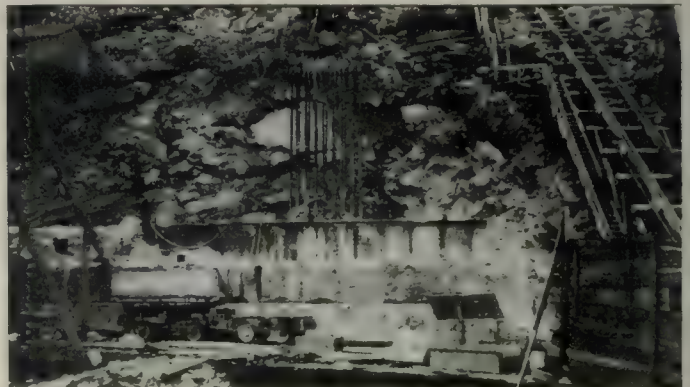
The concrete plant is at the foot of the cliff and consists of two Gates stone crushers and three concrete mixers—two Ransomes and one Smith mixer.

The stone and sand are brought by cars to the top of the cliff and shot down to the concrete plant by chutes. The cement will be lowered by a gravity

activity, the work here being carried on by night, as well as day, to take advantage of every low tide. The resting place of the huge caisson is being levelled and large rock filled cuts are being erected to form a protection from the swift current. The south main pier has not yet been removed and it will give additional protection to the caisson. It is expected that the sinking of this caisson will be started this sum-



Driving piles at north main pier to make platform for new caisson.—Remains of old main pier to right.



Removing north anchor pier, showing anchor girders and eye bars.

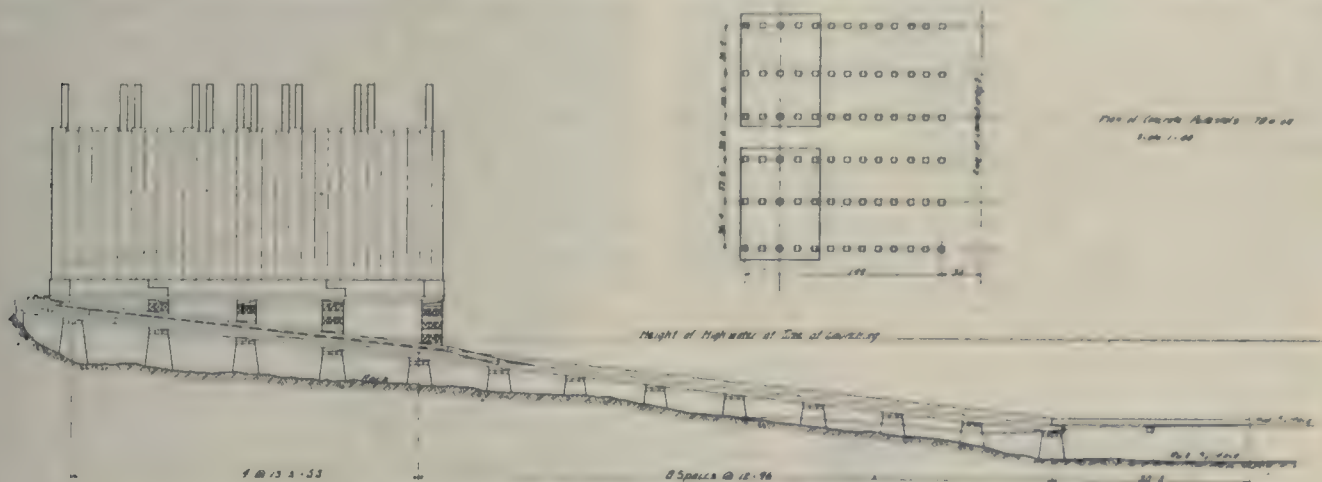
mer. It will be carried deep enough to be proof against any movement from the ice.

Phoenix Bridge Company

When the ill-fated bridge fell in 1907, the two approach spans remained standing. The contract for

the Dominion Steel Company of Sydney, N. S., who will shortly begin to remove it.

The contractors for the new masonry are the same as for the old, viz: Messrs. M. P. & J. T. Davis, whose chief engineer is Mr. Walter Retner, of New York. Mr. Retner has had wide experience in caisson



Sketch showing two north caissons on launchways.

removing them was let to their builder, the Phoenix Bridge Company, of Phoenixville, Pa. The north approach span was removed in 1910 and the plant removed to the south side when work was stopped for the winter. At present the Phoenix Bridge Company are removing the south approach span.

Koenig & Co.

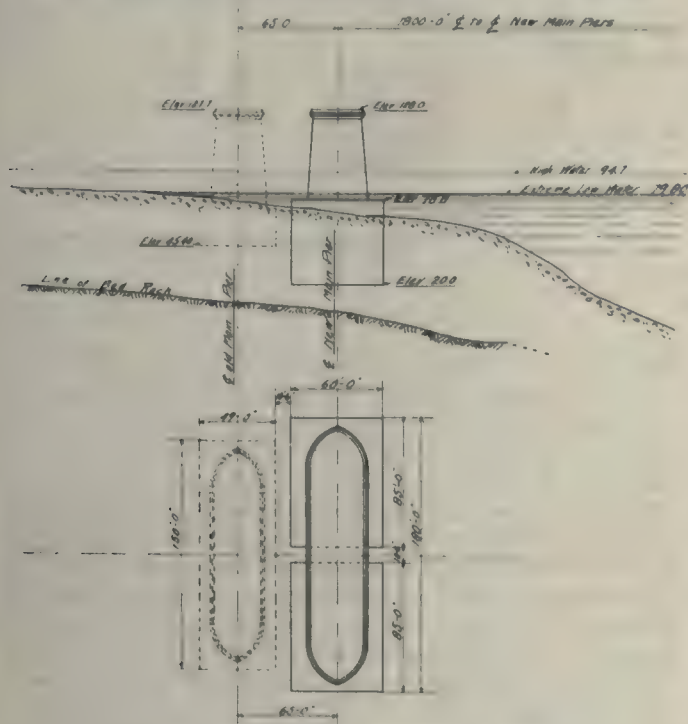
The contract for the removal of the debris of the old bridge is being handled by Koenig & Company,

work. Among other work he handled the caissons for the Manhattan bridge. Mr. M. P. Davis is also very active in his direction of the work.

At present Messrs. Davis have about 600 men employed on the work. They have an extensive plant of boilers, engine, air compressors, hoists, scows, etc.

The supervision of the entire bridge is in the hands of the board of engineers for the Quebec bridge, of which Mr. C. N. Monsarrat is chief engineer and chairman, with Ralph Modjeski, of Chicago, and C. C. Schneider, of New York, consulting engineers.

Mr. J. D. Wilkens is resident engineer in charge of the work. The engineering staff occupy offices on the north shore, overlooking the river, and only a few hundred feet from the bridge.



Old and new main piers, north side.

of Quebec, and is nearly completed. The huge members are cut into smaller sections by use of the oxy-acetylene torch or else they are blown apart by dynamite and removed by derricks. The debris is stored east of the bridge centre line and has been sold to

The Accepted Design for the Quebec Bridge

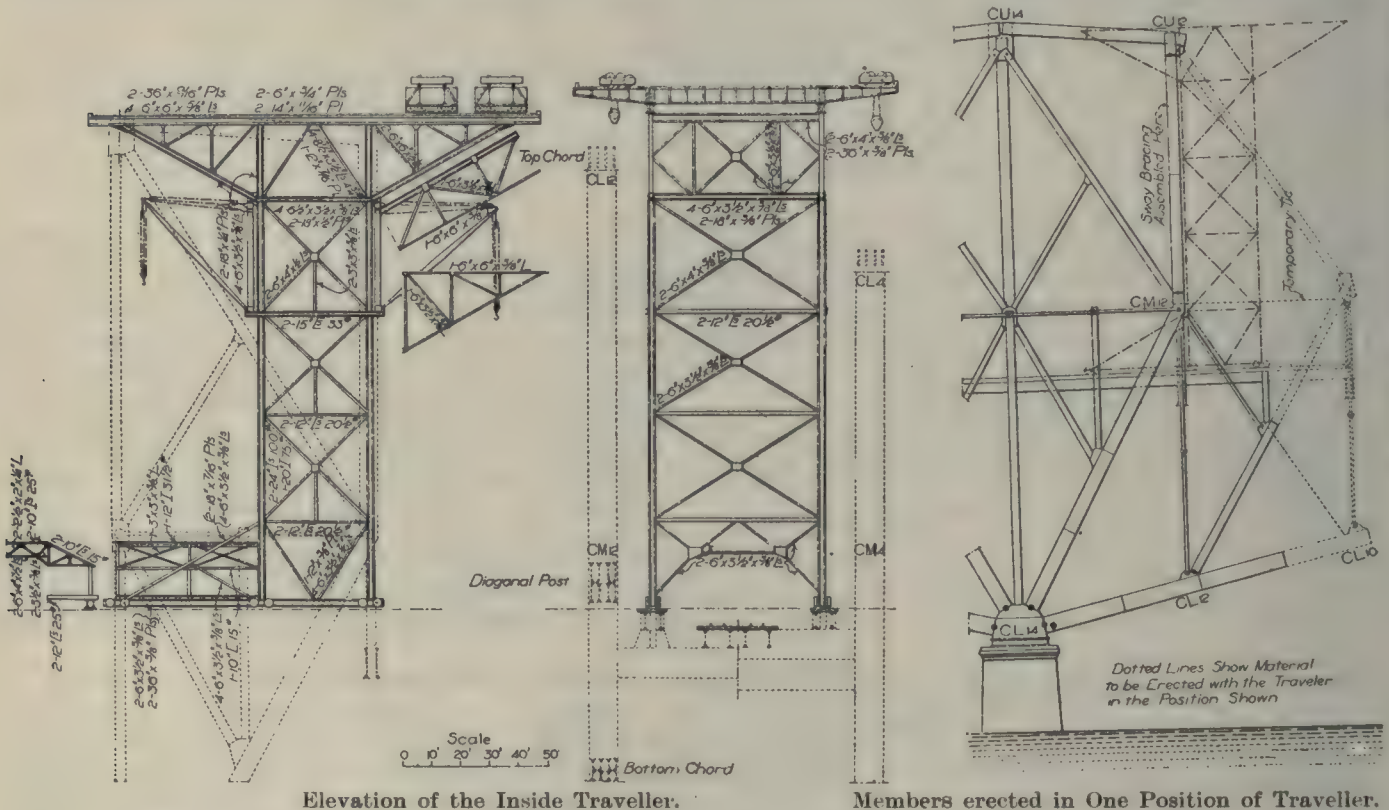
The design on which the \$8,650,000 contract has recently been awarded to the St. Lawrence Bridge Company, of Montreal, for the fabrication and erection of the superstructure of the Quebec Bridge is for a very much heavier, stronger and more costly structure than the original bridge design of the Board of Engineers, and from the designs submitted by other bidders, says the Engineering Record. It restores the length of the main span to 1,800 feet, increases the length of the suspended centre span to 640 feet, involves the construction of an entirely new substructure, and the dead weight is considerably reduced by the use of nickel steel for all principal members between the main piers, while greater mass and counterweight in the anchor arm has been secured by the use of carbon steel there. Eyebars have been eliminated in favor of rivetted tension members in the cantilever arm, but some of these have been provided with pin connections to facilitate erection. Many details of connections that were carefully developed in the official design have been retained or modified in the contract design, but the arrangement of the web members in the cantilever and anchor trusses is entirely different from that design or from that in any American bridge, and is considered statically determinate with a minimum of secondary stresses and

with no redundant members in the cantilever arms. The conspicuous omission of the members usually provided to connect the top chords of the centre spans and cantilever arms emphasizes the structural independence of the stresses. Modifications have been made in the original specifications and the present design has been carefully revised by the commission. The consulting engineers and the contractors have had the advantage of a careful study in connection with the original bridge, the great spans recently erected in the United States and the variety of designs submitted in competition with it.

The top chords and the main tension diagonals are all made of four heavy plate webs connected by very light bracing. They have a maximum depth of 78 in. for pieces 86 ft. long, thus developing great stiffness to resist flexure from their dead weight. The bottom chords have four webs 78 to 48 in. deep, with

In the cantilever and anchor arm trusses all members carry both dead and live loads excepting the four secondary ones marked X in the pier panels. All shear transmitted to points BB is taken directly down the inclined posts CC to the pier bearings, and the horizontal thrust at the points BB is taken by the tension subcord EE. Because of the shorter length of the anchor arm, the shear there will always be greater than on the cantilever arm, and the function of the diagonals DD is that of compensating braces carrying part of the shear from the anchor arm to the cantilever arm side, D1 being always in tension and D2 always in compression. The useful result of this construction is that the local distortion immediately at the pier is only that due to the compression of the comparatively short members cc, added to the depression, due to other sources of the panel point gg.

Comparison of the displacement diagram for this



full length longitudinal plate diaphragms. Both top and bottom chords are made in full panel sections of a maximum length of 86 ft. and will be fully spliced with joints made and completely riveted as the erection progresses. The web members are pin-connected to gusset plates projecting beyond the top and bottom chords so that neither of the latter have pin holes through them. The bottom chords have half-hole pin bearings on the main pedestals at the river piers, and the principal compression members in the truss webs have similar bearings at both ends. None of the compression members have forked ends, the maximum members will have a shop length of about 43 feet and a weight of about 300,000 lb., but it is believed that they can be fabricated without special difficulty.

In each panel the shear, being divided between two principal web members, is reduced to a moderate amount except in the main diagonals meeting on the river piers, and the chord connections providing for a moderate increment of stress at each panel point do not present special difficulties.

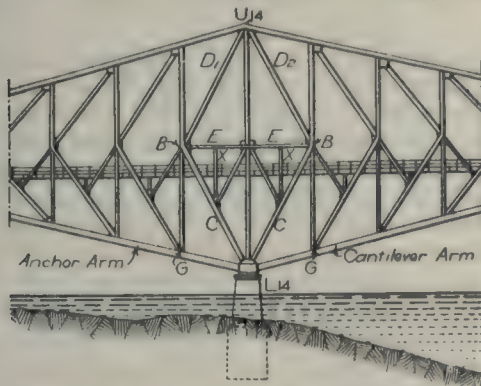
design, for the official design and for the designs previously used in cantilever bridges shows far less secondary stresses in the members connected to the main shoe in this design than in any other design examined, all of the secondary stresses in it being so small as to be considered practically negligible.

The contractors consider the greatest advantage in their design to be the ease and safety with which it is believed that the structure can be erected. Most of the members can be independently erected in due sequence. An overhang of only 42 ft., or one subpanel, is required for the traveler instead of two or three times as much which would be necessary for the erection of most of the other designs. This enables the length of the traveler to be sufficiently reduced to enable it to clear the sway-bracing at the first panel point from the end, thus permitting that bracing to be always connected up close to the traveler and maintaining the stability of the trusses as fast as they are extended. It is intended to complete the erection of

the anchor arms before commencing that of the cantilevers.

The most difficult and critical part of the work will be the placing of the 5,000-ton, 640-ft. suspended canter span which it is proposed to erect by ordinary methods at the proper height on shore falsework, which will be floated with it to position between the finished cantilever arms and connected to them. As there is here an average tide of 16 to 17 ft. and a corresponding current of six or seven miles per hour, the difficulties are great, and the feat will be one demanding the utmost skill and ability. No precedent of equal magnitude exists, but the contractors have for many years successfully employed this method of erection for numerous smaller spans, such as the Miramichi, the Fraser River, the Coteau and other important bridges.

It is proposed to erect the cantilever and anchor arms by a 600-ton steel traveler running on a special track carried on the regular floor-beams. The traveler will have a clearance of about 10 feet on each side with the trusses, and will run on two standard-gauge tracks about 54 ft. apart on centers, each carried by two lines of stringers 6½ ft. deep, borrowed



Panels at Main Pier.

from the permanent structure. The traveler will have a 36 x 54-ft. tower 160 ft. high, with a base extended in the rear to a total length of about 85 ft. It will be of riveted construction, with four vertical main columns. There will be a clearance 20 ft. high through the bottom extension for the delivery of materials to the overhang on a center service track, each side of which there will be cantilever platforms for the hoisting engine. The top chords of the overhang, about 150 ft. long over all and 54 ft. apart on centers, will form runway girders for two double cantilever traveling cranes, each of them having overhangs of 25 ft. which command both trusses with two trolley hoists of 60 tons capacity. This will enable all principal truss members to be erected simultaneously in pairs.

The facility with which the most difficult portion of the erection can be handled by this traveler is indicated by the diagram of the first two panels, C10-14, of the cantilever arm, where the traveler, supported on the semi-panel C12-13 clears all of the C12 connection and commands semi-panels C13-14. In this position it assembles all of the members indicated by dotted lines and thus completes the erection sufficiently to enable it to advance to C14 and erect the next sub-panel and so on.

Discoloration of retaining walls built in trench and temporarily backfilled along the face was avoided by using cinders, in the Bloomfield, N. J., improvements of the Delaware, Lackawanna & Western Railroad.

The walls were built in advance of the general excavation for depressed tracks, and on account of their great extent and height, it was necessary to pull the trench sheeting for re-use, the trench being filled front and back. If the original material, a reddish, sandy clay, were used or were permitted to run in against the wall face, there was danger of serious discoloration of the surface. In addition, this material was of a character such that it would stick to the wall, necessitating close approach of the steam shovel dipper in loosening it. This presented the danger of marring the wall with the dipper teeth. It was found that the cinder fill preserved a dry, clean surface, and that it flowed away from the wall toward the shovel in excavating so that it was not necessary for the teeth to approach the face closer than about 2 ft.

Cost Keeping for Contractors

A recent issue of the Journal of the American Society of Engineering Contractors contains an article entitled "Cost Keeping and Its Value in Relation to Estimating on New Work," which is significant in its substance as well as its title in that it indicates that the contractor of to-day is looking upon his business as not merely that of a good "boss," getting a maximum amount of work out of each laborer at the minimum wage, but that he is advancing it to be a profession, the laws of which should be studied and mastered if success is to be attained.

Even more significant of this than the paper itself was the discussion, in which several contractors stated their belief in this idea of contracting. One contractor whose work is largely reinforced concrete stated: "I keep a clerk on all of my work, and he has nothing to do but one thing, keep the time and keep track of the materials and their disposition. He check up materials, and that relieves the foreman of that duty. . . . It is a small job that does not pay for the clerk to keep time and check materials. I think that is as necessary as any other part of the work. If there is a bag of cement that goes over to a certain footing it is charged to that footing, and so on for other sections of the work. And all it costs to know that is the salary of the man who is taking notes of them."

Another speaker summed up the advantages to contractors of cost keeping as follows: "The old-fashioned contractor who did not keep cost records never knew whether he had made or lost money on his job until it was completed; and if he had made money he did not know on what items he had made it. He had made money on the whole job, and that is all he knew. And he used those same figures on the next job, if it was similar to the previous one; whereas, if he had kept a cost system he would have been able to bid more intelligently on work by reducing the price on some of the items where he had made more money than was necessary, and increasing the price for those items on which he had figured too low before."

The author of the article, Berton M. Laughhead, described in brief what is included in such cost keeping as follows: "In order to successfully make estimates that will enable a contractor to make safe bids, it is absolutely necessary that he keep daily records, in detail, of every branch of his work, so that on completion, he will be able from such records to compile a final cost sheet that will show him the total cost and the cost per yard of his work."

The Practical Phases of City Planning

The Experience of Well Known Experts, as given at the Recent Conference in Philadelphia—Abstracts of Principal Addresses

An excellent programme of papers and discussions was given at the third national conference on City Planning, at Philadelphia, May 15-17. A feature of the meeting was an exhibition of drawings and photographs conducted by the city of Philadelphia. The pictures illustrated the achievements of upwards of 100 cities in the United States, Canada, England, Germany and other countries.

Among those who attended the convention were Mr. Raymond Unwin, of London, Eng.; Mr. Thos. Mawson, of Liverpool University, Eng.; Mr. Thos. Adams, of London, Eng.; and City Engineer Rust, of Toronto. The attendance included, of course, the leading American experts.

Synopses of the principal papers are given below. It will be seen that these papers were confined almost exclusively to the practical phases of city planning and not to the aesthetics of the subject. The idea of the new city planning movement is not so much the "city beautiful" as the **basic plans** of the city, including streets and parks, and the relation of public and private buildings to each. It is the practical side of the work which demands the more serious consideration at this stage.

The main topics chosen for each of the seven sessions were as follows: (1) Municipal Real Estate Policies; (2) Public Buildings in General and Their Location in Reference to Parks and Open Spaces; (3) Buildings in Relation to Street and Sites; (4) Taxes, Assessments and Condemnation; (5) Dock and Harbor Improvements; (6) Street Widths and Their Subdivisions, and (7) A Uniform City Planning Code.

German Municipal Real Estate Policies

Some of the work done by German cities in city planning was outlined by Mr. Frederick C. Howe, of Washington, D.C. A German city enjoys almost supreme home rule. The American city is subject to legislative control. Every German city now has a plan formulated by landscape architects and by engineers and other specialists working together. Many German cities are large owners of land from which heavy revenues are derived. The cities have adopted the policy of "excess condemnation," or taking more land than is required for city improvements, selling the surplus at sufficient profit to pay for all or a part of the cost of improvement. The taxation of the unearned increment is also common. In some cases this tax amounts to from 33 to 40 per cent of the increase in its value. Mr. Thomas Adams, city planning expert of the local government board of England, opened the discussion on Mr. Howe's paper.

Public Buildings, and Their Location in Parks and Other Public Open Spaces

A paper on "Public Buildings" was presented by Mr. Ernest Flagg, of New York city. After showing how the advent of steel skeleton buildings in America had been really the introduction of a new type of construction rather than a new type of architecture,

and remarking that the recent introduction of steel construction in France bids fair to be accompanied by complementary architectural development, Mr. Flagg made some remarks on the height and location of public buildings.

He asked whether we are likely in this country to use low structures for public buildings or out-Herod Herod by making our public buildings even taller than our business structures. He thought the latter was likely, and predicted that within 25 years American cities would be running up public buildings 2,000 ft. in height. He brought in here his suggestions, previously made public, looking to a limitation on the height of that portion of buildings occupying a space equal to the whole ground area, but with no limit to the height of the tower portion of the buildings.

As regards sites for public buildings, he suggested that we might in this country well follow the example of European cities in clearing slum areas for city re-planning purposes and in utilizing a portion of them as sites of public buildings. When public buildings are located in an old business center, they add but little to the taxable value of the district and destroy old landmarks. By going a little to one side of business centers, land could be secured at low cost and the value of the whole district be materially increased by the erection of public buildings.

Mr. Frank Miles Day, of Philadelphia, read a paper on "The Location of Public Buildings in Parks and Other Open Spaces." He called attention to the large sums of money often expended in the acquisition of lands for public parks and squares and the continental pressure which is being brought upon public authorities to place public and semi-public buildings within these areas.

In essentially park areas, whose original justification was their sylvan landscape effect, buildings are generally an intrusion. There may be cases, however, where a portion of park land is naturally separated from the remainder or perhaps surrounded by buildings in such a way as to make it advisable to use these special areas as sites for public buildings.

Mr. Thomas Mawson, of the University of Liverpool, England, took exception to a statement by Mr. Day that architectural objects are out of harmony with rural landscapes. Mr. Mawson thought that instead architectural objects give a poetic and romantic touch to parks.

Mr. F. L. Olmsted remarked that a park now without a public building, which would be better if it had one, was faulty in its original design. Where architectural features mar parks and open spaces, this is usually due to haphazard location of the buildings or a vacillating policy. Sometimes to re-design a park is necessary on account of an original mistake in laying it out or because of changed conditions. The Museum of Natural History did not invade Central Park, New York, but instead a piece of land not suited to the general purposes of Central Park and partly

separated from it was completely cut off and dedicated to a new purpose.

In planning new tracts or additions to cities, it is advisable to make reservations for future public use, final use to depend upon circumstances. Some of these areas may finally be occupied by public buildings.

A member from Baltimore remarked that boulevards in open spaces in that city would have saved a large part of the fire loss which took place at the time of the great conflagration there. He also said that using small open spaces for buildings was generally an example of trying to get something for nothing.

Buildings in Relation to Street and Site

This subject was introduced by Mr. Lawrence Veiller, of the National Housing Association, New York city. As an illustration of the fact that city planning is not a full solution to the housing problem, he said that Washington is one of the best planned cities in the world and has some of the worst slums. City planning has three important relations to housing: (1) regulations of heights of buildings; (2) depths of lots, and (3) width of alleys.

Mr. Veiller presented his subject largely from the viewpoint of the housing of the so-called working classes, with particular relation to populations of foreign origin and but small earning capacity. All sentimentalities aside, and viewing only the known habits and financial limitations of these classes, the best means of housing them is to limit lot depths to 25 ft. and build rows of houses occupying the full depth of the lots. Such houses would be only two rooms deep, and thus every room would have light and air. Where great masses of people must be housed, back yards and play places have generally been a failure. Where land is reserved for front or rear yards it soon becomes bare ground and littered with rubbish. It is, therefore, useless to provide more space than what is required for light and air. Even in relatively small towns there is a remarkably strong opposition to any limitations put upon the utilization of land for building purposes.

It should be clearly understood that the 25-ft. solidly-built-up lot is designed only for unskilled laborers with limited means and desires. The author suggested more liberal provision for other classes of laborers, such as lots of 50 ft. and 125 ft. in depth. He remarked that to get away from the uniform street and block plans would be a revolutionary step in city planning in America, but submitted the proposition as an eminently practical one worthy of consideration.

The alley was characterized by Mr. Veiller as both a blessing and a curse. It has value for light and air purposes, but is generally an evil through becoming a dumping ground for all sorts of cast-off material, besides harboring serious nuisances. In a number of cities alleys are not a distinct evil. Where they exist they should be paved, lighted and cleaned by the city, receiving the same treatment and care as streets.

As to the regulation of heights of buildings, the author remarked that hotels and some office buildings must be high in practically all cities of any size, but that outside of New York city there is sufficient room to render tall buildings for general use unnecessary. The first thing to be done is to get streets right as to widths, and then to make the buildings conform to

the widths of the streets. Outside of New York and Boston there is no reason why building heights should not be limited to the widths of the streets. As a rule, a height of six stories should not be exceeded except in selected areas.

English Experts' Views

Mr. Raymond Unwin, of London, England, author of "Town Planning in Practice," said that he believed that city planning could be made to do more for housing than Mr. Veiller thinks. In densely populated England a space of 15 ft. is required at the rear of each house line, or 30 ft. in all between rear house lines, and the height of the house is limited to three storeys. Mr. Unwin also took issue with Mr. Veiller's ideas as to the advisability of providing garden spaces for laborers. He urged that sanitary abuses in alleys should be prevented instead of permitted. He thought that the block dwelling so common in the United States, and which is sometimes displacing the single dwelling in England, is very harmful. Some of the population should be carried into the suburbs, as in the garden cities and garden suburbs. The British Town Planning Act, he remarked, provides for controlling all these matters.

Mr. Unwin stated that streets are the most expensive and disagreeable form of open spaces that can be provided for the people. Building fewer houses to the acre but slightly increases the rental value of the house and grounds combined. Estimates show that three times the lot area can be provided for only 25 per cent. additional rental charge.

Mr. Thomas Adams, of London, said that the people of England are not docile, but that those of this country are. The English people refuse to be shut off from nature. He suggested that Mr. Veiller read the British Town Planning Act and learn that planning and housing are intimately related. The growth of cities must be directed into the suburbs. The alternative is not between ownership and tenantry.

In closing the discussion, Mr. Veiller mentioned some of the obstacles he had encountered during his fifteen years' work in attempting to bring about housing reform in American cities and to secure needed housing legislation in American states. So far as the population to be housed is concerned, we have to deal here with people from every country on the globe, which is very different from dealing with the homogeneous population of English cities. As an illustration of the difficulties encountered in securing legislation which will interfere with the personal liberties of the American citizen, Mr. Veiller said that for some weeks an attempt, thus far unsuccessful, has been under way to get an act through the Pennsylvania Legislature requiring that there should be one water faucet in every Philadelphia tenement; also, that while the health department of Philadelphia has the right to enter tenements for sanitary inspection it has a right to enter private houses for that purpose.

Street Widths and Their Subdivision

Mr. Nelson P. Lewis, M. Am. Soc. C. E., chief engineer of the board of estimate and apportionment, New York city, and chairman of the conference committee on Street Planning, introduced the above-named topic by remarking that readjustments of widths of old streets is sometimes possible and necessary, and may be effected by narrowing sidewalks and removing sidewalk obstructions, as has already been

done on 5th avenue, New York City, and as is now under way or proposed for several other overcrowded thoroughfares.

The first paper presented at this session was by Mr. Charles Mulford Robinson, civic adviser, Rochester, N. Y. The paper was entitled "Narrowing of Minor Residence Streets as Affecting Tenant and Owners," and was summarized from the chapters of a forthcoming book on "The Width and Arrangement of Streets," by M. Robinson.

Minor residence streets, Mr. Robinson remarked, are more numerous than those of any other class. A rigid adherence to standard street widths, regardless of the character of the streets and their occupants, places unnecessary burdens on abutting property, on account of the heavy cost of improving the street surfaces—and the speaker might have added because of the unnecessary cost of the land itself. This discourages development. Narrower streets would divert traffic to streets better designed to carry it, and would thus diminish the up-keep and lengthen the life of the pavements of the minor streets. Where wide streets are needed for through traffic in residence districts, the cost and excessive needs of local traffic might be placed upon the town as a whole. Considerations of this character are particularly important where the number of houses to the acre is limited, as is now being done in England.

Mr. John Nolen, landscape architect, Cambridge, Mass., submitted a paper on "Standardized Street Widths." His basis for standardization is the required unit width for a line of vehicles in the roadway and a line of pedestrians on the sidewalk. He gave standard street widths adopted in Washington, D. C., and a number of German cities, and suggested a tentative standard for American cities in general to be adapted according to local circumstances.

In discussing the paper just outlined, Mr. B. A. Haldeman, engineer in charge of city planning, Bureau of Surveys, Philadelphia, said that scientific study of each street problem is more important than any rules. It is always necessary to do more or less re-planning. The most essential consideration is a wiser regard for the needs of the city, which should dominate private interests. The control of street planning should be vested in a strong administrative body.

Two important considerations are standard unit widths and the provision of an elastic street. Since there is no likelihood of legislation fixing the width of vehicles, the assumption of a unit vehicle width of 9 ft. would perhaps be wiser than 8 ft. An allowance of 2 ft. as a pedestrian unit might be assumed. A planting space of 4 ft. for narrow and 8 ft. for wide streets might also be assumed.

The elastic street would combine present economy with the possibility of a future increase in capacity. It might begin with a width of two vehicle units for a roadway, or 18 feet, with 6 feet for each sidewalk, or a total width of 30 feet. The understanding, of course, is that streets under the elastic plan would be widened as traffic increased, but that meanwhile abutting property owners would have the reserve space virtually added to their front lawns. In conclusion, Mr. Haldeman said that skill, courage and power are more important than rules when dealing with street problems.

A paper on "The Street Surface" was next presented by Mr. Geo. W. Tillson, M. Am. Soc. C. E., now Consulting Engineer of the Borough of Brook-

lyn, New York City, but until recently Chief Engineer of the Bureau of Highways, Borough of Manhattan. The greater part of Mr. Tillson's paper consisted of a discussion of the various classes of city pavements. In his prefatory remarks, Mr. Tillson suggested a classification of streets into wholesale, retail and residential, with the idea of apportioning relative widths of roadway and sidewalk and choosing the pavement to suit various classes. Obviously, sidewalks for wholesale streets could be narrower and the roadways wider, relatively speaking, than those of retail streets. A roadway 42 feet wide might be allowed with two 9-foot sidewalks. The roadway width is based on an allowance of 13½ feet on either side of the street for trucks being loaded, and 15 feet for clear roadway for traffic, it being assumed that there would not be a continuous line of trucks under processes of loading on each side of the street.

"The Sub-Surface" of streets was considered in a paper by Mr. Geo. S. Webster, M. Am. Soc. C. E., Chief Engineer, Bureau of Surveys, Philadelphia. Since 1902, no vaults have been allowed beneath the Philadelphia streets nearer than four feet to the surface, the prohibition being designed to give space for pipes and wires. No underground structures are allowed in Philadelphia for which a permit has not been secured from a board of city officials created for that purpose. Records of all permits and of construction are kept. The permit fees more than cover the cost of drafting, clerical and inspecting forces.

The Principles of a Uniform City Planning Code

The final session was devoted to this topic, and was presided over by Mr. Walter L. Fisher, Secretary of the Interior Department, Washington, D. C. The subject was introduced by Mr. A. W. Crawford, Assistant City Solicitor of Philadelphia, who stated that the Hartford Commission on City Planning affords a precedent which may well be followed elsewhere, especially as it does not create a new administrative body to usurp the powers of already existing city officials.

Although the subject given on the programme called for a planning code, Mr. Crawford stated that, in order to let each proposed grant of additional power to cities stand or fall (in the courts) by itself it had been thought best to submit a series of city planning acts, each dealing with separate subjects. Accordingly, one bill accompanying the paper (which was to a degree a report of the Committee on Legal and Administrative Methods) would permit cities to plot vacant areas and to reserve portions for public purposes without defining the use to which these reservations should be devoted. Another bill would authorize cities to place a limit on the heights of buildings in specified portions of the city. Still other acts contemplated would provide, among other things, for excess condemnation.

In discussing the topic for this session, Prof. Ernst Freund, of the University of Chicago Law School, recorded an objection to excess condemnation, either as a means of making profit for a city or of restricting the character of buildings adjacent to city improvements. He preferred an assessment of benefits for raising the cost of improvements, and he also preferred to condemn easements for restrictions on the use to be put to adjacent property. He did not believe in cities controlling the action of individuals as to the character of improvements made by them. He thought that a city planning commission should

not be forced on a city, and that the powers of such commission should be advisory; also, that city planning commissions should have the authority to employ experts from outside their own city.

Mr. Frank B. Williams, of Hartford, Conn., and New York city, questioned whether in the formation of city plan commissions the aim should be to make a commission of experts wholly or in part. He said that as a rule men available for service on city planning commissions could not find the time to give unpaid expert services to the city, while in the smaller cities it was not always possible to find experts in the various lines. Mr. Williams also was of the opinion that it may be possible to do much good city planning or improvement work through the exercise of the health and police powers, especially as regards the relief of congested districts.

Mr. F. L. Olmstead said that the matter of restrictions on the development of the land by its owners might be subject to the local-option principle, under which a certain percentage of the property owners in a given district might agree on restrictions which would then become applicable to the district as a whole.

Mr. Thomas Adams remarked that the British Town Planning Act had for the first time introduced into legislation the word "amenity" in addition to health as an object to be attained through municipal action. Commenting on the remarks of the previous speaker to the effect that the City of Frankfurt, Germany, has never yet exercised the much-advertised powers given it a few years ago to take small irregular tracts of land from private owners and reapportion them so as to give better building sites and improve the city plan. Mr. Adams remarked that in England it had been found that compulsory powers are necessary in order to secure friendly agreements.

The Increasing Height of Office Buildings

The construction of office buildings from twenty to thirty storeys high, some of them with towers of large dimensions nearly doubling their height, has ceased to be unique and calls for consideration of the type, says the Engineering Record. Many structural features of such buildings, carried to extremes, are illustrated in the Woolworth building, New York City, which will rise 840 ft. or more above the bottom of its deepest foundation, and will probably involve a total expenditure of over \$10,000,000. Many things that are of importance in ordinary tall official buildings become grave problems in such a structure; their importance, complexity, and occasionally their novelty, require the most thorough investigation.

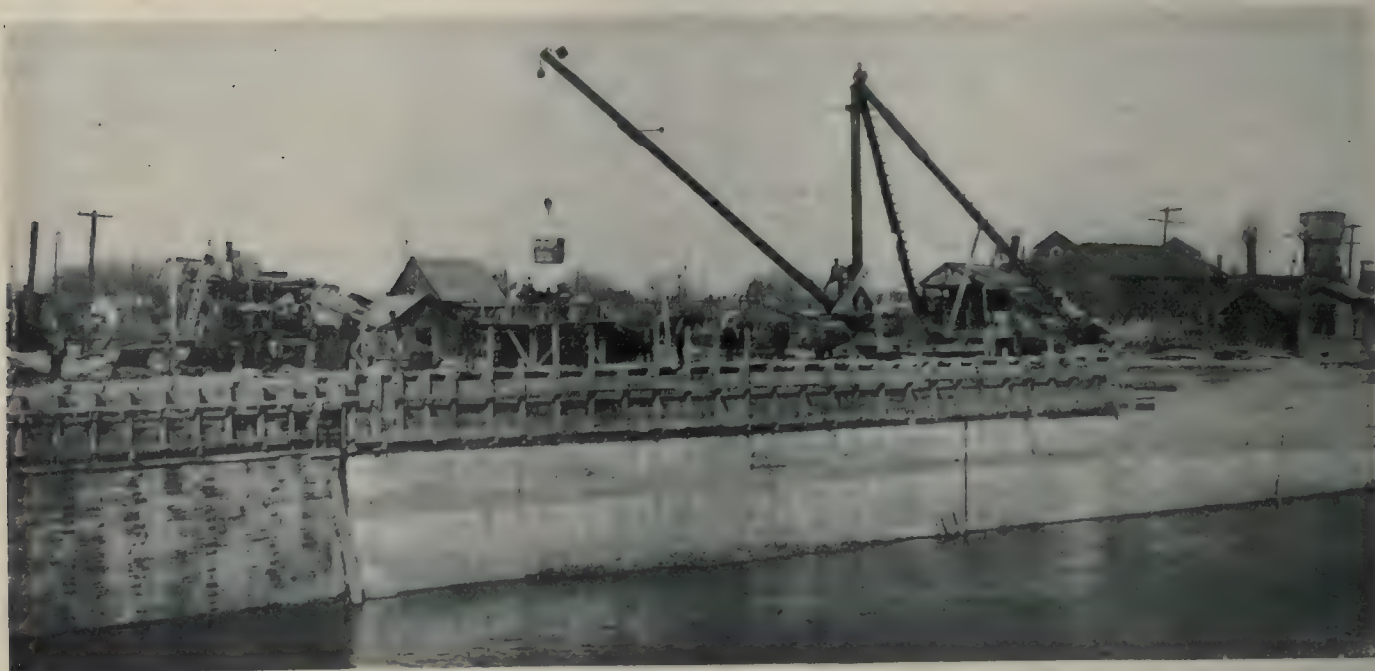
The best present practice reasonably safeguards life and adjacent property during the construction of the building, provides strength and stability for static loads and wind stresses, and assures protection against structural collapse from fire. But there are other qualities which are desirable in moderately tall buildings, although they have not generally been sufficiently considered, which become vital for these great towers. There should be, for example, special provision against structural deterioration from insidious causes like rust, electrolysis, fatigue of metal and possible abuse. Extreme precaution should be taken against the possibility of even the smallest piece of exterior stone, terra-cotta, tile or metal work becoming detached and falling from a great height to the

street. Slight earthquake shocks are a matter of record even in New York, and it is not certain that more severe ones may not occur. While the well-braced framework necessary to withstand wind pressures would probably endure any seismic vibration not sufficient to wreck the whole city, these would be greatly magnified by the height of the structure, and might produce the most disastrous disintegration between the steel work and the walls and other portions of the structure. Ordinary fire precautions will not suffice. The protection system must, of course, be entirely independent of the street service, and while the structure itself may be entirely fireproof, every room in it is a potential furnace because it may be filled with inflammable material, and unless all exterior windows are safeguarded flames may, in spite of fireproof floors, corridors and shafts, pass rapidly from storey to storey by breaking out of the lower windows and into the upper ones. Tenants occupying the upper floors should be safeguarded not only from actual flames but from smoke, panic and disabled elevator service.

No absolute necessity for these very tall buildings is recognized. The plea has, of course, been for the utmost utilization of exceedingly costly ground space and on account of the great congestion of the business districts where they are located. So far as the latter consideration is concerned the cure aggravates the disease, because the added thousands of tenants greatly increase the pressure in the already crowded streets and by overtaxing the inadequate transportation facilities make bad conditions worse. Excessively tall buildings can be municipally desirable only under special conditions which will permit of suitable proportion, artistic treatment and effective display, as, for instance, where they can be located on adequate areas in parks, or occupy commanding squares with unimpeded vistas through approaching avenues. The construction of exceedingly tall buildings on small sites in narrow streets makes chimney-like monsters never really pleasing to the eye, injurious to the usefulness of the narrow streets and greatly depreciating adjacent property.

The principal advantages of the very tall buildings are the opportunities they provide for the concentration of large allied interests and the pleasant quarters afforded tenants in the upper storeys, where the light, air and view are superior to those of ordinary office buildings. Careful analyses and estimates made a number of years ago indicated that office buildings about sixteen storeys high yielded the maximum percentage of profit on investment in the financial district of New York. Although the profitable heights of buildings may have somewhat increased with increasing values of real estate, it is significant that many tall buildings have considerable unrented space, and that it is claimed that the average net revenue from them amounts to only about three per cent. on the total investment.

At Vancouver, B.C., all the affiliated trades connected with the Building Trades Council have threatened to go out on strike unless the Master Builders' Association meets the demands of the carpenters, who are asking \$4.50 for an eight-hour day. Four thousand workmen are said to be associated with the Building Trades Council. Contractors state that at present they can get all the men they need. Large numbers of new arrivals continue to reinforce the employers.



Fallon Bros.' Contract on the Cornwall Canal.—The completed concrete wall.

Cornwall Canal Improvement

Good progress is being made on the work of improving the upper entrance to Lock 17 of the Cornwall Canal, for which Messrs. Fallon Bros., of Cornwall, Ont., have the contract. The concrete wall, which extends some 700 feet from the lock, is completed, and steamboat men are now taking advantage of this long-felt want. The bottom for the cribs was prepared by dredging, and the material was cast over and saved to make the back fill after the wall was completed. The cribs were built of white pine to water level, and entirely covered with five feet of concrete. The gravel was fed to the concrete mixer by slush scraper and steam hoist, and the concrete was taken from the mixer in centre dump pier buckets and travelling derrick. Where the concrete was deposited over cribs at the outer end it was conveyed in side dump cars of English make, and hauled by another steam hoist. While 2,400 cubic yards of concrete were put into this work within twenty days, not one foot of gravel was shovelled by hand.

The waste weir on the south side of the canal to the river St. Lawrence, which is now about complet-

ed, is an exceptionally fine piece of work. It is the only entire concrete weir on the canal. At present the contractors are doing their back filling behind wall with a specially made scraper worked by steam hoist.

Messrs. Fallon Bros. have another contract of about the same nature at the upper entrance to Lock 19, and work will be commenced at once.

Mr. John H. Smythe is superintending the construction for the contractors.

An Example of Inadequate Specifications

The following sentence is copied from a set of specifications covering many different classes of work, the job for which they were used having a large amount of concrete construction: "Concrete shall be mixed in the manner prescribed by the engineer, and of such proportions as the engineer may direct."

It is needless to say that nothing could be more indefinite than this clause, yet even by following it injustices can be inflicted, says The Contractor. It would seem that when specifications are so indefinite that it would be better not to have any specifications to govern the work. But few would agree with this statement owing to the fact that although some class-



Cofferdam built and forms nearly ready for concrete



Track system for transporting contractors' material

es of work might be poorly covered yet others may be described in great detail. In considering this clause we must first look into its origin.

No doubt such a clause was inserted in the specifications when concrete was but little used, and the amount of that class of work was always insignificant. In those days there were few, if any, mechanical mixers on the market, so that nearly all concrete was mixed by hand. Thus the contractor was to consult the engineer as to the method of mixing, that is, was sand and cement to be first mixed then water added, or was the concrete to be mixed dry, and then made wet, and how much water was to be used.

But with the introduction of many makes of mixers such questions were forgotten and the interpretation of the clause changed. The question to be decided was whether or not the concrete was to be mixed by hand or by machine, and if by the latter, what style of machine would be permitted. Here is where an injustice can be done the contractor. Under the specifications the engineer could prevent a mixer being used, compelling the contractor to mix all the concrete by hand, or if a mixer is allowed, the engineer could refuse to have on the job certain makes and styles of machines. These are not suppositions, but the editors of this journal have known of actual cases of these kinds, and contractors have been compelled to use methods and machines that made his work more expensive. This shows the necessary cutting out of specifications where the clauses have outlived their usefulness.

The second part of the provision quoted relates to the proportion of the materials to be incorporated in the concrete. Nothing affects the cost of concrete more than when the ingredients vary, and it is an easy matter to set forth the various proportions to be used. Even if the kind of structure to be built is not known, it is still possible to make the specifications definite. When it is not done the contractor is very apt to suffer. If he bids on a 1:3:5 mixture, it may be changed to a 1:2½:5 or even 1:2:4, and the cost will be increased. On the other hand the owner may be made to pay an excessive amount for the work, owing to this element of doubt.

A method in this connection, that is to be commended, is the dividing of the concrete work into classes, as Class A, Class B and so on. Thus the specifications can be definite as to each class, although on some work there may not be used concrete of certain classes, while if there is work to be done the specifications are explicit and the contractor has named a price for the work.

Some specifications go a step farther by providing for the different classes of concrete and obtaining a price on each class with forms and without forms. This is done to obtain more economical construction, and should be welcomed by contractors.

From these remarks it is evident that there should be no need of writing specifications as indefinite as those from which we have quoted.

Street Names on Concrete Curbs

Arkansas City, Kans., makes a practice of placing the street names on the top of the curb in the line of the sidewalk paving. The city owns a set of brass letters which are in charge of the city engineer, and these are loaned to the contractor to whom any curb and gutter work is awarded. These letters are brass,

3½ inches high and 1½ inches wide. With these the letters forming the street name are driven into the concrete while it is green, thus leaving the name depressed in the top face of the curb. These letters are sold by dealers in concrete workers' tools at from 15 to 25 cents each. Arkansas City has a population of 10,000 only. In a larger place where there is considerable amount of curb construction it would probably be profitable for each contractor to own his set of letters.

Estimating Buildings by the Square Foot

The subject of estimating the cost of a building at so much per cubic foot has received more or less attention in the trade press, with the result that a great diversity of opinion as to the merits of such a basis has developed.

The topic, however, has by no means been exhausted, and some interesting comments as to estimating the cost on a square foot basis are contributed by E. P. Hoerr to a recent issue of the National Builder.

The author states that every now and then we hear of a contractor and builder who estimates building on a cubic foot basis, using as the foundation of his estimates the cost per cubic foot of a contract he may have previously executed. Continuing he says:

"We are rather inclined to doubt the wisdom of estimating in this manner, for there are bound to be so many points at variance in the different buildings. These differences are, of course, considered, but is it not rather too much "guess work" to add or deduct here or there for these differences?"

"Let us suppose, for instance, that a contractor kept close cost on a house just built by him; say it was a frame building 26 feet wide by 32 feet deep with gable style. The studs and joists were of yellow pine, likewise the sheathing and under floors. The foundation was of concrete, the cellar floor being also concreted. There were two porches, front and rear of concrete and wood. The interior finish was of plain red oak throughout, with plenty of cabinets, bookcases and mantels. The top floors were also of oak corresponding to the finish of the rooms. The cost of this house was, say 15c. per cubic foot.

"Now he has placed in his hands a set of plans where the house is 36 feet front by 30 feet deep, with peak roof. The specifications called for Northern lumber to be used in its construction. The foundation to be entirely of stone and the cellar floor to be concrete. Only one porch is to be built in the front entirely of wood. The interior finish to consist of birch, oak and yellow pine. There are to be cabinets, bookcases, etc., but entirely different in size and style from those on the other job. Naturally there were many smaller differences.

"We surely know that the same square foot basis would not hold good on the two houses, but is it possible to even use it as a basis, and take up differences by adding or deducting? Would it not be better to figure anew? Seems like a too uncertain way of doing so important a thing.

"It's true, of course, that estimating at its best is in a sense a guess. But let a man take up the various sections one by one, considering each part singly, then put them all together as a whole, and he will come much nearer to the right cost than if he took it up as a whole in the first place."

Specifications for Reinforced Concrete

The Standard Building Regulations Adopted by The Canadian Cement and Concrete Association — A Satisfactory, Well-Balanced Code

The following specifications were adopted by the Canadian Cement and Concrete Association at their last convention in Toronto and are published in the annual report and proceedings of the association. The members of the special committee which brought in these regulations were Messrs. Peter Gillespie, Gustave Kahn and C. R. Young, Toronto, and J. A. Jamieson, Montreal. The report contains, in addition, a number of valuable papers given at the meeting. Copies may be obtained from Mr. Snaith, secretary-treasurer of the association, 57 Adelaide street east, Toronto.

I. General

1. Height of buildings.—There shall be no fixed limit to the height of buildings of reinforced concrete except that arising from the requirements of these regulations.

2. Plans and computations.—Before permission is granted by the Building Department to erect any reinforced concrete building, complete plans, accompanied by specifications, signed by the engineer and architect, must be filed with the Building Department and remain on file for public inspection until the building is completed.

3. The Building Department shall have access to the computations. These shall give the various loads assumed, such as dead, live and wind loads, the impact allowance, if any, and the resulting maximum stresses.

4. Specifications.—The specifications shall state the qualities of the materials to be used for making the concrete, and the density and strength required.

5. Certificate of carrying capacity.—Upon the completion of the building the engineer and architect shall issue, under the approval of the Building Department, signed certificates, to be posted on each floor of the building, stating the safe carrying capacity per square foot.

6. Records.—There shall be kept, for the inspection of the Building Department, careful records of the progress of the work. These records shall show the date of placing of all the concrete, the date of removal of the forms, and they must be turned over to the Building Department when the building is completed.

7. Walls.—Reinforced concrete walls may be used in place of brick or stone exterior or bearing walls with thickness reduced to two-thirds the thickness specified for brick walls. Such walls shall not be less than four (4) inches thick.

8. Reinforced concrete walls shall be reinforced at both faces. The maximum spacing of bars in the same vertical plane shall be 18 inches on centres. The quantity of metal employed shall be sufficient to provide for a uniformly distributed horizontal pressure of 30 pounds per square foot acting on either side of the wall.

II. Materials

9. Cement.—Only Portland cement shall be used in reinforced concrete structures which meets the requirements of the specifications of the Canadian Society of Civil Engineers.

10. Tests of the cement used in building operations shall be made from time to time under the supervision of

the Building Department and in accordance with the preceding specifications.

11. Fine aggregates.—Fine aggregates shall consist of sand, crushed stone or gravel screenings graded from fine to coarse and passing, when dry, a screen of quarter-inch mesh. Not more than six per cent. shall pass a screen having 100 meshes to the lineal inch. They shall be of clean, silicious material free from vegetable loam or other deleterious matter.

12. Mortar.—Mortars composed of one part of Portland cement and three parts fine aggregate when made into briquettes shall show a tensile strength at least equal to the strength of 1:3 mortar of the same consistency and age made with the same cement and standard Ottawa sand.

13. Coarse aggregates.—Coarse aggregates shall consist of inert material graded in size, such as crushed stone or gravel, which is retained on a screen of quarter-inch mesh. The particles shall be clean, hard, durable and free from all deleterious material. The maximum size of the coarse aggregates shall be such that they will not separate from the mortar in laying and will flow readily around the reinforcement and into all parts of the forms.

14. Cinder concrete.—Cinder concrete shall not be used for reinforced concrete structures; it may be used for fire-proofing. Where cinders are used as the coarse aggregate, they shall be composed of hard, clean, vitreous clinker, free from sulphides, unburned coal or ashes.

15. Medium steel.—Medium steel for reinforcement shall have an ultimate tensile strength of 58,000 to 66,000 pounds per square inch, an elastic limit of not less than one-half the ultimate strength and a minimum percentage elongation in 8 inches of 1,500,000 divided by the ultimate strength. In all respects not covered by this specification, medium steel shall conform to the requirements of the general specifications for steel bridges and viaducts of the Department of Railways and Canals, Canada, 1908.

16. High elastic limit steel.—High elastic limit steel for reinforcement shall be made entirely from new billets and shall have an ultimate tensile strength of 80,000 to 96,000 pounds per square inch, an elastic limit of at least half the ultimate strength, and a minimum elongation in eight inches of 1,200,000 divided by the ultimate strength. It shall bend cold 180 degrees around a pin the diameter of which is four times the thickness of the bar without showing fracture on the outside of the bend.

17. Rust, scale and dirt.—All loose rust, scale or dirt shall be removed from reinforcement steel before it is placed in the work.

III. Design

1. General Assumptions

18. The ratio between the moduli of elasticity of steel and concrete shall, for a concrete crushing at 2,000 pounds per square inch in 28 days, be assumed at 15.

19. The compressive stresses in a reinforced concrete beam shall be assumed to vary directly as the distance from the neutral axis.

20. The tensile resistance of concrete shall be assumed to be zero.

21. T. Beams.—Where adequate bond between slab and web of beam is provided, the slab may be considered as an

integral part of the beam, and its effective width may be determined by the following rules:

- (a) It shall not exceed one-fourth of the span length of the beam.
- (b) Its overhanging width on either side of the web shall not exceed four times the thickness of the slab, nor twice the thickness of the web.
- (c) Where the slab extends on only one side of the beam, it shall be permissible to consider as effective flange area, an overhanging width not greater than four times the thickness of the slab or twice the thickness of the web.

2. Bending Moments

22. Moments on slabs and beams.—In computing the positive and negative moments in beams and slabs, continuous over several supports, due to uniformly distributed loads, the following rules are recommended:

- (a) That for floor slabs the bending moments at centre and at support be taken at $\frac{w l^2}{12}$ for both dead and

live loads, where w represents the load per lineal unit and l the span length.

- (b) That for beams the bending moment at centre and at support for interior spans be taken at $\frac{w l^2}{12}$ and for end spans be taken at $\frac{w l^2}{10}$ for centre and ad-

joining support, for both dead and live loads.

23. Distribution of loads on slabs.—Floor slabs shall be designed and reinforced as continuous over the supports. The distribution of loads longitudinally and traversely in slabs reinforced in both directions shall be determined by the following formula:

$$r = L_1 \div (L_1 + B_1)$$

where r is the ratio of the load carried transversely to the whole load, L is the length and B the breadth of the slab. If the length of the slab exceeds 1.5 times its width, the entire load shall be assumed to be carried by the transverse reinforcement. Square slabs are preferably reinforced in both directions using reinforcement in each direction calculated for one-half the specified load.

24. Distribution of loads on beams.—The loads carried to beams by slabs which are reinforced in two directions will not be uniformly distributed to the supporting beams, but may be assumed to vary as the ordinates on the sides of an isosceles triangle, the base of which is the length of the beam. The moments in the beams should be calculated accordingly.

3. Working Stresses

25. The working stresses proposed below are for a concrete the ultimate crushing strength of which at an age of 28 days is 2,000 pounds per square inch. For concrete of greater or less compressive strength, proportionate increments to, or reductions from, the proposed stresses shall be made.

(a) Bending.—The maximum allowable compressive stress on the extreme fibre of beams shall be 650 pounds per square inch.

(b) Direct compression.—The maximum allowable compressive stress on concrete in columns without hoops, or in columns reinforced with less than one per cent. of hooping, shall be 500 pounds per square inch.

(c) Pure shear.—Pure shearing stresses, uncombined

with tension or compression shall not exceed 120 pounds per square inch.

(d) Diagonal tension.—Shearing stress combined with diagonal tension shall not be greater than 40 pounds per square inch.

(e) Bond.—The maximum allowable bond stress between concrete and plain steel shall be 60 pounds per square inch, and between concrete and deformed bars approved by the architect or engineer, 120 pounds per square inch.

(f) Tension in steel.—The tensile stress on steel reinforcement shall not exceed one-half of the elastic limit of the steel nor in any case 16,000 pounds per square inch.

(g) Columns.—Columns reinforced with longitudinal reinforcement only, shall be figured for a working stress in the concrete of 500 pounds per square inch and in steel, a stress of 7,500 pounds per square inch.

(h) Columns with at least one per cent. of reinforcement in the form of bands or hoops shall be figured at a working stress of 500 pounds per square inch on the concrete.

(i) Columns reinforced with at least one per cent. and not more than four per cent. of longitudinal bars and with at least one per cent. of reinforcement in the form of bands or hoops, or with structural steel column units which thoroughly encase the concrete core, shall be figured at working stresses of 650 pounds per square inch on the concrete and 9,750 pounds per square inch on the longitudinal reinforcement.

4. Details of Design

26. Spacing of bars.—The lateral spacing of bars should not be less than three diameters, centre to centre, nor should the distance from the side of the beam to the centre of the nearest bar be less than two diameters. The clear spacing between two layers of bars should not be less than one inch. In no case shall the minimum thickness of fireproofing be less than that specified by the Building Department.

27. Web reinforcement.—In the calculation of web reinforcement to provide a strength of 120 pounds per square inch, which is assumed to be the maximum permissible vertical shearing stress on beams no matter how well reinforced for diagonal tension, the concrete may be counted upon as carrying one-third of the shear, or for 2,000 pound—concrete, 40 pounds per square inch. The remainder may be provided for by means of metal reinforcement consisting of bent bars or stirrups, but preferably both. The area of a stirrup, acting in tension, must be proportioned to the force equal to the whole horizontal shear produced between the two adjacent stirrups less the amount to be carried by the concrete. This total horizontal shear may be found by multiplying the distance between the stirrups by the average horizontal unit shear, which is equal to the vertical unit

shear, and is represented by the expression $\frac{V}{d}$ where V is

the total vertical shear not carried by the concrete and d is the depth of the beam to the centre of the steel. In accordance with this method, the stress is a vertical stirrup

will be equal to $\frac{V_s}{d}$ and in a stirrup or rod bent at 45 degrees

it will be $0.7 \frac{V_s}{d}$, in which s is the horizontal spacing of stir-

rups or bent rods in the direction of the axis of the beam.

28. Stirrups.—The longitudinal spacing of stirrups shall be such that at least one rod shall intersect below the centre

of the beam any 45° line of rupture in the portion of the beam where the shearing stresses exceed the allowable shearing value of the concrete.

29. Length of columns.—The ratio of unsupported length of columns to their least width shall be limited to fifteen.

30. Area of hooped columns.—The effective area of the hooped column shall be taken to be the area within the protective covering which shall not be less than two inches in thickness. In the case of columns reinforced with structural shapes, it shall be taken as the area wholly within the structural shapes.

31. Longitudinal reinforcement.—Bars composing longitudinal reinforcement must be straight and shall have sufficient lateral support to hold them securely in place until the concrete is placed.

32. Hooping.—The clear spacing of bands or hoops shall not be greater than one-eighth the diameter of the enclosed column. Adequate means must be provided to hold bands or hoops in place so as to form a column, the core of which shall be straight and well centred.

33. Bending stresses.—Bending stresses due to eccentric loads must be provided for by increasing the section until the maximum stress does not exceed the values specified above.

34. Bases of Columns.—At the bases of columns, longitudinal reinforcement shall abut squarely on bearing plates, or shall be carried into the footing a sufficient distance to develop the compressive stress in the reinforcement on the basis of the working stresses specified above.

35. Splicing of reinforcement.—In columns, all longitudinal reinforcing rods shall be properly butted or spliced.

36. Wherever it is necessary to splice reinforcement by means of lapping, the length of the lap shall be determined upon the basis of the safe bond stress and the stress in the bar at the point of splice; or, a connection shall be made between the bars of sufficient strength to carry the stress. Splices at the point of maximum stress must be avoided.

37. Shrinkage and temperature changes.—Where large areas of concrete are exposed to atmospheric conditions, the changes of form due to shrinkage and variation of temperature must be provided for by placing small rods or light fabric near the exposed surface, of a quantity to be determined on the basis of the elastic and thermal properties of the materials.

IV. Construction

38. Measuring and mixing of ingredients.—The ingredients of concrete shall be thoroughly mixed to the desired consistency, and the mixing shall continue until the cement is uniformly distributed and the mass is homogenous and uniform in color.

39. Methods of measuring and proportioning the ingredients shall be such as are approved by the engineer or architect.

40. When the conditions will permit, a machine mixer of a type which insures the uniform distribution of the materials throughout the mass shall be used.

41. When it necessary to mix by hand, the mixing shall be on a water-tight platform, and special precautions must be taken to turn the materials until they are homogeneous in appearance and color.

42. Consistency.—The materials must be mixed wet enough to produce a concrete of such consistency as will flow readily into the forms and about the reinforcement, and which, on the other hand, can be conveyed from the mixer to the forms without separation of the coarse aggregate from the mortar.

43. Retempering.—Retempering mortar or concrete, i.

e., remixing with water after it has partially set shall not be permitted.

44. Placing of concrete.—Concrete shall be rapidly and continuously handled from the time the water is added until it is finally placed in the work. The placing shall be facilitated by the use of suitable agitating and ramming tools so as to produce a thoroughly compact concrete of maximum density.

45. Wetting.—Concrete exposed to premature drying shall be kept damp for a period of at least four days.

46. Forms.—Before concrete is placed, care shall be taken to see that the forms are substantial and thoroughly wetted and that the space is entirely free from debris.

47. Joining up new work to old.—When work is resumed, concrete previously placed shall be roughened, thoroughly cleaned of foreign material and laitance, drenched and slushed with a mortar consisting of one part Portland cement and not more than two parts fine aggregate.

48. Placing in water.—Where concrete must be placed under water, unusual care must be taken to prevent the cement from being washed away.

49. Freezing temperature.—Concrete should not be mixed or deposited at a temperature lower than 28 degrees Fahr. unless special precautions are taken to avoid the use of materials containing frost or covered with ice crystals, and to provide means to prevent the concrete from freezing after being placed in position.

50. Reinforcement.—The reinforcement shall be accurately located in the forms as required by the plans and carefully secured by wiring or other means against displacement before placing the concrete.

51. Joints.—Reinforced concrete work shall be stopped at points where joints will have the least possible effect on the strength of the structure.

(a) Footings shall, where practicable, be cast to their full depth at one operation.

(b) Columns shall be cast at a single operation and work shall be stopped at the underside of the lowest beams or girders bearing on the columns. Where a bracket is used, the bracket shall be considered a part of the beam or girder.

(c) Construction joints in beams and girders shall be vertical and at the centre of the span. Any concrete which may run past the bulkheads must be cleaned up before the concreting of the next section is started.

(d) Construction joints in slabs shall be at the centre of the span. Where a joint occurs between a slab and a beam or girder, no T-action in figuring the beam or girder shall be considered.

52. Removal of forms.—No forms shall be removed without the written consent of the engineer or architect.

53. Tile and joist construction.—Wherever floors are built with a combination of tile or other fillers between joints, the following rules regarding the dimensions and methods of calculation shall be observed.

(a) The ratio of minimum depth to clear span of joist shall not be less than one to twenty-four.

(b) Wherever a portion of the slab above the tile joist shall be considered as acting as a Tee-beam section, the slab portions must be cast monolithic with the joist and must have a minimum thickness of 2 inches. In such a case all regulations applying to Tee-beams shall apply to tile and joist construction.

(c) In no case shall the tile or other fillers be considered as bearing stress.

(d) Wherever porous tiles, or other materials which by their nature will absorb water from the concrete, are used between the joists, care must be taken to thoroughly saturate the tiles, or other materials, with water immediately before the concrete is placed.

Standard Specifications for Tests of Drain Tile and Sewer Pipe

The following specifications were recommended by the Engineering Experiment Station of the Iowa State College, and adopted by the Association of Iowa Cement Users, the Iowa Brick and Tile Manufacturers' Association, the Iowa Drainage Association and the Iowa Engineering Society.

Specifications for Standard Absorption Tests

1. **Specimens.** The specimens shall be each approximately three inches square, and shall extend the full thickness of the pipe wall, with the outer skins unbroken.

2. **Number of Test Specimens.** Five individual tests shall constitute a standard test, the average of five, and the result for each specimen, being given in the report of the test.

3. **Drying Specimens.** Each specimen shall be dried in an oven or by other application of artificial heat, until it ceases to lose further appreciable amounts of moisture when repeatedly weighed.

4. **Brushing Specimens.** All surfaces of the specimens shall be brushed with a stiff brush before weighing the first time.

5. **Weighing.** The specimens shall be weighed before immersion, on a balance or scales capable of accurately indicating the weight within one-tenth of one per cent.

6. **Water for Standard Test.** The water employed in the standard absorption test shall be pure soft water, at the air temperature of a room which is artificially heated in cold seasons of the year.

7. **Immersion of Specimens.** The specimens shall be completely immersed in water for a period of 24 hours.

8. **Re-weighing.** Immediately upon being removed from the water, the specimens shall be dried by pressing against them a soft cloth or a piece of blotting paper. There shall be no rubbing or brushing of the specimens. The re-weighing shall be done with a balance or scales capable of accurately indicating the weight within one-tenth of one per cent.

9. **Calculation of Result.** The result of each absorption test shall be calculated by taking the difference between the initial dry weight and the final weight and dividing the remainder by the initial dry weight.

Standard Tests of Bearing Strength

1. **Specimens.** The specimens shall be unbroken, full sized samples of the pipe to be tested. They shall be carefully selected so as to represent fairly the quality of the pipe.

2. **Number of Specimens.** Five individual tests shall constitute a standard test, the average of the five and the result of each specimen being given in the report of the test.

3. **Drying.** The specimens shall be dried by keeping them in a warm, dry room for a period of at least two days prior to the test.

4. **Weighing.** Each dried specimen shall be weighed on a reliable platform scale just prior to the test.

5. **Bedding of Specimen for Test.** Each specimen shall be accurately marked with pencil or crayon lines, in quarters, prior to the test. Specimens shall be carefully bedded above and below in sand for one-fourth of the circumference of the pipe, measured on the middle line of the tile wall. The depth of bedding above and below the tile at the thinnest point shall be equal to one-fourth the diameter of the pipe, measured between the middle lines of the tile walls.

6. **Top Bearing.** The top bearing frame shall not be allowed to come in contact with the tile or with the test load. The upper surface of the sand in the top bearing

shall be carefully struck level with a straight edge, and shall be carefully covered with a heavy, rigid top bearing, with lower surface a true plane, made of heavy timbers, or other rigid material capable of uniformly distributing the test load without any appreciable bending. The test load shall be applied at the exact centre of this top bearing in such a way, either by the use of a spherical bearing, or by the use of two rollers or rods at right angles, as to leave the bearing free to move in both directions. In case the test is made without the use of a machine, and by piling on weight, the weight may be piled directly on a platform resting on the top bearing, provided, however, that the weight does not touch the top frame holding the sand, and provided, further, that the weight is piled in such a way as to insure uniform distribution of the load over the top surface of the sand.

7. **Frames for Top and Bottom Bearings.** The frames for the top and bottom bearings shall be composed of timbers so heavy as to avoid any appreciable bending by the side pressure of the sand. The frames shall be composed of timbers so heavy as to avoid any appreciable bending by the side pressure of the sand. The frames shall be dressed on their interior surfaces. No frames shall come in contact with the tile during the test. A strip of soft cloth may be attached to the inside of the upper frame on each side along the lower edge to prevent the escape of sand between the frames and the tile.

8. **Sand in Bearings.** The sand used for bedding the tile at top and bottom shall be washed sand which has passed a No. 8 screen. It shall be dried by keeping it spread out in a warm, dry room.

9. **Application of Load.** The test load shall be applied gradually and without shock or disturbance of the tile. The application of the load shall be carried on continuously, and the tile shall not be allowed to stand any considerable length of time under a load smaller than the breaking load.

10. **Calculation of Bearing Load.** The total breaking load shall be taken as equal to the total top load, including the weight of top frame, sand for top bearing, top bearing timbers, etc., plus five-eighths of the weight of the pipe. This total load shall be divided by the length of the pipe in feet so as to give the bearing strength per linear foot of pipe.

Calculating the Modulus of Rupture

The modulus of rupture for drain tile and sewer pipe shall be computed from the results of the standard test for bearing strength, according to the following rule:

Divide the bearing strength per linear foot by 12, multiply the quotient by the radius of the middle line of the tile wall expressed in inches, and divide this product by the square of the minimum thickness of the tile wall at top or bottom, also expressed in inches. This quotient will be the modulus of rupture of the pipe expressed in pounds per square inch.

Among the many different brands of waterproofing materials now on the market, the H. W. Johns-Manville Company, 100 William street, New York, are offering a line of fabrics, felts, cements and coatings known as J-M waterproofing materials. These materials, which are the result of this firm's half century of experience, careful study and unexcelled facilities, are especially made to meet every condition in waterproof building construction and have been effectively used for waterproofing underground tunnels, walls of brick and concrete buildings, dams, reservoirs, swimming pools, etc., with much success. The Johns-Manville concern has issued a little booklet explaining fully the merits of their waterproofing materials, which they will gladly mail to anyone on request.

Personal News and Notes

Wm. Robinson, C.E., of Owen Sound, died last week in his 58th year.

A 9-hour day and 50 cents an hour is the basis of an agreement effected between the carpenters of Calgary, Alta., and the Builders' Exchange of that city.

Mr. W. Hollingsworth, a well known member of the city's engineering staff at Toronto, has been appointed assistant engineer at Hamilton, Ont., at a salary of \$2,000 a year.

The Toronto board of control has made City Architect McCallum a grant of \$2,600 to engage two inspectors for structural iron work. The appointments will only be temporary.

Mr. D. J. McKenzie, of Ottawa, dealer in builders' supplies, at Ottawa, has amalgamated with Standard Supplies, Limited, and will be Managing-Director of that company with office and warehouse at 106 Bank street.

The city of Lethbridge, Alta., is having a deluge of applications for the vacant post of city engineer. According to a recent dispatch from that city over 100 have applied for the job. The salaries asked range from \$1,200 to \$7,000 a year.

The Montreal press records how City Engineer Janin was struck by lightning last week, since when, according to the dispatch, he has enjoyed improved health. Evidently shocks of this kind are mild in comparison with those received within the precincts of the council chamber.

Mr. Stanley Mitton, architect, 413 Granville street, Vancouver, B.C., has been holding an exhibition in his studios. The possibilities of various materials have been demonstrated and complete schemes shown for buildings of various classes. Mr. Mitton is making this an annual feature of his business.

At Hamilton, Ont., last month 230 permits were issued for buildings aggregating in value \$539,005. The total for May, 1910, was \$202,625. The detailed statement shows that 116 brick dwellings were erected at a cost of \$262,200; 78 frame dwellings costing \$73,750; 2 factories, \$65,000; 8 store buildings, \$56,900.

The ratepayers of Cranbrook, B. C., have decided in favor of the installation of a sewerage system and a sewage disposal works at a cost of \$100,000. The work will be proceeded with immediately and will be carried out by day labor under the supervision of the John Galt Engineering Company, of Winnipeg.

The Grand Trunk Pacific are stated to have approved plans for the proposed new Selkirk Hotel, which is to be erected in Winnipeg at a cost of \$1,000,000. The latest information to hand is that the architects, Messrs. Ross & MacFarlane, are now working on the detail plans and that construction is to commence forthwith.

According to our Vancouver correspondent the friction between the contractors and the carpenters in that city last month was offset considerably by the bad weather. From the 1st of the month to the 20th, he states, there were only three actual working days on account of the rain. This constituting the wettest May on record at Vancouver.

At Ottawa the final plans for the new departmental block are again delayed owing to the absence of the Prime Minister. This means holding the work over for another year. The latest suggestion is that the buildings be placed on the east side of Sussex street. A number of influential people are supporting the scheme and it will probably receive some consideration. Otherwise it was hoped to commence building operations in July.

The Standard Construction Company, Toronto, is suing E. A. Walberg for \$16,000 for the construction of eight miles of transmission line, which has been laid between the Mines Power Company's power house on the Maddabitima River and Cobalt. A contract was entered into for the construction of 25 miles of a line for \$19,000, but after the building of eight miles the plaintiffs ceased work, claiming that the defendant obstructed them. The case is proceeding.

At Montreal considerable interest is being taken in the selection of paving material for extensive work which is to be paid for by property owners. It has been pointed out that the city, with a larger population than Toronto, has less than one-fifth the quantity of permanent paving, aside from the fact that the work in the latter city is superior. It would seem that a little good missionary work might be accomplished at this stage by some of the enterprising paving concerns.

Mr. Thomas J. Drummond, of Montreal, president of the Canada Iron Corporation, Limited, is in Europe on a trip combining business with pleasure. He is accompanied by Mrs. Drummond, their son Louis, and Master Gerald Drummond, son of Mr. George E. Drummond. They expect to be away two months. Mr. Drummond is one of the six delegates appointed by the Iron and Steel Institute of America to attend the conference of the iron and steel manufacturers of the world in Brussels early in July.

J. W. Stewart, of Foley, Welch & Stewart, returned recently to Prince Rupert, after a visit of inspection over G. T. P. construction at Skeena river. Good progress is being made on the work. The tunneling beyond Kitselas is being prosecuted expeditiously and the sinking of the caissons for the Skeena river bridge is preceeding without any serious difficulty. Mr. Stewart was to leave in a few days for Edmonton, from which point he proposed to inspect the progress of the work as far as it had been proceeded with by his company.

The Consolidated Plate Glass Company of Canada, Limited, are building a new warehouse and factory in Winnipeg, on Barmoral street, near Portage avenue. The building will be 167 by 50 feet, four storeys and basement. It is expected to be finished about July 1. Mr. J. E. Wilson, who has been with the company in Toronto for the last seven years, will have charge of the Winnipeg branch. Good progress is being made on the new general offices, factory and warehouse on Spadina avenue, Toronto, and the company expect to remove at an early date.

A Made-in-Canada Fair Building was erected recently at Vancouver, in one day, by union labor. Three hundred carpenters put 125,000 feet of lumber into place in six and one-half hours. The dimensions of the building are 60 x 252 feet. An incidental item in the construction was the erection of a fence 1,200 feet in length and 9 feet high. Upwards of one and one-half tons of nails were used. The building covers over 1,500 feet of floor space. According to the Vancouver World, to whom we are indebted for the above details, 10,000 citizens witnessed this notable feat.

Trouble is brewing in the ranks of the men employed in the erection of steel work on some of the large buildings now going up at Montreal. Reports state that the men consider this a good time to demand higher wages, and that a strike is in prospect if their demand is not complied with. The trouble may be smoothed over or fought out, but at the present writing there is considerable apprehension regarding the outcome in local building circles. There is much work to be done and capable men are not over plentiful, so it is hard to form any idea as to what the result will be if the men made a determined stand for more pay.

The Sandstone, Brick & Sewer Pipe Company (head offices Calgary), are putting up a new plant at Sandstone, Alta., twenty miles from Calgary. Operations will be commenced early in July. Temporary kilns will be built this year and the output during 1911 will consequently be limited to 500,000 brick a week. Continuous kilns will be put in next year, however, when it is expected to increase the output to one million bricks a week. The manufacture of sewer pipe, terra cotta, etc., will also be added next year. The manager of the concern is Mr. F. Prendergast, formerly connected with the Alberta Portland Cement Company.

Arthur J. Barclay, Licentiate R.I.B.A., Toronto, has obtained an appointment as architect with the Department of Public Works at Ottawa. Mr. Barclay is a medallist of the Royal Institute of British Architects and came to Canada a few years ago from Montrose, Scotland, where he enjoyed an excellent reputation in the profession. Among his most recent successes in Ontario is the award of first place in the competition for plans for municipal buildings and fire station at Goderich, Ont. The town of Goderich hopes to retain Mr. Barclay as consulting architect on this work. Meantime communications regarding it may be addressed to Mr. Barclay at 294 Bathurst street, Toronto.

Mayor Drouin, of Quebec, accompanied by Mr. W. D. Baillarge, returned recently to the ancient capital after a visit to Montreal, Toronto and Boston, undertaken for the purpose of inspecting the various paving works in those cities. Upon his return the Mayor of Quebec told the council that he had never seen streets kept in such a perfect condition as those in Toronto. While in the United States Messrs. Drouin and Baillarge paid a visit to the Hassam Paving Company's great works at Worcester, Mass., and were most favorably impressed with the product of that concern. As previously announced in these columns the city of Quebec has been authorized to expend \$400,000 on paving work this season. Tenders for a considerable portion of the work have now been submitted. At date of writing they are in the hands of the city engineer for report.

Several leading American railway contractors were in Edmonton last week sizing up their prospects for a share of contracts aggregating about \$15,000,000. Tenders were due to be opened last Friday for the building of a 160-mile section of the C. N. R. from Kamloops to Hope, through the Fraser river canyon. Among the visitors were A. R. Porter, of Porter Bros., Spokane and Portland; Martin Woolson, of Woolson & Cochrane, St. Paul; W. A. Winston, of Winston Bros., St. Paul; and P. Welch, of Foley, Welch & Stewart. Mr. Porter stated that it was his firm's intention to establish in Canada. He stated that in the coast states there was no work in sight and thousands of men were idle. Mr. Porter is a native of Nova Scotia and he considers that he has a right to return to the country for a living now that development is beginning to pan out in the States.

After completing arrangements for the shipment of a quantity of asphalt from Fort McMurray, to be used for experimental purposes in paving an Edmonton street, to demonstrate the utility of deposits in the north country, J. K. Cornwall, M.L.A., returned to Edmonton last week from Athabasca Landing. The asphalt will be placed in sacks and loaded at Fort McMurray on the Hudson's Bay company's boats for transportation to Grand Rapids. From here it will be brought to Athabasca Landing on a steamer of the Northern Navigation company, and will be freighted from the Landing to Edmonton, reaching there about June 15th.

J. S. Irvin, Ottawa—One of the Pioneers of the Canadian Cement Industry

Perhaps no one man has done more for the cement industry in this country than Joseph S. Irvin, of Ottawa. Many of the largest factories in North America owe their existence to him, and the industry in general is indebted to him for many improvements which have resulted from his constant endeavor to effect improvements in this field. He was identified with the introduction into Canada of the dry method of manufacturing cement. He was also instrumental in bringing the first block machine into Canada and was among the most energetic advocates of reinforced concrete at the experimental stage of that construction. In the negotiations which resulted in the merger of the leading Portland cement companies and the organization of the Canadian Cement Company he took an active part.

When, in 1901, he entered the Canadian field of the Portland cement industry it had three great requirements. One, was a man with organizing ability to form companies and secure capital from somewhat conservative investors. Another, was a man with mechanical training necessary to build the right kind of factories to produce high grade cement at low cost. The third was a campaign to impress



Mr. Joseph S. Irvin of Ottawa.

upon the people of Canada the advantages of cement construction, against which, at this time, there was yet considerable public prejudice.

Fortunately for the industry, the pioneers in the cement business found Mr. Irvin a man possessing all these requisites. If there was any doubt of it at the time, after years have amply fulfilled the hopes of those who first invested under his leadership.

It is interesting to follow how quite unconsciously his natural gifts were trained in early years for just such a position as he now occupies. When a young man he entered the employ of a big harvesting company at Plano, Ill. He was naturally a machinist and in a few years he could build any part of a grain binder; but he was naturally an organizer, as well, and in a short time the company appointed him travelling organizer and expert. When twenty-one he was general manager of Michigan and Northern Indiana, with from twenty-five to fifty travelling salesmen and over three hundred agencies under his supervision. He remained in this line of activity with marked success for some years. His observations, however, had impressed upon him

the growing importance of the Portland cement industry, and, refusing a tempting offer to become general manager for Northern Michigan for the McCormick Reaper Company, he became associated with this field in 1898, distinguishing himself at once in the organization and development of the Peninsula Portland Cement Company, of which he was elected a director. The Peninsular Company's plant was at Cement City, Mich., and in due course this received a visit from a Canadian deputation which had been appointed to make careful investigations in the United States with a view to effecting improvements in the industry at home. This visit resulted in Mr. Irvin's being induced to cross the border to assist in the organization of the National Portland Cement Company, at Durham, Ont. Later he returned to the United States and helped to organize the Southern States Portland Cement Company, at Atlanta, Ga., and the Western States Cement Company, at Independence, Kan. About this time he and his associates, appreciating the advantages of manufacturing cement by the dry process, decided upon the investigation of properties in Ontario and Quebec with a view to finding the proper materials and other conditions for the erection of a plant. This resulted in the organization of the International Portland Cement Company, and the erection in 1902 of a splendidly equipped plant at Hull, Que. A great demand ensued for the product of the plant, which was enlarged twice in four years.

The possibilities of Western Canada next attracted Mr. Irvin and those associated with him, who after going over the ground from Fort William to the Rockies, decided upon establishing a plant at Exshaw, Alta. This plant is up-to-date in every particular and contains all the improvements evolved from the other plants. His activities are unlimited and he is now organizing a company which will erect a plant at Spokane, Wash., which, when completed, will be one of the largest in the country.

Mr. Irvin's interest in the cement industry has not been confined exclusively to the consideration of dollars and cents. He undertook much of the pioneer work of introducing concrete construction throughout Canada and he has written a number of excellent articles and pamphlets setting forth the uses and advantages of cement. He has addressed public meetings and given demonstrations at the big exhibitions. In fact he has taken every available opportunity to promote the welfare and success of the industry in the broadest application.

He is a man of unswerving honesty of purpose, ever alive to opportunity, a man of untiring energy and an optimist all through; moreover, he is always genial and always approachable—indeed, much of his success as an organizer may be attributed to his magnetic personality.

Western Ontario Builders Organizing

The London Builders' Exchange sent a large delegation to St. Thomas last week to discuss with the exchange in that city the question of a more adequate organization of building interests. As a result of the discussion it was resolved that the officers of the London and St. Thomas exchanges should get into communication with contractors and supply dealers in all the cities and towns in Western Ontario districts and endeavor to have them organize local exchanges as early as possible. It was also resolved that the secretaries of the two exchanges represented at the meeting immediately communicate with the officers of the other exchanges in Western Ontario with the view of forming a provincial association of builders, prior to the meeting of the national convention, which will be held in Toronto in February, 1912. The representative director of the

Canadian National Association for Western Ontario, Mr. E. R. Dennis, gave an interesting description of the itinerary of the delegates to the convention held in Winnipeg last February, and a synopsis of the most important business transacted at the Winnipeg convention. He was followed by Messrs. Martyn, Jones and Gould, of London, who touched upon some of the practical methods to be derived by affiliation with the national association.

The St. Thomas exchange has made excellent progress since its organization a few months ago. Its quarters are centrally located and are well equipped for carrying on the work.

Trade News from Montreal

Mr. George W. Goodbody is the contractor for an addition to the Engineers' Armory at Point St. Charles.

Messrs. O Martineau & Son, Limited, are building eight three-storey houses on St. Denis street at a cost of \$24,000.

Messrs. Sparrow & MacNeil, general contractors, Montreal, have moved into their new offices at No. 12 Beaver Hall Square.

Splendid progress is being made by Mr. E. G. M. Cape, contractor, who has the construction for the extension to Fairmount avenue school. The roof will soon be on.

Mr. F. P. Jones, manager of the Canada Cement Company, denies the statement published in Winnipeg that the price of cement is about to be increased. He says if there is any change it will be lowered.

The council of the municipality of Laprairie has decided to pay its share of the cost of constructing the highway between St. Lambert and Rouse's Point, this being a section of the Quebec to New York highway.

The managers of St. Giles Presbyterian Church have purchased a lot at the corner of Boulevard St. Joseph and Nelson street on which they will erect a new church edifice. It is not known when work on the new church will be commenced as the management have not yet appointed their architect.

In one week recently building permits to the value of \$33,000 were issued by the Building Inspector in the town of Outremont, Montreal. The largest structures were semi-detached cottages on Rockland avenue, for Mr. A. Lesserette, and on St. Viateur street for Mr. A. Paissent, at \$10,000 each.

The Standard Ideal Company, of Montreal, have moved from Notre Dame street to No. 44 Beaver Hall Hill where extensive alterations are being made to the premises, which when completed will give them one of the finest show rooms in the city for the display of modern sanitary furnishings manufactured by this company.

Good progress is being made on the central building of the Y. M. C. A. on Drummond street, and the Westmount and Fairmount branches. If the work continues under as favorable conditions as have prevailed hitherto, the architects expect both branches to be completed by November or December, and the headquarters to be ready for opening by March, 1912.

For some days past workmen have been employed in taking down the upper storeys of the old Y. M. C. A. building at the corner of Craig street and Victoria square. Last fall this building was condemned owing to some defect in

the foundation. It is stated that a temporary roof will be erected over the ground floor and that the Shedden Forwarding Company, which was obliged to move out along with other occupants when the building was condemned, will return to occupy the premises temporarily.

The management of the Windsor Hotel have commenced the demolition of the Synagogue Temple Emmanuel, which they recently purchased from a Hebrew congregation in Stanley street, and will shortly begin the construction of a power house and laundry on the site. The large boilers and heating apparatus will be removed from the basement of the hotel into the new structure just across the street. Good progress is being made on the new Synagogue which is being built in Westmount for the use of this congregation.

Over 600 men are now hard at work on the new elevator being erected by the Montreal Harbor Commission. Streams of liquid concrete are being poured into the moulds of the substructure. The second storey has been begun and the walls are rising in sections of about six feet, the frames or forms being raised to a new elevation as fast as the last section laid becomes hard enough to permit being built upon by the next section. This elevator, when completed, will have a capacity of some \$2,000,000 bushels, which is considerably larger than the Commissioners' elevator No. 1. or the Grand Trunk elevator at Wind Mills Point.

The steel frame work of the Dominion Express building at the corner of St. James and St. Francois Xavier streets is now up almost to its full height, in fact part of the frame work has reached the height of the roof. The Structural Steel Company, Limited, which has the contract for supplying and erecting the steel work of this building, made almost a record by placing the frame work of the first eight storeys inside of about ten days. The total height will be ten storeys above the St. James street level and three storeys below. Owing to the pergola style of roof which will be put on the building, the frame work cannot be completed for a few weeks, but the work so far has been very satisfactory.

In connection with the extension of the Victoria pier in the Montreal harbor it was found that the distance between the end of this pier and that of the guard pier would be less than 1,000 feet, which is the required distance between the end of the piers and any other obstruction. Consequently the Harbor commissioners have decided to cut a piece off the east end of the guard pier and extend it towards the south shore. This will give the required distance between the piers and at the same time the turning of the guard pier will have the effect of diverting the strong current which hitherto has existed at this point farther out into the river. This will considerably lessen the current in the harbor and make it much easier for ships to berth at the Victoria and other piers on the harbor front. Work has already been commenced on the guard pier. The construction will be held together by a rip-rap which is expected to be strong enough to resist the force of the current at any time of the year.

Rumors continue to be circulated to the effect that the Canadian Northern Railway Company are purchasing a large area of land in the vicinity of St. Catherine and Bleury street for terminal purposes. Officials of the company in Montreal say they know nothing about such deals, and the statement has been made that it would be impracticable to have a railway station established south of St. Catherine street for the reason that they would have to go down to a very great depth so as to pass beneath the city's sewer system, and in any case they would be obliged to enter the city by tunnel under the mountain. By establishing their terminals in the vicinity of Ontario street, below Sher-

brooke street at certain points they would be able to enter a tunnel practically on the level emerging on the north side of the mountain without too serious a grade. Certain very expensive real estate deals recently put through, involving the transfer of hundreds of acres of land between the mountain and the Back river, have been popularly connected with this railway terminal project. If the company have really bought the tract of land known as the Maher Boulevard they will have a right of way extending practically from Outremont to the Back river. For obvious reasons, however, neither the company nor the real estate dealers will make any statement in connection with these matters.

The Toronto building permits for last month totalled \$2,643,755. This total is \$773,455 in excess of May, 1910. Since Jan. 1st the permits aggregate \$9,555,513, compared with \$7,518,098 for the corresponding period of last year.

Good roads construction in York county will be in charge of the following officials: highway engineer, E. A. James; assistant and construction engineer, A. E. Edwards; bridge engineer, Frank Barber. The sum of \$300,000 is to be expended upon the improvement of York county roads.

The management of the Dominion Carbolineum Works, Limited, of Vancouver, whose new and modern plant on the North Arm of the Fraser was recently described in these columns, have secured permission from the Registrar of Joint Stock Companies of British Columbia to change the firm name to "The Dominion Creosoting Company, Limited." This title better covers the nature of the business, which is constantly expanding. See advertisement elsewhere.

Mr. E. T. Dartnell, of Montreal, dealer in builders' supplies, has removed from 157 St. James street to 8 Beaver Hall Square. The new premises are commodious and splendidly adapted to the various lines carried by Mr. Dartnell, which include high grade face brick, tapestry brick, terra cotta fireproofing, floor quarries, and roofing tiles. One of the important orders for supplies received so far this season, calls for 160,000 white porcelain tiles to be used in the exterior of the Dominion Express Building now being erected in that city from plans by Messrs. E. & W. S. Maxwell.

The Pulsometer Steam Pump Company, 17 Battery Place, New York City, have sent us a copy of their catalogue No. 17, descriptive of the Pulsometer, its operation, construction and field of application. The Pulsometer is claimed to be the simplest, handiest, most efficient and most durable steam pump known for general low service water raising purposes. It can be set up and taken down quickly, and it will operate practically without attention and will not be subject to interruptions or excessive wear due to gritty or muddy water. Contractors will do well to investigate its merits for trench draining and excavation.

"A Handy Book of Greenhouse Materials," is the title of a practical booklet published by M. Brennen & Sons Manufacturing Company, Limited, Hamilton, Ont., manufacturers of greenhouse construction materials and hot bed sash. One of the most important features in the manufacture of greenhouse material is the kind and quality of lumber used. The Brennen Company use white cork pine, exclusively, for the reason that it is less affected by atmospheric conditions than any other. Prospective builders of this type of work will do well to obtain figures from the firm.

Contracts Department

News of Special Interest to Contractors, Engineers, Manufacturers and Dealers in Building Supplies.

Information for insertion in these columns is invited from Architects, Contractors, Engineers, etc.

Waterworks, Sewerage and Roadways

Battleford, Sask.

Tenders are called until June 19th for material and construction of waterworks and sewerage system. Wm. Kitson, town engineer. Advertisement in "Tenders and For Sale Department" of this issue.

Cobourg, Ont.

Tenders addressed to D. H. Minaker, clerk, will be received until June 19th for construction of cement walks. Specifications at office of clerk. Estimated expenditure, \$3,000.

Calgary, Alta.

A by-law is in course of preparation to construct a further 30,000 square feet of permanent paving.

Cannington, Ont.

Plans are being made for drainage system to cost about \$3,000 for this village. Engineer in charge, Cavana & Watson, Orillia. Glazed pipe, 8 in. to 15 in. will be used, length, 3,400 feet.

Cardston, Alta.

By-law on gravity water system will be voted on early in July. Engineer, R. E. MacArthur, Lethbridge.

Foam Lake, Sask.

Tenders addressed to Thomas H. Rowley, secretary-treasurer, Foam Lake, Sask., will be received until June 15th for construction of cement sidewalks. Plans, etc., at office of the above.

Halifax, N.S.

Plans are being prepared by W. W. Doane, city engineer, for sewer system, \$98,000. Part to be constructed this year, Cobourg Road and Oxford street.

Lacombe, Alta.

The construction of waterworks system for fire protection will commence at once.

Medicine Hat, Alta.

The \$33,350 by-law for cement walks, \$17,500 for curbs, gutters and boulevards, \$40,000 for plank walks and \$80,000 for grading were carried.

Moncton, N.B.

Tenders will be called for erection of pumping station in connection with waterworks system. John Edington, city engineer. Estimated cost, \$16,000.

Tenders will probably close on June 18th for dam for waterworks, \$85,000. J. Edington, city engineer.

Separate tenders received about July 1 for laying main water pipe, 18,000. J. Edington, city engineer.

Tenders will be received until about July 1st for excavation of trench for main pipe line for waterworks. Estimated cost, including laying of pipe, \$75,000. John Edington, city engineer.

Tenders addressed to J. Edington, city engineer, will be received until June 5th for clearing right of way for pipe line for new reservoir.

Moose Jaw, Sask.

The \$170,000 by-law for paving having been carried, contemplated improvements will be now made; \$28,000 by-law for cement sidewalks, was also carried.

Montreal, Que.

Tenders addressed to Board of Commissioners will be received until June 12th for supply of artificial paving blocks and sidewalk and crossing flags. L. N. Senecal, secretary.

Tenders are also called until 15th June for construction of pavements, etc.

North Bay, Ont.

Tenders are called until June 15th for laying about 25,000 lin. feet of sewers, and furnishing certain materials therefor. Advertisement in "Tenders and For Sale Department" of this issue. T. N. Colgan, commissioner of works.

Tenders called until June 15th for supply of sewer pipe. T. N. Colgan, commissioner of works. Advertisement in "Tenders and For Sale Department" of this issue.

Stellarton, N. S.

Tenders for loan of \$29,000 for water and sewerage are called until June 15th. J. W. Henderson, town clerk.

Steelton, Ont.

Tenders addressed to J. Robinson, town clerk, will be received until June 10th for construction of reinforced concrete outfall sewer, about 570 feet in length and 66 inches interior diameter. Chipman & Power, engineers, Toronto. Advertisement in "Tenders and For Sale Department" of this issue.

St. David's, Ont.

Negotiations are in progress between the St. David's Spring Water Company, Limited, and this municipality in regard to the installation of a waterworks system for the village. Secretary, Water Company, E. W. Murphy, Niagara Falls, Ont.

Thorold, Ont.

A by-law will shortly be prepared to cover the cost of proposed pavement and sewerage scheme.

Vancouver, B.C.

Tenders addressed to W. McQueen, city clerk, will be received until June 13th for supplies used in connection with the sewer construction.

AWARDED

Calgary, Alta.

Calling for the second tenders for the asphalt paving has resulted in a lower bid being put in by the Calgary Paving Company, who now offer to do the work at \$2.32 a square yard. Their previous

bid was for \$2.45. The Crown Paving Company repeated the tender which they put in some time ago for \$2.27. It was decided that the Calgary Paving Company should be given 25,000 square yards in the work to be given in the next by-law at the same figure as the lowest tendered on that work.

Edmonton, Alta.

The contract for construction in tunnel and supply of all materials for reinforced concrete block sewer was awarded to W. Manders, \$179,816. A. J. Lat-ornell, city engineer; contractor's engineer, R. Gregory, Edmonton.

Lethbridge, Alta.

The Canada Iron Corporation has been awarded the contract for five hundred tons of c. i. pipe for this city, about two miles. It is expected that the total amount will be put down this season.

Melville, Sask.

The successful tenderers for supply of equipment for waterworks and electric light were received: Kilmer Pullen & Burnham, Toronto, generators, switchboards, exciters, pumps, motors, and compressors installed complete, \$7,438; Northern Electric & Mfg. Co., Ltd., Winnipeg, street lighting system, \$832; Northern Electric & Mfg. Co., Ltd., Winnipeg, poles and line material, \$2,947; Wm. Bros & Sons, Minneapolis, two compression tanks, \$2,018; Stanley Brock & Co., Toronto, cast iron mains, \$37 per cwt.; Stanley Brock & Co., Toronto, special castings, \$60.80 per cwt.

The following were the successful contractors: McAvity & Son, St. John, 4-in. hydrants, \$36; 6-in. hydrants, \$46; 8-in. gate valves, \$17.50; 6 in. gate valves, \$9.75; 4-in. gate valves, \$6.50. Jas. Robertson Co., Winnipeg, pig lead, \$4.55 per cwt., oakum, \$3.20 per cwt.

Moose Jaw, Sask.

The contract for extension of storm sewer was awarded to Walter Manden, Edmonton, Alta, \$11,000. Others tendered as follows: H. G. McVean, Regina, Sask., \$12,950; W. E. Ransome, Moose Jaw, \$8,850; Navin Brothers, Moose Jaw, \$11,913; P. Kilkinny, Ltd., Moose Jaw, \$11,148.

The contract for concrete sidewalks, curb and gutter, was awarded to Moose Jaw Construction Co., Ltd., \$55,430. Others tendered as follows: W. E. Ransome, Moose Jaw, \$56,018.35; Nairn Brothers, Moose Jaw, \$61,492.69; Occidental Construction Company, \$65,441.04; Moose Jaw Paving Company, Moose Jaw, \$30,393.99 (part of work only); Western Pavers, Ltd., Winnipeg, \$39,628.63 (part of work only). W. F. Heal, city clerk.

Montreal, Que.

The tenders for laying of permanent sidewalks are as follows: George Janin, chief engineer; Bithulitic Company, \$26,500; Quinlan Asphalt Company, \$14,000; Henault & Hefferman, \$3,960; J. Char-

tier, \$4,000; Hofeler Cement Company, \$10,000; Hassam Paving Company, \$40,042; Sicily Asphalt Paving Company, \$31,000. The sidewalks are to be constructed in either asphalt or cement. Report about June 12.

Ottawa, Ont.

Contracts for pavements to be laid down this season were awarded by the board of control recently, as follows: Somerset street from Bronson to Division street, to the Union Construction Company, \$24,258.90. The other tenders were: The Barber Asphalt Company, \$26,000; The Ottawa Construction Company, \$24,870.

King Edward ave., from Laurier avenue to Somerset street, to the Ottawa Construction Company, for \$10,897. The other tenders were: The Barber Asphalt Company, \$12,180, and the Union Construction Company, \$11,465.60.

Okotoks, Alta.

Work— $\frac{1}{2}$ mile of cement walk. Contract for $\frac{1}{2}$ cement walk awarded to Curliss & Mattaini, 1102 Centre street, Calgary. Price, 17 $\frac{1}{2}$ cents per sq. ft. Other tenderers: James Metcalfe, Okotoks, 18 cents; Crown Paving Construction Co., Calgary, 19 cents; Forest City Paving Co., Calgary, 17 $\frac{1}{4}$ cents for walks, 25 $\frac{1}{2}$ cents for crossings. D. J. Downey, clerk.

Penticton, B.C.

Contracts for waterworks material (bids opened May 1) have been awarded as follows: 69,800 lin. ft. 4, 6, 8 and 10 inch c. i. pipe at \$46.05 to \$47.35 per ton f.o.b. via Pacific and Vancouver, or \$53.77 to \$55.05 via Atlantic & C. P. R.; to Crane Co. for 10,000 ft. 12-in. pipe steel, lap welded, at \$1.1969, and 400 feet 14-in. 14-in. at \$1.6801, and gates for \$3,719; to Simson, Blakwell & Co., of Vancouver, for hydrants, \$2,668; to Canadian Fairbanks Co. for galvanized pipe, \$1,248, and meters, \$2,418, and to Drummond, McCall & Co., Montreal, Que., for steel pipe, \$2,850. F. H. Latimer, Consulting Engineer, Penticton, B.C.

Quebec, Que.

The cost of paving according to different tenders received was as follows: granite paving, I. Blodeau & Sicily Asphalt Co., \$90,000; scoria blocks, Madden & Barbeau, \$107,000; Sicily Asphalt Co., \$158,000, and Falardeau & Co., \$142,000, not including scoria blocks between the rails. The tender of Madden & Barbeau for scoria blocks was accepted, that for asphalt referred for report.

St. Lambert, Que.

The contract for supply of concrete pipes was awarded to Messrs. Francis & Co., that for vitrified pipes to Messrs. F. Hyde & Co.

The council have awarded the following contracts for municipal improvements and machinery: quantity of sewer pipes to Hyde & Webster, \$11,090; concrete pipe, F. Hawkins, (Aberdene) Granite and Marble Works, \$8,460; ten ton steam roller, The Monarch R. R. Co., \$2,600; crusher, screen and elevator, Canada Ford Co., \$1,139; portable engine and boiler, Williams & Wilson, \$790; surface for sidewalks, gutters and curbs, The Canadian Hassam Paving Co., at \$1.31 per lineal foot. The work will average about six feet in width.

St. John, N.B.

Tenders were awarded as follows: Paving blocks, Hilyard Bros., 1,500 yards at 55 cents per square yard; asphalt, Robert Reford Co., Ltd., \$23.50 per ton; coal tar, Carritte Paterson Co., \$3.40 per barrel; hardwood for use in making steam, George Dick, \$7.39; Bay Shore spruce, C. E. Harding & Son, \$14.50 per thousand; paving Johnston street, W. J. Thomas, 48 cents per square yard.

Waterloo, Ont.

The tender of the Warren Bitulithic Paving Co., Toronto, for the paving of King street, Waterloo, from William to Young streets, at \$2.29 per square yard, was accepted. The cost of the pavement will be about \$50,000. Work will be commenced at once, and it is expected will be completed by September 1st.

Railroads, Bridges and Wharves

Burford Township, Ont.

Tenders for superstructure and substructure combined will be called about July 1st by the County of Brant for reinforced concrete bridge, one 75-ft. span, 16 ft. wide, foundation hard gravel over Whiteman's Creek. Engineer, W. H. Fairchild, Brantford; county clerk, A. E. Watts, K.C., Brantford.

Finch, Ont.

Tenders addressed to D. B. Cameron, clerk, township of Finch, will be received until June 9th for construction of the McLean drain in the 7th concession. Length of drainage work, 6,170; estimated quantity of earth excavation, 6,143 cu. yds. Plans, etc., at office of Magwood & Walker, civil engineers, Cornwall.

Meadow Brook, Westmoreland Co., N.B.

Tenders will be called about July 1st for bridge here, concrete abutments as foundation, superstructure, hard pine. Engineer, A. R. Wetmore, Fredericton.

Montreal, Que.

The Canadian Pacific Railway has under consideration plans for the construction of a five hundred foot bridge at Graham station, Ont.

Tenders addressed to David Seath, secretary, harbor commissioners, will be received until June 15th for supply of timber for 1912. David Seath, secretary.

Ottawa, Ont.

Tenders addressed to L. K. Jones, secretary, Department of Railways and Canals, will be received until August 1st for construction of a section of about 185 miles of the Hudson Bay railway from Pas Mission to Thicket Portage. Advertisement in "Tenders and For Sale Department" of this issue.

Tenders are to be called shortly for the extension of the Intercolonial Railway from Dartmouth, N.S., to Deans settlement; from New Glasgow to Sunny Brae, and also for an extension to Baddeck, C.B.

Osnabruck, Ont.

Tenders addressed to H. E. Hodgins, clerk, Osnabruck Centre, will be received until June 19th for construction of reinforced concrete bridge over the Hoople creek at lot 10, second concession. Engineer's estimate, 107 cu. yds. reinforced concrete, \$1,500; 230 cu. yds. excavation, \$140; 480 cu. yds. grading, \$240; 250 lin. feet and wing fence, \$50;

expanse, \$200, total, \$2,130. Plans, etc., with above and with Magwood & Walker, engineers, Cornwall.

Port Arthur, Ont.

Tenders addressed to Mackenzie, Mann & Co., Toronto street, Toronto, will be received until July 1st for construction of the following sections: Port Arthur to a point on the boundary line between districts of Thunder Bay and Algoma; from end of section 1 to Kapuskasing Lake; Kapuskasing Lake to Sellwood junction. Tenders to include clearing, grubbing, grading, bridges, trestles, culverts, masonry, fencing, telegraph line, track laying, and blasing. Plans, etc., at office of above.

Quebec, Que.

It is announced that satisfactory financial arrangements have been made for the building of a new railway to run in an air line from Quebec to St. John, N.B., crossing the State of Maine, by a syndicate known as the St. John and Quebec Railway Company. Mr. Gould, president.

Toronto, Ont.

Tenders addressed to F. S. Spence, chairman board of control, will be received until June 20th for construction of a steel span crossing the tracks of the C. P. R. at Weston Road. Specifications, etc., at the Department of Railways, Bridges and Docks, engineer's office. Advertisement in "Tenders and For Sale Department" of this issue.

Public Buildings, Churches, Schools, etc.

Berlin, Ont.

The by-law to raise \$15,000 toward the erection of proposed addition to the Berlin-Waterloo hospital was carried.

Belleville, Ont.

The Board of Education have approved of the plans of Ellis & Co., architects, Manning Chambers, Toronto, for two public schools, one 10-room, the other 12-room, brick and stone, costing respectively \$35,000 and \$50,000. Tenders after June 20th.

Brandon, Man.

Work will commence shortly on the projected addition, 4-storey brick wing to Brandon College. Principal, A. P. McDiarmid, D.D.

The site has been purchased for Winter Fair building for the Winter Fair Association, concrete and steel. No details have been worked out yet. W. A. Elliott, architect for previous work, will probably take charge.

Birchton, Que.

Tenders were called until June 6th for erection of school for District No. 2, Low Forest, Eaton. A. F. Swan, secretary-treasurer.

Brantford, Ont.

Burke, Horwood & White, Toronto, have been recommended as architects for the new Y. M. C. A. building, \$100,000.

Tenders will be called shortly for all trades with the exception of masonry for Roman Catholic church here, \$10,000. Architect, R. Closhesky, 236 James street, Hamilton.

Tenders addressed to Leslie Hastings, trustee, will be received until June 17th for erection of Grand View school, \$18,-

000. Plans call for 2-storey 6-room, brick and stone, 81 x 74, slate roof. Architects, Taylor & Taylor, Brantford.

Chippewa, Ont.

On June 23rd a by-law will be submitted for approval, to provide \$11,000 for the erection of a school house. W. A. Myers, clerk.

Cannington, Ont.

New tenders are wanted for 2-storey school here, \$8,000. Specifications call for brick, cement foundation, steam heating, shingle roof. G. M. Miller & Co., 59 Yonge street.

Cornwall, Ont.

Tenders addressed to L. K. Jones, secretary, Department of Railways and Canals, will be received until June 9th for erection of machine shop. Plans, etc., at offices of chief engineer, Ottawa, and of resident engineer, St. Lawrence Canals, Cornwall.

Calgary, Alta.

The congregation of Knox Church have accepted the plans for the new church and the board of managers were authorized to call for tenders. Building proper will cost over \$150,000; organ, about \$10,000; furniture and cost of manse to be erected later, not included. Mr. Justice Stuart and J. T. MacDonald, are interested.

Tenders will be called for construction of new municipal hospital. W. F. Heal, city clerk.

Nearly \$25,000 has already been subscribed towards the \$75,000 required by Grace Presbyterian congregation for their new church. Rev. A. Elser, pastor.

East Sherbrooke, Que.

Tenders are called until June 20th for erection of Protestant hospital here. Specifications call for 4-storey, stone and brick, stone foundation, hot water heating, fireproof, etc. C. E. White, architect.

Fergus, Ont.

Plans for a new Armory, 64 feet by 32 feet, to be built by the Dominion Government, have been received, the only condition attached being that the council provide a free site, which, no doubt, will be done.

Fort Erie, Ont.

Tenders are called until June 24th for 1-sty. hall (brick veneer) for St. Paul's Church, Fort Erie. Plans, etc., at Henry Emrick's, Bridgeburg, Ont.

Fort William, Ont.

Tenders will be called shortly for theatre, \$75,000, solid brick, stone, tar and gravel roof, two tiers of galleries. Owner, J. C. Murray & Co.; architect, G. W. & G. L. Rapp, Chicago.

Gleichen, Alta.

Plans are being prepared for erection of Fire and City Hall, \$7,000. Architect, J. D. W. Wilson, Dominion Block, Calgary.

Hamilton, Ont.

Tenders will be called shortly for new school building, brick and stone. Architects, Stewart & Witton, Hamilton.

Halifax, N.S.

New tenders will be called for Technical School laboratory. Lowest tender received, \$21,000; estimated cost,

\$12,000. The Commissioner of Public Works and Mines will call for tenders.

Tenders are called until June 15th for garbage disposal plant, \$40,000 with capacity of 50 tons in 24 hours. City engineer, F. W. W. Doane.

Tenders to be called about June 20th for erection of Tower Road school. W. J. Busch, architect, 60 Bedford Row.

Lumsden, Sask.

On June 14th a by-law will be submitted to raise \$7,000 by way of debentures, for the erection of a skating and curling rink. B. Morton, secretary-treasurer.

Lethbridge, Alta.

The armory to be erected here is estimated to cost about \$30,000. Mr. Manwaring, secretary, board of trade.

London, Ont.

Tenders are called by County Clerk T. E. Robson, until June 9th for alterations to court house. City Architect, A. E. Nutter.

Lennoxville, Que.

Tenders are called until June 15th for erection of school building, \$15,000. Specifications call for brick and stone, 2-storey. Architect, J. W. Gregorie, Lennoxville.

Medicine Hat, Alta.

Tenders addressed to E. J. Fewings, secretary-treasurer, general hospital are called until June 12th for erection of brick addition to nurses' home.

Montreal, Que.

The following tenders for the new smallpox hospital for the city of Montreal are under consideration by the controllers: J. B. Pauze & Co., \$41,000. Mantineau & Prenoveau, \$33,900. Joseph Denis, \$33,701. J. Gauthier, \$47,500. O. Rondeau, \$38,980. N. Allard & Fils, \$32,500. Messrs. Marchand & Haskell, architects.

The Sparrow Amusement Company has purchased a building site on St. Catharine street, east of the present Theatre Francis, on which, it is stated, a theatre capable of seating 2,100 people, will be erected.

Ottawa, Ont.

Tenders will be called shortly for erection of New Westminster Presbyterian Church, 60 x 99, stone, steam heat, electric light, asbestos shingle roofing, interior finish ash and oak, metal ceiling, steel beams. Architect, A. Keefer, Free Press building, Ottawa.

Renfrew, Ont.

Plans are being passed on by Minister of Education for gymnasium addition to high school, 2-storey, 35 x 75, concrete foundation, solid brick walls. Tenders will be called later. J. D. McNichol, architect, Renfrew.

Red Deer, Alta.

The by-law to raise \$10,500 to purchase the Exhibitions Association property was carried.

Regina, Sask.

Tenders are called until June 12th for erection of parish hall. Architects, Storey & Van Egmond.

Tenders addressed to J. H. Cunningham, secretary, public school board, will be received until June 7th for erection of addition to Albert school. Architects, Storey & Van Egmond.

Saskatoon, Sask.

The by-law for extension of the municipal hospital was defeated.

Work will commence on the new St. Paul's hospital for the Order of Grey Nuns, headquarters, Montreal. Estimated expenditure, \$100,000.

Swift Current, Sask.

This municipality is contemplating the erection of a hospital. Secretary, A. J. Macdonald. Further information later.

Strathcona, Alta.

The trustees of St. Anthony's have taken an option of block 12 between Fifth and University avenues for a building site for a new school.

South Vancouver, B.C.

The Provincial government will be asked to guarantee bonds to the extent of \$1,000,000 as provision for hospital.

Sault Ste. Marie, Ont.

The erection of a theatre is under consideration by the Star Amusement Co. The building will probably be 2-storey, brick, 44 ft. x 105 ft. Tenders will probably be called for Sept. 1st.

Plans are called for erection of general hospital. Proposed building, 3-storey solid brick, hot water heating, electric lighting, stone foundation. For further information address Algoma Benevolent Society, this city. Estimated cost, \$20,000.

Trail, B.C.

The school by-law to raise \$25,000 was carried by a large majority.

Thamesville, Ont.

On June 12th a by-law to raise \$3,500 for town hall purposes will be voted on. W. J. Cryderman, clerk.

Toronto, Ont.

Plans are being prepared by Symons & Rae, architects, 15 Toronto street, for Parish House, \$15,000, for St. John's Church, West Toronto.

Tenders addressed to J. P. Hynea, architect, Bank of Commerce Building, for erection of a building on St. Patrick street for the Young Women's Christian Association.

Tenders are called until June 12th for the several trades required in enlargement of Earl Grey Frankland schools, also midsummer repairs (all trades). Advertisement in "Tenders and For Sale Department" of this issue.

Tenders addressed to R. C. Desrochers, secretary, department of public works, Ottawa, will be received until June 14th for supply of fittings for Central post office. Plans, etc., on application to Mr. T. A. Hastings, clerk of works, postal station "F" Toronto; and at the above department.

Verdun, Que.

The Presbyterians here will tear down their church, corner of Ross and Church streets, and erect a larger structure in its place.

Viridien, Man.

The \$25,000 by-law for opera house and telephone exchange will be voted upon this month. W. A. Elliott, architect.

Victoria, B. C.

The plans prepared by Architect C. E. Watkins, for the new high school to be erected in the Spring Ridge district have been accepted by the school board. In-

structions were given to call for tenders for construction as soon as possible.

Vancouver, B. C.

Tenders are called until June 5th for erection of 2-storey brick and stone school near East Collingwood school. J. H. Bowman, architect.

Weiland, Ont.

Tenders addressed to J. McCaw, secretary public school board, will be received until June 20th for erection of 8-room school here. Plans, etc., at office of A. E. Nicholson, architect, 46 Queen street, St. Catharines, and at the store of the above.

Waterville, Que.

Tenders are called until June 15th for erection of Episcopal church hall, \$3,500. Specifications call for 1-storey, shingle roof, hot-air heating.

Winnipeg, Man.

The members of St. John's Methodist Church have decided to take steps to enlarge the present edifice, or erect a new one.

AWARDED

Calgary, Alta.

The general contract for erection of Golf & Country Club house has been awarded to Blacksire, Lytle & Jones, \$15,000. Architect, Lawson & Fordyce, Calgary.

The new garbage destructor will be of the Heenan & Froude type, equipped by Laurie & Lamb, Montreal, who undertake to have it in operation by Nov. 1st. Capacity of plant 75 tons per day.

Contracts have been awarded by the school board for the erection of five 2-room school houses as follows: To J. Macphail, one in West Mount Pleasant and one in La Grange, at 4,350 each. To H. Loughheed, one in Erlton at \$4,200. To H. Church, one in Glengarry and one on a site to be selected later, \$4,350.

Fort William, Ont.

The contract for erection of Roman Catholic Separate school has been awarded to C. Mathieu, \$12,000. No sub-contracts let yet.

The contract for erection of Central school annex was awarded to R. McLeod, \$29,680. Instructions were given to call for tenders on painting, glazing, heating and plumbing.

Lake Megantic, Que.

The contract for the building of the new Presbyterian church has been awarded to Mr. Jos. Coulet of Megantic, for \$4,450 for the finished structure.

Montreal, Que.

Messrs. Martineau & Prenoveau have the contract for erection of the new normal school which the ladies of the congregation are erecting on Sherbrooke street west. Architects, Marchand & Haskell.

Nutana, Sask.

The Brandon Construction company has been awarded the contract for a school, \$55,000.

Orillia, Ont.

The general contract for erection of Y. M. C. A. building was awarded to E. Webb, Orillia. J. H. Robertson, architect. Contracts for plumbing and heating not awarded.

Toronto, Ont.

The contractors for erection of Deer Park Presbyterian Church were as follows: Masonry, Leslie & Killer, Waterloo; carpentry, Geo. Nicholson, 61 Clinton street; plastering, Thos. Fitzgerald, 47 Sorauren ave.; heating and plumbing, W. J. McGuire, Ltd., 86 King street west; slate roof, G. Duthie & Sons, 30 Widmer street; iron work, Dominion Bridge Company, 4 Richmond street east; terra cotta work, Chillas & Black, 106 Bay street, agents for Doulton Co.; architects, Sharp & Brown, 18 Wellington street east.

The following tenders were accepted by the board of education:—Fern avenue school—Masonry, J. W. Hewitt, \$12,041; carpenter work, Frank Armstrong, \$7,039; plastering, George White \$12,041; carpenter work, Frank Armstrong, \$1,128; roofing and tinsmithing, Forbes Roofing Co., \$854; fire proof floors, H. Lucas & Son, \$1,354. Ogden street school—Masonry, G. T. Gayton, \$1,100; carpenter work, M. Hutchinson, \$2,386; plastering, Geo. White, \$588; painting, J. Casey \$210; heating, etc., Fred. Armstrong Co. \$299; structural steel, Reed & Brown, \$1,755; roofing and tinsmithing, Geo. Duthie & Son, \$330. Roden school—Masonry, R. Chalkley & Son, \$13,200; carpenter work, Frank Armstrong, \$10,185; plastering, Geo. White, \$1,296; painting, Jas. Casey, \$799; structural steel, W. H. Salten, \$1,250; roofing and tinsmithing, Geo. Duthie & Son, \$1,160; terra cotta work, R. Chalkley & Son, \$1,845; cupboard doors for armouries, Simpson Planing Mill, \$75; liquid slating, W. Walker, 35c a yard.

Winnipeg, Man.

The contract for heating and ventilating the Strathcona school and new addition was let to Thomson & Horner, \$16,300. This includes air washer and Vacuum cleaner. J. B. Mitchell, architect, commissioner, school buildings.

The contract for 1,300 feet of iron fence around King Edward school was let to Munro Steel and Wire Works for 71½ cents per lin. ft.

Residences

Brantford, Ont.

Tenders received after June 5th until June 15th for erection of residence for W. B. Preston. Estimated cost, \$10,000. Specifications call for tapestry brick, brick foundation, 3-storey, slate roof, hot water heating, electrical work, hardwood interior finish.

Tenders will be received shortly for priest's residence, \$10,000. Plans call for pressed brick, concrete foundation, with stone facing, 40 ft. x 40 ft., hot water heating, electricity, slate roof, hardwood and Georgia pine finish, 2½ storeys. Rev. Dean Brady is interested. Architect, R. Closhesy, 236 James street south, Hamilton.

Brockville, Ont.

Tenders addressed to B. Dillon, architect, will be received until June 10th for the various trades required in connection with improvements to residence of A. Gilmour.

Calgary, Alta.

Tenders called after June 2nd for erection of residence for J. E. B. May. Architect, Burroughs & Richards, 11 Crown Block. Estimated cost, \$4,000

Drummond, Que.

Tenders addressed to Thos. Tremblay, city engineer, were received until June 3rd for erection of double tenement house here, about 3¼ miles from Sherbrooke.

Galt, Ont.

Tenders called after June 10th and received until June 20th for store, \$4,000, for J. A. McDougall, Galt. Foundation constructed last fall. Specifications, brick veneer, hot water heating, interior finish ash, electric light, 2-storey, 36 x 48.

Medicine Hat, Alta.

Architect Williams is preparing plans for the Nurses' Home for the general hospital. Estimated cost, \$7,000. Plans for residence for F. M. Ginther on the corner of Fifth avenue and Balmoral street are also being prepared. Estimated cost, \$3,500.

Orillia, Ont.

Tenders will be called shortly for 2-storey residence, \$5,000, for S. S. Mullett. J. H. Robertson, architect.

Toronto, Ont.

Tenders called after June 8th for erection of apartment house, \$6,000, for W. H. Mitchell, Toronto. Plans call for 3-storey brick, 40 x 43. J. Hunt, Stanford, Yonge Street Arcade, Toronto, architects.

Thornbury, Ont.

Tenders will be called for 8-room, solid brick residence, \$3,000 for E. C. M. Pedwell. Architect, John Wilson, Collingwood.

Vancouver, B.C.

Plans have been filed for extension of apartment house at Thurlow and Haro streets, \$125,000, by Mr. P. Agren.

Calgary, Alta.

Tenders called after June 2nd for erection of residence, \$4,000, owner, J. E. B. May; architect, Burroughs & Richards, Crown Block.

Winnipeg, Man.

Tenders are called until June 8th for erection of residence for Mr. Geo. Cram by E. D. Tuttle, architect.

Tenders addressed to E. D. Tuttle, architect, 701 McArthur building, will be received until June 9th for erection of two residences.

AWARDED

Hamilton, Ont.

The general contract for residence for Bank of Montreal has been let to R. Tope, 191 Robinson street, brick and stone construction. Architects, Stewart & Witton.

Business Buildings and Industrial Plants

Belleville, Ont.

The by-law to grant aid to Messrs. Marsh & Henthorn towards erection of \$40,000 building will be submitted June 26th; also that for Allard & Platinum Co., who agree to expend not less than \$10,000 on site.

Brockville, Ont.

Plans are prepared for plant for National Manufacturing Co., \$15,000, calling for brick, 400 x 50, exhaust steam

heating, patent roofing. Nothing further will be done for some time. A Stuart Allaster, architect, Brockville.

Tenders will be called shortly for building for Metropolitan Bank, Toronto. Plans call for 1-storey masonry and wood construction, hot water heating, electric lighting, interior oak and brick materials—cut stone, metallic lath, structural iron, vaults, plastic relief, plate glass.

Brantford, Ont.

The Massey-Harris Co., Ltd., will build a large extension to their plant at Brantford.

Tenders are called until June 15th for erection of bank and office building, \$30,000 for Royal Loan & Savings Co. Specifications call for 3-storey, 40 x 63, fireproof, reinforced concrete, marble front, brick foundation, electrical work, terra cotta brick, metallic lath, pipe covering, plate glass, sheet metal work, vaults, hardwood and marble.

Plans were presented for approval covering the 10-storey block which is to be erected for Ald. Rogers at corner of Granville and Pender streets. Estimated cost, \$500,000.

Chatham, Ont.

Tenders were called for erection of brick and concrete packing house at the junction of the G. T. R. and P. M. railway. Plans, etc., at office of O'Keefe & Drew.

Calgary, Alta.

Alderman Ross is planning a 2-storey and basement addition to his present block in Hillhurst. Estimated cost, \$30,000.

Collingwood, Ont.

Tenders will be called shortly for factory for E. A. Ditson, Collingwood, of solid brick. Architect, John Wilson.

Fort Frances, Ont.

The transfer of thirty acres to the C. N. R. for their tourist hotel has been ratified by council. Stipulated expenditure, \$150,000 on hotel, \$50,000 on grounds.

Guelph, Ont.

The by-law to grant civic privileges to the Independent Tire Co. was carried in return for which a factory will be erected to cost \$50,000.

Hamilton, Ont.

Tenders will be called at once for brick and stone hotel. Owner, W. Willison, John and Jackson streets. Architect Munro & Mead, Main street, Hamilton.

Tenders will be called shortly for erection of factory for Zimmerman Mfg. Co., 2½ storeys, stone and brick, 150 x 60. Owners in charge of work. Estimated cost, \$25,000.

Tenders will be called at once for business building, \$40,000, for Standard Sanitary Co., Ltd. Architect, Stewart & Witton.

Hespeler, Ont.

The A. B. Jardine Company will erect a new moulding shop at Hespeler, Ont.

Kingsville, Ont.

The exchange hotel here was destroyed by fire on the 30th ult. Owner, W. Wilson. Estimated loss, \$15,000.

Lethbridge, Alta.

Tenders are called until June 21 for erection of grain elevator 40 miles south of this city. Elevating machinery, cleaners, metal siding and lumber required. Architects, H. M. & W. A. Whiddington, Lethbridge.

London, Ont.

The cold storage plant here was damaged by fire to the extent of about \$20,000 on the 30th ult.

A building permit for \$60,000 was issued recently for C. P. R. improvements in East London. A roundhouse is to be erected. New repair shops will be built in the fall.

Mulgrave, N. S.

Tenders addressed to A. W. Campbell, chairman government railways managingboard, will be received until June 10 for construction of a brick and stone passenger station here. Plans, etc., at office of the above department, at the station master's office here and at the chief engineer's office, Moncton.

Medicine Hat, Alta.

Tenders were called until June 3rd for erection of brick and stone building for Medicine Hat Printing and Publishing Co., Ltd. W. T. Williams, architect.

The Union Bank has purchased the corner of Fourth avenue and Toronto street. It is understood that a 3-storey building will be erected here. Local manager, Mr. Hopper.

Medicine Hat, Alta.

By-laws were carried granting a site and 250,000 cubic feet of gas per day to the glass works backed by D. C. Cameron, of Winnipeg, which will employ 150 hands. The same concessions go to the Alberta Foundry and Machine company, employing 100 hands. This month a vote will be taken on granting a site to the Preston Planing Mills, the Gordon Nail Works and the Medicine Hat Milling company. The Union bank has purchased a site on Toronto street and will immediately proceed to erect a 3-storey building.

Montreal, Que.

Plans for the Carlton Hotel, corner of Sherbrooke and Drummond streets, were approved by Mr. A. Chausse, the building inspector, subject to certain alterations, which will make for little thicker exterior walls. The cost of the hotel building will be \$1,250,000, exclusive of all furniture and fittings. It will be ten storeys high, containing 350 rooms, three staircases, four elevators, and two fire escapes. The building will be fireproof throughout. The architects are Messrs. Warren and Wetmore, New York.

Orillia, Ont.

Plans are being prepared by J. H. Robertson, Orillia, for factory for National Hardware Co., \$15,000. Specifications call for brick (slow burning) cement foundation, asbestos roofing, 2-storey, 45 x 100 x 34, steam heating, electric lighting, iron columns.

Plans are being prepared by J. H. Robertson, Orillia, for brick and stone store for Cabana & Watson. Specifications call for steam heating, electric lighting, 4-storey. Work will commence in the fall.

Port Arthur, Ont.

Messrs. John Stirrett & Sons propose erecting planing mills, sash and

door factory, in Midway. Estimated cost, \$85,000.

Regina, Sask.

The Farmers' Steel and Wire Company, Limited, will erect a 6-storey warehouse, 110 x 112, the first two storeys being built this year. Architect, W. W. Hilton.

Plans are being prepared for the erection of a five or six storey building for the Leader Publishing Company, on Hamilton street. Sharon and Darrach are said to be preparing the plans for the building. Estimated cost, \$200,000.

Sherbrooke, Que.

It is understood that Bank of Montreal will erect a branch on the property recently purchased here by them. Local manager, Mr. R. A. Aiken.

Smith's Falls, Ont.

Tenders addressed to H. A. Davidson, Smith's Falls, will be received until June 15th for erection of brick block on corner of Beckwith and Russell streets. Plans, etc., at office of architect, Smith Falls, and at store of H. A. Davidson.

Southampton, Ont.

Tenders are called at once by Bell Furniture Co., Ltd., for installation of vacuum heating system and sprinkler system for fire protection in new addition to chair factory.

Toronto, Ont.

Tenders were called until June 5th for erection of stores and apartments, \$20,000, cor Spadina and St. Patrick. Architect, H. Simpson, 82 King street east, Toronto.

Woodstock, Ont.

Tenders were called for erection of 1-storey bonding factory for Crown Lumber Co., Ltd., Woodstock. Interior finish will be of cement. Specifications call for cement work, asbestos pipe covering, telephone system, sprinkler system, electric bells, plate glass. Architect and contractor, F. G. Bachman.

Winnipeg, Man.

The Gilmour Soap Company, Montreal, are reported to be contemplating the erection of a branch factory. G. M. Bilmour, manager.

The Canadian Swift Packing Company have secured a building site with trackage at the corner of Adelaide and William avenue, and it is understood that they intend to build this summer.

It is announced that the new Winnipeg Electric Railway office building, on the corner of Notre Dame avenue and Albert street, will most probably be a ten-storey building. Preliminary plans have been prepared which will be laid before the board at their next meeting.

Vernon, B. C.

Tenders were called until May 29th for erection of 2-storey and basement general store building for the Hudson Bay Co. Plans, etc., at Davis Chambers, 615 Hastings street west, Vancouver. Dalton & Eveleigh, architects, Vancouver.

Vancouver, B. C.

A factory building is contemplated by the Brantford Motor Truck Co., Ltd., building to commence at once. R. A. Bailey and R. P. Cumback, owners.

A building permit has been issued to Boyd & McWhinnie for 6-storey build-

ing, corner of Cordova street and Columbia avenue, \$60,000.

AWARDED

Hamilton, Ont.

The general contract for erection of factory building, \$15,000; office building, \$40,000, for Oliver Plow Company, has been awarded to Prack & Perrine, Gilkinson street, Hamilton. Contractor for iron work, Hamilton Bridge Company.

Regina, Sask.

James McDiarmid & Co., Winnipeg, are stated to have been awarded the contract for erection of C. P. R. and C.N.R. new Union Station.

Sherbrooke, Que.

The general contract for erection of store for D. W. Stinson, Sherbrooke, has been awarded to J. V. Laplante. Specifications call for stone and brick, 3-storey building to be completed Sept. 1st.

Swift Current, Sask.

The general contract for erection of hotel has been awarded to Martin & Murphy, Regina. Estimated cost, \$60,000. Cement contract, A. Gilsbrow, Swift Current; plumbing contract, J. Simes. Excavations for foundations nearly completed.

Winnipeg, Man.

Carter-Halls-Aldinger Co., Ltd., have been awarded the contract by the C. P. R., for the erection of an addition to the tender and wheel shop in the company's Weston shops, 220 feet by 54 feet 8 inches.

A contract, amounting to \$90,000, it is stated, has been awarded to Peter Lyall and Sons, for the erection of the train shed at the new Union depot.

Vancouver, B. C.

The contract for the construction of the examining warehouse to be built by the Dominion Government has been awarded to A. McDermott & Co. of Winnipeg. The estimated cost of the building, which is to be of stone structure and four storeys in height, is given as \$350,000.

Power Plants, Electricity and Telephones

Berlin, Ont.

The by-law to raise \$20,000 for alterations, etc., to gas and electric light plants was defeated, also that for the laying of new tracks on King street.

Brantford, Ont.

Tenders are called by Engineer W. P. Kellett, Brantford, until August 1st for construction and equipment for the Brantford & Port Dover Railway. Length, 30¼ miles; steel towers (6,600 volt, single phase); five large bridges. Surveys made.

Canora, Sask.

By-laws aggregating \$100,000, for waterworks and electric light, have passed the council, and will shortly be submitted for approval.

Comox, B. C.

Tenders addressed to W. L. Coulson, general manager, will be received until June 26th for supply of Hydro-electric equipment for the Canadian Collieries,

(Dunsmuir) Ltd., Puntledge River. Contract includes complete hydraulic and electric equipment, furnishing and installation of two direct connected units, each unit developing 3,750 k.v.a. at switchboard. Plans at office of company, Pemberton Block, Victoria.

Tenders also received until June 26th for construction in connection with development of power, including clearing, construction of dams, flume, pipe line and power house.

Hamilton, Ont.

A by-law will shortly be submitted to provide for \$500,000, for power and light distribution plant.

Hull, Que.

The Hull Electric Company intend to erect car sheds, repair shops and offices for their railway at a cost of \$25,000, on their property near the Hull Junction (Ottawa and Gatineau Valley station) in the Little Farm. Plans for the buildings, which will be constructed of brick, with all modern improvements, will be presented to council by Mr. Chene, city engineer, who has gone carefully over the plans, and will present them to the city council on Monday next.

Middleton, N.S.

A by-law is under consideration to provide \$15,000 for the purchase and installation of an electric light plant.

Moose Jaw, Sask.

The by-law to raise \$7,500 for ornamental lights was carried; also that for electric light system, \$35,000.

Niagara Falls, Ont.

Tenders addressed to J. Robinson & Sons, Niagara Falls, will be received until August 1st for the following electrical equipment: lathe, drill press, shaper, electric rectifier.

Prince Albert, Sask.

Bids will be received until June 26 by C. O. Davidson, secretary-treasurer, for hydraulic power and electrical power equipment at La Colle Falls Power Station. C. H. & P. H. Mitchell, Engineers, Traders' Bank Building, Toronto, Ont.

Peterborough, Ont.

The Otonabee Power Co., it is stated, will spend \$200,000 on increasing its equipment to provide an output of 4,000 h.p. About 50 acres of land have been purchased for extensions. Estimated expenditure, \$200,000. Messrs. Ross & Holgate prepared plans in 1907.

Swift Current, Sask.

In connection with power plant there will be an opening for sale of electric meters, no house connections or secondary wiring done yet. Engineer, J. Darlington Whitmore, Regina.

AWARDED

Moose Jaw, Sask.

Contracts for equipment for the power house were awarded as follows: To the Babcox-Wilcox Co., boilers at \$5,975, stoker at \$2,000, piping at \$375, tee bars and supporting flue, \$200. The City Weigh Master reported receipts for the week of May 30 as follows: Water, \$7.67; scales, \$6.50; dog pound, \$8.00.

Regina, Sask.

Some 290 iron poles will be purchased for the street railway work, from Dawson & Company, Winnipeg.

Saskatoon, Sask.

The Dominion Bridge Co., Montreal, were the successful tenderers for the steel framework for the new power house. A. J. Randall, Saskatoon, will put together some 170 tons of frame work at \$16 a ton.

Winnipeg, Man.

The tender of Dunn Bros. for the street light known as the "mast arm," meaning that the lights are at the end of square arms on a 22-ft. standard, was accepted. Amount of tender, \$15,612 for 150 delivered in the city brackets, half way up the pole to carry the signal lamps which will flash red lights for the fire department and green lights for the police patrol system will cost \$7.

Miscellaneous

Winnipeg, Man.

The following building permits were issued recently: J. W. Phillipson, dwelling, Telfer street, \$2,000; Stanbridge Realty Company, dwelling, Morley avenue, \$2,500; J. Robinson, dwelling, Wellington Crescent, \$20,000; H. Rodgers, dwelling Victor street, \$2,400; Hicks Construction Co., 9 dwellings, McMillan ave., \$27,000; Machray Parker, dwelling, Assiniboine ave., \$10,000; A. Rheume, tenement, Alexander ave., \$2,600; Presbyterian church, Burrows ave., \$25,000; A. Macam, dwelling, Dorchester avenue, \$4,000; Winnipeg Supply Co., coal bins, Nora street, \$3,000; G. A. Muttelbury, two stores, Portage avenue, \$5,600; J. M. Suttie, dwelling, Fisher street, \$5,000; D. Kirkerod, two dwellings, Lenore street, \$7,000; P. Rungle, tenement house, Boyd avenue, \$2,900; C. L. Taylor, dwelling, Wellington Crescent, \$30,000; J. G. Walker, dwelling Wardlaw avenue, \$6,000; C. Henneson, dwelling, Toronto street, \$2,500; T. P. Carver & Son, dwelling, Polson avenue, \$2,500; P. Tropik, two dwellings, Aberdeen avenue, \$1,600; Andrews and Son, dwelling, Yale avenue, \$4,500; Andrews & Son, dwelling Harvard avenue, \$8,000; W. D. Brock, dwelling, Assiniboine avenue, \$7,500; F. W. Stoneham, dwelling, Lipton street, \$3,000; Lawrence Brothers, three dwellings, Richmond street, \$4,800; J. A. Patterson, dwelling, Athol avenue, \$2,800; MacKissock and Thomas, Limited, two dwellings on Dominion street, \$10,000; G. R. Crowe, dwelling on Assiniboine avenue, \$33,000; H. J. Box, dwelling, Crescent Road, \$10,000; J. A. Matthews, three dwellings, Rosedale avenue, \$7,500; F. Walker, dwelling, Dorchester avenue, \$9,000; H. Holderson, dwelling, Inkster avenue, \$3,000; L. D. Fitzgerald, dwelling, Victor street, \$3,360; J. F. Scribner, dwelling, Agnes street, \$3,800; J. A. Munro, store and apartment block, Pembina street, \$20,000; H. J. Box, dwelling, Crescent road, \$10,000; J. A. Matthews, three dwellings, Rosedale avenue, \$7,500; F. Walker, dwelling Dorchester avenue, \$9,000; H. Holderson, dwelling, Inkster avenue, \$3,000; L. D. Fitzgerald, dwelling, Victor street, \$3,300; J. F. Scribner, dwelling, Agnes street, \$2,800; T. E. Lewiston, stores and apartments, Selkirk avenue, \$20,000; E. Bray, brick dwelling, Bannerman avenue, \$3,000; A. C. Galbraith, 4 dwellings, Wolesley avenue, \$10,000; A. C. Galbraith, nine dwellings, Bannerman Place, \$22,500; A. R. Cavanagh, dwelling, Oakwood avenue, \$4,000.

Tenders and For Sale Department

Contractors' Material IN CANADA

Three Industrial Motors, 3, 5 and 7½ h.p.
C. W. Co. Auto Starter 5 to 15 h.p. and 15 to 40 h.p.

Brown 10-ton Locomotive Crane, overhauled.
Two Lidgerwood Complete Cableways.

Thirty-eight Western, One-way, Side Dump Cars.

We have quite a lot of material in Canada.

If in want of anything, write us. What have you to sell?

THE MALES COMPANY,
No. 82 Perin Building,
Cincinnati, Ohio.

Tenders

For the Construction of a Reinforced Concrete Subway

Sealed and endorsed tenders addressed to the Chairman of the Utilities Committee will be received at the office of the City Clerk up to 5 o'clock p.m., June 30th, 1911, for the construction and supply of all materials in connection therewith.

Plans, specifications and forms of tender may be obtained at the office of the City Engineer, Fort William; the office of the Contract Record, 220 King street west, Toronto; Canadian Engineer, 62 Church street, Toronto, or Builders' Exchange, Winnipeg.

The lowest or any tender not necessarily accepted.

JOHN WILSON,
City Engineer.

City Engineer's Office,
May 16th, 1911. 22-24

Tenders

For

Waterworks Supplies, Etc

TAVISTOCK, ONTARIO,

Sealed tenders addressed to the town clerk will be received up to 12 o'clock noon on Wednesday, June 14, 1911, for waterworks supplies and labor as follows:—

Approximately 2,250 feet of 8-inch, 2,550 feet of 6-inch and 2,100 feet of 4-inch cast iron water pipe, about 7 tons of special castings, about 16 hydrants, valves, etc. Also excavating for, laying and covering above pipe. One steel elevated tank.

Conditions and forms of tender, plans and specifications may be seen at the office of either of the undersigned.

Lowest or any tender not necessarily accepted.

F. W. FARNCOMB,
Consulting Engineer.

64 Bank of Toronto Chambers, London, Ont.
J. G. FIELD, Village Clerk.
Tavistock, Ont. 21-23

Bucket Crane

FOR SALE—One full circle, self-propelling, modern 10 to 15-ton capacity Browning size No. 1 Locomotive Crane, standard gauge, 4-wheel truck, 38 ft. steel boom, 8 x 10 engines, equipped to handle Clam or Orange Peel. Will furnish with or without bucket. Attractive price, fine condition, quick delivery. Inspection here.

WILLIS SHAW MACHINERY CO.

39 So. LaSalle Street, Chicago.

CITY OF SASKATOON

Sub-Structure for 19th Street Subway

Sealed tenders, addressed to the City Commissioners, Saskatoon, and endorsed "19th Street Subway," will be received up to twelve o'clock noon on Thursday, June 15th, 1911, for the above.

All information may be obtained from M. H. McLeod, Chief Engineer, Canadian Northern Railway, Winnipeg, or from George T. Clark, City Engineer, Saskatoon.

The lowest or any tender not necessarily accepted.

JAMES CLINKSKILL,
W. B. NEIL, City Commissioners.
E. M. SNELL,

Saskatoon, Sask. May 23, 1911. 22-23

VILLAGE OF BIGGAR SASKATCHEWAN

Sealed tenders marked Tender No. 1, Tender No. 2, Tender No. 3, Tender No. 4, Tender No. 5, Tender No. 6, Tender No. 7, will be received by the Sec.-Treas. of the Village of Biggar, Sask., up till noon, Tuesday, June 13th, 1911, for the following:—

Tender No. 1.—Trenching, laying and back filling for cast iron water mains, hydrants, valves, etc.

Tender No. 2.—For supplying cast iron water mains and specials.

Tender No. 3.—For supplying hydrants, valves and valve boxes.

Tender No. 4.—For supplying and installing all pump machinery.

Tender No. 5.—For supplying and installing a compressed air storage tank.

Tender No. 6.—For erection of a power house.

Tender No. 7.—For the construction of a concrete reservoir.

An accepted cheque equal to five per cent. of the amount of tender must accompany each tender.

Plans and specifications can be seen at the offices of the Secretary-Treasurer of the Village of Biggar, Sask., or the Engineer, Yorkton, Sask., or copies can be had from the Engineer on receipt of a marked cheque for \$10, which cheque will be returned on return of the plans and specifications.

F. McARTHUR,
Consulting Engineer,
Yorkton, Sask.

22-23

City of Fort William, Ont.

SALE OF MUNICIPAL PUMP- ING & ELECTRICAL GEN- ERATING PLANT

Tenders in bulk or in part will be received by the city clerk, addressed to the Chairman of Utilities Committee, on or before the 1st day of July, 1911, for the sale of the following equipment:

2 Duplex Compound Northy Pumps, High pressure cylinder, 14 in. diam; low pressure cylinder, 20 in. diam.; pump cylinder, 11 in. diam; stroke cylinder, 15 in. diam. Capacity of each, 600 gallons per minute.

1 tandem compound engine—cylinders 21 in. x 46 in., and 40 in. x 46 in.

1 engine 20 in. x 46 in. with counter shafting pulleys and belting complete.

1 Westinghouse revolving field 600 kw., 2 phase, 60 cycles, 2400 volt generator with exciter, switchboard, etc.

1 royal electric 180 kw., 133 cycle, 2400 volt, generator with exciter, switchboard, etc.

The above equipment has been thrown out of use by hydro-electric power and water gravitation system, but would be suitable for a town of 5,000 population.

Machinery can be inspected at any time at the city power house, Fort William.

The successful tenderer must be prepared to have lots awarded to him cleared from the site before the 1st day of September, 1911.

For further information apply at city engineer's office.

JOHN WILSON,
City Engineer.

May 17, 1911. 21-23



CITY OF TORONTO

Tenders

For a Steel Span Over the Tracks of the C.P.R. At Weston Road

Tenders will be received by registered post only, addressed to the Chairman of the Board of Control, City Hall, Toronto, Canada, up to noon on Tuesday, June 20th, 1911, for the construction of a steel span crossing the tracks of the C. P. R. at Weston Road, in the City of Toronto.

Envelopes containing tender must be plainly marked on the outside as to contents.

Specifications and forms of tender may be obtained upon application to the Department of Railways, Bridges and Docks, City Engineer's Office, Toronto.

The tenderers shall submit with their tender the names of two sureties (approved of by the City Treasurer, not members of the City Council, or officers of the Corporation of the City of Toronto), or in lieu of said sureties, the bond of a guarantee company approved of as aforesaid.

The lowest or any tender not necessarily accepted.

F. S. SPENCE,
Chairman of the Board of Control.
City Hall, Toronto, May 29, 1911. 23-24

TOWN OF GODERICH

Storm Sewer Extensions

Sealed tenders will be received by the Town of Goderich, addressed to the Town Clerk, until 4 p.m., Thursday, June 15th, 1911, for the furnishing and laying of approximately 12,800 lineal feet of storm sewers, building manholes, catchbasins, etc. Plans and specifications may be seen and all information obtained at the Town Clerk's office.

The lowest or any tender not necessarily accepted.

L. L. KNOX, Mayor.
Town Clerk.
Goderich, Ont., May 27, 1911. 22-23

Tenders

For Jail at Guelph

Whole or separate tenders will be received by the undersigned up till Friday, June 9th, for the erection of jail and jailer's residence in the City of Guelph, County of Wellington.

Plans and specifications may be seen at the office of the architect, W. A. Mahoney, Telephone Building, Guelph, or at the office of the Contract Record, 220 King street west, Toronto.

Lowest or any tender not necessarily accepted.

22-23 T. J. MOORE, City Clerk,
Guelph, Ont.

CITY OF MOOSE JAW

Sask.

Sewer and Water Extensions

Sealed tenders endorsed "Contract 37 or 38," as the case may be, will be received by the City of Moose Jaw addressed to the undersigned City Clerk until 8.30 p.m. on Monday, June 19th, 1911.

Any tender received after the above stated time will be declared informal.

Contract 36.—The laying of approximately 7,900 lineal feet of 24-inch Trunk Sewer.

Contract 37.—The laying of approximately 16,832 lineal feet of sanitary sewer of varying sizes and approximately 19,197 of water main of varying sizes.

Plans and specifications may be seen at the City Engineer's office.

Contract 38.—The supply of approximately:
236 lineal feet of 24-in. c.i. pipe.
358 lineal feet of 18-in. c.i. pipe.
6787 lineal feet of 12-in. c.i. pipe.
4669 lineal feet of 10-in. c.i. pipe.
11508 lineal feet of 8-in. c.i. pipe.
4905 lineal feet of 6-in. c.i. pipe.
Also special castings.

Contract 39.—The supply of approximately:
6710 lin. ft. of 24-in. vitrified tile pipe.
526 lin. ft. of 18-in. vitrified tile pipe.
4582 lin. ft. of 10-in. vitrified tile pipe.
11508 lin. ft. of 8-in. vitrified tile pipe.
180 lin. ft. of 6-in. vitrified tile pipe.
Also junctions, bends, etc.

Specifications for 38 and 39 may be obtained from the City Engineer's office upon application.

The lowest or any tender not necessarily accepted.

J. M. WILSON, City Engineer,
Moose Jaw, Sask.
W. F. HEAL, City Clerk,
Moose Jaw, Sask.
22-23

Tenders for Trunk Sewer

Sealed tenders marked "Tender for Trunk Sewer" will be received by the undersigned up till noon on Tuesday, June 13th, 1911, for the construction of a six-foot diameter concrete trunk sewer about Twelve Thousand feet (12,000 ft.) long for the City of Calgary.

Each tender must be accompanied by an accepted bank cheque for \$500 payable to the City Treasurer, which will be returned to the bidder unless he fails to execute a contract, should it be awarded to him.

The successful bidder will be required to execute a bond in the sum of Thirty Thousand (\$30,000) for the faithful performance of the contract and a guarantee of maintenance for one year after the contract is completed.

The City reserves the right to reject any or all tenders.

Plans and specifications can be seen at the office of the City Engineer at Calgary; the office of the Contract Record, Toronto; office of Canadian Engineer at Winnipeg, and the Engineering Record, 239 West 39th street, New York.

22-23 W. D. SPENCE,
City Clerk.



Department of Railways & Canals, Canada

Hudson Bay Railway

NOTICE TO CONTRACTORS

Sealed tenders addressed to the undersigned and endorsed "Tender for construction of Hudson Bay Railway," will be received at this office, until 10 o'clock on Tuesday, the 1st of August, for a section of about 185 miles from Pas Mission to Thicket Portage.

Plans, specifications and form of contract to be entered into can be seen on and after Wednesday, May 31, 1911, at the office of the Chief Engineer of the Department of Railways and Canals, Ottawa, and at the office of the Chief Engineer of the Hudson Bay Railway, Winnipeg, at which places forms of tender may be obtained.

Parties tendering will be required to accept the fair wages schedule prepared or to be prepared by the Department of Labor, which schedule will form part of the contract.

Contractors are requested to bear in mind, that tenders will not be considered, unless made strictly in accordance with the printed forms, and in the case of firms, unless there are attached the actual signature, the nature of the occupation, and place of residence of each member of the firm.

An accepted bank cheque for the sum of \$200,000 made payable to the order of the Minister of Railways and Canals must accompany each tender, which sum will be forfeited if the party tendering declines entering into contract for the work, at the rates stated in the offer submitted.

The cheques thus sent in will be returned to the respective contractors whose tenders are not accepted.

The cheque of the successful tenderer will be held as security, or part security, for the due fulfilment of the contract to be entered into.

The lowest or any tender not necessarily accepted.

By order,
L. K. JONES,
Secretary.

Department of Railways and Canals,
Ottawa, May 26, 1911.

Newspapers inserting this advertisement without authority from the Department will not be paid for it. 23-24

BOARD OF EDUCATION

Tenders Wanted

Sealed tenders addressed to the Secretary Treasurer of the Board will be received until Monday Noon, June 12th, 1911, for the several trades required in the enlargement of

EARL GREY SCHOOL
FRANKLAND SCHOOL
MIDSUMMER REPAIRS (all trades).

Plans and specifications may be seen and all information obtained at the office of the Board, City Hall. Each tender must be accompanied with an accepted bank cheque for five per cent. of the amount of tender or its equivalent in cash.

The lowest or any tender will not necessarily be accepted.

W. W. HODGSON,
Chairman of Committee.
W. C. WILKINSON,
Secretary-Treasurer.

Toronto, Ont., June 1, 1911. 23-23

TOWN OF NORTH BAY

Tenders

For

Laying Sewer Pipes, etc

Sealed tenders, addressed to the undersigned, will be received up till 12 o'clock noon on Thursday, 15th June, 1911, for all labor necessary for laying approximately 25,000 lineal feet of Sewers, ranging from 6-in. to 36-in., in the Town of North Bay; and furnishing certain materials therefor, according to Specifications, Plans, and Profiles, to be seen in the Office of the Commissioner of Works, North Bay.

All pipe will be supplied by the Corporation, on board cars at North Bay; the Contractor to unload and do all handling.

Work must be commenced immediately after awarding the contract.

The lowest or any tender not necessarily accepted.

T. N. COLGAN,
Commissioner of Works.
North Bay, May 31, 1911. 23-23

CITY OF TORONTO

Tenders

For the Construction of a Concrete Floor Slab and a Reinforced Concrete Bent at the Western Road Bridge

Tenders will be received by registered post only, addressed to the Chairman of the Board of Control, City Hall, Toronto, Canada, up to noon on Tuesday, June 20th, 1911, for the construction of a concrete floor slab on a steel span crossing the tracks of the C. P. R. at Western Road in the City of Toronto, and a reinforced concrete bent under the north end of the said steel span.

Envelopes containing tender must be plainly marked on the outside as to contents.

Specifications and forms of tender may be obtained upon application to the Department of Railways, Bridges & Docks, City Engineer's Office, Toronto.

The lowest or any tender not necessarily accepted.

G. R. GEARY, Mayor,
Chairman of the Board of Control.
City Hall, Toronto,
May 29, 1911. 23-24

TOWN OF BATTLEFORD Saskatchewan

Sealed tenders, addressed to the Town Council of Battleford, will be received until noon, Monday, June 19th, for material and construction of a waterworks and sewerage system.

Plans may be seen and schedules of quantities, specifications, etc., obtained at the office of the Town Engineer.

Each tender must be accompanied by an accepted bank cheque on a chartered Canadian bank equal to five per cent. (5 per cent.) of the contract price.

H. C. ADAMS,
Secretary-Treasurer.
WM. KITSON,
Town Engineer.

23-24

TOWN OF STEELTON PROVINCE OF ONTARIO

Notice to Contractors OUTFALL SEWER

Sealed tenders will be received by the Town Clerk until 8 p.m. Saturday, June 10th, 1911, for the construction of a Reinforced Concrete Outfall Sewer about 570 feet in length and 66 inches interior diameter.

Plans and specifications will not be sent out to contractors, but may be seen at the office of the Engineers, Toronto and Steelton. Correspondence should be addressed to the Toronto office.

A certified cheque for \$1,000 shall accompany each tender.

The lowest or any tender not necessarily accepted.

JAS. LYONS, Esq., Mayor,
Steelton, Ont.
J. ROBINSON, Esq., Town Clerk,
Steelton, Ont.
CHIPMAN & POWER, Engineers,
Toronto, Ont.

23-23

TOWN OF NORTH BAY

Tenders For Supply of Sewer Pipe

Tenders will be received by the undersigned, for the Corporation of North Bay, up till noon on Thursday, 15th June, 1911, for the supply of Sewer Pipes as shown below.

Pipes to be delivered f.o.b. cars at North Bay, and delivery to commence not later than one week after contract has been awarded, and to continue as fast as may be required.

Approximately 5,700 lineal feet 10-in. Pipe. (Vitrified Tile).
Approximately 1,260 lineal feet 20-in. Pipe.
Approximately 2,720 lineal feet 24-in. Pipe.
Approximately 1,800 lineal feet 30-in. Pipe.
Approximately 1,520 lineal feet 36-in. Pipe.
Approximately No. 575 10 x 6 in. T. Junctions.
Approximately No. 335 20 x 6 in. T. Junctions.
Approximately No. 200 24 x 6 in. T. Junctions.
Approximately No. 120 30 x 6 in. T. Junctions.
approximately 102 x 26 in x 6 in.
Approximately No. 80 20 x 8 in. T. Junctions.
Approximately No. 60 30 x 8 in. T. Junctions.
Approximately No. 20 36 x 8 in. T. Junctions.

Parties tendering are requested to submit a tender for the 20-in., 24-in., 30-in. and 36-in. Pipe in Cement Concrete as well as Vitrified Tile.

The lowest or any tender not necessarily accepted.

T. N. COLGAN,
Commissioner of Works.

North Bay, May 31, 1911.

23-23

Tenders for Sidewalks

will be received by the undersigned until 8 p.m. of Monday, the 19th June, current, for the construction of \$3,000 worth of Cement Sidewalks.

A marked cheque for \$50 must accompany tenders.

The lowest or any tender not necessarily accepted.

For specifications apply to

D. H. MINAKER, Town Clerk,
Cobourg, Ont.

June 11, 1911

23-24

TOWN OF STETTNER Alberta

Electric Light

Sealed tenders addressed to the undersigned will be received until 18 o'clock on Monday, 3rd July, 1911, for the following:—

One 125 k.v.a. Generator, Exciter, and Switch-board.

One Tandem Compound Steam Engine.

One 72 in. x 16 ft. Boiler and Stack.

Cedar Poles and Pole-line material.

Erection of Pole-line.

Specifications and all information may be obtained at the offices of the engineers, the John Galt Engineering Co., 317 Portage avenue, Winnipeg.

The lowest or any tender may not be accepted.

DAVID MITCHELL,
Town Commissioner,
Stettler, Alberta.

23-23



Sealed tenders addressed to the undersigned, and endorsed "Tender for Breakwater at Bare Point, Port Arthur, Ont.," will be received at this office until 4 p.m., Wednesday, July 5, 1911, for the construction of a Breakwater at Bare Point, Port Arthur, Electoral District of Thunder Bay and Rainy River, Ont.

Plans, specifications and form of contract can be seen and forms of tender obtained at this Department and at the offices of E. B. Temple, Esq., District Engineer, Port Arthur, Ont.; J. G. Sing, Esq., District Engineer, Confederation Life Building, Toronto; H. J. Lamb, Esq., District Engineer, London, Ont.; and J. L. Michaud, Esq., District Engineer, Merchants' Bank Building, St. James street, Montreal, Que.

Persons tendering are notified that tenders will not be considered unless made on the printed forms supplied, and signed with their actual signatures, stating their occupations and places of residence. In the case of firms, the actual signature, the nature of the occupation, and place of residence of each member of the firm must be given.

Tenders are asked for two modes of construction, and each contractor must send in with his tender an accepted bank cheque on a chartered bank, payable to the order of the Honourable the Minister of Public Works, equal to ten per cent. (10 p.c.) of the amount of the higher of the bids, which cheque will be forfeited if the contractor decline to enter into a contract when called upon to do so, or fail to complete the work contracted for. If the tender be not accepted the cheque will be returned.

The Department does not bind itself to accept the lowest or any tender.

By order,
R. C. DESROCHERS,
Secretary.

Department of Public Works,
Ottawa, June 2, 1911.

Newspapers will not be paid for this advertisement if they insert it without authority from the Department.

23-24

CITY OF KINGSTON

Notice to Paving Contractors

Sealed tenders under registered post only, addressed to the undersigned, will be received by the Board of Works up till 12 o'clock noon, Saturday, June 24th, 1911, for the construction of:—

15,000 square yards of asphaltic macadam;
9,700 lineal feet of curb and gutter.

Plans and specifications are also on file at the office of the Contract Record, 220 King street west, Toronto.

The lowest or any tender not necessarily accepted.

H. B. R. CRAIG,
City Engineer.

June 5th, 1911.

23-24

CITY OF PRINCE ALBERT

Tenders for POWER WORKS

Sealed tenders will be received up until noon, Monday, June 26th, 1911, by the Corporation of the City of Prince Albert, Province of Saskatchewan, for the construction of

Power Station Superstructure and Transmission Line

being portions of the proposed hydro-electric power development on the North Saskatchewan river at La Colle Falls (distant 25 miles east of the city).

Tenders are invited on each separately and must be plainly marked on the outside of envelope and addressed to the Secretary-Treasurer, City of Prince Albert, Saskatchewan.

Each tender must be accompanied by an accepted bank cheque for \$500, payable to the Secretary-Treasurer, which cheque will be returned to the bidder unless he fails to execute a contract should it be awarded to him.

The successful bidder on each of the works will be required to execute a bond in the sum of \$3,000 for the faithful performance of the contract.

The city reserves the right to reject any or all tenders.

The plans and specifications will be on file and may be seen on and after June 8th, 1911, at the City Hall, Prince Albert; office of "Canadian Engineer" at Winnipeg and Montreal, or at the offices of the Engineers, C. H. and P. H. Mitchell, Traders Bank Building, Toronto.

ANDREW HOLMES, Mayor.
C. O. DAVIDSON, Secretary-Treasurer.

Prince Albert, Sask.
June 1st, 1911.

23-24

Miscellaneous

Advertisements under this heading two cents per word per insertion. Minimum charge 50 cents

REPRESENTATIVE WANTED

An American company manufacturing Thomas Locking System special Sectional Sheared Bar for reinforcing concrete, want an engineer to handle the sales end of their business on shares. Address, Box 282, Contract Record, Toronto, Ont.

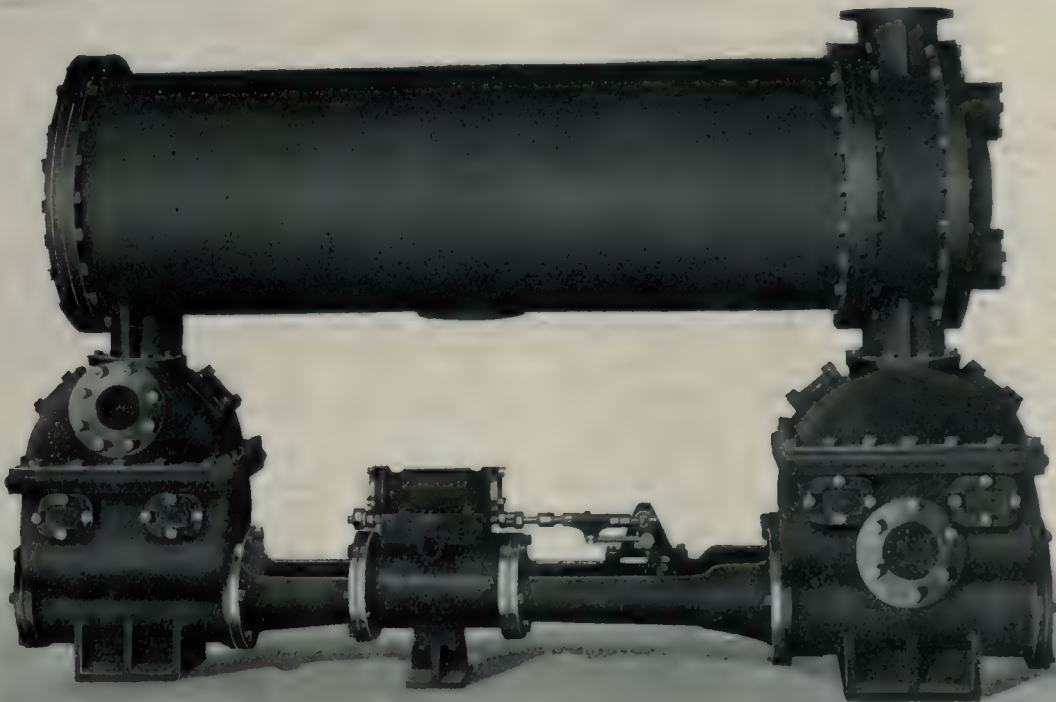
23-24

REPRESENTATIVES WANTED

Large American firm manufacturing a product for making dustless roads desires to secure competent representatives in eastern and western Canada who have connection with municipal authorities and town and city engineers. All proposition. Apply Box 284, Contract Record, Toronto, Ont.

23-24

Condensors



Condensor built by The John Inglis Co., Limited

BOILERS, ENGINES, PENSTOCKS,
Water Towers, Steel Tanks, Heavy Plate
Work, Condensors, Air Compressors, Pump-
ing Machinery, Special Machinery of all kinds

Let us Submit Prices.

The **John Inglis Company**

Engineers and Boilermakers

Limited

14 Strachan Ave., TORONTO, Canada

Unclassified Items

Brandon, Man.

Local architects will be invited to submit plans for erection of St. Matthias church on 13th street. No further details as yet.

Brantford, Ont.

Tenders received by Geo. Wedlake until June 10th for erection of Methodist church. Architects, Taylor & Taylor, Brantford.

Calgary, Alta.

Tenders are called about July 15th for erection of 3-storey business block for L. R. Burns, Calgary. Solid brick, concrete, steam heating, electric lighting, tar and gravel roof, 99 x 110. Tenders received after July 1st.

Chatham, Ont.

Tenders addressed to W. G. Merritt, city clerk, will be received until June 12th for construction of glazed pipe sewers.

Tenders addressed to Ward Stanworth, 80½ King street, will be received until June 11th for erection of packing house, \$15,000, for O'Keefe & Drew. Plans call for 2-storey and basement, concrete foundation, construction, slow burning wood, roof, steel construction, cut stone reinforced concrete, vaults, freight elevator, sheet metal fireproof doors and windows, electrical work, refrigerator.

Hamilton, Ont.

Recent building permits include: E. Stewart, two frame dwellings, on Francis street, for J. Smithen, \$2,250; Stewart & Witton, for the erection of a brick I. O. O. F. temple building, on Gore street, \$45,000; W. A. Edwards, for the erection of a brick addition to factory building, 47 Main street east, \$6,000; J. W. Cummings, for the erection of a brick dwelling on Blythe street, between Stinson and Alanson streets, for S. Jones, \$2,000.

Kingston, Ont.

Tenders are called until June 24th for construction of paving, 15,000 square yards asphaltic macadam, 9,700 lin. ft. of curb and gutter. H. B. R. Craig, city engineer. Advertisement in "Tenders and For Sale Department" of this issue.

Medicine Hat, Alta.

Plans are being prepared for office building, \$20,000, brick, 2-storeys, concrete foundation, for W. Cousins. Architect, Mr. Trimble.

Plans are being prepared for erection of theatre for Ready & Perley, Medicine Hat, \$25,000, brick and stone, concrete foundation, structural iron, fire escapes, fireproofing material.

No tenders will be called for labor on the 30,000 square yards of cement walks to be laid costing \$55,000. City owns plant and will use steel forms. A. K. Grimmer, city engineer.

Work will commence shortly on a foundry for E. L. Davis, \$7,500. Specifications call for concrete foundation, metal siding, frame construction, gas heating and lighting and patent roofing. Work will be done by day labor.

Plans are being prepared for construction of mill for Alberta Linseed & Paint Co., \$75,000. They call for concrete foundation, frame construction, gas lighting, gas heating, patent roofing, 3-storey, cement and structural iron, met-

al siding. Bonus received from city. Additional information later.

Re erection of St. Barnabas church. Tenders were received from Clemsha & Coltman, Regina. Tenders exceeded estimate fifty per cent., and vestry felt that they could not finance this amount, so parish is asking for competitive plans not to exceed \$25,000, and to include heating, plumbing, electric wiring and fixtures and congregational seating capacity of 400. Plans must be in by June 16th. J. H. Collier, secretary of vestry.

Tenders are to be called at once for one and one-half storey residence for F.

Ottawa, Ont.

V. V. Rogers is calling for tenders for removing 40,000 cubic yards of filling. It is to be moved about 800 feet.

Tenders received after June 1st for residence for Miss Lane. Plans call for brick veneer, 2½ storeys, hot water heating. Architect, J. P. MacLaren. Sparks street.

A capitalist, supposedly George H. Perley, has made a donation of \$50,000 towards a hospital for incipient tuberculosis patients in Ottawa. It is probable that the work will be begun soon.

Tenders are called until June 9th for erection of 2-storey factory for McFarlane & Douglas, Slater street. Only masonry and carpentry being called for just now. Architect, J. A. Ewart, 193 Sparks street.

Tenders have been received for cement pavements for Somerset street from Bronson avenue to Division street. They are: Union Construction Company, \$24,258; Barber Asphalt Company, \$26,000; Ottawa Construction Company, \$24,820. The tenders for the King Edward avenue paving were: Barber Asphalt, \$12,180; Union Construction Co., \$11,465, and the Ottawa Construction Company, \$10,987. The board of control has recommended the lowest tender in each case be accepted.

Renfrew, Ont.

Tenders will be called within 30 days for erection of residence for J. A. Jamieson. Plans call for 2½ storeys, brick and stone foundation.

Regina, Sask.

Recent building permits include: W. G. Dand, Victoria avenue, brick dwelling and barn, \$6,900; J. A. Wright, Sixteenth avenue, brick dwelling, \$6,500; John Ingram, Robinson street, frame dwelling, \$3,000; J. F. Anderson, Smith street, brick dwelling, \$10,000; Western Trust Company, Eleventh avenue, block of offices, \$70,000; Cameron and Heap, Dewdney street, warehouse, \$45,000; Methodist College, Sixteenth avenue, college, \$275,000; fire hall, Scarth street, new fire hall, \$15,000; power house, Dewdney street, addition to power plant, \$7,000; exhibition buildings, cost \$53,500; R. M. Moore, Albert street, store and dwelling, cost \$3,000.

Toronto, Ont.

Tenders addressed to the chairman, joint building committee of the Y. M. C. A., will be received until June 20th for erection of Central Building, Nos. 22-40 College street. Architects, Burke, Horwood & White, 28 Toronto street.

Vancouver, B.C.

Tenders are called for 5-storey brick mill and reinforced concrete construction, concrete foundation, plumbing,

heating, electric wiring. Owner, G. H. Cottrell, 139 Water street; architects, Parr & Fee, 570 Granville street, Vancouver.

Recent building permits include:

Parsons & Haddock, brick warehouse, four storeys, Hamilton street, \$35,000; National Finance Company, alterations, Pender street, \$6,000; J. C. Waghorn, additions, 1670 Beach avenue, \$3,500; R. Evans, dwelling, 3050 Hemlock street, \$10,500; Peter Faulkner, frame dwelling, 2298 First avenue west, \$3,500; Boyd & McWhinnie, six-storey brick building, Cordova and Columbia, \$60,000; W. D. McKenzie, frame dwelling, 416 Sixteenth avenue east, \$5,000; W. J. Dickinson, 628 Harris street, \$8,000; Jefferson & Clapham, 1433 Twelfth avenue, two houses, \$2,800; W. Tinney, 2932 Sophia street, \$9,000; T. W. Nixon, 2223 Parker street, \$3,000; Hawes & Rowlett, 2907 Woodland drive, \$4,000; W. H. Creitz, 2318 McDonald street, \$4,000; Provincial Government, Normal school grounds, \$2,680.

West Oxford Tp., Ont.

Plans are being prepared for erection of 1-storey school, \$4,000. Plans call for cement foundation, 27 x 44, hot air heating, slate roof, metal ceiling. Tenders received after June 15th, close June 30th. Architect, Taylor & Taylor, Brantford.

Wilkie, Sask.

Tenders are received until June 10th for the drilling of a well up to 300 feet in depth for a 6 in. or 8 in. casing. T. A. Dinsley, secretary-treasurer.

Whitby, Ont.

Two by-laws, one to ratify an agreement with the Seymour Electric Power Company to supply power to the town, and the other to establish a free library, were carried.

AWARDED

Chatham, Ont.

The sub-contracts for erection of Church and Rectory, Pain Court, have been awarded as follows: heating and plumbing, Mitchell Bros., Chatham; iron work, F. Callahan, Chatham; general contractor, Blonde Lumber Mfg. Company.

Hamilton, Ont.

The contract for erection of Colonial Theatre for the Colonial Theatre Co., Hamilton, has been awarded to G. E. Mills, 614 King street east, Hamilton, \$20,000. Architect, J. A. Armes, Hamilton.

Medicine Hat, Alta.

The contract for brick manholes has been awarded to John Farrer, Redcliff, at \$1.25 per foot high. Other tenders were John Pettit, Medicine Hat, \$1.80; Geo. Worthy, Medicine Hat, \$2.00, and Hotson & Leader, Lethbridge, \$2.25 per foot high. A. K. Grimmer, city engineer.

Souris, Man.

The general contract for erection of public school here was awarded to A. E. Bullock, Brandon. Contracts for heating and plumbing not let yet. Contract originally awarded at same figure to Piggott & Son, Hamilton.

Woodstock, Ont.

The contract for erection of building for Ken Knit Co. was awarded to J. W. Taylor, Woodstock, on May 27th. Building to be completed September 15th.

Contract Record

ESTABLISHED 1886

A Weekly Journal of
Building, Contracting, Engineering, Public Works
Municipal Progress, Advance Information

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CHICAGO - - - - - 4059 Perry Street
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Vol. 25

June 14, 1911

No. 24

The Art of Criticising

Criticism is fair and legitimate. Most of us need to be hit, and hit hard sometimes, principally because we often get the notion that we have a monopoly of wisdom. This is particularly true of those who are accustomed to have their own way because for the time being they are placed in a position of authority. But criticism should be constructive rather than destructive. Most any fool can see the badness and the weakness in men and things. Faults are always glaring. But it takes a wise man to see the good which may be covered by the bad. Not to judge merely by superficial appearances requires knowledge. True criticism does not necessarily mean a pointing out of weakness. It may be the discovery of virtue. However, most criticism is of the other kind. It is just plain simple "knocking." Criticism of another generally acts as a boomerang upon the unjust critics, because the critic is most apt to point out in another the failing which is peculiarly his own. As a general proposition it is better to criticise yourself than to wait until another fellow gets a chance to criticise you; and be merciless to yourself in your criticism, if you expect mercy from another.

Confidence in the Crop

According to information to hand from Winnipeg, the favorable conditions that have surrounded agricultural operations in the west during the present season have been responsible for a great increase in public confidence regarding the outcome. It is not safe to make definite calculations as to the extent to which past records will be left behind, but it may be reasonable to use Mr. William Whyte's preliminary estimate of 200,000,000 bushels of wheat as a starter. This figure is reached by multiplying the acreage of approximately 10,000,000 by 20, the prospective average yield in bushels. There is always a possibility that the average yield will run over twenty bushels,

as it did in Saskatchewan two years ago, and there is an equal chance that the acreage under wheat may be more than 10,000,000. There are those who say that the area will be nearer 12,000,000 acres, just as there are those who say that the average production is more likely to be twenty-five bushels. The estimates may be revised in a week or so, as the figures of acreage sown to the various grains will then be available.

With due consideration for the weather, current estimates of crop production may be accepted as a basis, and calculations, forward or backward, may be made in accordance with atmospheric developments from now on. There is reason to believe that with unfavorable conditions in July the total production of wheat may go as low as 140,000,000 bushels, the total for 1909, but it can scarcely be less than that amount. On the other hand, it may run as high as 225,000,000 bushels, or about twice that of 1910. An average of these extremes will not be far from the actual total. There is every probability that the best records of past seasons will be broken. The average yield of wheat for a ten-year period in the west is about 18 bushels per acre. On an area of 10,000,000 acres, this would mean a yield of 180,000,000 bushels.

Toronto City Architect on the "Safe Side"

Apparently the City Architect of Toronto, Mr. McCallum, continues to find a certain amount of diversion in giving out odds and ends of interviews to evening newspaper reporters, who publish the impressions obtained from Mr. McCallum in a semi-technical strain which is not altogether discreditable to their ingenuity. Evidently the aforesaid reporters have caught something of the warlike spirit manifested by Mr. McCallum, for we find quite an extensive article appearing in a recent issue of the Toronto Telegram under the caption, "McCallum Sticks to Guns." From the stand Mr. McCallum has taken we can only assume that the metaphorical allusion is to the guns of war and not to the new cement guns shown at the recent exhibition in Toronto. We are strengthened in this conviction by the consideration that Mr. McCallum has made some very unkind remarks about reinforced concrete construction. For instance, if we are to believe the Toronto Telegram, he says: "Concrete construction is a new form of building and it is a process which cannot be too closely watched. There is no other form of building in which it is so easy for builders to evade the bylaw, and it is only by the closest supervision that we can feel sure of the work."

"Then," Mr. McCallum continues, "it is not well known yet just what this form of construction will stand . . . I have no right to take a chance . . . I know that the formula which I demand is safe and I intend to insist on it."

Now we cannot vouch for it that Mr. McCallum delivered these sentiments word for word. Unfortunately we were not present at the interview. But Mr. McCallum gets the credit for all this twaddle, and seemingly he is not altogether averse either to taking the credit or to leaving a stigma upon the work of the Citizens' Committee.

Mr. McCallum seems to be getting some support upon the ground that he is careful and that he is on the "safe side." But the architect or engineer who must have a wide margin of expense left to enable him to get on the "safe side" is a back number, now-a-days.

The City Architect has shown some disposition to explain things to the general public. Can he find a

technical defence for his action in the case cited below, which is only one of a number of instances brought forward in the application for revision?

"Last summer one of the members of this committee proposed the construction of a reinforced concrete floor for a new school building in this city, basing his design upon the best Canadian and American engineering practice, but adopting the live loads specified in the Toronto by-law. A test was devised and carried out which demonstrated a capacity 37 per cent. in excess of the test requirements of the by-law, but the City Architect refused a permit and required the addition of concrete and steel which under ordinary conditions as to the prices of material and labor, increased the cost of the floor 21 per cent. If the excessive requirements of the present by-law respecting floor loads in schools had been taken into account, the extra cost of this floor over one rationally designed would have been substantially more than 21 per cent."

Finally, we would suggest that "The Telegram" employ its spare time in collecting more up-to-date information upon that "new form of building"—reinforced concrete construction.

An Interesting Report on Canadian Trade

His Majesty's Trade Commissioner for the Dominion of Canada, Mr. Richard Grigg, has just made a report on the Board of Trade, at London, England, on the trade of the Dominion of Canada for the period from July 1, 1906 to March 31, 1910. The report covers nearly every phase of Canadian operations and is divided roughly into three parts:

(1) A general survey of the economic conditions of the Canadian market.

(2) The import trade of Canada.

(3) A survey of particular branches of trade.

Trade conditions for the period named are analyzed very carefully and the figures relating to labor and to some of the principal commodities used by engineers and contractors are of practical interest.

More Brick and Less Fires

The two great elements of costly damage in a building are the marble or granite exteriors and the wooden and combustible interior trimming and decoration. The latter is being eliminated and at great jumps, doors and window frames can now be produced in metal as cheaply as in wood and floor surfaces can be and are made of plastic materials, cements, etc., vastly superior to wood in wear, comfort and fire-resistance and that cost no more. People still have the notion that granite, marble and stone are the proper caper in monumental buildings, surfaces that go all to pieces in a hot fire, but the business men tend more and more to wall surfaces of undamagable brick and terra cotta. You'll see brick and terra cotta preponderating to a still greater extent in 1911.—Brick.

Concrete fence posts for railway use have been studied and tested during the past year by the committee on signs, fences and crossings of the American Railway Engineering and Maintenance of Way Association, and the indications of the study are that they are practicable, durable and economical. In the report of the committee to the annual convention it is stated that the 8-ft. post is most desirable, and that those with a cross section approaching a square form

are easiest made and most suitable for fencing. The spacing should be the same as for wood posts. The investigations indicate that the stone or gravel used in the concrete for these posts should pass a ½-in. square mesh and that the concrete should be mixed wet, in a batch mixer, and poured into the molds. Experience shows that extra precaution should be used in the selection of material, mixing of concrete, and handling and curing of the posts. It is observed that the poured posts are a little over 25 per cent stronger than tamped posts of the same size, mixture and reinforcement, and that they are also better able to withstand the action of frost and alkali. For best results posts are allowed to remain in the yard undisturbed for at least 60 days after coming from the molds. Breakage to be expected in handling and transportation is not in excess of 0.3 per cent.

Repairing Concrete Floors

There is a popular and widespread fallacy to the effect that a concrete floor once chipped or cracked is practically at the end of its usefulness. This is undoubtedly due to the results of unskilled workmen attempting to repair a damaged floor. Unless proper care is taken and the workman engaged on the job has sufficient knowledge of concrete, a repair job is most unsatisfactory.

In this connection, the practice of the Aberthaw Construction Co., Boston, is worth noting. In certain of the concrete buildings erected by this firm floors have been chipped in particular places because of some phase of the industry which gave rise to dropping heavy materials in one place, as, for example, the winding rolls in a paper mill. When a floor has become chipped out in some such manner as this, the proper method of repairing is to chip out with mallet and chisel a recess usually square, of sufficient depth to reach to the bottom of the deepest break in the concrete surface. The rough surface resulting from this process is then treated with acid to bring out the solid aggregate, or else a stiff brush is used to remove all the loose dust, and the recess washed out by sluicing out with a hose. When all the dust particles have been removed the recess is grouted with cement and before this has set the granolithic finish is applied and leveled up with the rest of the floor.

The Commission of Conservation has sent a bound volume containing two addresses delivered at the second annual meeting of the commission held at Quebec last January. These are, Agricultural Work in Ontario, by C. C. James, Deputy Minister of Agriculture for Ontario, and Unsanitary Housing, by Dr. Chas. A. Hodgetts, Medical Adviser to the committee on public health of the Commission of Conservation. The latter address will be read with interest by many readers of the Contract Record who appreciate the evils of improper housing and the deleterious effect of their continuance upon the individual. The housing question which is becoming of greater importance every year in Canada, has been more particularly brought to the attention of Canadians by Mr. Henry Vivian, M.P., the English expert. In this address the existing conditions in Canada are discussed, and some of the disclosures made should warrant careful investigation by our leading municipalities. The health laws of the various provinces are epitomized and their inefficiency is commented upon.



Construction of the Cambie Street Bridge, Vancouver, B.C.—View of north steel trestle

The Cambie Street Bridge at Vancouver

The Longest Steel Structure of the Kind in British Columbia—Details of Design and Methods Employed in Erection of Substructure

Special to the Contract Record

The Cambie street bridge is the longest steel bridge in British Columbia, it being 3,390 feet between abutments. It comprises two viaducts, of plate girder construction, resting on steel columns, in turn resting on concrete pedestals which are supported by pile piers capped with concrete. Between these two viaducts and over the main channel is a 264-foot centre bearing, riveted Pratt truss drawspan. The north viaduct is level and the floor is fifty feet above mean tide. This level also carries the roadway over the C. P. R. tracks, thereby eliminating a grade crossing.

The tops of posts of the viaduct construction are flush with the tops of girders, and the latter butt on diaphragms in the posts. The same rivets pass through the end flanges of both girders butting on the posts. The general arrangement of the span lengths are five 80-foot girders and a 40-foot in series. The bents supporting the 40-foot girders are braced longitudinally, making a tower which imparts longitudinal stability of the whole. This regularity of span lengths is not adhered to the shore on account of the crossing of the railroad tracks at the north end. The first 17 panels from the south end are 40 feet long, except those crossing a railway track which are thirty-five feet and the bents are skewed. Throughout the viaduct construction the main girders and posts are 24 feet, centre to centre, and cross girders are riveted to the main girders every twenty feet. On the outside of the cross girders, riveted to them through the main girders, and reinforced by cover plates over the latter, are cantilevered brackets, 18 feet long.

Parallel to the main girders are six runs of steel stringers, four between and under the street railway rails, and one on each outside, stiffening the cantilever brackets and carrying the load of the roadway. The tops of these stringers are crowned six inches and on these lie six by nine creosoted ties. On these ties are spiked four by twelve creosoted planks and on these are laid creosoted fir paving blocks. There are double street railway tracks spaced ten feet, centre to centre. On the ends of the ties are bolted the curb, four by ten creosoted timbers giving a roadway between of forty-four feet. Outside of the curbs,

resting on the ends of the cantilevered brackets are 5-foot sidewalks of 2 x 12 untreated fir planks, supported by four runs of 4 x 12 fir joists. This sidewalk is built independent of the curbs, so that it can be renewed without disturbing them. There are steel hand rails in which, every eighty feet, are steel posts which carry the trolley wires and lighting brackets.

The trusses of the drawspan are twenty-four feet centre to centre, between which run the car tracks. There are cantilevered brackets outside supporting a 10-foot roadway and 5-foot sidewalk. The floor be-



The lower bridge in right background is the old wooden structure erected in 1800. Upon the completion of the new bridge the old one will be demolished.

tween trusses is paved. It affords a passage for swift moving vehicles such as light rigs and automobiles, while the slower, heavier traffic can take the outside roadways. The centre bearing drawspan, a newer type, is supported on a large casting at the centre of the pivot pier and is kept in balance by six wheels which run a track on the circumference of the pier. At the ends of the drawspan are massive collapsible gates hinged to bases of posts on the fixed construction. A smooth crossing at the ends of the drawspan is afforded by rail locks which are hinged to the rails on the viaduct so that they rise in a vertical plane be-

fore the span is to be turned. These gates and rail locks are operated by small motors under the floor of the fixed spans, but controlled from a machinery house on the centre and top of the drawspan. In this house is the motor for drawing the wedges from under the ends of the span and turning it. Beside these end wedges, are two, one on each end of the centre bearing casting, which are worked simultaneously with the end wedges. These centre wedges insure a greater solidity and less vibration to the span



Cambie Street bridge construction, looking north from south abutment

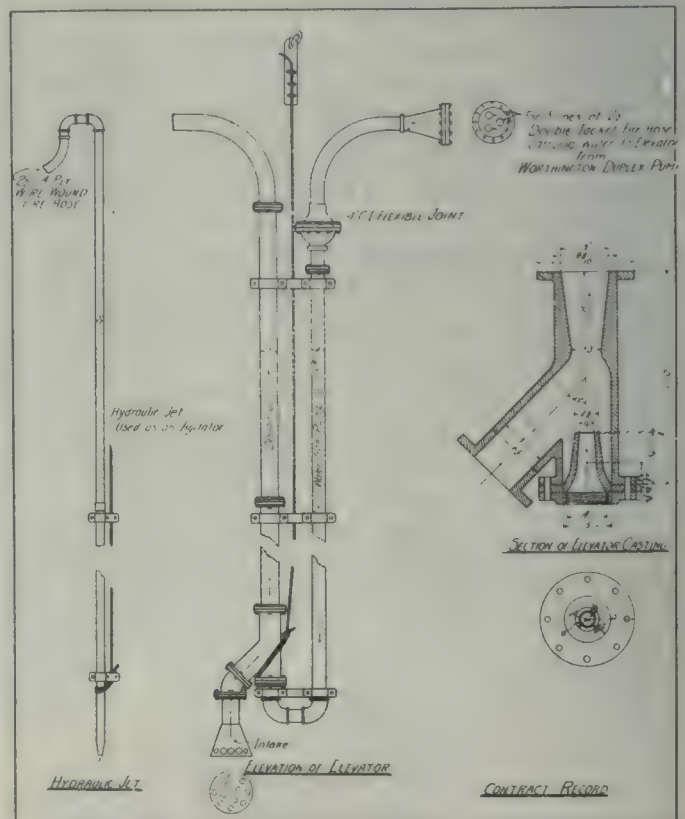
when closed. The end wedges drive between the tops of the end columns of the viaduct and shoes under the ends of the draw span. The span is locked in place by a latch, which falls in a slot resting on a strut connecting the end posts of viaduct. The sides of this slot are held in place by strong springs which take up any momentum the span may have when closing to position.

The approximate quantities in the superstructure are as follows; metal and machinery in drawspan, 450 tons; metal in viaduct construction, 3,200 tons; creosoted timber, 850 M., B.M.; untreated fir timber, 415 M., B.M.; pavement, 16,600 square yards.

The foundations are of three types, the most simple on shore where the earth was simply excavated to the hard-pan. The foundations of the pivot pier and rest piers of the drawspan were put in by the pneumatic process with which all are familiar. The supports of the steel trestle rest on the pile piers, that is, piles driven to refusal on the hardpan, or cemented gravel cribs sunk to a depth of about ten feet and filled with concrete which forms a cap of grillage to transmit the load from the concrete pedestals above to the piles. Piles were driven first, there being nine under each pedestal, spaced three feet centre to centre in each direction. The cribs or boxes made of 12 in. by 12 in. timbers laid horizontally, 14 feet by 14 feet outside measurement, were then built about the piles and held to position by guide piles which had been driven with the bearing piles. Each crib had fourteen courses of timber, secured by long bolts for cofferdams. The lower ends of the cofferdam bolts screwed into large nuts which were held by sockets cut in the top timbers, so that when the pedestal was completed the nuts could be taken off the upper end of the bolt. The belts were then unscrewed from the lower nuts with a Stilson wrench, thereby releasing the cofferdam. The cribs when completed and ready for sinking were weighted with large granite blocks on the corners, from 30 to 35 tons

being put on. Then the cribs were sunk by having the mud, sand and shells pumped out with the hydraulic elevator. (See plan of same).

In connection with the elevator, a water jet with same pressure as that on the elevator, slightly over 100 pounds per square inch, was used to cut up and place the mud in solution. In other words, it was used as an agitator. The elevator was placed about the middle of the cribs on the bottom and but seldom moved. The jet was moved constantly about. Care and skill were necessary to keep the jet at the proper elevation to get the best results. The jet was raised or lowered by a derrick in accordance with signals from the operator. As the material was removed by the hydraulic elevator the cribs sank and were put down to the first layer of crust or hard clay. When the cribs were sunk to this depth all mud was cleaned out and the first three to five feet of concrete, called the sealing course, was placed under water with excellent results. The mixture was one part of cement, two of sand and three of gravel—made very wet. It was dumped into a tremie, a heavy pipe about 10 inches in diameter with a hopper on the top. This hung from a separate derrick, the cable being attached to the hopper by means of a chain bridle spread sufficiently high to allow the concrete bucket to swing over the tremie. The batch would fill the pipe, and in order to get the next batch in it was necessary to raise the pipe about a foot. Then the concrete would run down the pipe. When low enough to allow another batch in, the tremie with hopper was lowered. In this way the concrete was never exposed to the washing effect of the water. After three days the water was pumped out and the balance of the concrete was deposited in the dry, after the sealing course had been cleaned of any scum or laitance. This was very little, sometimes amounting to about an inch and less. The footing, which covered



Details of pumping apparatus used by contractors

the tops of the piles to a depth of about two feet, having been all placed, the form was placed and filled. The anchor bolts were set in the tops of all pedestals except those on which stood rocker columns. The forms were made with sides in separate pieces, but which fitted neatly at the corners. The sides were of 4-inch boards, $1\frac{3}{4}$ inches thick, tongue and grooved and dressed on the inside. These boards were nailed to 6 in. by 8 in. timbers at intervals of four



Lowering last bent at north end draw span

feet. These girts were bolted together, the bolts being outside of the form. When a form was to be removed the bolts were loosened and the form removed as a box and placed in another crib. There the nuts on the bolts would be screwed up, making the form tight. To get a smooth finish the concrete was spaded along the sides of the form. The pedestals required no retouching worth mentioning when the form was removed.

Hydraulic Elevator in Caisson

As mentioned previously, pneumatic caisson work being so well known, it is unnecessary to touch upon it in connection with these bridges. It might be of interest, however, to mention a novelty—the use of the hydraulic elevator in connection with this kind of work. The hydraulic elevator (see plan) was operated by water fed to it from a large duplex pump at a pressure of 100 pounds per square inch at the pump. The first eight to ten feet of material to be penetrated consisted of soft mud, sand and broken shells, a material commonly ejected from a caisson by blowing it out through a pipe, counting for pressure to do so on the difference between the compressed air in the caisson and the normal pressure outside. For the first ten feet in sinking this inner pressure was very light, as there were only three or four feet of water at low tide. By attaching the elevator to the pipes in the caisson, which had been provided for

that purpose, and by using water from the power scow employed in sinking the cribs, it was found that greater progress could be made, as the elevator would take out the material as fast as it was fed to it and could be worked continuously; whereas in depending upon the air pressure the air valves could only be opened intermittently on account of blowing off all the air. By a comparison of the two methods in caissons of equal size, 16 x 16, it was found that with the use of air pressure 123 cubic yards were blown out in 42 hours, as against 115 cubic yards in 19½ hours when the hydraulic elevator was used. The latter threw out nearly double as much as the former. No trouble was experienced by the air escaping with the water, as one might suppose. When not ejecting, a target or wooden board was kept over the end of the suction and the water from the pump simply allowed to enter and leave through the pipes.

The following quantities are in the substructure: concrete in abutments, 3,990 cubic yards; concrete in bases of pedestals, 3,670 cubic yards; concrete in shafts of piers and pedestals, 3,300 cubic yards; mass of foundation of pneumatic piers, 2,440 cubic yards; piles below cutting edges of cribs, 3,600 lin. feet.

The amount of the substructure contract was about \$210,000, and that for the steel work, \$440,000.

The engineers who designed the bridge and under whose supervision it is being built, are Waddell & Harrington, with Mr. C. P. Moss as their resident engineer. The contractors for the substructure are Palmer Brothers & Henning, of Vancouver, and the Canadian Bridge Company, of Walkerville, Ont., are furnishing the steel and erecting it. Their plant is as complete and labor-saving as can be made.

For complete description of the Granville street and Westminster avenue bridges, both of which were also designed by Messrs. Waddell & Harrington, see Contract Record, March 8, 1911.

Cementation of Wet Ground

A most interesting method used in connection with shaft sinking or tunneling through water-bearing ground has been developed in the Pas-de-Calais coal district of France, which is termed "cementation." The coal measures of the district are overlain with bedded marls and chalks, more or less fissured, and the fissures in some places are so filled with water that ordinary methods of shaft sinking would fail. Heretofore, the freezing system has been successfully used, but the new cementation method can be employed at less cost. In one instance, the cost of cementation through 343 ft. of water-bearing ground was \$13,200. Briefly, the process used by this company is to drill a set of holes in the water-bearing ground, six in number, arranged in a circle, surrounding the site of the proposed shaft, and then to pump a cement grouting through the holes until the fissures and interstices are filled. Shaft sinking is then proceeded with as it would be through ordinary rock strata. The system seems applicable to many situations where water is encountered in either shaft sinking or tunnel driving in broken rock.

During the first five months of 1911 the building permits issued at Toronto recorded an increase of nearly two and a half million dollars over those for the corresponding period of 1910, the figures being respectively \$9,555,513 and \$7,518,098. The total for last month was \$2,643,755, compared with \$1,870,350 for May, 1910.

Use of Concrete in Highway Construction

Principles Underlying the Best Work—Practical Directions: Ample Drainage Essential—Cost of Tarring and Sanding—Importance of Surface Treatment*

By W. A. McLean, Provincial Engineer of Highways for Ontario.

Modern use of concrete in highway work includes many details. It is largely used for pavement foundations, sidewalks, bridges and culverts, bridge abutments and retaining walls, bridge floors, curbs and gutters, man-holes, catch-basins, hand-rails, and other special features. Its use for much of this work is so well-known and has been so frequently written about, that to attempt a complete description would be to repeat largely what has been already well said. There are points, however, upon which progress is being made, or with regard to which some problem remains unsolved, and which are therefore deserving of comment.

Concrete has become the recognized foundation for asphalt, brick and other high-class pavements for streets of towns and cities, and for the foundation of such brick pavements for country roads, as those largely used around Cleveland, Ohio, in Cuyahoga County. Its use as a paving material for the surface of the street or road has, however, been looked upon with considerable uncertainty, although in a number of cases, some degree of courage has been shown in carrying on this class of work.

Favorable Reports from Windsor, Ont.

Windsor has been the principal place in Ontario to adopt this type of paving, and reports as to its merits have, to the present, been favorable. Experimental blocks have been laid in Brantford, Chatham, Toronto and other cities.

Recently the good roads movement in Michigan, as carried on in Wayne county, surrounding the city of Detroit, has led to the adoption of concrete for the country road construction. These roads are characteristic of main highways radiating from a large city. Requirements of this traffic have led to the adoption of a type of roadway consisting of a central concrete pavement from 10 ft. to 18 ft. wide. On either side of this are gravel or macadam shoulders making a road of the desired width, usually from 24 ft. to 30 ft. from outside to outside of gutters. The first of these roads, two miles in length, was built in 1909, and was found so satisfactory that in 1910 about 15 additional miles of this work was completed or begun. The cost has varied according to local conditions, but including shoulder, drainage, and culverts, has been approximately \$1.35 a square yard of concrete.

Process of Construction

Concrete pavements are laid in much the same way as concrete sidewalks. The sub-grade is excavated and rolled. This should be carefully done so that the monolithic pavement will have a base of uniform strength. If the sub-soil is of sand or gravel, the concrete may be laid directly on it, but if it is clay or other impervious soil, it should have a layer, three or four inches thick, of gravel, cinders, broken stone or other strong and porous material. The sub-grade should have the same camber or crown as the

finished roadway is to have. If a town street, curbs are laid first; but in a country road, curbs are not used, the surface being merged into the gravel or macadam shoulders.

Over the sub-grade the concrete base is spread, to a depth varying with the amount of traffic, usually 4 in. to 6 in. The mixture should be proportioned for greatest density but common practice employs a 1:3:7 mixture of cement, sand and broken stone; or a 1:8 mixture of cement and gravel. The base should be immediately covered with a wearing surface of 1½ in. or 2 in. thick of strong mortar or concrete.

At intervals of about 25 ft. there should be expansion joints across the roadway, about ½ in. wide; and at the curb similar longitudinal joints, to be filled with pitch or asphalt.

To attain good results, the greatest care must be taken in particulars now well known in paving and general concrete construction. As with any form of road construction, drainage should be ample. The surface coat should be immediately spread on the base before the latter has commenced to harden, so that union will be complete. A well rolled and uniform foundation will prevent much cracking. Mixing of the concrete should be thorough, as imperfect mixing is the cause of a vast amount of poor concrete. The surface should be protected from the sun in the usual way with straw, sand, burlap, and should be kept moist until it has fully hardened. As a rule, a concrete road or pavement should not be opened for traffic in less than ten days or two weeks.

A perfect pavement, meeting all desirable conditions of cost, durability and service rendered has not yet been found; and as requirements in many cases are of an opposite character, it is not probable that a pavement ideal for universal use will ever be invented. The more important qualities usually sought in a pavement or road material are that it should be:

- (1) Low in first cost.
- (2) Easily and cheaply maintained.
- (3) Smooth and hard, so as to offer least resistance to traction.
- (4) Easily cleaned.
- (5) Noiseless.
- (6) Not producing dust and not muddy.
- (7) Non-absorbent and sanitary.
- (8) Such as to give a good foothold for horses.
- (9) Comfortable for those driving on it.
- (10) Neither glaring nor hot.

The principal objections to concrete as a material for roads and pavements have been that the surface is too hard and glassy to give a proper foot-hold for horses; that it is rigid and therefore hard on the feet of horses; that it reflects heat and has an unpleasant glare; that expansion joints chip at the angles and under constant traffic deepen to holes; that cracks due to defective construction and to uneven foundations

* Before the Canadian Cement and Concrete Association.

are difficult to repair, and, like expansion joints chip at the corners.

Satisfactory Experiment at Ann Arbor

On the other hand, it has been recognized that were these difficulties overcome, concrete has certain merits.

My attention has recently been drawn to the concrete pavements of Ann Arbor, Michigan, which have been treated with a surface painting of tar over which a thin layer of fine gravel is spread, just sufficient to be saturated and held by the tar.

These pavements are constructed in the usual way by the mixing process. They consist of a bottom layer of concrete 5 ins. thick, composed of one part Portland cement to eight parts of sand and gravel, and a top layer of Portland cement mortar 2 ins. thick, made in the proportion of one part of cement to two parts of sand. An expansion joint 1 in. wide is left at each curb, and an expansion joint about $\frac{1}{2}$ in. wide each 20 ft. transversely of the street. After the concrete has partially set and is dry, there is spread a thin coating of hot coal-tar or distilled coal-tar, and before this is dry it is covered with a uniform layer of sharp sand. The transverse joints are filled with a mixture of pitch, or tar and sand, care being taken to fill the joints flush with the surface of the pavement.

In 1909, 1,883 square yards of this pavement were laid and in 1910, so satisfactory was the experiment, that there were laid 18,223 square yards while petitions have been received for over 70,000 square yards to be laid this year.

For applying the tar, a steel tank holding about 450 gallons is used, under which is a fire-box for heating the tar, and to the rear is a 2 in. gas pipe used for sprinkling the tar. When tar has been sprinkled over the pavement, a rotary sweeper is driven over it which distributes the tar uniformly over the street. The sand, which is passed through a $\frac{3}{4}$ in. screen, is then spread by a wagon having a triangular box 5 ft. long on the rear. Near the bottom of this box is a $2\frac{1}{2}$ in. curved shaft, belted to the hub of the wagon. As the shaft revolves, the sand is put on a screen and by the time it reaches the pavement, is nicely spread.

In appearance, these pavements resemble sheet asphalt, the tar and sand coating overcoming the glare and reflection of heat. The tar and sand fill the expansion joints and depressions, serving as a wearing surface. The expansion joints disappear from view and do not chip at the corners. The tar-sand coating deadens the noise of traffic and makes the pavement impervious to moisture. If cracks appear they are painted with tar and sanded so that they, too, disappear and they do not crumble under traffic. The treatment, in short, overcomes the more objectionable features of the concrete pavement.

Tar pavements as heretofore laid in Ontario have cost about \$1.15 a sq. yd. The tar treatment in Ann Arbor has cost 2 cents a square yard, and the treatment has been found to last for two years, making the cost of tarring and sanding 1 cent per square yard per annum. If further experience shows the success of this treatment, it should prove a boon to the smaller towns and villages in paving their main business streets. It should be useful for residential streets in large cities and would be exceedingly effective for main roads adjacent to large cities.

On the New York State highways an experimental road was last year built near Rochester of concrete cubes in a manner somewhat similar to the German "Kleinpflaster," and to the "Durax" roadway of England. The New York cubes are two inches square, of gravel or stone concrete, and are turned out by machine. The road is first constructed with a good stone foundation; or, if an old macadam road, is reshaped and crowned. The cubes are hauled and dumped like ordinary road material, but are spread uniformly by hand. They are laid in a sand cushion, sand is swept into the joints, and they are then well consolidated by rolling. The cost on the experimental section was 50 cents a square yard or equal to the cost of a bituminous binder. The appearance when finished was very satisfactory and it is hoped that the method will be found adequate for the requirements of rapid motor traffic, including resistance to wear and freedom from dust.

Concrete pavements, in addition to the mixing process, have been laid by a patented grouting method. A body of broken stone is first put down, rolled to place, and then flushed with a thin cement grout and rolled until consolidation is complete. By another process, not patented, the cement, sand and stone have been mixed and spread dry. This is spread to grade, rolled to place, then sprinkled and rolled until consolidation is complete and setting has commenced. It is doubtful that either of these processes meet the requirements of thorough mixing, essential in making good concrete.

Concrete in Bridges

Concrete has by no means displaced steel for bridge construction, but that each has its place is the consensus of opinion reached by bridge engineers. The field of concrete bridges, reinforced with steel, is largely confined to spans up to 50 feet—where either flat or arched design may be employed. Concrete arches are commonly applicable to situations up to 100 ft. or 125 ft. span, provided there is sufficient rise, but the use of arches is in all cases restricted to situations where the abutment foundations are strong and unyielding. For spans up to 50 ft., flat-top concrete bridges with vertical reactions are suitable for situations where the arch could not be employed, but even here a stronger foundation is essential than would be required in the case of a steel truss bridge. Slight movements of the abutments are ruinous to a concrete arch; are permissible to a slight extent with flat or beam concrete bridges, though to a less extent than would work serious injury to a steel truss.

Temperature stresses have been one of the serious difficulties in the design of concrete bridges. For short spans up to 50 ft., these may be disposed of by the use of steel, well distributed through the concrete. The amount of steel required in an arch will of course depend upon the design of the arch, but in a general way one per cent. of steel is required to take care of temperature stresses, particularly in spandrel walls. For longer span bridges, expansion joints become necessary in the spandrel walls over the haunches and at the crown. These are objectionable in several ways. They weaken the bridge, but it is chiefly as has the appearance of a crack, and creates a feeling taken. To the user of the bridge, the expansion joint regards the appearance to which exception can be of distrust in the strength of the bridge. These expansion joints are usually filled with asphalt or pitch to keep out moisture, but this treatment does not con-

ceal them and some other means of dealing with this detail of bridge construction would be welcomed by engineers.

There is a tendency to improve the appearance of shorter concrete bridges by the use of ornamental hand-rails. This is desirable, but failure frequently occurs through neglect of temperature stresses. Open rails should be broken into lengths of 8 ft. to 10 ft., giving expansion joints and the ends of each span supported on a post. Between the posts, spindles of various types may be used. The writer has seen a bridge of over 100 ft. length in which much attention was given to appearance, but the hand-rails were not given expansion joints and every spindle in the bridge had been sheared.

In the design of concrete arches, there are architectural details too often overlooked. The parapet or coping should be slightly arched, otherwise it will look concave. The wing walls should not be straight but should be if possible slightly curved, as otherwise they look weak.

Importance of Surface Treatment

Surface treatment of concrete is all important. The surface should be a part of the concrete itself. A mere plastering of a defective surface will not permanently remedy the defect. In securing a good finish, the frame-work should be dressed and closely fitted. The concrete mixture should be wet; should contain sufficient sand and should be carefully spaded against the form work so as to avoid airholes and cavities. A good finish can be obtained by using fine granite in the surface mixture, this to be treated with acid or brushed with wire before the concrete has fully set. This treatment is not practicable except for special work, but in all cases a smooth and close-grained surface can be obtained by using sufficient care. The practice of making the exposed surface of stronger concrete is good, and is readily accomplished by carrying up a board a few inches inside the surface to retain the core concrete until it is partially set, when the board can be removed and the surface concrete put in place.

A common fault in short span country bridges and culverts is that they are too short. As a rule it will be found as cheap to carry tile entirely across the road using shorter head walls and widening out the fill, than to use a shorter length of tile with necessarily higher and longer head walls to retain the earth fill. Short span bridges on country roads should always have a width of at least 20 ft. to accommodate traffic. It is an improvement in the appearance of such short bridges to extend the wing walls almost straight, carrying them to the top of the roadway and putting on a suitable hand-rail. The public sees little but the hand-rail of short bridges, and if it is strong and of a good appearance is impressed by it. A bridge need not be ornamented, but is often a chief feature of the landscape and should not disfigure it. It can be made ornamental, and certainly ought to be.

Bricks in street gutters in Chicago have been set in courses at right angles to the curb according to the observations of Mr. Samuel Whinery. In his report to the commission on city expenditures he states that if a strip 12 to 14 inches wide be set in each gutter parallel to the curb the rapid flowing away of water from the gutters is facilitated.

Maintenance of Macadam Roads

The Edinburgh county road surveyor gives the results of his observations in England and his experience in Scotland with respect to the use of tar and pitch as binding materials for stones used in making and repairing roads. The four methods of applying tar are: (1) Tar spraying; (2) tar macadam; (3) pitch grouting; (4) tar matrix.

The above methods and cost per superficial yard over ordinary macadam, detailed by the county road surveyor, are here summarized:—

Tar Spraying—It is essential that all dust and caked mud be removed from the road before the liquid is applied. After tarring, a slight sprinkling of whinstone screenings is spread over the surface. Hand tar spraying is considered superior to machines, although it costs slightly more and takes longer. In this process tar is not so much a binder as a waterproof protection to the road surface. It is soon worn away, however, and when broken up the road is thrown into an uneven and dirty condition. It is now admitted that tar spraying lasts only for one season. The life of a road subjected to much fast motor-car traffic is increased 15 to 20 per cent. when tar sprayed. One of the main thoroughfares in Edinburgh county cost on an average \$1,460 per mile per annum to maintain as at present. If tar sprayed its whole width the cost would be \$1,800 per mile, after allowing for the increased life of the road, as above indicated.

Tar spraying is most suitable for county roads where expenditure is limited, and although tarring the entire surface would be preferable, a width of 10 to 12 feet in the centre would accommodate motors and protect the metal bed, allowing at least double the length being sprayed, and leaving the sides with a better foothold for horses during frost.

Tar Macadam—This consists of thoroughly mixing the stone with tar and pitch previous to its being laid on the highway. All stones should be dry, which necessitates preparation of the material under a cover structure. Tarring may be done by hand or machinery. It is usual to allow the material to lie in heaps one to three weeks to mature before applying. The coatings are applied in three layers of $2\frac{1}{2}$ and $1\frac{1}{2}$ inches and $\frac{1}{2}$ inch stone, rolled separately, and finished with a thin layer of fine dry screenings. Tar macadam roads are easily cleaned, and the cost of maintenance on an average of years is less than ordinary macadam. It is slippery during frost and unsafe on gradients steeper than 1 in 20. Under very heavy traffic it loses its bituminous surface in two or three years, and the top layer becomes separated from that below. This system involves a comparatively heavy initial expenditure, and its general adoption on county roads would appear to be impracticable.

Pitch Grouting—This consists of application to a scarified road, rolled smooth, of a three to four inch coat of whinstone metal, consolidated in a dry state, after which boiling pitch and tar is poured into the joints, sprinkled with small whinstone or limestone gravel, and rolled until thoroughly hard. The composition is made up as follows:—Pitch (best coal tar) 1,100 pounds; refined tar, heavy bodied, 800 pounds; creosote oil, 100 pounds; total, 2,000 pounds. The mixture is applied to the roads at boiling point with spray cans, whinstone chips are immediately applied, and rolling at once undertaken. This composition is of a quick-setting nature, but retains considerable

viscosity. The surface must be thoroughly dry before it is applied. The surface is smooth, but not slippery. The traffic is carried on the metal and not on the tar, as is the case with tar macadam, tar painting, or tar matrix. This is regarded as the best system for tarring county roads, as it makes them almost dustless, effects a great economy in cleaning, is easily repaired, and the life of the road is increased at least one-third.

Tar Matrix—There are three methods of applying tar matrix. It is unusual to slightly scarify the existing road surface. The first is to spread a layer of small gravel, previously tarred, to a depth of one inch to 1½ inches, on which is laid ordinary road metal. This is rolled until the matrix is forced to the surface. In the second the road metal is spread first and well rolled in the dry state before the matrix, composed of tarred materials up to one inch in size and to the foregoing depth, is applied. This is rolled until the interstices are filled with the matrix and a smooth surface has been obtained. A thin finishing coat of finer tarred materials is usually applied, sprinkled with dry sand or chippings, and rolled until thoroughly hard. The third or Gladwell system is a combination of the first two, having a matrix both above and below the metal.

Rocmac—Roads made on the Rocmac system are claimed to be dustless, waterproof, economical, durable, and non-slippery. The solution is a chemical composition, made under pressure, the foundation of which is silicate of soda and sugar. The solution is mixed with high-class ¼-inch limestone and gravel free from impurities. This is laid about one inch to 1½ inches deep on the road surface, which has been slightly scarified. On this is spread the ordinary macadam metal, about three inches thick, and thoroughly rolled until the matrix entirely fills the interstices and comes to the surface. Owing to the simple preparation of the matrix and small plant required, the work can be undertaken by ordinary workmen, but experiments have proven expensive compared with pitch grouting.

In Scotland as well as England, county road boards have experimented with tar macadam in constructing new roads, and maintenance of old have practically abandoned it, the cost being prohibitive. Tar spraying of 10 to 12 feet in the centre is generally regarded as the limit of economical treatment of macadam roads in outlying districts, and this has been restricted to main thoroughfares and of village roads. For suburban roads it is likely that the use of pitch grouting will increase.

Manufacture and Consumption of Cement

The table below shows the increase in demand for cement and the way in which Canadian production has overtaken and surpassed the import from the outside. It is taken from Mr. Richard Grigg's report on Canadian import trade.

Year	Cement manufactured in Canada	Cement imported into Canada	Cement consumed in Canada
1904 barrels	908,990	784,630	1,694,988
1905 "	1,541,568	917,558	2,264,106
1906 "	2,152,562	666,931	2,785,695
1907 "	2,491,513	672,630	3,108,723
1908 "	3,495,561	469,049	3,134,338

The Winnipeg building permits last month broke the record of \$2,104,450, established in May, 1910, by

\$125,000. The total for last month was \$2,229,480, representing 564 permits. The figures for the first five months of 1911 are \$5,791,230, compared with \$7,492,400 for 1910.

The largest and costliest public work now in progress in Vancouver is the Cambie street bridge, a sister to the Granville street bridge. This huge high-level steel structure was commenced last year and will not be completed until next August. The bridge was designed by Messrs. J. A. J. Waddell and John L. Harrington, who are invested with supervisory jurisdiction until the city takes it over from the contractors. The dimensions of the bridge may be briefly pointed out. The length over all is 3,395 feet. The approaches in addition, at the north and south ends, will be about 3,000 feet. The roadway will be block

The extraordinary resistance of reinforced concrete to violent shocks is shown in a recent article in *Ferro-Concrete* on the Lievin experimental gallery for investigating coal-dust explosions. Another striking instance was furnished by the explosion of two gas storage drums at the reinforced concrete factory of the Prest-O-Lite Company, Indianapolis, resulting in practically no damage to the building where the explosion occurred, but which brought down the roof of a building 25 feet away, and cracked the walls of another building 100 feet distant. In the reinforced concrete building, the only damage consisted of a hole in the roof the size of the drum base, and work was resumed half-an-hour after the explosion occurred. The necessary repairs were readily effected by bending back the reinforcing bars and covering them with concrete.

Medicine Hat is forging ahead as an industrial centre, due, of course, to the great supply of natural gas at hand. Such industries as glass factories and steel plants find natural gas a splendid fuel for producing the intense heat required by such industries as these, and low cost is, of course, a great attraction. Bylaws passed last week grant a free site and 250,000 cubic feet of gas a day to a glass factory which will employ 150 hands and like concessions to the Alberta Foundry and Machine Company. In all, twelve new industries have been located at Medicine Hat, or are negotiating for locations, since the first of theyear.

The Grand Trunk Pacific railway will build 645 miles of new lines in the west this year. Much of this new trackage will be in Saskatchewan, important lines being those from Regina to Moose Jaw, seventy-two miles of the Prince Albert branch, the line from Regina to Griffin and the Battleford Oban branch.

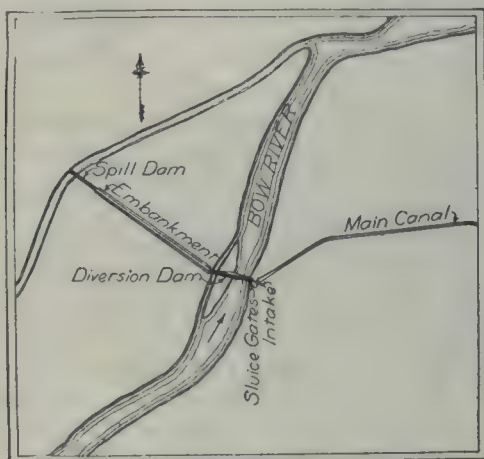
Exceptional building activity is reported from New Westminster, B.C. Among recent permits may be mentioned that for the Westminster Trust Block, which will cost \$150,000. The buildings in course of erection include a new \$100,000 tram station for the B. C. Electric Railway and a \$45,000 warehouse for the Kelly-Douglas Company. There is an unprecedented amount of business in residence work.

Cleaning catch basins at St. John, N.B., during 1910 cost 95 cents per cubic yard of material, according to the last annual report of Mr. William Murdoch, city engineer. The total number of cleanings was 4,018, making 1,519 cubic yards.

A Great Irrigation Project in the West

Constructional Features of Important Development Undertaken by the Southern Alberta Land Company—Progress and Details of the Work

An irrigation project near Medicine Hat, which includes 200 miles of canals, a 360,000 acre-ft. reservoir 47 miles from the source of supply and about 45 miles from the land to be watered, intake works and a 2-mile siphon under 200-ft. head, is now about 50 per cent. completed, and will be ready to deliver water to part

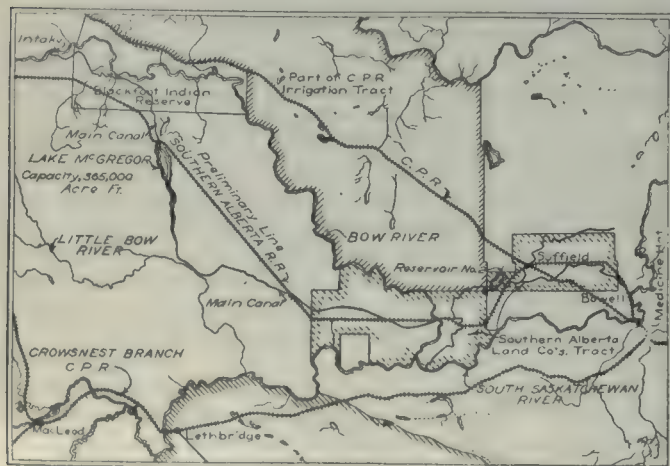


Sketch of Dams at Main Intake.

of the land next season. The object of the development is to provide water to irrigate about 60 per cent. of a 500,000 acre tract lying on both sides of the Bow river, west of Medicine Hat and north of the South Saskatchewan river.

As the land to be reclaimed lies upon a plateau well elevated above the river, which flows on a low gradient through a deep and comparatively narrow valley, the diversion of water presented many natural obstacles. The wide walls of the valley are high and rather steep, and in many places are cut by deep and precipitous drainage channels. To avoid a high bank five miles below the intake, the canal line is diverted to a deep cut leading from the river to the channel of lateral drainage valley. Between this point and the storage reservoir there are two deep and important crossings of East and West Arrowwood Creeks.

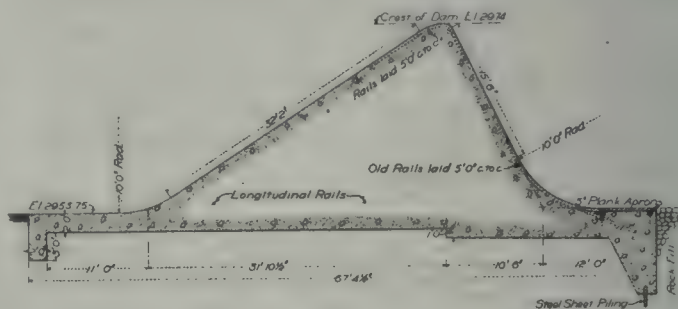
A great natural depression, twenty miles long and



Map Showing General Layout of Irrigation System.

from one-half to two and one-half miles wide, has been used to create a storage reservoir in which the flood waters of the Bow river can be stored and drawn upon for irrigating purposes whenever required. Emerging from the reservoir, the natural drainage is southerly toward the little Bow river, but its elevation is high enough to permit the projection of the canal along the eastern side wall, finally reaching out upon the summit commanding the plateau on which is located the land to be irrigated on the west of the river. To reach the land on the east side of the river, it is necessary to continue the canal along the summit on the west bank, and to cross by an inverted siphon. Some twelve miles from this point a second reservoir of 10,000 acre-ft. capacity provides additional storage for the lands east of the river.

Water supply.—The source of the supply is the Bow river, which heads in the Bow and Coldwater Lakes at the head of the Bow Pass. The river has a well-sustained volume of discharge year to year, due, it is said, to its being dependent less upon annual snow-fall than upon the glaciers and the regulating influence of the lakes at its head. The hydrographs taken at Calgary for the years 1897 to 1900, inclusive, show a range of less than one foot in the normal maximum discharge level for those years, omitting an unprecedented flood in 1897, which continued for only three



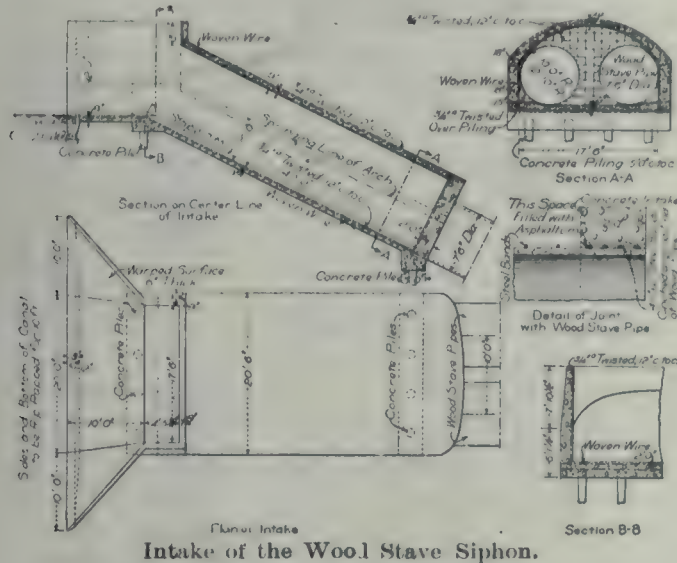
Cross Section of Diversion Dam at Intake of Main Canal.

days. It is to be noted that the period of maximum flow, being the period of highest temperature, comes at the same time as the greatest demand for irrigation water. Not many records have been taken, but an average of about 10,000 sec.-ft. represents flood conditions in June at Calgary and about 2,000 sec.-ft. the minimum flows from September to April. A single prior license grants 3,000 sec.-ft. of water to another company. The margin between this and greater flows available for the use of this company is still further augmented by the storage capacity in the reservoir.

Duty of Water.—Under the terms of the land grant, the duty of water is prescribed at 150 acres per second foot. This is equivalent to an annual precipitation of 18 inches in addition to the natural rainfall of about 9 inches during the months of May, June, July and August, making a total of 27 inches from which it was estimated that there should be deducted twenty per cent. for evaporation and transportation losses. The irrigation period has been taken at 184 days, during which the continuous flow of one cubic

foot per second would amount to 368 acre-ft. If this were spread over 150 acres, it would represent a depth of 2.4 feet. These assumed figures are given, as upon them is based the carrying capacity of the canals in the system.

The main structural features of the project are the intake, the deep cut emerging from the river valley, the crossings of the two Arrowwood Creeks, Lake McGregor and the inverted siphon crossing the Bow river. The dam is in three sections, a concrete struc-



ture in the form of a low diverting weir in the main channel, 530 feet long; an earth embankment, 1,800 feet long, and a 526-foot concrete structure similar to the first mentioned, across the minor channel on the east side, which will act as a spillway. The crest of this concrete structure across the minor channel is ten feet above the bed of the canal and the crest of the embankment eleven feet higher than the main spill dam and finished twenty feet wide on top. It is built of earth, and has downstream slopes 2:1 and upstream slopes 3:1, rip-rapped with boulders. The overflow dams are designed to take a discharge of 118,000 sec.-ft., 54,000 sec.-ft. being the highest recorded flood.

The concrete section of the dam is reinforced longitudinally with six old rails to take care of shrinkage and temperature cracks. As a protection against the action of the ice, rails are placed over the crest and at the toe, as shown in the drawing. Sheet-steel piling was driven in a trench under the toe and then concrete placed over the top of the piles to prevent undermining. The concrete apron is overlaid with 3-in. plank, drift-bolted to timbers laid in the concrete to take the impact of the ice. The head gates are set in a reinforced concrete structure and are provided with fenders.

Feeder Canal.—Leading from the diversion dam to Lake McGregor, the inlet canal has a cross-sectional area of 350 square feet, and is designed to carry 1,035 sec.-ft. of water. The ruling gradient is 1.056 feet per mile, with additional head for flume and siphon crossings. The elevation of the bed of the canal at the intake is 135 feet above the elevation of the outlet of the lake. The length of the canal line is 50.76 miles. In the fifth and sixth mile from the intake there is a section 8,800 feet long in which the cut runs from 40 to 64 feet deep. The excavation work at this point was accomplished by 100 teams and three steam

shovels furnished by the Atlantic Equipment Company, which loaded the material onto standard gauge flat cars. The canal has a bottom width of 25 feet and side slopes of 1.5:1, up to the high-water line, and 1:1 above this. As the material encountered was hard clay, the steepening of the canal slopes above the water line not only effects a considerable saving in excavation, but it is said to be the experience with cuttings of this character in the stiff clay slopes prevalent in Alberta that a tendency to slumping can only be corrected by cutting the slopes as nearly perpendicular as possible, thus avoiding the lodgment of snows in winter and the consequent softening and sliding after thaws.

In distributing the gradient throughout the length of the feeder canal, numerous deep cuttings occur in the first 25 to 30 miles, and to avoid as much of this as possible, the gradient was kept up until this section of the country was passed, which occurs in the thirty-first mile. Nearly all of the surplus gradient was thrown into the section between the above named point and the lake, which resulted in the establishment of a grade of 2.64 feet per mile, with 9.25 feet extra elevation above the present high-water line of the reservoir, which will be available for further increase in the storage capacity of the lake, without interfering with the free flow in the canal. On this lower section the canal is 15 feet wide on the bottom, has an 8-foot depth of water and sides cut to the slope of 1.5:1, as in the first section. This provides a carrying capacity of 1,055 sec.-ft., with a velocity of 4.55 feet per second; but as this is merely a transportation channel, it is not considered that such erosion as may take place will involve any real injury to the canal.

Inverted Siphon.—The East Arrowwood crossing consists of two wood stave pipes 7.5 feet in diameter



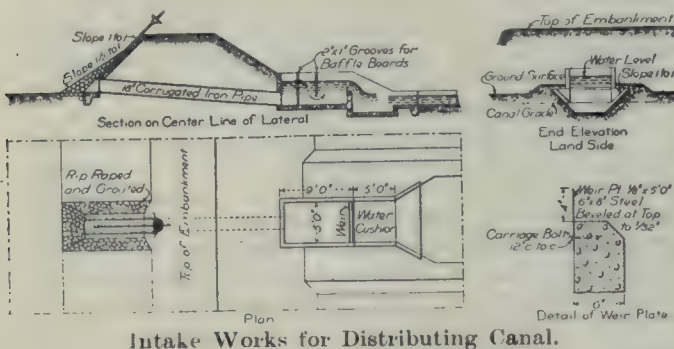
View of Intake from Canal Side.

furnished by the Pacific Coast Pipe Company, Seattle. The two ends are practically identical reinforced concrete structures, and only the intake is shown. An alternative design of following up and down the steep side walls of the valley for a total distance of three miles and spanning the channel proper by a low flume, 1,800 feet long, was at first laid out, but abandoned as being more expensive, not only for first cost, but for maintenance and operation, than the inverted siphon finally adopted. The intake and outlet of the

siphon are built wholly in excavation, and the foundations carried down to material firm enough to carry the load imposed. In order to lose as little head as possible, the entrance is made by a flaring inlet, having warped surface sides, which change the canal section of 350 square feet to the 146.7-ft. arched conduit section at the end of which the water enters the two wooden stave pipes, having a combined area of 88.3 feet.

The West Arrowwood Creek crossing is an overhead wooden flume supported on pile trestles having a maximum height of 45 feet. This flume has a sectional area of 160 feet and the velocity will be 6.4 ft. per second. A head of about 0.5 feet will be lost in the 1,056-foot length.

The necessary works to convert Snake Valley, as it was locally called, into a storage reservoir, renamed Lake McGregor, consisted of earthen embankments at either end, having lengths of 3,600 and 2,100 feet



Intake Works for Distributing Canal.

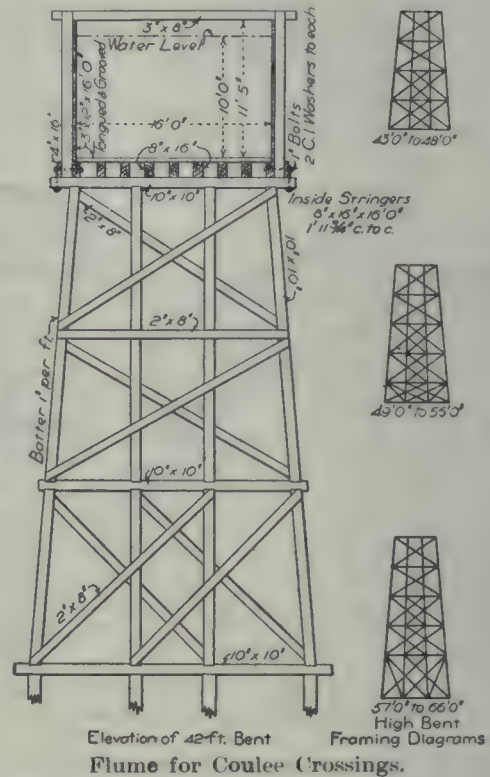
and heights of 48 and 46 feet respectively. These dams are 23 feet wide across the top and rise to an elevation 10 feet above high-water line, which is 30 feet above the outlet level. The inner slopes of the dam are to be faced with an 8-in. layer of concrete cut up into 16-ft. strips by expansion joints running up the slope. As a further measure against cracking, the concrete will be reinforced by 4 x 8½-in. woven wire placed close to the under side of the concrete. The concreting terminates at the base in a vertical wall of the same thickness as the facing, which extends two feet below the toe of the dam.

The outlet works consist of a reinforced concrete gate tower, an outlet culvert through the dam, and buttressed wing walls leading to and from the above structures. The two gate outlets are located at the upper end of the outlet culvert and are provided with two 5 x 10-ft. sluice gates built by the Ransoms-Rapier Company, of London, England. To prevent erosion of the bottom of the inlet and outlet, the space between the abutment walls is riprapped and grouted.

About five miles away from the lake outlet the side walls of the Little Bow River are encountered, and from here on the canal will lie upon steep slopes for about eight miles. This canal, up to where it forks just west of the company's tract, will have a capacity of 1,900 sec.-ft., and a bottom width varying from 30 to 40 feet, dependent on the gradients due to the slopes of the country. The 85 miles of canal between Lake McGregor and the Bow River siphon contain eight reinforced concrete drops and one flume 4,600 feet long. A typical head gate for distributing canals, having capacities of from 15 to 20 sec.-ft., is shown, in which steel measuring weirs, 5 feet wide, are placed on the land side of the embankment.

The spillways in the main canal are reinforced

concrete structures built in the embankment and provided with 5 x 6-ft. steel sluice gates, built by the Western Steel Headgate Company, of Denver, Col. At creeks crossed by wooden flumes three steel sluice



gates, 4 ft. 8 in. x 6 ft., built by the same company, are provided in the side of the flume through which the water is delivered to the flaring outlets which carry the discharge away from the base of the trestle.

Bow River Siphon.—About 120,000 out of the 300,000 acres of irrigable land in the project are located on the east side of the Bow River. For full development this will require 800 sec.-ft. of water, which is to be carried across the river in a wood stave conduit eight feet in diameter supported on a bridge, the type of which is not yet determined, but to be designed for the accommodation of a roadway. The total length is 6,300 feet, and the pipe will be under a maximum head of 200 feet.

As to progress in the work, the dam, intake structure and embankment across the island have been completed at a cost of about \$150,000. The 46-mile canal, involving 3,500,000 cubic yards of excavation, and the dams at the north and south ends of Lake McGregor, containing 300,000 and 130,000 cubic yards of material, respectively, have been finished. Four hundred teams are now at work on the first 14 miles of outlet canal along the banks of the Little Bow River, where the cuts run up to 60 feet. The line from the Little Bow to the Bow River siphon is covered with men and teams, with the expectation of completing it in time for irrigation next season. The East Arrowwood crossing, flumes, intake wasteways and outlet from Lake McGregor were constructed by the Carter-Halls-Aldinger Company, Limited, of Winnipeg. The remainder of the work is being done by the J. D. McArthur Company, also of Winnipeg. Mr. Arthur M. Grace is chief engineer for the Southern Alberta Land Company, Limited, and Mr. James D. McGregor, of Brandon, Man., is managing director.—Engineering Record.

Economies in Future House Construction*

By Hilder Daw, New York City

Economies in future house construction are engenerative in various classifications: Wages, weight, competency, values and innovations.

Wages: Within the last twenty years we have seen the growth of trades unionism rising from an ethical argument into a controlling and uncontrollable force. The time must come when contractors will receive as well as be compelled to give, equitable returns for specie.

Weight involves expense in every direction. Values, haulage, freightage and handlings are based upon our scales; therefore relief must be given by re-inforcements in all productions, whether in sewer pipes, steps, slabs, beams, walls or components. Perishable timbers will be replaced by reinforced concrete members whose specific gravity will be counterbalanced by their minor proportions.

Competency: A very present injury to competent contractors is caused by the marauding bands of ignorant workmen. Instigated by unscrupulous architects and engineers, who seek to cut prices so that they may propitiate their wavering clients, many a foreman, advised of tendered prices, has been induced to launch his frail barque upon the uncharted waters of mastership. The remedy for this procedure lies in legal enforcements necessitating a Bill of Quantities with the plans and specifications. Successful bidders will not then sit paralysed, wondering what they have overlooked.

Values: Material prices will have to be approved by governmental commissioners, a similar course to that adopted towards railway freight charges.

Economy in building waits upon the removal of the foregoing disturbing factors, as well as upon innovations in construction.

The immovable laws of the Medes and Persians are paralleled by the antiquated building by-laws of many communities. It has taken many years to convince their authors that reinforced concrete deserved some consideration. Even now a flimsy balloon timber firetrap is admitted in preference to a thin reinforced concrete wall.

The crying evil of the present town life is the cramped quarters, sanctioned by the building by-laws, in which citizens have to live.

About sixty years ago, in England, money was raised by taxing window lights. To dodge this iniquitous tax, people bricked up many of their windows, the result being that their health and eyesight were seriously affected. That lesson has never been forgotten, and our present by-law that requires the window area to be one-tenth of the floor area is a result. I might here mention that the statesmen who devised that window tax became blind. The public unfeelingly commented "He taxed God's light and the Lord has withdrawn the light of the sun from him."

The horoscope of building innovations must be plotted upon the present world. Concrete has developed into reinforced concrete; and the nebula of the Vitrous Age is within our vision.

The coming race will eliminate the use of steel in reinforcement; electrolysis will dissolve our skyscrapers within decades.

Regrets are unavailing and unnecessary. Rapid transit facilities will develop outlying suburbs, whereon the present hives of workers will be distributed.

The telephonic communications, now a necessity and a curse, will be replaced by personal wireless telephony. Our thumb prints will be sent to selected communicators;

magnified into an electrotpe, they will be the method of "tuning up" to our correspondents.

Building deteriorations (resulting from earth and traffic tremours), as well as disastrous fires, will necessitate quake-proof structures.

These present and future conditions ordain the use of concrete, in all its many adaptations, as our future building material.

Wall construction will be of poured concrete, faced with artistic brick, iron and other entablatures. Plaster compound with fusible minerals will enable the constructor to cover his structure with preparations, which, when dried and ignited, will result in a vitrous glaze, surpassing in sheens the colors of the mirage.

Pipes and conduits will be impressed into reinforcing duty, saving, thereby, space and appearance.

Wall papers will be displaced by tintings, sprayed on to the concrete walls by air brushes. Stencils and bas-relief will remove all monotony.

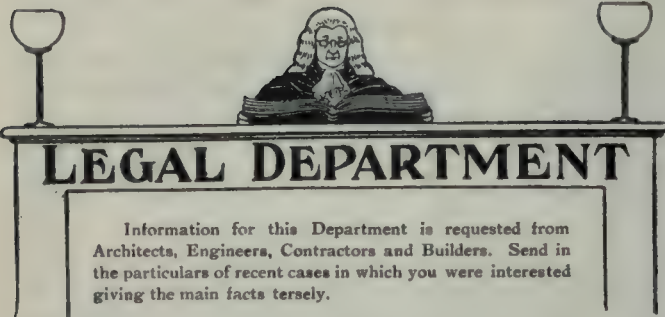
Roof construction will change greatly. The hideous forest of chimneys as seen in England is here replaced by a single flue; but even that flue will disappear when our contaminations, whether of dust, air or smoke will be blown into the sewers, there to assist in the sewage disposal problem.

Smoke abatement will permit of the utilization of our roofs. Flattened into sleeping quarters or roof-gardens, they will be bordered by encaustic embellishments and surmounted by pergolas and minarets and cupolas, thereby developing a new style of architecture that will embody the wonders of the east with the benefits of the west.

In no other country in the world, it is asserted, are there such vast, varied and valuable deposits of gypsum as in the province of Nova Scotia. The exposures show beds of from a few feet to hundreds of feet in thickness, ranging in color from gray to snow white, and frequently of the best quality. Gypsum is found in Pictou, Antigonish, Colchester, Cumberland, Hants, Kings and Halifax counties, and in every county of Cape Breton. Some of the deposits have been operated for nearly a century, but during all this time only two mills have been established for the manufacture of gypsum products, one at Windsor in 1901 and the other at Cheticamp, Cape Breton, in 1908. The production of gypsum rose from 300,000 tons in 1908 to 322,974 tons in 1910, practically all being sent to foreign countries, the United States taking \$290,949 worth in 1910.

"Roads That Pay" is the title of an interesting booklet received from the Canadian Mineral Rubber Company, 1 Toronto street, Toronto. A few words of wisdom from Jas. J. Hill are contained on the introductory page:—"Good roads are expensive, but it costs more money to do without them than to build them." The "roads that pay," it is claimed, are the waterproof, dustproof and autoproof roads, made with Pioneer road asphalt. Pioneer road asphalt has been used extensively in the United States where it is held by leading experts to be the most economical and durable material of the kind ever used. Pioneer roads are strangers to dust, mud, ruts, and holes. A firm, elastic surface, proof against the disintegrating effects of time and traffic, is assured. Pioneer road asphalt does not evaporate and there are no excessive after costs due to repeated renewals. As announced in a recent issue of the "Contract Record," the city of Victoria has awarded its whole season's contract to the Canadian Mineral Rubber Company. Municipal authorities will do well to get in touch with this firm at its Toronto office and secure catalogues and quotations.

* Extracted from Address delivered before the Architectural, Building, Contracting and Engineering Conference, New York, May 23, 1911.



Negligence of Building Contractor.—In an action, Earle vs. Reid, the defendant was repairing a 4-storey brick building when it collapsed and fell against an adjoining building, injuring a clerk, who brought action for damages to recover \$3,000. In the trial it was shown that defendant had acted with negligence in placing the iron columns on a defective wall. Judgment was given plaintiff for \$500.

Mechanics' Lien.—Seaman vs Canadian Stewart Company. Plaintiffs brought action to recover \$21,834.87 from Canadian Stewart Company for work done and materials supplied in connection with excavation of the site and foundation of an elevator at Fort William. Plaintiffs entered upon the work, and in course procured advances from the Union Bank. Later the work was taken out of plaintiffs' hands. Later plaintiffs assigned to the bank \$5,371.79 out of the \$21,834.87 for which they claimed a lien under the Act as collateral security. Bank caused a lien to be registered. The company paid \$24,000 into court. At the trial it was held that the agreement did not express all the terms of the agreement between parties; that their minds were not agreed, and there was no contract. Court found plaintiffs entitled to \$20,265.04 for their work done upon quantum meruit for which judgment was entered with costs and plaintiffs were declared entitled to a lien upon the lands in question and the money paid into court.

The Court of Appeal held that there was a valid contract; that plaintiffs should be paid for amount of yardage excavated by them, amounting at contract price, to \$9,028.85, to which sum the judgment should be reduced.

Negligence in Municipal Work.—In the action, Boyd vs the city of Toronto, heard recently in the Divisional Court, the plaintiff sued for \$1,000 for damages which he alleged had been caused by the negligence of the city in digging a trunk sewer along a street without taking the proper precautions for shoring up the sides of the sewer whereby a subsidence of his land occurred with the result that the walls of the house were cracked and the structure otherwise impaired. The court held that it was not even necessary to prove negligence in the methods of work adopted by the city, and that in operations of this kind the work must be carried out so as not to disturb the soil of the frontages. The plaintiff was awarded judgment for \$600 and costs, this amount being upheld subsequently in an appeal.

J. D. McArthur vs. Dominion Government

One of the biggest law suits entered in Canada for some years will be begun shortly, with the Federal Government as defendant and the contractors on the National Transcontinental Railway as plaintiffs. The amount involved totals about \$700,000, and the issue is as to the proper amount the government should pay for the work done by the contractors on the National line from Moncton to Winnipeg, now nearing completion.

Some months ago the Board of Arbitrators, consisting of Mr. Collingwood Schreiber, chief consulting engineer to the government; Chief Engineer Grant of the National

Transcontinental Railway Commission, and Chief Engineer Kelliher of the Grand Trunk Pacific Railway Company, after an inspection of the whole line from Moncton to Winnipeg, agreed on a report deducting about \$700,000 claimed by the contractors according to the classification of work done under the contract specifications. The deductions were made on the ground of over-classification of rock material, overbreak, etc.

Most of the cases in dispute between the engineers of the Commission and the engineers for the contractors are in district "F," between Winnipeg and Superior Junction, under contract to Mr. J. D. McArthur. He is now entering suit, on behalf of all the contractors affected, to have the Exchequer Court decide as to the correctness of the award. An immense amount of evidence will be necessary before the court can decide on the facts of the case, and the legal costs will probably constitute a new high record for Canadian civil actions. It is thought probable that the final award will allow the contractors between three and four hundred thousand dollars more than the arbitrators have allowed.

The action brought by the Standard Construction Company, of Montreal, against A. E. Wallberg and the Mines Power Company, of which Wallberg is president, to recover \$16,185 for work performed under certain contracts, was dismissed with costs. The plaintiffs contracted with the defendants to build a transmission line from their power house to their sub-station at Cobalt, 25 miles, for \$19,000. When they had finished only part of the work they withdrew their men. The Court held that the plaintiffs, having failed to complete their contracts, could not recover from the defendants, who expended \$5,000 to finish the line. The judge referred the matter of the damages to which the defendants are entitled, to the local master, suggesting to the defendants that they might make allowance for the absolute inadequacy of the amount provided for under the contract for the construction of the transmission line.

Trade News from Montreal

The new 25,000 barrel mill of the St. Lawrence Flour Mills Company, Limited, is now completed and ready for operation. It is situated at 1110 Notre Dame street west and extends from that street to the canal. Connected with the mill is an elevator of 350,000 bushels capacity. The mill is of reinforced concrete construction and the elevator of concrete and tile. The contractors for the mill construction were Messrs. Barnett & McQueen, of Minneapolis and Fort William. The machinery was supplied and installed by the Allis-Chalmers Company, of Milwaukee. The mill will be operated by electrical power supplied by the Canadian Light Heat & Power Company, the installation for which has already been completed. Mr. George A. Grier is president of the company, Mr. Thomas Williamson, vice-president, and Colonel Labelle, managing director.

Mr. C. E. Deakin, of Montreal, has been awarded the contract for a 100-ton Kraft paper mill to be erected on Baptist Island, opposite Three Rivers, for the Wayagamack Pulp and Paper Company, Limited. The installation of a 50-ton unit of machinery is under way and is expected to be ready for operation by October 1st, with another 50-ton unit to follow in the spring.

Messrs. D. G. Loomis & Sons have been awarded a contract for a new flour mill for the Dominion Flour Mills, Limited, which was incorporated with an authorized capital stock of \$1,500,000. The mill will be situated on the Lachine Canal, opposite Messrs. Loomis' offices. It will cover a ground area of 75 feet by 200 feet. The capacity of the mill

will be 2,000 barrels a day. The concrete foundation has been begun and the superstructure will be of concrete and brick. The plans for the building have not yet been completed and the total cost of the structure is not yet known. Mayor W. B. Wood, of Brantford, is the president of the new company. This mill will be operated in connection with five others in Ontario and the west, now controlled by the new company.

Good progress is being made on the concrete work of the C. P. R. bridge on Notre Dame street, in rear of the Viger station, and also on the new paint factory of Ramsays, Limited, at Maisonneuve. Both of these contracts are being carried out by Mr. E. G. M. Cape.

The plans of the new Windsor street station of the Canadian Pacific Railway provide for an elaborate system of passenger and traffic elevators. In the part of the building now used by the company there are three elevators, and the drawings for the extension show eight more, so that in all there will be eleven elevators in the station when the addition now being built is finally completed. The entire system of lifts will be operated from a central plant located in the basement of the station and nine of them will be of the direct vertical plunger and counterweight pattern and the other two of the horizontal hydraulic type. The controlling valves of the elevators will be so constructed that the lifts will come to a stop without jar or shock and the passenger hoists will be all equipped with a limit stop valve, which will automatically decrease the speed of the elevator as it nears either end of its run and will ultimately bring the cage to a stop if the operator should by any chance neglect to do so himself. The elevators will vary in size from 6 feet by 6 feet to 9 feet by 11 feet and will have runs varying up to 170 feet. The shafts for these elevators are now being sunk, the depth in the shafts sunk so far being about 193 feet. The elevators will be capable of raising loads of from 250 lbs. to 7,000 lbs.

Address on City Planning

Montreal was visited recently by Mr. Raymond Unwin, the noted expert in city planning, and author of "Town Planning in Practice." Mr. Unwin is the architect of the Hampstead garden suburbs near London and is regarded as an authority on civic hygiene and kindred subjects. Mr. Unwin gave an illustrated lecture in the art gallery before a large and fashionable audience, under the auspices of the City Improvement League in co-operation with the Art association of Montreal. Mr. Unwin urged his audience to profit by the mistakes that had been made in England, where manufacturing towns and cities had sprung up without any design or supervision that would make for the beauty of the place or the health of the residents. The passing of the Town Planning Act gave citizens the power to call on town councils to enforce the Act when they did not do so voluntarily. Montreal, Mr. Unwin considered, had now reached a stage when serious attention should be given to plans for the future welfare of the city. He had made a tour of inspection through the city and found that slum areas were developing both in the centre and in the suburbs. Dire consequences would follow if these were allowed to spread or even to exist in the districts in which they now were found. The death rate in Montreal was now over twenty-two per thousand as against fourteen per thousand in the big city of London, and about four per thousand for the garden cities. He described a hovel he had seen about a stone's-throw from the City Hall which contained two bedrooms without any windows and with no ventilation except through doorways leading into a stuffy living room and in front of this living room was a heap of malodorous garbage. Such buildings were calculated to

kill off children by thousands and men and women by hundreds. If the old wooden shacks constructed between the main buildings were torn down, light and fresh air would be given access to these residences and the death rate would be reduced accordingly. "What is the use," he asked, "of sending people to Montreal to build up a big city and develop its commerce if they are to be killed off at this rate?" Lantern views were shown of modern planned cities and towns in Europe which the lecturer declared had an individuality of their own. One city was built on a hillside, another on a plain, and a third on a harbor. The American checkerboard system of long streets running at right angles to one another was contrasted with German cities built in harmony with the contour of the ground, and with the ancient Greek cities, in which the scenic beauties had been preserved by ordered planning. The advantages and disadvantages of straight and curved streets were well illustrated by views of Paris, Oxford, London, and Augsburg, and the drawbacks of diagonal streets by views of Chicago and Philadelphia. The relation of tree planting to architecture was illustrated by views of Stuttgart and Versailles. Mr. Unwin described the origin of the garden city idea in the haphazard suburbs projected by speculative builders. The audience repeatedly showed its approval of this system represented England at the First International City Planning Conference held in America.

A day or two after Mr. Unwin of Garden City fame visited Montreal, Mr. Thomas Adams, executive inspector of the local government board for England under the British Town Planning Act, arrived there from Philadelphia, where he was one of the English representatives at the City Planning Convention. Mr. Adams expressed the opinion that the Town Planning Act might be adopted in Canada with great advantage. Legislation on this subject he thought would come within the powers of the provincial legislature. Mr. Adams is a very strong advocate of suburban residence. Speaking of New York he said that he thought the money spent in building sky-scrapers would be better expended in tunnelling under the rivers and building railway lines or establishing other means of communication between Manhattan and the main land. He believes in spreading the people out over the country where there is plenty of light and fresh air, and his advice to every large city is to employ every means possible to prevent congestion.

The Norman W. Henley Publishing Company, 132 Nassau street, New York, have favored us with a set of their Concrete Workers' Reference Books. These books give complete practical information upon the construction of concrete wall forms, concrete floors and sidewalks, silos, concrete chimneys, monuments, mausoleums and burial vaults, and also directions for the molding and curing of ornamental concrete. The author is A. A. Haughton. These books may be obtained at fifty cents each. They should be of great value to every contractor and concrete worker.

Bulletin 107, issued by the John McDougall Caledonian Iron Works, Limited, contains particulars of the official tests of McDougall turbine pumps which form part of the waterworks system of Montreal. The pumps were tested in actual service under exacting conditions. It is interesting to note that in one case the pumping unit earned a substantial bonus and that in both instances the pumping units largely exceeded the contract capacity.

The annual convention of the Union of Canadian Municipalities will be held at the City Hall, Quebec, August 29-31.

The Usual Delay at Ottawa

Indecision as to Site Holds Up the New Departmental Buildings—Activity in Other Quarters

Ottawa, June 10, 1911

There is another delay in the progress of the new departmental building for the federal government, which was to have been erected on Mackenzie avenue. After the first plans were adopted, the Ottawa Improvement Commission came forward and urged that room should be left for the driveway to run in front of the new building. This was agreed to and necessitated a rearrangement of the plans, making the building narrower and at the same time taking off one storey. Now another deputation urges that the building thus cramped up between the driveway and Sussex street would spoil its effect and wants the government to expropriate land on the other side of Sussex street and to build the new building there. Accordingly the entire progress has been held up until there is a final decision as to where the structure shall go. In the meantime it is urged that one large scheme should be prepared which for years to come would regulate the building on the part of the government in the capital, as well as the growth of the city and the work of the Improvement Commission. For some time the idea of having such an extensive plan has been mooted to regulate how the city should grow and the present indecision with regard to the location for the departmental building has furnished another argument in its favor.

Low Figures for Street Paving

The contracts have been let for the street paving and show that the city has again been able to get very low rates. The two successful tenderers were the Union Construction Company and the Ottawa Construction Company. The specifications are for a heavy asphalt pavement made of 6 inches of concrete and 2½ inches of asphalt, with a ten-year guarantee. The prices range from \$2.18 to \$2.22 a square yard.

Work has begun on the west end drainage scheme. The contractor, Thomas McLaughlin, has 200 men on the job with 4 sewer trench machines and double drum steam hoists, 8 steam drills, 2 forty horse power boilers, rock crusher and concrete mixer. There are about 3½ miles of sewer construction.

There was never such a rush in the brick business in Ottawa as at the present time. The plants will manufacture about eight or nine million more brick this year than last owing to the new plant of the Peerless Brick and Tile company which, it is expected, will produce 12,000,000 brick this year, while last year it only turned out about 3,000,000.

Never in the history of the city was there so much renovating of dwellings as this year. In nearly every street, particularly where the more expensive residences are situated, there are large numbers of houses being rebuilt or considerably altered. It does not show much on paper but it means considerable activity in the buying of supplies.

The Supply Market

Sand is selling from 87½ cents to \$1 a cubic yard, according to the haul. Gravel is selling at \$1.25 a cubic yard, rubble stone at \$1 a ton, crushed stone (2 inches) at \$1.40 a ton, and crushed stone (five-eighths inch) at \$1.95 a ton.

There is a considerable shortage of labor both in the trades and in ordinary labor. In all the branches of the building line it is extremely hard to get men. In the case of the painting firms, most of them have advanced the charge per hour in jobbing from 45 cents to 50 cents.

Important Construction

Work on the Blackburn building, which will be perhaps are largest commercial building in the city, is progres-

sing very satisfactorily. It is being constructed in three sections, the first of which will be completed about August. The corner section will be begun as soon as the first section is in a condition to receive the tenants.

Two important tenders are being called for just now. One is for an addition to the warehouse of John M. Garland & Sons, Limited, and the other is the new Congregational church. Both of these are in the hands of A. LeB. Weeks, architect. The Garland annex will be a reinforced concrete structure. In the case of the church, both brick and stone prices have been asked.

Contract News from the Coast

Vancouver, June 8, 1911.

The Grouse Mountain Scenic Incline Railway Company has been incorporated and capitalized at \$750,000 in 1,500 shares of \$500 each. Among the directors are: Ex-Mayor May, of North Vancouver; W. J. McGuigan, W. H. R. Collister, L. C. Miles, W. J. Manson, M.P.P., and W. H. R. Collister. The engineers are Waddell & Harrington.

This line will form one continuous route, operated by electric power supplied by the British Columbia Electric Company, and will start from their projected extension along the Capilano river at "Canyon View," five miles north of Vancouver, across Burrard Inlet. About 1½ miles eastward will be located the foot of the incline, from which point the observatory cars will be raised to an altitude of about 2,350 feet by one and a half miles of cables, constituting the longest incline in the world. From the top of the incline the railway will skirt the rugged crest of Grouse Mountain to a height of 4,250 feet to the selected pleasure resort, comprising 320 acres of undulating lands, including a small lake of 12 acres. An hotel will be erected here to provide accommodation necessary to the establishing of summer and winter sports, also pleasure grounds. The outlook from this high peak extends west over the island-studded straits of Georgia, Vancouver Island, and the Olympian range of mountains in Washington state. South and east views extend over Vancouver city, the Fraser river valley and Mount Baker in the United States.

The cost of construction of the railway will amount to \$520,900; equipment of power house, poles, wires, cars, cables, etc., \$99,100; hotel, \$50,000; sport attractions, etc., \$33,000; making a total outlay of \$703,000.

Work clearing the right of way was commenced on May 22nd. Tenders will be called for the completion of the work by October 1, 1912.

Reference was made recently in the Contract Record to the fact that an English company, headed by Wm. Owen, M. E., London, Eng., would establish \$20,000,000 steel works near Vancouver. It is now definitely stated that they will be located at Pitt Meadows, where 200 acres have been purchased bordering on Pitt river, on the main line of the C. P. R., about 20 miles from Vancouver. The capacity of the proposed works will be 1,000 tons daily, and some 3,000 men will be employed. Blast and open hearth steel furnaces and rolling mills will be erected. The plant and machinery will be brought from Europe.

The five-million-dollar mark is expected to be reached in city building at Edmonton, Alta., this year. For the first five months of the year the permits aggregated \$2,500,000.

Building operations at Calgary have been tied up owing to trouble with the bricklayers. A recent report states that seventeen builders who are not associated with the Builders' Exchange, have signed up an agreement to pay 70 cents an hour.

Personal Mention

Mr. J. G. Lindsay, city engineer of Belleville, Ont., was a recent visitor to Lethbridge.

The South Vancouver council have appointed Mr. R. D. Royston assistant engineer for that municipality.

Mr. P. B. Motley, of the C. P. R. engineering department, has been appointed engineer of bridges for that company, with headquarters at Montreal.

Professor Stone, Dean of Engineering at the University of New Brunswick, has resigned in order to take up the practice of his profession at Vancouver.

Mr. L. M. Jones, formerly assistant city engineer of Port Arthur, Ont., has been appointed city engineer, vice Mr. Antonisen, resigned.

Mr. Harry Worswick, until recently associated with the Worswick Paving Company, has been appointed foreman of paving construction at Victoria, B.C.

Mr. R. S. Lea, of Montreal, has been selected by the city of Vancouver to report upon a sewerage system for the drainage of the section lying between the inlet and the north arm of the Fraser river.

Mr. D. Chene, city engineer of Hull, Que., has resigned his position in consequence of interference with his department from the city council. Mr. Chene states that it was one of the conditions of his appointment that he be given full control. Instead of this he has been treated in an arbitrary



Mr. Dosithe Chene, formerly City Engineer of Hull, Que., who has resigned.

manner and has had to submit to aldermen, "who knew little about civic improvement and less about engineering." Mr. Chene has secured an appointment as sanitary engineer and architect with the Dominion Government. He will take up his new appointment immediately. A biographical sketch of Mr. Chene was published in the Contract Record of May 31, 1911.

Mayor Adams, of Lethbridge, has been investigating paving work in Edmonton, Calgary and other cities with a view to obtaining information for Lethbridge, which will undertake a considerable amount of this class of work this season.

City Engineer Antonisen, of Port Arthur, has resigned, following an order of the city council that all civic employees must register their arrival and departure by a time clock. This, Mr. Antonisen considered beneath the dignity of a city engineer and he accordingly refused to work under such conditions. Mr. Antonisen is a native of Christiana, Norway. He left Europe for San Francisco in 1898



Mr. J. Antonisen, the retiring City Engineer, Port Arthur

and made connections with Canada in 1905, securing a position with the C. P. R. as resident engineer at Winnipeg. He was appointed town engineer of Port Arthur in 1906. He is a member of the Canadian Society of Civil Engineers and a charter member of the American Society of Engineering-Contractors. A detailed sketch of his career was published in our issue of June 8, 1910.

Following the resignation of Mr. C. M. Arnold, the city of Lethbridge, Alta., is now without a city engineer. For the present Mr. H. Meech, formerly assistant to Mr. Arnold, is taking over the work and will continue to fulfill the duties of city engineer until an appointment is made. This state of affairs comes at rather an inopportune time inasmuch as the city is contemplating the expenditure of about \$500,000 on municipal improvements. Numerous applications have been received for the post, however, and it is expected that an appointment will be made in the near future.

Mr. E. N. Harvie, engineer of the municipality of South Vancouver, has resigned. The causes are stated to be the refusal of the city council to give Mr. Harvie sole control of his department and the independent appointment of an assistant engineer by the council. Mr. Harvie has held the post since March, 1909, since which date work aggregating in value \$540,000 has been carried out under his supervision. The salary attached to the post is \$150 a month.

Mr. Willis Chipman, Toronto, has been asked to act as consulting engineer with City Engineer Macallum, of Hamilton, Ont., in the preparation of a report on the water-works system.

The city of Guelph, Ont., established a record for itself last month by issuing permits to the value of \$244,770. The permits include that for the Homewood Sanitarium, which is to cost \$175,000.

Forty Years in the Canadian Field

One of the best known engineers in Winnipeg, and in Western Canada, for that matter, is John William Astley, C.E., engineer of construction for the city of Winnipeg. Mr. Astley tenders against every class of contractor for every class of work in Winnipeg, and he is conceded to be one of the shrewdest estimators in the profession. The ability to estimate for work and undertake the construction satisfactorily is possessed by very few engineers, and Mr. Astley's success in this department has stamped him as an engineer of outstanding ability. That this is pretty generally realized is evidenced by the fact that he received a



Mr. J. W. Astley, Engineer of Construction for the City of Winnipeg

tempting offer recently from the city of Victoria, B.C. He declined in favor of his old post at a new figure. The city of Winnipeg rose to the occasion—and well it might, for men of the type of J. W. Astley are scarce nowadays.

Anything like a detailed sketch of the career of such a man as Mr. Astley, who has had over forty years' wide and varied experience, would fill a book. His earliest records go back to the early '70's, when he took up railway engineering with the Northern Railway of Canada, rising from assistant engineer to become chief engineer of the Muskoka branches of that line. He has been engaged in every class of engineering and construction work for the Canadian Pacific and other railways. Probably he has explored more railway routes than any other man in Canada. He is a born bush man, and is possessed of a cast iron constitution.

In 1900 he was appointed assistant city engineer of Winnipeg and remained with Col. H. N. Ruttan, city engineer, until 1908. He then undertook to explore a railway from Glenora to Dean Lake, B.C., and another line from Glenora to Dawson. Mr. Astley remained in Dawson for some time as chief engineer and then manager of the Klondyke Mines Railway. He also designed and built the Dawson waterworks, the most northerly system of the kind on the continent. In 1908 he was appointed to his present position of Engineer of Construction for the city of Winnipeg. Mr. Astley has just entered upon what promises to be a very busy season. As we have said, he tenders on many classes of work, and he secures nine-tenths of the construction upon which he figures. This means over one million dollars a year. He is a man of indomitable energy.

"I have a holy unrest, like the wandering Jew," he once told us. "I must be driving ahead at some undertaking, whether it is municipal work or travelling around Europe on my own."

J. W. Astley is a man who has succeeded on his own merits entirely. The salary question in municipal work has always been a secondary consideration with him and yet he has succeeded in this as in other matters, for the reason that he is known to say what he means and mean what he says. Had he confined his attention exclusively either to engineering or contracting he would have achieved success. As it is, he has chosen something harder—the combination of the two, and he is doing it well.

Eminent American Engineer appointed on Quebec Bridge

Mr. Charles Conrad Schneider, who has been appointed to the Board of Engineers in charge of the construction of the Quebec bridge, was born at Apolda in the Duchy of Saxony, Germany, on April 24, 1843. After graduating from the schools of his native city he served two years' apprenticeship in a machine shop to prepare himself for engineering studies. This is quite a common practice in Great Britain and on the continent, where a knowledge of practical work is considered essential for the complete grasp of theoretical studies. In 1861 he entered the Royal School of Technology at Chemnitz, from which he graduated three years later. After graduating he served in various capacities in the shop, the field and the office, obtaining rapidly a general knowledge of all branches of manufacture. In 1867 he came to America and worked for three years as a designer of locomotives and other machinery at the Rogers Locomotive Works, at Paterson, N. J. His early training, therefore, eminently fitted him for the career of a structural engineer, in which he has achieved so much distinction.



Mr. C. C. Schneider, of Philadelphia, who will share with Messrs. Monsarrat and Modjeski the responsibility of the Quebec Bridge construction

It would fill a volume to enumerate even the more important works with which Mr. Schneider has been identified during the last 30 or 40 years. But it is of special interest to the Canadian profession to recall the fact that in 1882 he designed the cantilever bridge over the Fraser river for the Canadian Pacific Railway, and in 1883 the famous Niagara

river cantilever for the Michigan Central Railway. The latter was probably the most notable American structure up to the opening of the Brooklyn bridge, for it was built in six months and contains many new ingenious ideas in design and detail. Among other structures of this period which Mr. Schneider designed was the Stony Creek viaduct on the Canadian Pacific Railway, which, at the time of its construction, was the highest viaduct on the continent.

During the last eight years Mr. Schneider has devoted his attention to private consulting practice and has acted as consulting engineer for the American Bridge Company. Previous to this he was vice-president of that company, in charge of engineering. He entered the position when the American Bridge Company was formed, with the Pencoyd Iron Works, of Philadelphia, as its most important constituent. He had organized a bridge and construction department at the Pencoyd Works and had directed the design and construction of bridges for nearly all of the leading American railways.

Mr. Schneider is a member of a number of leading engineering societies. He is a past president of the American Society of Civil Engineers.

News and Notes

Regina, Sask., issued building permits last month to the value of a million dollars.

During the first five months of the current year Hamilton spent \$539,005 on building. This is \$336,380 in excess of the corresponding period of last year.

From June 1 to May 21 the city of Victoria expended \$1,181,785 on building operations. For the corresponding period of last year the total was \$975,235.

The Northern Construction Company have over 600 teams at work on the Brazeau Line on the C. N. R., and will begin grading on the Red Deer-Calgary branch next week.

The city of Edmonton is planning an expenditure of \$225,000 on paving work this season. A by-law will be submitted at an early date. At Calgary the expenditure in paving will be nearly a million dollars.

The building permits issued last month at London, Ont., total \$195,470, compared with \$87,165 for May, 1910. Since Jan. 1, 1911, the permits total \$413,667, as against \$415,880 for the corresponding period of 1910.

Competitive plans are to be invited from Canadian architects for the new Technical School buildings at Toronto. First, second and third awards will be made. Details of the prizes will be announced later. The general plans for the new buildings will not be outlined until early in the fall.

We note that the Appleby Company of England, who are represented in this country by the Ford Iron Company, 485 St. James street, Montreal, have now on order 17 Kerpely gas producers of the largest size, including a battery of nine for the new steel works of John Lysaght, in Lincolnshire, Eng.

Messrs. A. B. Ormsby, Limited, Toronto and Winnipeg, report the first five months of 1911 to be a record in connection with building within Winnipeg and the west. Among the many contracts they have closed in Winnipeg during the past few weeks have been the North Collegiate, for the Winnipeg Public School Board; the Bank of Montreal in Winnipeg, for Messrs. Norcross Bros.; Rutherford Apartment, for Messrs. Claydon Bros., Winnipeg; new terminal station for Messrs. Claydon Bros.; additions, St. Johns telephone exchange, for Messrs. J. J. & J. M. Kelly; Manitoba Government telephone stores building, for D. D. Wood; Grose & Walker, warehouse; new police station for D. D. Wood; new Y. M. C. A., north end, for S. Brynjolfson; ad-

ditions to Dingwall Block for Messrs. Saul & Irish; new C. P. R. coach shops for Messrs. Claydon Bros.; McLean Building at Calgary for J. A. Girvan Company; new house for Mr. Gooderham; new C. P. R. boiler shop for the J. McDiarmid Construction Company; new Brooklands School for J. Dolmer; new Nurses' Home in connection with Winnipeg General Hospital for Messrs. Wallace & Aikins; new steam plant for Winnipeg Electric Railway Company, and C. P. R. freight sheds for R. J. Barker & Company.

The city of Toronto water works department recently purchased from the John McDougall Caledonian Iron Works Company, Limited, ten Venturi meters, ranging from 12 in. to 36 in. in diameter. These meters are a necessity for all turbine pumps and almost a necessity for reciprocating pumps in order to check up the slippages and other irregularities. One of these Venturi meters now in operation in the city of Montreal has a diameter of 108 in. and a range between 30 and 75 million Imperial gallons per 24 hours. At the present time it is measuring the supply of the Montreal pumps of an average pumping capacity of 42 million Imperial gallons per 24 hours.

According to an announcement given out recently by Mr. C. C. Ballantyne, the Sherwin Williams Company of America have sold out their large Canadian and British interests to the Sherwin Williams Company of Canada, Limited. The purchasers are C. C. Ballantyne, managing director of the Sherwin Williams Company of Canada, Limited, and Mr. W. H. Cottingham, president of the Sherwin Williams Company of America, these two being associated with other strong financial interests. Mr. Cottingham will be president of the new concern and Mr. Ballantyne, vice-president and general manager.

Trade Enquiries

The Dominion Government Trade and Commerce reports contain the following trade enquiries. Readers of the "Contract Record" may obtain the names of enquirers by writing us, enclosing stamped envelope, and stating number of enquiry.

500. Patent jointing cement.—A London firm would like to get into communication with Canadian importers of engineers' supplies likely to be interested in a new patent jointing cement.

506. Agencies abroad.—A London company is open to undertake agencies in financial matters for any kind of Canadian business, and invites correspondence from responsible firms interested.

516. Steel rods and hoops.—A Welsh firm manufacturing steel rods and hoops is anxious to extend their Canadian business by getting into touch with actual consumers and merchants in the Dominion.

517. Water-tube steam boilers.—A north of England firm would like to interest Canadian manufacturers and others in their water-tube steam boilers.

525. Cement.—A firm in Cartagena wishes to be placed in communication with Canadian exporters of the above article. Prices to be quoted f.o.b. New York. Brand usually imported 'Atlas Portland.'

542. Electrical insulators in stoneware and porcelain, &c., &c.—Inquiry is made by a well known London firm manufacturing electrical insulators in stoneware and porcelain; also conduits, troughing, cable racks and floor tubes, &c., for power stations, for the names of Canadian importers.

543. Tiles and mosaics.—A firm in the English Midlands wishes to get into touch with a Canadian firm who are practical fixers and designers of floor and wall treat-

ments, with a view to interesting them in tiles and mosaics.

543. **Tiles and mosaics.**—A firm in the English Midlands wishes to get into touch with a Canadian firm who are practical fixers and designers of floor and wall treatments, with a view to interesting them in tiles and mosaics.

Medicine Hat Builders' Exchange

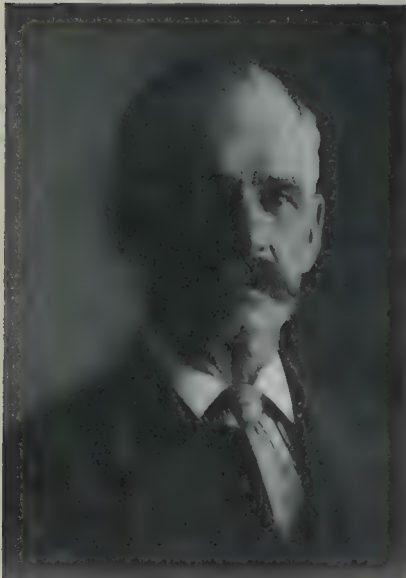
The Medicine Hat Builders' Exchange is one of the youngest organizations of its kind in the west, and already it is one of the most active. A short time ago it affiliated with the Provincial Exchange of Alberta, which is comprised of the Calgary, Lethbridge, Edmonton and Medicine Hat exchanges, working under the jurisdiction of the Canadian National Association of Builders. There is a general disposition among contracting interests in Western Canada to take a firm stand in defence of the individuality and freedom of the employer, and in this respect the members of the Medicine Hat Exchange have shown themselves to be of one mind. The Exchange movement is strong at Medicine Hat and the membership of the association is assuming

understood that there will be new terminals in Toronto and Montreal, and in connection with the latter it is proposed to ultimately put a bridge over the St. Lawrence.

The Grand Trunk Pacific has decided upon the location of the divisional point on the Edmonton-Calgary line. It will be at the west end of Buffalo Lake and the name selected for it is Mirror. Steel already has been laid to that point, and a train service will be inaugurated next month. It is expected that in addition to being a divisional point, Mirror will also be the junction point for at least two branch lines, one east and one southeast, with a possibility of a western extension. Provision will be made for yards, roundhouses and light repair shops.

Preliminary surveys have been completed by the Canadian Pacific Railway for a line of railway from Wilkie, Sask., through to the Cold Lake country, to meet a line located west from Fort McMurray country two or three years ago.

L. B. Merriam, 125 Phoenix Building, Winnipeg, is engineer in charge of the construction of the Kootenay and Alberta Railway in southwestern Alberta. Grant Smith &



President: J. A. Trimble



Secretary: J. D. Sverard



Vice-President: T. F. Hook

OFFICERS OF THE MEDICINE HAT BUILDERS' EXCHANGE

gratifying proportions, although necessarily not so large as some of the older established organizations. We give herewith photographs of the president, Mr. J. A. Trimble; second vice-president, T. F. Hook, and secretary, Mr. J. D. Everard. Mr. Everard is doing excellent work in the interests of this young exchange and we expect to hear something more from Medicine Hat in the near future.

Canadian Railroad Development

It has been officially announced, according to information received from Nelson, B. C., by the Canadian Pacific Railway, that a line will be constructed this summer from Three Forks to the Lucky Jim Mine, and that contracts will be let and work started shortly.

The Canadian Northern Railway is understood to be planning an initial expenditure of \$5,000,000 and an ultimate expenditure of between \$30,000,000 and \$40,000,000 for the construction of terminals in Montreal and Toronto. It is

Co., of Spokane, Wash., are the contractors and D. Whitaker, of Pincher Creek, Alta., is resident engineer. Owing to some 12 or 14 days' rain and snow during May the work has been somewhat delayed. The estimated outlay is \$450,000. Of the constructional features of interest may be mentioned one large cut of 150,000 cubic yards and two trestles 150 feet high, requiring 2,000,000 feet B.M. of timber in their construction. Nearly all of the timber required for these structures was either on the ground or on the road at the time of writing (June 3). In addition to the ordinary grading outfits on the work there are four machines in use, two of which have steam engines driving the belt direct.

Mr. C. S. Cunningham, superintendent of the Southern division of the Grand Trunk Railway at St. Thomas, Ont., has been transferred to the Western Division at Detroit, Mich., as 'Acting Superintendent, pending the return of Mr. F. W. Egan, who has been granted leave of absence on account of ill health. Mr. C. G. Bowker, Assistant Superintendent at London, Ont., will have charge of the Southern Division with headquarters at St. Thomas.

Contracts Department

News of Special Interest to Contractors, Engineers, Manufacturers and Dealers in Building Supplies.

Information for insertion in these columns is invited from Architects, Contractors, Engineers, etc.

Waterworks, Sewerage and Roadways

Berlin, Ont.

County Council decided to purchase road roller and stone crusher. \$2,700 debentures will be raised. Road Commissioner, Clerk Bowman.

Chatham, Ont.

Tenders are called for glazed sewer pipe. Owner, City of Chatham; W. G. Merritt, city clerk, King st. from Duke street to P. M. railway; Forest street from Arnold to Delaware avenue; Charteris street from William to east end of same street; West street from Lorne avenue to Grey street. Tenders closed June 12.

Dereham, Ont.

Tenders called for improvement drain (Reynold's Creek), Dereham Township, Oxford County; Clerk, Alex. Bell, Verschoyle. Work, 6 1/5 miles in length, and according to estimates consists of excavation of 28,940 cubic yards of earth. Plans, etc., at residence of Alex. Bell, clerk. Tenders received until June 19th by clerk.

Halifax, N. S.

Contemplated cement walks, \$5,750. (Young avenue). Owners, City of Halifax; city engineer, F. W. W. Doane. Sidewalk has been ordered by council. Report later.

Lindsay, Ont.

Tenders called for bridge. Owner, Tp. of Carden, Victoria, Co.; clerk, J. R. McNeillie. Tenders close July 5th. Advertisement in "Tenders and For Sale Department" of this issue.

Montreal, Que.

Tenders called for filtration beds, etc., \$750,000. Owner, city of Montreal; engineer, Geo. Janin, City Hall, Montreal. Work to be finished by September, 1913. Tenders to be in by July 13.

Moose Jaw, Sask.

Tenders called for concrete culverts. Owner, City of Moose Jaw; W. F. Heal, city clerk. Engineer, J. M. Wilson. Three concrete culverts. Tenders received by city clerk until July 19th for construction.

Tenders are called for street sweeper. Owner, City of Moose Jaw; W. F. Heal, city clerk. Tenders called until June 12 for supply of 1 street sweeper. Prices f.o.b., Moose Jaw, and endorsed "Tenders for Street Sweeper."

Nanaimo, B. C.

Tenders called for paving. Owners, Corporation of Nanaimo. City engineer, Allan Waters. Tenders called after June 7th for laying 15,000 superficial yards of asphalt and other alternative paving in business streets. Plans at office of city engineer.

New Glasgow, N.S.

Tenders called for waterworks, \$200,000. The town will call for tenders for excavation and laying of pipe from pumping station, 4-7 miles out in the country. Tenders called after June 8. Supplementary report later.

Niagara Falls, Ont.

Pavement, (McRae street). Owner, City of Niagara Falls, Ont. Engineer, J. C. Gardner, Niagara Falls, Ont. Proposed work, 3/4 mile, 33 ft. wide. W. B. Masters, Niagara Falls, made McRae sub-division and is still holding it. Further negotiations, apply to W. B. Masters.

North Bay, Ont.

By-laws carried for waterworks and storm sewers. Owner, Municipality of North Bay, Ont.; commissioner of works, T. N. Colgan. Debentures by-law for waterworks extension, \$100,000. sanitary and storm, \$45,000. Both by-laws carried.

Oshawa, Ont.

Plans in progress for sewage disposal plant. Owner, Town of Oshawa; town engineer, Frank Chappell. Plans in preparation. Work to be secured by contract. Tenders not yet called.

Port Arthur, Ont.

Tenders called for pavements. Owner, Corporation of Port Arthur; city engineer, J. Antonisen. Tenders are called until June 24th. Advertisement in "Tenders and For Sale Department" of this issue.

Simcoe, Ont.

Specifications in progress, sewage and sewage disposal, \$30,000. Owner, Town of Simcoe, W. C. McCall, clerk. Engineers, Chipman & Power, Mail Building, Toronto; complete system, tile pipe, size 20 in. down. Plans and by-law being considered.

Southampton, Ont.

Tenders called for extension of waterworks system. Town clerk, J. C. Eckford. Waterworks engineer, G. W. Martin, Southampton. By-law for \$7,500 carried to extend (proposed) new intake pipe and cement basin and to install a new turbine pump and an electric motor of 40 h.p. Wanted—Price for furnishing, installing and connecting 40 h.p. electric motor and turbine pump, complete; also prices on c. i. pipe, say 600 ft. 12 in. dia. Full information on application to Waterworks, Eng. of town clerk.

St. Thomas, Ont.

Tenders called for concrete culverts. Owner, Tp. of Yarmouth, Ont.; engineer, Jas. A. Bell, C.E., St. Thomas. Two concrete culverts on town line between Delaware and Southwold. Plans, etc., at office of engineer. Tenders called by engineer until June 13.

Tenders called for reinforced concrete

coagulating basin. Owners, Waterworks commission, St. Thomas; Geo. E. Croker, chairman. Tenders called until 5 p.m., June 24th, for construction of a reinforced concrete coagulating basin, capacity 400,000 gallons, at St. Thomas waterworks.

Thorold, Ont.

Tenders to be called for sewage pipe, \$25,000. Owner, Village of Thorold; engineers, Chipman & Power, Mail Building, Toronto. 15 in., 12 in., 10 in., and 8 in. tile pipe, length about 15,000 feet. Tenders called shortly.

Estimates being made for road improvement, \$15,000. Owner, Town of Thorold; D. J. C. Munro, clerk; engineer, J. E. Gardiner, Niagara Falls, Ont. \$15,000 voted for road improvement at last election. Estimates being made for macadam roads and various kinds of pavements.

Negotiations in Progress for road paving. Owner, Stamford Tp. and rest of Welland County. Parties concerned, Stamford Tp. and rest of Welland County. Engineer, J. C. Gardner, Niagara Falls, Ont. Under consideration, about 100 miles of provincial aided good roads, providing engineer's report shows that proper allowance is being made for good roads already constructed. Engineer's report in about two weeks.

Walkerville, Ont.

Bids to be received for street paving and curb, \$79,000. Owners, Owen McKay, Walkerville, Ont. Asphalt block on a 6 in. concrete foundation and reinforced concrete. About 25,000 yds. of the former and two or three blocks of the latter, on Sandwich street, Argyle, Monmouth and Devonshire roads and Victoria avenue. Money for the work was voted by the ratepayers Saturday, the work to be completed this year.

Welland, Ont.

Tenders to be called for street pavement. Owner, Town of Welland; G. R. Boyd, clerk. Engineer, D. T. Black, Welland, Ont. The clerk was instructed by council to call for tenders for vitrified brick, bitulithic with brick between car tracks and 18 inches on each side, asphalt block and tarolithic.

AWARDED

Halifax, N. S.

Contracts awarded for installation of 2200 water meters to John McFatridge, Argyle street, Halifax, at 60c per wiped-joint. Engineer, F. W. W. Doane, Halifax.

Lethbridge, Alta.

Contract awarded for street grading, storm sewer, sanitary sewers, later mains. Owner, City of Lethbridge, engineer, H. W. Meech, acting city engineer, Lethbridge. Contractor, N. K. Boyd, Winnipeg, Man.; lump sum bid on contracts, A. C. D. & E., \$119,596.

Contract awarded for cement sidewalks, \$21,963.08. Owner, City of Leth-

bridge, Alta. Engineer, H. W. Meech, acting city engineer, Lethbridge. Contractor, Forest City Paving Co., Lethbridge, Alta. and Regina, Sask. About 22,000 square yards of walk and 15,000 feet curb.

Contract awarded for cement pipe, \$10,667.99. Owner, City of Lethbridge, Alta. Engineer, H. W. Meech, acting city engineer, Lethbridge; contractor, Forest City Paving Co., London Ont., Regina, Sask. and Lethbridge, Alta. This pipe is substituted for vitrified tile piping for storm sewer. It has not been definitely decided whether it will be used or not.

Moose Jaw, Sask.

Contracts awarded for extension to storm sewers. Walter Mandin, Edmonton, Alta. City engineer, J. M. Wilson.

Contracts awarded for cement sidewalks. Moose Jaw Construction Co., \$55,530.32, for sidewalks, curbs, and gutters. Engineer, J. M. Wilson, city engineer.

Contract awarded for street paving, \$127,906. Owner, City of Moose Jaw, Sask.; W. F. Heal, city clerk; engineer, J. M. Wilson, Moose Jaw. Contractors, Moose Jaw Paving Company, \$127,906. (Douglas Fir Blocks). National Paving Co., Ltd., will pave one street.

Oshawa, Ont.

Contract awarded for cement sidewalks to W. J. Anthistle, Cromwell street, London, Ont., at 11c. per sq. ft. Scott & Co., Sherbourne street, Toronto, tendered at 16c per sq. ft. Town engineer, Frank Chappell.

Ottawa, Ont.

Contract awarded for pavements, King Edward avenue, to Ottawa Construction Co., \$10,987. Engineer, N. J. Ker, city hall.

Contract awarded for pavement, \$24,250., Somerset street. Engineer, N. J. Ker; contractor, Union Construction Co., Ottawa, Ont.

Strathcona, Alta.

Contract awarded for paving. Owner, City of Strathcona, Alta.; engineer, A. J. Maclean, Strathcona. Contractor, Bitulithis and Contracting Company, Winnipeg. Price, \$2.95 a square yard. Two years ago \$3.25 was the price charged—a year ago, \$3.00.

Railroads, Bridges and Wharves

Ayr, Ont.

Tenders called for two concrete bridges, (over Cedar Creek). Owner, Township of Waterloo. Reeve, Thos. Hall, near Ayr. Engineer, E. O. Fuce, Galt. Plans, etc. with Thos. Hall or at office of engineer. Cement supplied by township council; tenders to be at so much per cu. yd. Tenders received by Thos. Hall until June 17th.

Brandon, Man.

Survey completed for railroad bridge. Owners, Canadian Pacific Railway Co., double tracking line. No decision as to action to be taken. Present two-span steel cantilever may be widened or new single track built alongside. Survey just completed, matter under consideration by Winnipeg office. Report later.

Tenders pending. Industrial spur. Owner, C. P. R. Engineer, E. Melsted, Brandon. Track will develop warehouse site, 4 track yards. Survey has been

made one mile. Tenders have not been called.

Railway construction contemplated. Owner, Brandon, C. P. R., C. N. R., G. N. R., 1½ miles, survey made. Transfer line to connect all three railroads. Route authorized by railway commissioner. Engineers Board sits in Brandon, June 14, to hear application of city for orders to construct. G. N. R. to operate.

Golden, B. C.

Tenders to be called for bridge, \$25,000. Owners, Department of Public Works, Victoria, B. C.; engineer, J. E. Griffiths, Public Works, Victoria, B. C. New swing bridge across Columbia river, 42 miles south of Golden to provide facilities for settlers of Windermere district. Definite date bids called not ascertained. Report later.

Halifax, N.S.

Tenders called for reinforced concrete pier and sheds. Owner, Department of Railways and Canals, Ottawa. L. K. Jones, secretary. Tenders called until July 20, 1911, for the construction of a reinforced concrete pier and sheds at the Deep Water Terminus Intercolonial Railway. Plans, specifications, etc., after June 20, at office of above or chief engineer Intercolonial Railway, Moncton, N.B., or consulting engineer John Kennedy, Montreal.

Peterborough, Ont.

Tenders called for two bridges. Owner, County of Peterborough; county clerk, E. M. Elliott, county office Peterborough. Steel work or superstructure required for Spencer's bridge, Drummer and Brown's Falls bridge, Burleigh. Plans, etc. with county clerk. Tenders received by clerk until June 19th.

Port Arthur, Ont.

Tenders called for breakwater at Bare Point, Rainy River district. Owner, Department of Public Works, Ottawa; secretary, R. C. Desrochers, Ottawa. Tenders are called until July 5 for construction. Plans, etc. at Dept. offices of district engineers, at Port Arthur, Toronto, London and Montreal.

Stellarton, N.S.

Tenders called for addition to engine house. Owner, Department of Railways and Canals, Ottawa. Chairman, Government Railways Managing Board, A. W. Campbell, Ottawa. Construction of addition of six stalls to engine house. Plans, etc., at office of the Secretary, Department of Railways, Ottawa; Station Master, Stellarton, Chief Engineer, Moncton. Tenders received by A. W. Campbell, until June 23rd.

Scarboro Township.

Tenders called for bridge, \$10,000. Owner, County of York. Clerk, J. A. Ramsden, 57 Adelaide street east, Toronto. Engineers, Barber & Young, 57 Adelaide street east. Concrete abutments, length of span, 90 feet clear, width 16 feet. Tenders received by the Engineer until July 1, for superstructure and substructure.

Township of Burford, Ont.

Tenders called for bridge. Owner, Township; Wm. Milnim, Reeve, Cathcart, Ont. Tenders received until July 1 for the concrete work on a steel bridge. Plans and specifications at residence of Reeve.

Trail, B. C.

Tenders to be called for bridge, \$150,000. Owners, J. E. Griffiths, public

works engineer, Victoria, B. C. New bridge across Columbia at Trail. Authority given to instal fixed centre span, but piers to be of sufficient strength to support steel towers should it be decided to replace fixed with a movable span. Date bids to be called not ascertained. Report later.

Public Buildings, Churches, Schools, etc.

Brantford, Ont.

Contemplated hospital addition, \$100,000. Parties interested, Hospital Board and city councils. To provide additional accommodation, city will be asked to vote \$90,000, county \$10,000 approximate. Vote will be taken shortly.

Tenders to be called for nurses' home, \$20,000. Owner, General Hospital, Brantford. Architect, Taylor & Taylor Brantford, associated with Weeks & Greeve, Buffalo. Tenders will be called about July 15th.

Tenders called for addition to church; owners, Methodist Church; architects, Taylor & Taylor, Brantford; 1 storey and basement, red brick, stone foundation, 62 ft. x 62 ft. hot water heating, electric light, shingle roof, interior finish, ash, metal ceiling. Tenders were received by George Wedlake, Brantford, until June 10, 1911.

Tenders wanted for convent, \$10,000. Owner, Roman Catholic Church, Rev. Dean Brady. Architect, Robert Clohecy, 236 James street south, Hamilton, Ont. 2½ storeys, hardwood and Georgia pine finish, 45 x 40, kitchen 30 x 30, hot water heating, electricity and gas, slate roof. Plans at St. Basil's Presbytery, 77 Albion street Brantford. Tenders to be received by architect until June 14, for carpentry and joiner's work.

Belleville, Ont.

Tenders to be called for two schools, \$35,000 and \$40,000. Owners, Board of Education, Belleville; architects, Ellis & Co., Manning Chambers, Toronto; 2 storey and basement, brick, stone foundation, steam heat, electric light, gravel roof, maple floors, pine trimmings. One school, 10 rooms; other, 12 rooms. Specification same for both. Tenders received after June 20, 1911.

Brandon, Man.

Contemplated church, \$40,000. Owners, St. Matthew's Anglican Church, Brandon. Present church being sold, new structure to be started this year. Architects will be invited to submit plans. No details yet.

Plans in progress for addition to Princess Theatre, \$5,000. Owner, C. Eagles, Brandon; architect, T. Sinclair, Brandon. Stage and basement to be extended 10 ft. to rear. Present truss roof to be ciled with composition.

Dunnville, Ont.

Tenders called for schools plumbing. Owner, Board of Education, Dunnville, Ont.; chairman, Thos. Marshall, Dunnville; secretary building committee, W. G. H. Gilpin. Plumbing of the new high school, also the public school. Plans, etc., with chairman. Tenders must be made in separate enclosures; received by the secretary until June 27th.

Fort William, Ont.

Tenders to be called for Y. M. C. A. \$75,000. Owner, Y. M. C. A., Fort Wil-

liam, R. E. Mason, Fort William; 3-storey, solid brick, 100 x 100, cement foundation, cut stone, structural iron, fire escapes, fireproof doors, electrical work, steel beams, iron columns. Tenders called in about 10 days. If bids are within limit, may build 4 storeys. Supplementary report later.

Guelph, Ont.

Architect chosen for Y. M. C. A. building. Owner, Y. M. C. A., Guelph Architects, Mills & Hutton, Hamilton, Ont. W. A. Mahoney, Guelph, associate.

Glencoe, Ont.

Tenders called for school. Owner, Aldeborough Tp. J. A. McRae sec-treas., Wardsville, Ont. Tenders received until June 24, 1911.

Granby, Que.

Plans being prepared for St. Joseph street College, \$50,000. Owner, Municipalite Scholaire de Notre Dame de Granby. Architect, Dalbe Viau, 76 St. Gabriel, Montreal. Brick and stone, cement foundation, cut stone, marble, terra cotta, tile, fireproofing, reinforced concrete, structural iron, fire escapes, vaults, sheet metal work, metal ceiling roof, cornice, fireproof doors, asbestos materials, pipe covering, electrical work, iron columns, about 60 x 100 ft., 4 storeys. Date of receiving of tenders not yet decided.

Hamilton, Ont.

Architect to be chosen for public school. Owners, Board of Education, Hamilton. Building Committee authorized to engage architect to prepare plans for a 10-room school on Maple avenue and to call for tenders.

Lennoxville, Que.

Plans in progress for academy, \$18,000. Owner, Protestant school com., Lennoxville; architect, J. W. Gregoire, Sherbrooke; 3 storeys, stone and brick, 54 x 85 ft., stone foundation, electric light. Tenders received after July 1st. Time to close not fixed yet.

Little Current, Ont.

Tenders called for industrial school, \$15,000, Shesheganing Reserve, Ont. Owner, Dept. of Indian Affairs, Ottawa. Architect, Government, 2 storeys, stone foundation, wood construction. Plans, and specifications can be seen at Ottawa or Mr. Thornburn, Indian agent, Gore Bay. Tenders received until June 26, 1911.

Merritt, B.C.

Tenders called for hospital, \$16,000. Owners, Hospital Board, Merritt, B.C. Architect, Blackmore & Birds, Loo Bldg., Vancouver. 2-storey, concrete foundation, frame construction, reaco-lith or terrazo tiling, hospital type plumbing fixtures, hot water heating. Tenders received now by architects.

Medicine Hat, Alta.

Competitive plans called for St. Barnabas Church, \$25,000; owner, St. Barnabas Parish, Medicine Hat, Alta.; secretary of vestry, J. H. Collier, Medicine Hat, Alta. Tenders were received from Clemsha & Colman, Regina. Tenders exceeded estimates. Competitive plans called not to exceed \$25,000 and to include heating, plumbing, electric wiring fixtures, seating capacity, 400. Architects paid 2½ per cent. for plan and 2½ for supervision—unsuccessful sketches returned. Plans to be in by June 16th.

Moose Jaw, Sask.

Tenders called for school, \$100,000. Owner, Moose Jaw school board; architect, R. G. Bunyard, Moose Jaw, two storeys and basement, reinforced concrete and brick, 137 x 82 ft., concrete foundation, fan system, heating, electric light, gas, iron roof, interior finish oak and fir. Tenders called June 12, close about the 26th.

Contemplated, new post office, \$300,000. Owners, Dominion Government, Ottawa. Bids will be called for in about two weeks. Report later.

Plans in progress for church, \$120,000. Owners, Trustees Presbyterian Church. Architect, F. Glemenshaw, Regina. Plans are being prepared but work will not commence until location of new railways is decided.

North Vancouver, B.C.

Architects chosen for public school (Ridgeway avenue). Owner, Public School Board. Architect, Messrs. Claude P. Jones and W. C. F. Gillam, 429 Pender street west, Vancouver. Fireproof construction, reinforced concrete faced with red brick and stone trimmings, slate roofing secured from quarries from Jervis Inlet, 16 class rooms.

Niagara Falls, Ont.

Competitive design called for rink. Owner, Niagara Falls Hockey Athletic Association Limited. Secretary, R. C. McFarlane, Niagara Falls. At a meeting of the association June 7, the secretary was instructed to invite architects to submit competitive designs for a fire-proof rink not less than 75 x 180 feet seating accommodation 2,500.

Newdale, Man.

Tenders are called for school, \$12,000. Owners, Municipality of Newdale; sec-treasurer, Johnson; architect, W. A. Elliott, Brandon, Man., one storey brick and stone, 64 x 36 ft., Muller hot air heating, pitch roof. Plans accepted June 6th. Tenders called June 20th, close June 27th. Received by owners.

Ottawa, Ont.

Tenders called for heating public school, \$5,000, Mutchmor street. Owner, Public School Board, C. Ross, secretary. Official in charge, W. Garvock, Elgin street school. Steam heating, direct radiation and mechanical ventilation (two boilers, 14,000 square feet floor space). Tenders received until June 15, by secretary.

Pembroke, Ont.

Tenders being called for church addition. Owner, Methodist Church, Pembroke; architect, M. C. Edey, Ottawa. The addition will be of brick.

Quebec, Que.

Tenders called for public building. Owner, Department of Public Works & Labor, Quebec, P.Q. Secretary, A. Gagnon, Que.; architect, Marchand, & Brasseur, 164 St. James street, Montreal. Completion of new jail. Plans at Parliament Building and at office of architects. Tenders received until June 21, by Hon. L. A. Taschereau, Minister of Public Works, Quebec.

Renfrew, Ont.

Tenders called for addition to Collegiate Institute. Owner, Board of Education, Renfrew; sec-treas., Geo. Eady, Jr., Renfrew; architect, J. D. McNicol. Addition to be used as a gymnasium. Plans, etc., with the architect. Tenders

received until June 16th by the secretary-treasurer.

Sawyerille, Que.

Tenders are called for improvements to the Model School.

Sherbrooke, Que.

Tenders called for Monastery, \$75,000. Owners, Redemptorist Fathers, Ste. Anne de Beaupre, Que; architect, L. N. Audet, Sherbrooke; cut stone and brick, foundation stone, cement work, 4 storeys, reinforced concrete, fire escapes, sheathing paper, steel beams, electrical work, structural iron. Tenders close June 13th.

St. Thomas, Ont.

Tenders called for public school. Owner, Board of Education; secretary-treasurer, H. W. Talman, 460 Talbot street; architect, J. T. Finlay, Southern Loan Chambers, St. Thomas. Masonry, carpentry, slating, plumbing, plastering, painting, hot air heating, electrical and galvanized iron work. Plans, etc. with architect.

Swift Current, Sask.

Contemplated hospital, \$25,000. Architects, Sharon & Darrach, Regina and Swift Current. Plans have been provisionally accepted and returned to Regina for alterations. Tenders will be called in 10 days.

Trail, B.C.

Tenders called for school. Owner, Trail School Board; secretary, F. E. Dockerill; architect, A. Carrie, Nelson, B.C.; 8 room, brick and concrete construction. Plans at office of secretary and architect after June 10. Tenders received until June 28.

Toronto, Ont.

Plans in progress for church, \$10,000. Owners, Davenport Methodist Church, Davenport Road. Architect, D. E. Smith, 77 Victoria street, Toronto, brick 72 x 60, brick foundation, steam heat, electric light, felt and gravel roof, maple flooring. Tenders called shortly.

Tenders to be called for club house, \$25,000; owners, Knights of Columbus, Toronto; architect, C. J. Read, Confederation Life Building; 3 storeys, brick and stone, 100 ft. x 75 ft., brick foundation, steam heat, combination lighting, felt and gravel roof, reinforced concrete. Tenders called about June 23, 1911.

Plans in progress for Oddfellows Hall, \$20,000; owners, Manchester Unity I. O. O. F., Toronto, architects, Ellis & Connery, Manning Chambers, Toronto; brick and stone, 50 ft. x 90 ft. stone foundation, steam heating, electric light, felt and gravel roof. Tenders called shortly.

Contemplated, church, \$13,000. Owners, Dufferin Street Presbyterian Church. Architect, W. R. Gregg, 23 Jordan street, Toronto. Brick. Tenders received about August 1st.

Virten, Man.

Tenders called for opera house and telephone exchange, \$25,000. Owner, municipality of Virten. Architect, W. A. Elliot, Brandon, stone and brick structure. By-law passed June 3. Bids will be called June 9, received by town clerk until June 20, 1911.

Windsor, Ont.

Tenders called for public building, \$14,000. Owner, Windsor Athletic Club,

Windsor, Ont. Brick and steel construction, concrete foundation, steam heating, composition roofing, interior finish Georgia pine, three storeys, 51 ft. 8 in. x 92 ft., fire escapes, cut stone, sheet metal, iron columns, plate glass, electrical work. Tenders received after June 14, close June 30.

West Oxford Township, Ont.

Plans in progress for school, \$4,000. Owner, West Oxford Township; architect, Taylor & Taylor, Brantford; 1 storey and basement, brick, cement foundation, 27 ft. x 44 ft., hot air heating, slate roof, interior finish ash, metal ceiling. Tenders received after June 15, close June 30, 1911.

AWARDED

Campbellton, N.B.

Erection of Baptist Church, \$16,000. Owner, Baptist Church; chairman building committee, W. P. Gray; architect, Leslie R. Fairn, Aylesford, N.S. Work to be done by day labor.

Dresden, Ont.

General contract awarded for post office, \$14,000. Owner, Dominion government; architects, Jacques & Williamson, Wallaceburg; 2 storeys, brick and stone, concrete foundation, steam heat, electric light, galvanized iron roof, marble and oak finish, 48 x 48; general contractor, J. Clarke, Dresden; sub-contract not completed.

Fort William, Ont.

Contract awarded for public school, \$45,000. Owner, Board of Education; architect, R. E. Mason, Fort William; general contractor, R. McLeod, Fort William; 65 x 60 ft., 2 storeys solid brick. Tenders for heating, plumbing and lighting called in about 10 days.

Guelph, Ont.

Contract awarded for Isolation Hospital. General contractors, P. H. Secord & Sons, Brantford.

Jail & Jailers' residence, \$27,277. General contractors, G. A. Scroggie.

Ottawa, Ont.

Contracts awarded for military building, \$22,000. Owner, Militia Department, Ottawa. Architect, A. P. Deroche, Woods Building, Ottawa; general contractor, W. G. Adamson, Sparks street, Ottawa; four buildings, frame, 1½ storeys.

Runnymede, Ont.

Contracts awarded for school, \$20,000. Owners, Runnymede School Board; architects, Ellis & Connery, Manning Chambers, Toronto; 2 storeys, brick, 90 ft. x 70 ft. General contract awarded to Guay & Shaw, Oshawa, Ont.

Revelstoke, B. C.

Contract awarded for Court House, \$120,000. General contractors, Messrs. Foot & Pradelon, Revelstoke; building to be ready by end of November.

St. George, Ont.

Contracts awarded for church, \$14,200. Owner, Baptist Church; Dr. Patten, chairman building committee; architects, Taylor and Taylor, Brantford; basement stone, balance brick, 450 sittings. Mason, Thos. Hull, Lynden; carpenter, plaster, iron, stone, sheet metal, F. M. Misener, Jerseyville, Ont., heating and plumbing not yet let.

Souris, Man.

School, \$32,500. Owner, Souris School Board; architect, T. Sinclair, Brandon; 2 storey brick and stone; general contractor, A. E. Bullock, Brandon, Man.; heating and plumbing not let, contract originally awarded at same figure to Piggot & Son, Hamilton, who refused to carry out.

Residences

Granby, Que.

Building in progress for residence, \$3,300, Central street. Owner, Mrs. Philip Gousy, Ste. Cecile de Milton; architect and contractor, Theo. Delorme, Granby, 2 storey, 36 x 49 ft., building to be completed July 15th. Plans prepared by contractor. Heating contract not yet let.

Ottawa, Ont.

Tenders called for residence. Architect, J. P. MacLaren, Spark street, Ottawa; 2½ storeys, brick and veneer, hot water heating, electric light, 24 ft. x 42 ft.

Renfrew, Ont.

Plans in progress for residence, \$5,000. Owner, G. McIntyre, Renfrew; architect, J. D. McNicol, Renfrew; 2 storeys, brick, cut-stone foundation, hot air heating, interior finish hardwood. Plans being drawn. Date tenders received announced later.

Toronto, Ont.

Tenders called for three dwellings, \$5,000 each, Pembroke street. Owner, Hy. Niscon, 9 Gifford street; architect, P. H. Finney, 43 Victoria street; brick, stone foundation, hot water heating, gas and electricity, modern plumbing, slate or asbestos cement roof, hardwood flooring, 2½ storeys, 51½ x 62 ft. Tenders close June 20.

Tenders to be called for residence, \$9,000. Owner, Mr. Humphrey, Toronto; architect, Curry & Sparling, Toronto; 2½ storeys, brick and stone, 86 x 38, brick foundation, hot water heating, gas and electric light, slate roof, interior finish hardwood. Tenders called shortly.

Tenders called for two residences, \$3,500 each, Woodlawn avenue. Owners Rev. W. A. Strongman, Toronto, Ont. Architect, P. H. Finney, 43 Victoria street. Two detached houses; brick, stone construction, hot water heating, gas and electric light, modern plumbing, slate roof, hardwood floors and stair, 2½ storeys, 30 ft. x 32 ft. Tenders received after June 15th.

Tenders called for apartment house, \$65,000, Davenport and McAlpine. Owner, Dr. Johnson, Elm street, Toronto. Architect, W. H. Mallory, 31 Queen street west; three storeys, brick and artificial stone, 36 x 48, stone foundation, hot water heating, combination lighting, felt and gravel roof, interior finish pine. Tenders closed June 14.

Wallaceburg, Ont.

Tenders called for residence, \$3,500. Owner, Charles Snively, Wallaceburg; architects, Jacques & Williamson, Wallaceburg; two storeys, brick, concrete foundation, hot air heating, electric light, interior finish, oak, 28 ft. x 32 ft. Tenders called until June 19, 1911.

Windsor, Ont.

Tenders called for residence, \$4,000, Ouellet avenue. Owner, J. E. White,

Windsor, Ont. Architect, Jacques & Williamson, Windsor, Ont. Two storey brick, 25 x 30, cut stone, hot water heating, shingle roof, electrical work, art glass.

AWARDED

Brantford, Ont.

Contracts awarded for residence, \$12,000. Owner, Mayor M. F. Muir, Brantford; architect, L. D. Barber, Brantford; 2 storeys, brick and timber, 45 ft x 85 ft. General contractor, Schultz Bros., Ltd., Brantford. Heating and plumbing not yet let. Owner to supply shop hardware.

Hamilton, Ont.

Contracts awarded for residence, \$16,000. Owner, G. G. Gurnsey, 37 James street south; architect—General contractor, G. G. Gurnsey. 100 houses will be built by the company represented by G. G. Gurnsey near the Oliver Plow Works, Ltd.

Montreal, Que.

General contract awarded for two residence flats, \$6,000. Owner, architect, general contractor, Elzear Cote, 1227 St. Andre street, Montreal. 3-storeys, brick, 46 x 55.

General contract awarded for six dwellings, \$10,000. Owner, architect, general contractor, L. Clement, 478 Parc Lafontaine, Montreal, 3-storeys, brick, 60 x 90.

General contract awarded for eight dwellings, \$24,000, Duluth avenue. Owner, architect, general contractor, C. Martin, 678 Bourbonniere street, Montreal. 3-storey, brick, 108 feet frontage by 60 feet deep.

General contract awarded for residence, \$17,000, Pine avenue. Owner, architect and general contractor, H. C. Hitch, Coristine Bldg., Montreal. 2-storey, stone front brick, 25 x 50.

General contract awarded for nine dwellings, \$12,000. Owner, architect and general contractor, P. J. Charlebois, 1234 St. Hubert st eet, Montreal. 3-storeys, brick and wood, 75 feet frontage by 40 feet deep.

Business Buildings and Industrial Plants

Brandon, Man.

Contemplated, freight shed, \$6,000. Owner, C. P. R. Engineer, E. Melsted, Brandon. Frame, pitch roof, 1 storey. Will be built concurrently with construction of Industrial Spur line.

Brantford, Ont.

Tenders called for bank and office building, \$30,000. Owner, Royal Loan & Savings Company, Brantford. Architects, L. D. Barber & Chapman McGiffen Association, Brantford. Three storeys, 40 x 63, fireproof reinforced concrete, marble front, brick foundation, electrical work, terra cotta brick, metallic lath, pipe covering, plate glass, sheet metal work, vaults, hardwood and marble. Tenders—time for receiving extended to June 20, 1911.

Tenders called for stores and apartments, \$8,000. Owner, Dr. J. W. Robinson, Brantford; architects, Taylor & Taylor, Brantford; 3 storeys, brick and stone, concrete foundation, hot air heating, electric light, modern plumbing, tar and gravel roof, pine finish (interior), structural iron, 40 x 50, vaults,

metal ceiling, cornice, skylights, steel beams, iron columns, plate glass, prismatic glass. Tenders called until June 17th.

Calgary, Alta.

Tenders to be called for business block, 9th avenue. Owner, L. R. Burns, Calgary; architect, Leo. Dowler, Calgary, Alta.; foundation 99 x 110; steam heating, electric light, interior finish, fir, fire escapes. Tenders received after 1st July, close 15th July.

Elora, Ont.

Tenders called for factory, \$4,000. Owner, Elora Furniture Co., Elora, Ont. Architect, W. A. Mahoney, Guelph, Ont. Frame, cement foundation, steam heating, electric light, patent roof, 2-storey, 75 x 50. feet, sheathing paper, metal siding, cornice, fireproof doors. Tenders received immediately.

Fredericton, N.B.

Tenders called for passenger station. Owner, Department of Railways and Canals, Ottawa. Chairman Government Railways Managing Board, A. W. Campbell, Ottawa. Construction of station; plans, etc., with the Secretary of the Department, with the Station Master, Stellarton, and Chief Engineer, Moncton. Tenders received by A. W. Campbell until June 17th.

Granby, Que.

Building in progress for factory, \$10,000, Water street. Owner, Granby Electric Web-Mfg. Co., Granby; architect, J. H. Perkins, Lowell, Mass.; dimensions 52 x 90; sprinkler system, 2 storeys; building being erected by day labor by owner; all material purchased but sprinkler system.

Highgate, Ont.

Plans in progress for stores, \$25,000. Owner, Dr. McPhail, Highgate. Architect, S. G. Kinsey, Chatham, Ont., stone, brick and frame, foundation stone and concrete, steam heating, electric light, 2 storeys, interior pine finish, 48 x 60, plate glass, metal ceiling, cornice, electrical work.

Montreal, Que.

Tenders called for terra cotta plant, \$150,000. Owners, Montreal Terra Cotta Lumber Co. Location at Lakeside, near Montreal. Kilns, machinery and dryers required. Bids will be called for kilns at once. Received at 26 Board of Trade Building, Montreal.

Medicine Hat, Alta.

Plans in progress for office building, \$20,000, 4th avenue. Owner, W. Cousins, Medicine Hat; architect, Trimble, Medicine Hat; brick, 2 storeys, concrete foundation. Plans being prepared.

New Westminster, B.C.

Contemplated office building, \$150,000. Owner, People's Trust Company, head office, New Westminster, have just purchased a lot on Columbia street, 66x132. They will shortly erect a 6-storey office building. Supplementary report later.

Contemplated, office building, \$150,000, (Begbie, Lorne and Clarkson sts.) Owner, Westminster District Liberal Association; secretary, J. H. Diamond.

Niagara Falls, Ont.

Contemplated, factory, \$90,000. Owner, American Cyanide Co., Niagara Falls, Ont. Architect not chosen. Reinforced concrete construction. Dupli-

cation of present plant just announced. Westinghouse, Church & Kerr, likely to be general contractors.

Orangeville, Ont.

Destroyed by fire, business building, \$60,000. Owner, Hurndall Novelty Furniture Company, Orangeville. 3-storey, 55 x 11, wing 45 x 55, engine house, 28 x 30, 2-storey.

Prince Albert, Sask.

Contemplated, business building, \$75,000. Owner, J. S. Macdonald, Prince Albert, Sask. Architect, A. G. Creighton, Prince Albert. 6-storey fireproof construction.

Revelstoke, B.C.

Destroyed by fire, sawmill, \$40,000. Owner, Dominion Sawmills & Lumber Co., Ltd. The Bowman Lumber Company has been absorbed by the above company. The question of rebuilding has not been decided.

Regina, Sask.

Tenders called for office building. Owner, Dominion Trust Co., Ltd.; architects, Storey & Van Egmond, Regina and Saskatoon. Tenders received until June 15th.

Sherbrooke, Que.

Contemplated bank building, Wellington street. Owners, Bank of Montreal; architects, Peden & McLaren, 120 St. Alexis street, Montreal; stone building for branch.

Plans in progress for addition to foundry, Rand street. Owners, Canadian Rand Co., Sherbrooke; concrete foundation, brick, concrete and steel. Tenders called for shortly.

Plans in progress for store, \$12,000. Owner, P. T. Legaru Sons, Que; architect, J. W. Gregoire, Sherbrooke. 2-storeys, brick and stone, 60 x 100, stone foundation, electric light. Tenders received after July 1st. Time to close not fixed yet.

Stellarton, N.S.

Tenders called for business building. Owner, Acadia Coal Company, Stellarton, N.S. Architect, Chas. Mitchell, care Acadia Coal Company. Vitriified brick, wash house 52 x 40, rescue station 55 x 25, lamp house 47 x 18. Tenders called until June 20.

St. John, N. B.

Tenders called for addition to brush factory. Owners, T. S. Simm & Co., St. John; architect, F. Neil Brodie, St. John, N. B., power house, boiler house, and machine shop, 48 x 55 ft. Tenders to be called this week.

Toronto, Ont.

Tenders called for store and apartment, \$8,000, Bloor street. Architect, J. M. Cowan, 65 Adelaide street east; brick and stone, stone foundation, hot water heating, gas and electric lighting, modern plumbing, felt and gravel roofing, 2 storey, 21 x 75, structural iron, cornice. Tenders received after June 12th.

Specifications in progress for office, \$5,000, Dundas street. Owner, Ryan & Son, architects, 37 Arthur street; J. N. Cowan, 65 Adelaide street; brick and artificial stone, stone foundation, hot water heating, gas and electricity, modern plumbing, slate roof, interior maple flooring, 3 storey, 21 ft. x 60 ft. Specifications are being changed and tenders previously called, held for consideration.

Vancouver, B. C.

Tenders called for warehouse building. Owner, G. H. Cottrell, 139 Water street, Vancouver; architects, Parr & Fee, 570 Granville street, Vancouver; 5 storey brick, mill and reinforced concrete construction, concrete foundation, plumbing, heating, electric wiring.

Westport, Ont.

By-law carried for foundry, \$10,000. Owner, Westport Foundry Company. The company's premises were recently destroyed by fire.

Wallaceburg, Ont.

Plans ready for store and flats, \$7,000. Owner, A. Martin Wallaceburg, Ont.; architects, Jacques & Williamson, Wallaceburg; 2 storeys, brick and concrete, foundation concrete, electric light, composition roof, interior Georgia pine, metal ceiling, 60 x 100 ft. To be built immediately by day work.

Winnipeg, Man.

Tenders called for car shops. Owners, Commissioners of the National Transcontinental Railway, Ottawa; secretary, P. E. Ryan, Ottawa; construction and erection complete. Plans, etc. at offices of chief engineer, Gordon Grant, Ottawa, or S. R. Poulin, district engineer, St. Boniface, Man. Forms of tender to be supplied by W. T. Press, mechanical engineer, Ottawa.

AWARDED

Chatham, Ont.

Contracts awarded for business building, \$25,000. Owner, O'Keefe & Drew. General contractor, Moore & Stephens, Chatham, Ont., 2 storeys and basement. Masonry, W. Robertson; cement, Geo. Fields; sheet metal, G. Callahan.

Contracts awarded for factory, \$5,500. Owner, Wm. Gray & Sons, Campbell Co., Ltd., Chatham. Architect, T. L. Wilson & Son, Chatham. General contractor, Wm. Drader Lumber Company, Chatham; masonry and stone, Moore & Stephens, carpentry, Wm. Robertson; cement, Geo. Fielder; sheet metal, F. Callahan, all of Chatham. Dimension of Building 52 x 70, three storeys.

Hamilton, Ont.

Contracts awarded for business building, \$3,000. Owner, Spectator Printing Co.; architects, Stewart & Witton, Hamilton; Prov. and Loan Bldg., Hamilton. General contractor, W. H. Cooper, 197 Emerald street west.

Montreal, Que.

Contracts awarded for C. P. R. Depot. Owner, C. P. R., Montreal. General contractor for heating system, J. Ballantyne & Co., 159 St. Antoine street. Contractor for galvanized iron pipe and installation for ventilation system, McFarlane & Douglas, Ottawa.

Contracts awarded for 10-storey office building. Owner, Henry Birks & Sons, Ltd., Montreal. Architect, Knobbs & Hyde, Montreal; excavating, masonry and plastering, James Stewart; reinforced concrete, F. J. Jago & Co.; roofing, Reed & Co., Ltd.; painting, F. Lefebvre & Co., all contractors in Montreal.

Contract awarded for flour mill. Owner, Dominion Flour Mills, Ltd., Montreal; general contractor, D. G. Loomis, Cote street, St. Paul; concrete, 200 x 75 feet.

(Continued on page 63)

Tenders and For Sale Department

CITY OF KINGSTON

Notice to Paving Contractors

Sealed tenders under registered post only, addressed to the undersigned, will be received by the Board of Works up till 12 o'clock noon, Saturday, June 24th, 1911, for the construction of:—

15,000 square yards of asphaltic macadam;
9,700 lineal feet of curb and gutter.

Plans and specifications are also on file at the office of the Contract Record, 220 King street west, Toronto.

The lowest or any tender not necessarily accepted.

H. B. R. CRAIG,
City Engineer. 23-24

June 5th, 1911.



Department of Railways & Canals, Canada

Hudson Bay Railway

NOTICE TO CONTRACTORS

Sealed tenders addressed to the undersigned and endorsed "Tender for construction of Hudson Bay Railway," will be received at this office, until 16 o'clock on Tuesday, the 1st of August, for a section of about 185 miles from Pas Mission to Thicket Portage.

Plans, specifications and form of contract to be entered into can be seen on and after Wednesday, May 31, 1911, at the office of the Chief Engineer of the Department of Railways and Canals, Ottawa, and at the office of the Chief Engineer of the Hudson Bay Railway, Winnipeg, at which places forms of tender may be obtained.

Parties tendering will be required to accept the fair wages schedule prepared or to be prepared by the Department of Labor, which schedule will form part of the contract.

Contractors are requested to bear in mind, that tenders will not be considered, unless made strictly in accordance with the printed forms, and in the case of firms, unless there are attached the actual signature, the nature of the occupation, and place of residence of each member of the firm.

An accepted bank cheque for the sum of \$200,000 made payable to the order of the Minister of Railways and Canals must accompany each tender, which sum will be forfeited if the party tendering declines entering into contract for the work, at the rates stated in the offer submitted.

The cheques thus sent in will be returned to the respective contractors whose tenders are not accepted.

The cheque of the successful tenderer will be held as security, or part security, for the due fulfilment of the contract to be entered into.

The lowest or any tender not necessarily accepted.

By order,
L. K. JONES,
Secretary.

Department of Railways and Canals,
Ottawa, May 26, 1911.

Newspapers inserting this advertisement without authority from the Department will not be paid for it. 23-24

Steam Shovels

We own and have for sale near Buffalo, N.Y., two Vulcan 75-ton 2½-yard steam shovels; late model, with new extra large boilers and in excellent condition; also one 70-ton. These will stand most rigid inspection and we are offering them at unusually low prices. Confer with us.

WILLIS SHAW MACHINERY CO.,
39 So. La Salle Street,
Chicago, Ill.

Contractors' Material

90 Austin 6-yd. two-way Dump Cars, 4 ft. 8½-in. gauge.

Davenport 10 x 16 Dinkey, Standard gauge.

Baldwin 16 x 24 American type locomotive, 4 ft. 8½ in.

Bucyrus 55-ton Steam Shovel, built 1903.

Marion A. A. Steam Shovel, built 1903.

Six Wheel Scrapers.

Two Lidgerwood Cableways, complete.

All of this material in Canada. No duty. Have you anything to sell? Write us.

THE MALES COMPANY,
No. 82 Perin Building,
Cincinnati, Ohio.

CITY OF PRINCE ALBERT

Tenders for POWER WORKS

Sealed tenders will be received up until noon, Monday, June 26th, 1911, by the Corporation of the City of Prince Albert, Province of Saskatchewan, for the construction of

Power Station Superstructure and Transmission Line

being portions of the proposed hydro-electric power development on the North Saskatchewan river at La Colle Falls (distant 25 miles east of the city).

Tenders are invited on each separately and must be plainly marked on the outside of envelope and addressed to the Secretary-Treasurer, City of Prince Albert, Saskatchewan.

Each tender must be accompanied by an accepted bank cheque for \$500, payable to the Secretary-Treasurer, which cheque will be returned to the bidder unless he fails to execute a contract should it be awarded to him.

The successful bidder on each of the works will be required to execute a bond in the sum of \$3,000 for the faithful performance of the contract.

The city reserves the right to reject any or all tenders.

The plans and specifications will be on file and may be seen on and after June 8th, 1911, at the City Hall, Prince Albert; office of "Canadian Engineer" at Winnipeg and Montreal, or at the offices of the Engineers, C. H. and P. H. Mitchell, Traders Bank Building, Toronto.

ANDREW HOLMES, Mayor.
C. O. DAVIDSON, Secretary-Treasurer.
Prince Albert, Sask.
June 1st, 1911. 23-24

Tenders for Sidewalks

will be received by the undersigned until 8 p.m. of Monday, the 19th June, current, for the construction of \$3,000 worth of Cement Sidewalks.

A marked cheque for \$50 must accompany tenders.

The lowest or any tender not necessarily accepted.

For specifications apply to

D. H. MINAKER, Town Clerk,
Cobourg, Ont.

June 11, 1911

23-24

TOWN OF BATTLEFORD Saskatchewan

Sealed tenders, addressed to the Town Council of Battleford, will be received until noon, Monday, June 19th, for material and construction of a waterworks and sewerage system.

Plans may be seen and schedules of quantities, specifications, etc., obtained at the office of the Town Engineer.

Each tender must be accompanied by an accepted bank cheque on a chartered Canadian bank equal to five per cent. (5 per cent.) of the contract price.

H. C. ADAMS,
Secretary-Treasurer.
WM. KITSON,
Town Engineer.

23-24



CITY OF TORONTO

Tenders For a Steel Span Over the Tracks of the C.P.R. At Weston Road

Tenders will be received by registered post only, addressed to the Chairman of the Board of Control, City Hall, Toronto, Canada, up to noon on Tuesday, June 20th, 1911, for the construction of a steel span crossing the tracks of the C. P. R. at Weston Road, in the City of Toronto.

Envelopes containing tender must be plainly marked on the outside as to contents.

Specifications and forms of tender may be obtained upon application to the Department of Railways, Bridges and Docks, City Engineer's Office, Toronto.

The tenderers shall submit with their tender the names of two sureties (approved of by the City Treasurer, not members of the City Council, or officers of the Corporation of the City of Toronto), or in lieu of said sureties, the bond of a guarantee company approved of as aforesaid.

The lowest or any tender not necessarily accepted.

F. S. SPENCE,
Chairman of the Board of Control.
City Hall, Toronto, May 20, 1911. 23-24

Tenders Wanted Notice to Contractors Tenders for Bridges

Sealed tenders will be received by the undersigned, up to Friday, June 23rd, at one o'clock p.m., for the construction of one 10-foot span flat top concrete bridge and one 45 foot span steel bridge on concrete abutments for the County of Wellington, also one 32 foot span concrete girder bridge and one 70 foot span steel bridge on concrete abutments for the Township of Minto.

Plans and specifications for both concrete and steel work can be seen at the office of W. D. McEILLAN in the Town of Harriston, where the tenders will be opened.

The lowest or any tender not necessarily accepted.

Tenders will be required to furnish satisfactory security for the fulfilment of their contracts.

H. GRAEF,
Chairman Boundry Line Bridge.
Clifford, Ont.

W. D. McEILLAN,
Clerk of Minto,
Harriston, Ont.

24-25

Tenders

For the Construction of a Reinforced Concrete Subway

Sealed and endorsed tenders addressed to the Chairman of the Utilities Committee will be received at the office of the City Clerk up to 5 o'clock p.m., June 30th, 1911, for the construction and supply of all materials in connection therewith.

Plans, specifications and forms of tender may be obtained at the office of the City Engineer, Fort William; the office of the Contract Record, 220 King street west, Toronto; Canadian Engineer, 62 Church street, Toronto, or Builders' Exchange, Winnipeg.

The lowest or any tender not necessarily accepted.

JOHN WILSON,
City Engineer.

City Engineer's Office,
May 16th, 1911.

22-24

CITY OF TORONTO

Tenders

For the Construction of a Concrete Floor Slab and a Reinforced Concrete Bent at the Western Road Bridge

Tenders will be received by registered post only, addressed to the Chairman of the Board of Control, City Hall, Toronto, Canada, up to noon on Tuesday, June 30th, 1911, for the construction of a concrete floor slab on a steel span crossing the tracks of the C. F. R. at Western Road in the City of Toronto, and a reinforced concrete bent under the north end of the said steel span.

Envelopes containing tender must be plainly marked on the outside as to contents.

Specifications and forms of tender may be obtained upon application to the Department of Railways, Bridges & Docks, City Engineer's Office, Toronto.

The lowest or any tender not necessarily accepted.

G. R. GEARY, Mayor,
Chairman of the Board of Control.

City Hall, Toronto,
May 29, 1911.

23-24

Sealed bulk or separate tenders will be received up till 3 o'clock p.m. June 20th, addressed to the undersigned for the erection of a Bank Building, for the Royal Loan and Savings Company, Brantford.

Plans may be seen at the office of L. D. Barber, architect, Brantford, or Chapman, Mc Giffin & Scott, architects, Toronto.

The lowest or any tender not necessarily accepted.

L. D. BARBER, architect,
Temple Building, Brantford.

24-24

TENDERS

Sealed tenders addressed to the undersigned will be received until 5 o'clock p.m. on Saturday, June 24th, for the construction of a reinforced concrete coagulating basin, of a capacity of approximately 400,000 gallons, at the St. Thomas Waterworks.

Plans and specifications may be seen and form of tender obtained at the office of the City Engineer.

The Commission does not bind itself to accept the lowest or any tender.

GEO. K. CROCKER,
Chairman Waterworks Commission.
St. Thomas, June 9, 1911.

24-25



Department of Railways and Canals

Intercolonial Railway

Improvements at Halifax

Sealed tenders addressed to the undersigned and endorsed "Tender for Pier and Sheds," will be received at this office until 12 o'clock noon of the 20th day of July, 1911, for the construction of a reinforced cement concrete pier and sheds at the Deep Water Terminus of the Intercolonial Railway, at Halifax.

Plans, specifications and form of contract to be entered into may be seen and full information obtained on and after the 20th day of June, 1911, at the office of the Chief Engineer, of the Department of Railways and Canals, Ottawa, Ont., and at the office of the Chief Engineer of the Intercolonial Railway at Moncton, N.B., or at the office of the Consulting Engineer, Mr. John Kennedy, Montreal.

Parties tendering will be required to accept the fair wages schedule prepared or to be prepared by the Department of Labor, which schedule will form part of the contract.

Contractors are requested to bear in mind that tenders will not be considered, unless made strictly in accordance with the printed forms, and in the case of firms, unless there are attached the actual signature, the nature of the occupation, and place of residence of each member of the firm.

An accepted bank cheque for the sum of \$25,000, made payable to the order of the Minister of Railways and Canals must accompany each tender, which sum will be forfeited if the party tendering declines entering into contract for the work, at the rates stated in the offer submitted.

The cheque thus sent in will be returned to the respective contractors whose tenders are not accepted.

The cheque of the successful tenderer will be held as security, or part security, for the due fulfilment of the contract to be entered into.

The lowest or any tender not necessarily accepted.

By order,

L. K. JONES,
Secretary.

Department of Railways and Canals.
Ottawa, June 5th, 1911.

Newspapers inserting this advertisement without authority from the Department will not be paid for it.

24-25

Tenders will be received by the undersigned until Saturday, July 1st, for the concrete work for a steel bridge to be erected in the Township of Burford, Ont.

Plans and specifications may be seen at any time at my residence, Cathlamet, Ont.

24-25

WM. MILMINT,
Reside

TOWN OF VIRDEN

Debentures

Sealed tenders will be received by the undersigned until noon Thursday, July 6, 1911, for the purchase of an issue of twenty years debentures of the Town of Virden to the value of \$25,000, bearing interest at 5 per cent. dated July 2, 1911, with equal annual payments of principal and interest.

The said debentures covering the cost of construction and finishing of certain additions to the present municipal building, etc.

Offers to be made payable net, at the Canadian Bank of Commerce, Virden, Man.

Validity of said debentures guaranteed by the Municipal Commissioner of Manitoba. Tenders to be marked "Tenders for Debentures." The highest or any offer not necessarily accepted.

J. F. C. MENLOVE,
Sec. Treas Town of Virden.

Virden, Manitoba.

24-25

CITY OF PORT ARTHUR

Tenders for Pavement

Sealed separate tenders, endorsed on envelope, "Tender for Paving," will be received by the undersigned up to 6 o'clock p.m. of Saturday, June 24th, 1911, for the paving of streets in the city of Port Arthur as undernoted:

1. Bay street, Cumberland to Algoma:
With Asphalt Block, Sheet Asphalt and Bitulithic, and laying and paving street car tracks according to Engineer's plans, etc

Estimated quantities:—
Pavement, approximately 4,784 sq. yds.
Curb and gutter, approximately 2,000 lin. ft.
Track construction, approx. 3,106 sq. yds.

2. Similar tenders for Algoma st., Bay to John:

Estimated quantities:—
Pavement, approximately 4,100 sq. yds.
Curb and gutter, approximately 2,000 lin. ft.
Track construction, approx. 3,378 sq. yds.

3. Similar tenders for Algoma st., John to Queen:

Estimated quantities:—
Pavement, approximately 1,685 sq. yds.
Curb and gutter, approximately 940 lin. ft.
Track construction, approx. 845 sq. yds.

4. Similar tenders for Pearl street, South:

Water to Court:—
(No Street Car Tracks)

Estimated quantities:—
Pavement, approximately 4,000 sq. yds.
Curb and gutter, approximately 1,836 lin. ft.

5. Similar tenders for Cameron street, Cumberland to Court:

(No Street Car Tracks)

Estimated quantities:—
Pavement, approximately 1,780 sq. yds.
Curb and gutter, 1,340 lin. ft.

This latter street to include tender for construction with RockMac.

All tenders must include construction of proper curbs and gutters.

Further instructions as to specifications and forms of tender may be obtained from the City Engineer.

A marked cheque for ten per cent of the estimated amount of contract must accompany each tender.

The lowest or any tender not necessarily accepted.

J. McFEEGUE, City Clerk

Corporation Offices, Port Arthur,
June 10th, 1911.

24-25

Bridge Tenders Bridge Tenders

Sealed tenders will be received by William Purvis, Esq., Columbus, Ontario, for the building of a 36 x 20 foot concrete arch bridge on the fourth concession East Whitby, near Oshawa, up to noon on Friday, June 30th.

For further information apply to the undersigned.

24-25 BOWMAN & CONNOR, Engineers,
36 Toronto Street, Toronto.
H. GIFFORD, Reeve,
Cedardale, Ont.

Sealed tenders will be received by the Clerk of Markham Township, Unionville, Ont., for the building of a steel superstructure with concrete abutments for a concrete arch in the Township of Markham, near Thornhill, up to noon on Friday, June 30th.

For further information apply to
BOWMAN & CONNOR, Engineers,
36 Toronto Street, Toronto.
J. PAGET,
Thornhill, Ont.

TENDERS

for Steel and Concrete Bridge

Mud Lake Narrows

TOWNSHIP OF CARDEN

County of Victoria

Tenders will be received by the undersigned until Wednesday, July 5th, 1911, for the following works:

1. Two steel spans with concrete floors, each 60 feet over all, 14 feet roadway between curbs, to carry a 10-ton roller at least, and to be approved by the Engineer of Highways of the Department of Public Works of Ontario.
2. One 120 feet span, same width and relative strength.
3. Three concrete piers to receive two 60-ft. spans.
4. Two concrete piers to receive one 120-ft. span.
5. Stone filling of approaches.

Plans and specifications may be seen at the office of the County Clerk, Lindsay and Whitby.

The committee claims the right to accept a tender for either two spans or one span; three piers or two piers and to decline any or all of the tenders.

J. R. McNEILLIE,
Clerk, County of Victoria.
Lindsay, June 12, 1911.



Sealed tenders addressed to the undersigned, and endorsed "Tender for Breakwater at Bare Point, Port Arthur, Ont.," will be received at this office until 4 p.m., Wednesday, July 5, 1911, for the construction of a Breakwater at Bare Point, Port Arthur, Electoral District of Thunder Bay and Rainy River, Ont.

Plans, specifications and form of contract can be seen and forms of tender obtained at this Department and at the offices of E. B. Temple, Esq., District Engineer, Port Arthur, Ont.; J. G. Sing, Esq., District Engineer, Confederation Life Building, Toronto; H. J. Lamb, Esq., District Engineer, London, Ont.; and J. L. Michaud, Esq., District Engineer, Merchants' Bank Building, St. James street, Montreal, Que.

Persons tendering are notified that tenders will not be considered unless made on the printed forms supplied, and signed with their actual signatures, stating their occupations and places of residence. In the case of firms, the actual signature, the nature of the occupation, and place of residence of each member of the firm must be given.

Tenders are asked for two modes of construction, and each contractor must send in with his tender an accepted bank cheque on a chartered bank, payable to the order of the Honourable the Minister of Public Works, equal to ten per cent. (10 p.c.) of the amount of the higher of the bids, which cheque will be forfeited if the contractor decline to enter into a contract when called upon to do so, or fail to complete the work contracted for. If the tender be not accepted the cheque will be returned.

The Department does not bind itself to accept the lowest or any tender.

By order,
R. C. DESROCHERS,
Secretary.
Department of Public Works,
Ottawa, June 2, 1911.

Newspapers will not be paid for this advertisement if they insert it without authority from the Department.

23-24

Toronto Main Drainage

Low Level Interceptor:

Section No. 4, 3,244 linear feet, 4 ft. 9 in. circular brick in tunnel.

Storm Overflow Sewers:

Wilton, Section No. 1, 4,490 linear feet, average nominal size 5 ft. x 5 ft. 6 ins., brick or concrete in tunnel.

Wilton, Section No. 2, 3,562 linear feet, average nominal size 4 ft. x 4 ft. 3 ins., brick or concrete in tunnel.

Sealed tenders for the construction of the above concrete and brick sewers complete will be received by registered post only, addressed to the Chairman of the Board of Control, Toronto, Ontario, up to noon of July 4th, 1911.

Plans and specifications are on file at the office of this journal in Montreal. Plans may be seen and specifications and further information may be obtained from the Main Drainage Works, City Engineer's Office, Toronto.

G. R. GEARY, Mayor,
Chairman, Board of Control.

TOWN OF THOROLD

PROVINCE OF ONTARIO

Sewerage Works

Notice to Contractors

Sealed tenders will be received by the Town Clerk until 8 p.m. on Monday, June 26th, 1911, for the labor and materials required for the construction of a System of Sanitary Sewers, comprising about 13,000 lineal feet of pipe sewers.

Plans and specifications may be seen at the office of the Engineers, Mail Building, Toronto. Deposit cheque for \$1,500 required for labor, and \$500 for sewer pipes.

The lowest or any tender not necessarily accepted.

A. McCULLOCH, Esq., Mayor,
Thorold, Ont.
CHIPMAN & POWER, Engineers,
Toronto, Ont.
24-25 D. J. C. MUNRO, Esq., Town Clerk,
Thorold, Ont.

TOWN OF OSHAWA, ONT.

Sedimentation Tanks, etc.

Sealed tenders, accompanied by a marked cheque for \$500 will be received up to Saturday noon, July 1st, 1911, for the construction of screening chambers, sedimentation tanks, sludge beds and all appurtenances thereto.

Plans and copies of specifications are held for inspection at the offices of the "Contract Record," 220 King street west, Toronto; the "Canadian Engineer," Church street, Toronto, and the office of Mr. T. Aird Murray, C.E., Consulting Engineer, Lumsden Building, Toronto.

Copies may be obtained from the Town Engineer, together with forms of tender, upon deposit of a fee of \$1.00, which will be returned when plans are returned.

W. E. N. SINCLAIR, B.A., L.L.B.,
Mayor.
FRANK CHAPPELL,
Town Engineer.
Town Hall, Oshawa.

Miscellaneous

Advertisements under this heading two cents per word per insertion. Minimum charge 50 cents

REPRESENTATIVE WANTED

An American company manufacturing Thomas Locking System special Sectional Sheared Bar for reinforcing concrete, want an engineer to handle the sales end of their business on shares. Address, Box 282, Contract Record, Toronto, Ont.

23-24

REPRESENTATIVES WANTED

Large American firm manufacturing a product for making dustless roads desires to secure competent representatives in eastern and western Canada who have connection with municipal authorities and town and city engineers. All proposition. Apply Box 284, Contract Record, Toronto, Ont.

23-24

Permeability of Concrete

That brick pavements, and in fact, pavements made of all kinds of material, expand with the heat and contract with the cold is, of course, well known; such expansion in some instances resulted in the arching of a pavement, the centre lifting in some cases several inches from the foundation. We do not recall, however, having seen any figures as to the actual amount of expansion and contraction caused in pavements by temperature changes. An investigation of the amount of such movement is being undertaken by the United States Bureau of Standards, which has sent from Washington two of its engineers to study the brick speedway at Indianapolis, which is considered perhaps the most perfect specimen of brick paving in the country. From the results of these tests it should be possible to estimate with more exactness the size of expansion joints which it is necessary to provide in constructing brick pavements of various widths and in various climates.

At the same time these engineers propose to test the rigidity of the pavement—that is, the deflection occasioned by the passing of a load over it. For this purpose a sensitive spirit level will be used which will indicate a change in level at one end of one ten-thousandth of an inch. This would not seem to have as much immediate value to the engineer, although it may serve to indicate the value of certain coefficients of elasticity and other properties of brick pavements.

Business Notes

Laferrriere & Frere, Montreal, Que., dissolved.

W. A. Kenny, Ltd., Kazabazu, Que., incorporated.

Caron & Rioux, plasterers, registered, Montreal.

O. Cauchon & Co., painters, registered, Montreal.

Lemoyne & Desy, Montreal, contractors. Dissolved.

MacLean Daily Reports

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Business Buildings and Industrial Plants

(Continued from page 61)

Moose Jaw, Sask.

General contract awarded for business building, \$150,000. Owners, Times Printing Co., Ltd., Moose Jaw; architect, Storey & Van Egmond, Regina, Sask., 6 storey brick and reinforced concrete; general contractor, Peter Lyall & Company, Montreal. No information as to sub-contractors. Report later.

General contract awarded for office and warehouse, \$20,000. Owner, Massey Harris Co., Ltd., Regina; architect, R. G. Bunyard, Moose Jaw, 3 storeys and basement, brick and stone, 28 x 98 ft. General contractor, A. B. Fleming, Regina, Sask.; awarded June 6, 1911.

Sherbrooke, Que.

Contracts awarded for addition to new Sherbrooke House, \$15,000. Owner, H. Higgins, St. Johnsbury, Vt.; architect, C. E. White, Sherbrooke, Que., 1 storey added; brick 80 x 40 ft.; general contract let June 8 to Sherbrooke Construction Co. Building to be completed Aug. 20th.

Contracts awarded for addition to factory, \$8,000. Owner and architect, The MacKinnon Holmes Co.; Sherbrooke; general contractor, Sherbrooke Construction Co., Sherbrooke. Concrete brick and steel, 100 ft. x 50 ft., 1 storey. Contract was let June 1. Work is being done on unit basis.

Three Rivers, Que.

Contract awarded for pulp and paper mill, to General contractor C. E. Deakin, 11 St. Sacrament street, Montreal. Cement, style of mill, 100 ton Kraft paper, 50 ton unit for paper to be ready Oct. 3; 50 ton unit for paper to be ready in spring; building to be completed Oct. 1, 1911. Owner, Wayagamack Pulp and Paper Co., Ltd., Montreal.

Power Plants, Electricity and Telephones

Stettler, Alta.

Tenders called for electric light equipment. Owner, Town of Stettler, Alta.; town commissioner, Daved Mitchell, Stettler, Alta.; engineers, The John Galt Engineering Co., 317 Portage avenue, Winnipeg, Man. One 125 K.V. A. generator, exciter and switchboard; one tandem compound steam engine; one 72-in. x 16 ft. boiler and stack; cedar poles and pole-line material; erection of pole line. Specifications, etc., at offices of the engineers. Tenders called July 3, 1911.

Whitby, Ont.

By-law carried for power company. Parties interested, Seymour Electric Power Co., and Town of Whitby. The agreement to supply power to the town was ratified.

Miscellaneous

St. John, N. B.

Contemplated garbage disposal plant, \$50,000. Owners, City of St. John; city engineer, William Murdock. Enquiries being instituted.

Winnipeg, Man.

Tenders addressed to chairman, board of control, will be received until July

3rd for supply of apparatus and materials required for installation of police patrol telegraph system. Specifications, etc., at office of F. A. Cambridge, city electrician; M. Peterson, secretary.

The municipality of Springfield has a choice of four offers to supply light, heat, power and electric railway service. These include offers from the Winnipeg Street Railway Company and from Mr. Charles Chamberlain, representing the Great Falls Power Company.

Manager Wilford Phillips, Winnipeg Electric Street Railway Company, has organized an educational campaign to assist teachers in the public schools to teach the children how to prevent accidents. His plans have been outlined to Mr. D. McIntyre, superintendent of schools, who will seek the co-operation of the teachers.

New Companies

John Morrow Screw & Nut Co., Ltd., Ingersoll, Ont., incorporated. Incorporated, capital \$100,000. Incorporators, W. L. Carr and F. C. Gullen, of Toronto.

Art Metals, Ltd., Toronto, Ont., incorporated, capital \$40,000. Incorporators, D. G. Hagarty and R. C. Darling, both of Toronto.

Sweet Machinery & Foundry Co., Ltd., Cobalt, Ont., incorporated, capital \$40,000. Incorporators, W. R. Sweet and J. T. Sweet, both of Cobalt.

St. Mary's Portland Cement Co., Ltd., Toronto, Ont., incorporated, capital \$500,000. Incorporators, H. E. Rose and G. H. Sedgewick, both of Toronto.

J. Lefebvre, Limited, Montreal, incorporated, to carry on business as master plasterers, and general contractors, capital \$100,000. Incorporators, J. P. Lefebvre and Joseph Lefebvre, both of Montreal.

Dominion Explosives, Ltd., Ottawa, Ont., incorporated, capital \$100,000.

Prince Rupert Hydro-Electric Co., Ltd., Montreal, incorporated, capital \$5,000,000. Incorporators, O. B. MacCall-

um and G. V. Cousins, both of Montreal.

Canadian Electric Welding Co., Ltd., Montreal, incorporated, capital \$500,000. Incorporators, G. V. Cousins and E. G. T. Penny, both of Montreal.

Rust, as shown in Removal of Seventeen-Storey Building

The Gillender Building, a seventeen-storey structure at the northwest corner of Wall and Nassau streets, New York city, was built in 1896, and removed in 1910.

When built, all the columns were encased in solid brick work. The steelwork received one coat of paint in the shop and two after erection, but on removal, showed little evidence of ever having been painted at all.

From the top to the bottom, wherever the spaces between the brick and steel were filled with Portland cement mortar, there was no rusting, but, wherever the mortar did not fill such spaces completely, rusting had begun. Generally, the under sides of the top and bottom flanges of the floor-beams had begun to show rust, while the web and upper surfaces, having been in contact with mortar, were in good condition.

The worst rusting of all was from the sixth floor down, on the northeast corner, where the columns had been against the adjoining building, on the north side. The cover-plates of these columns looked as if they had never been painted but had stood in the open, exposed to all weather, for six or seven years. On these columns one-half, in volume, of many rivet heads could easily be removed.

This building had been erected by first-class contractors and with first-class materials; and although the rusting had not yet made the building unsafe, there is no telling how soon it would have become so.

It would seem that if the columns had been encased and filled with wet concrete there would have been little danger of rust, and they could thus have been easily protected from electrolysis. Oil or oil paints should not be placed on steel to be thus encased.

Tabulated Report from Vancouver on the Tenders for Steel Pipe

	price per ft.	price per ft.	price per ft.	price per ft.
Name	Shell	34" 5/16"	34" 3/8"	18" 3/8"
Macdonald Godson Co., City.....	\$3.58	\$4.00	\$4.96	\$2.82
John Coats & Co.	3.88	4.25	5.42	2.76
Balfour Guthrie Co.	3.645	4.192	5.037	2.68
W. Beverley Robinson	3.813	4.523	5.263	2.768
J. Coughlan & Sons	4.25	4.6	5.4	3.2
C. Gardiner Johnson	3.89 1/6	5.67 1/8	6.99 13/20	4.00 1/8
McDougall Jenkins, Ltd.	5.0452	4.5668	5.44445	2.7574
F. Darling	4.58	5.12 1/2	5.89	3.11 1/2
Robertson Godson Co.	3.80 3/4	4.53 1/2	5.38 1/2	2.812/3
Evans, Colman Evans	4.53		6.17	3.15
Drummond McCall & Co.	3.8	4.3	5.13	2.96
Clayton Sons & Co.	4.38	5.04	5.77	3.6
Canadian Bovine Co.	4.23	4.73	5.44	2.97

8. Re tenders for Cast Iron Pipe.

The following tenders were received for 18 in. Cast Iron Pipe and referred to Engineer Burwell to tabulate:

	price per ton		price per ton
Evans, Coleman Evans	\$36.58	Cochrane & Co.	\$40.40
Balfour Guthrie & Co.	25.15	Camden Iron Works	55.50
A. F. Forsythe	45.90	Robertson Godson Co.	37.05
The Canadian Bovine Co.	45.80	C. Gardiner Johnson Co.	45.10
Anglo American Supply Co.....	40.19	Drummond McCall Co.	36.50

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Concerning Certified Cheques and Other Sources of Trouble in Contracting

A growing cause of complaint among contractors is the excessive deposit required with tenders. There is no objection to putting up a reasonable sum, but a great many corporations ask for a deposit of 5 to 10 per cent., apparently without any regard to the amount of the contract. Such a requirement, on a large undertaking, often amounts to many thousands of dollars. It is this feature of the practice which is rightly considered unreasonable. And it is not only unreasonable, but it is against the best interests of the work, for it means less competition. Some of the best men in the business find their money held up sometimes, and it is not every contractor capable of taking a \$100,000 contract who can always post a certified cheque for \$10,000, or even \$5,000 in the case of a deposit of 5 per cent.

Now we contend that for small contracts, up to say \$10,000, a deposit of 5 per cent. is not unreasonable, but in the case of larger contracts the percentage might well be reduced. In many cases it would be quite sufficient to stipulate a certain reasonable sum. If the object of these certified cheques is only to insure the bona fide intentions of the bidder, then this end would be attained by a cash deposit of a thousand dollars, or so, even in the case of contracts of \$50,000 and upwards.

If it were the custom all over the world to demand this excessive deposit it would tie up a tremendous amount of money in the case of the larger concerns, some of which have as many as 200 branches. Fortunately the Canadian field is an exceptional one, but supposing it were not, and assuming that the same conditions obtained everywhere and that each branch of one of these big companies had tender cheques out ranging from \$5,000 to \$10,000, it would mean a total sum of from \$1,000,000 to \$2,000,000 standing idle purely on deposit against tenders, apart altogether

from any consideration of the bonds that would be required upon the award of the contracts. We fail to see why Canadian corporations should adopt such an arbitrary practice and require so large a guarantee of good faith.

In England, in the case of practically all public work it is customary to forward specifications and full information (such as bills of quantities in the case of building contracts), upon receipt of a cheque varying from \$15 to \$25, the return of the cheque being guaranteed upon receipt of a bona fide tender.

The deposits required in the case of a number of contracts that we have selected at random from recent issues of our London contemporaries are indicated below:

Erection of H. M. Stationery Office and	
Office of Works' Stores, London.	3 guineas
Erection of Barracks at Dover	10 shillings
Erection of Public School Building at	
Macclesfield	2 guineas
Asphalt paving repairs, Tottenham	5 pounds
Supply of approximately 400 tons of cast	
iron pipes and specials, Southend-on-Sea	5 guineas
Construction of locks, sluices, weirs,	
bridges, river sidenings and dredging	
on the River Medway	10 guineas

In the above list it will be seen that the range is confined practically to from \$2.50 to \$25, the requirement of \$50 in the last named undertaking being exceptional owing to the comprehensive nature of the contract. Can it be that English contractors, labor and material are so superior to our own that a nominal guarantee in their case is considered sufficient?

Holding up Deposits

A custom which cannot be condemned too strongly is that of retaining the tender cheques for a considerable period after the award has been made. A leading firm of Toronto contractors recently told the writer something of their experience in this regard. They have lately had several good sized cheques held up for three or four months in spite of the provision in the specification that the deposits would be returned upon the signing of the contract, or at any rate within sixty days.

A further cause for complaint, which happily is not reported very often, is that in some cases tender cheques, although accepted by the bank, have been actually cashed and the cost of exchange charged.

It seems to us that half the people with whom contractors have to negotiate are indifferent to the best interests of those they serve, and that the other half have an ignorant over-estimation of the financial resources of the contractor. There are a few, it may be, who have adopted the old fashioned principle of getting on "the safe side"—irrespective of the cost.

The contracting community should take a firm stand in matters of this kind. No improvement will ever come but by persistent effort, and it must be united effort at that.

We have heard numerous complaints in connection with the matters discussed above and we would be interested in knowing more of the experience and views of our readers.

The G. T. P. has effected an agreement with the city of Prince Rupert, B.C., whereby it has agreed to start work at once on a two and a half million dollar dry dock, a hotel to cost one million dollars, station, round houses, shops, etc.

Stability and Progress of Canadian Produce

An examination of the comparative tables which have just been issued by the Department of Trade and Commerce for the fiscal year ending March 31, 1911, showing details of the trade of Canada for the year as compared with the year previous shows that Canada has taken a long stride forward in her progress as a commercial nation. The total of imports for consumption and exports was \$759,000,000, greater by \$82,000,000—over 12 per cent., or one-eighth—than that of the previous year, which was also a record maker in point of trade. To this total may be added \$10,000,000 of imports which were not entered for consumption, making the grand aggregate of Canadian trade for the year \$769,000,000—about \$76,000,000 increase over the previous record. Imports for consumption show an increase of \$86,000,000—almost 23 per cent. Of this increase about two-thirds was dutiable goods, and the customs duties collected were greater by \$12,000,000—20 per cent. or one-fifth—than in the previous year.

Compared with the year 1909-10 total, exports show a decrease of about \$4,000,000, but compared with the greatest year total previous to 1909-10 the increase is over \$17,000,000. The decrease is due to a drop of \$8,000,000 in agricultural products and to slightly lower totals in the animal and forest classes. To counterbalance this there is an increase of almost \$4,000,000 in the amount of manufactured goods exported while the mines gave an increase of \$2,700,000.

A decrease in total exports does not necessarily show lessened demand for Canadian goods abroad, but rather a decrease in the amount of goods available for export. On the other hand, an increase in the export of manufactured goods indicates the growing popularity of Canadian products in other countries.

It must be borne in mind that foreign trade is subject to fluctuations which it is impossible to control and difficult to explain. From these variations Canada suffers probably less than any other commercial country in the world, and the steady and rapid increase of her business in the world market and the infrequency and small importance of the periodical reactions are outstanding features which prove the stability of her commerce and guarantee her advancement in the years to come.

Increase in Area of Field Crops

A recent bulletin of the Census and Statistics office issued to-day states that the season this year has been favorable for field crops in all parts of Canada, and excellent reports have been received from all the provinces. The lowest percentage of condition is made for fall wheat, which suffered from inadequate protection in the winter months, and also to some extent from spring frosts. The areas of fall wheat are greater than last year by 4.50 per cent and of spring wheat by 13.70 per cent. The total area in wheat is 10,503,400 acres, as compared with 9,294,800 in 1910 and 7,750,400 in 1909. The per cent. condition of fall wheat at the end of May was 80.63, and of spring wheat 96.69. The area in oats is 10,279,800 acres and its condition 94.76, as compared with 9,864,100 acres and 93.95 per cent. condition last year. Barley and rye each show a small decrease in area, but the condition is higher than at the same period last year. Slight decreases are also reported for areas of peas, mixed grains, and hay and clover, with

per cent. condition of over 90. Hay and clover have a reported condition of 91.45 for the Dominion, being practically 100 in Manitoba, Saskatchewan and Alberta. The area of the field crops named is 32,051,500 acres for 1911, compared with 30,554,200 acres for 1910 and 28,194,900 acres for 1909. In the provinces of Manitoba, Saskatchewan and Alberta, the area in wheat, oats and barley was 3,491,413 acres in 1900, 6,009,389 acres in 1905, 11,952,000 acres in 1909, and 13,809,300 acres in 1910, and it is 15,355,500 acres this year. The increase of these crops from 1900 to 1911 was 2,663,699 acres in Manitoba, 7,364,315 acres in Saskatchewan and 1,836,073 acres in Alberta.

The Window Glass Trade

England and Belgium are the sources of supply to Canada for window glass. Usually in the opening of Montreal navigation very large importations arrive by the early boats. This has not been the case this year, however, for various reasons. Trade for the past year has been exceedingly brisk in England, consequently the home demand has been far above normal. This, together with the fact that the South America markets have very largely increased their purchases of window glass from England, has made it exceedingly difficult for the English manufacturers to make Canadian deliveries in the usual quantities.

So far as the Belgian manufacturers are concerned, they have benefited by the good times in England, and as a result of the continued improvement in the quality of Belgian manufacture, the trade of that country controls about 80 per cent. of the English demand. This has had its effect on prices, which have advanced since last fall about 20 per cent. The manufacturers also are banded together in a very strong syndicate whose tendency is toward a further advance in view of the scarcity of the supply and the approaching mid-summer shut-down. All of this means that window glass for the present year in Canada is going to be both scarce and higher priced. Up to the present time Canadian importers have not advanced their prices to cover the advance made by the manufacturers, but as the present stocks on hand are depleted, a considerable increase must be demanded by the jobbers.

Window glass is one of the few commodities which in the last five years has been constantly decreasing in price. To-day it is sold in Canada at lower figures than ever before. This is not attributable to decreased cost of manufacture, but to the exceedingly keen competition existing in the trade.

Building Supplies in Cuba.

According to a report from Havana, extensive docks are being built in Cuba, and large quantities of cement and structural steel will be needed. The structural work is in the hands of the MacArthur Perks, Limited, Havana, with whom Canadian firms should correspond if they desire to quote prices.

Contractors are extremely busy laying a sewerage system, paving the public streets and laying out extensive residential quarters. This should present an opportunity to place creosoted wood block, hard stone paving blocks, sewerage pipes, etc. The contractors are the Cuban Engineering Company, of Havana, for the sewerage, and the Uvalde Asphalt Paving Company, Havana, for the paving of the city.

Restricted Competition for Public Work

Some of the Reasons why many Contractors Refuse to Bid— Excessive Deposits — Form of Contract — Guarantee Clause

Competition in bidding on their construction work is what every city official and public engineer wishes, yet in too many cases the competition is restricted, and with this restriction comes graft, collusion and fraud. The idea is to throw public work open to the broadest competition, yet the laws surrounding bidding in some cases, the manner in which specifications are drawn up, the form of contract and many other things throttle competition, until to-day many contractors refuse to bid upon public work, especially in some of the cities, and the awarding of contracts has in some cases become a farce, and even a blot upon the business of contracting.

Excessive Deposits

First of all competition is throttled in making proposals. The rules governing bids generally provide for a certified check of ten per cent. of the total amount of the proposal. Sometimes a lump sum is named for the amount of the certified check, but the sum named is generally about ten per cent. of the engineer's estimate. This deposit of a certified check is often a hardship upon contractors and prevents many hard working and responsible men from bidding.

A contract for half a million dollars means a certified check for \$50,000, and even a contract for only \$30,000 means a check for \$3,000. Thus a contractor who may have the plant and ability to undertake the first job, may be prevented from bidding by not being able to put up a certified check for \$50,000. The subject of this check too is to show the standing of the bidder and to compel him to enter into a contract, if the contract is awarded to him. This can be accomplished as well by a bidder's bond, or the contractor can be given the choice between a bidder's bond and a certified cheque. This feature of public bidding limits competition. Several years ago a contractor was asked to make up a bid for a bulkhead, the bidding price being not quite \$60,000, for which a certified check for nearly \$6,000 had to accompany the proposal. On the day of submitting the bids, the contractor was disappointed in obtaining the certified check, so he could not bid. Only two contractors made bids and the work was awarded to the one, whose bid was about four per cent. higher than the contractor who was prevented from bidding. This contractor could have obtained a bidder's bond, as he had done so frequently. There is no doubt that he could have finished the work at a profit, for within a month he obtained a contract for about \$70,000 worth of similar work in the same locality from a railroad company, at smaller prices and finished this work ahead of the contractor in the municipal work, and with a handsome profit.

The Forms of Contract

The next feature that restricts competition on public work is the form of contract. It is true that during the past decade many forms of contract have been wonderfully improved, but there are still a large number of contracts, which many responsible contractors

would not care to sign. Contractors when they can obtain plenty of work from private corporations, will not bid on public work, or if they do bid it is only to set high prices on the job. Naturally, a contractor must be held to the obligation he assumes, but this is done by private corporations with more equitable forms of contracts.

Specifications are so drawn that competition is often throttled, and at the same time a premium is often placed on dishonesty. Only recently the writer in reading a set of specifications for city work, saw a clause that stated that the work to be done under this contract and specification should be better than that known as "first class." This would seem to be a joker, and the contractor is the one to pay for the joke. Such a clause or provision would seem to be written in a set of specifications for the purpose of allowing the inspector on the work to mulct the contractor.

First class work is supposed to be the best there is, so a provision that calls for work of a superior quality to the best, means that the inspector can so wrong the contractor, that the latter will gladly effect any settlement with the inspector that will allow him to go on with his work. Such things are wrong, but when specifications put such opportunities into the hands of an underpaid man, it is compelling a contractor to be dishonest or else be worried beyond endurance, besides having his work cost more money.

Plans and specifications are likewise so drawn as not only to add to the cost of the work, but to limit competition. These things seldom occur on work done for private corporations, consequently it is possible to eliminate them from public contracts.

The Guarantee Clause

Another feature that has a tendency to limit competition is the guarantee clauses, that is embodied in so many contracts. A guarantee that covers a patented article or method might be advisable, but on ordinary construction, where plans can be made by the engineer in charge and the proper inspection is given the work, there is no need of a guarantee, not even for materials, for tests of all materials can be made in laboratories before they are placed in the structures.

When a guarantee was given in shops of a maintenance bond the conditions were not so bad, but now many cities are demanding cash deposits as guarantees, ranging from five to ten per cent. of the value of the work. This will tie up within a few years, if the practice would become general, many thousands and possibly millions of dollars, which would otherwise be used in contracting. Thus some men, for lack of capital that they cannot afford to have tied up in this manner, would be able to undertake public contracts, especially those that call for a cash guarantee.

These are the many ways that competition is throttled on public work. The remedy is simple, namely, to make such changes that collusion and graft will be entirely eliminated, and allow all competent and reliable contractors to bid upon public contracts. In

advocating this it does not mean that inexperienced and unreliable men should have the bars thrown down to them, for it is not the idea to lower the standard of work to be done for the public, but rather raise that standard.

The greater competition is on work, the higher the standard of construction is likely to be. It is a fact that if a large number of competitors are anxious to obtain a job the successful bidder will give a good class of work, while if a man feels that the work has come to him easily, he will also feel that he can do as he pleases, and will do an indifferent class of work, and if graft enters into the letting, the work will be skimped and slighted whenever possible.

Many examples could be given and much more could be said, but there can be but one opinion on such an important subject, namely, that there should be genuine competition and honest work free from all graft. These ends can be obtained if the remedies pointed out are applied.—The Contractor.

The Rochester and Lake Ontario Water Company's Filters

The water purification plant of the Rochester & Lake Ontario Water Company, at Charlotte, N. Y., obtains its supply from Lake Ontario through a 24-in. cast iron intake pipe extending 4,000 ft. from the shore into water 40 ft. deep. The water is sold in a part to Rochester and to several of its suburbs. The plant consists of a 430,000-gal. coagulation basin and eight pressure filters, having a sand area of 200 sq. ft. each; there is a pressure of 235 lb. per sq. in. on the filter. The sand in the filters is about 3 ft. in depth, has an effective size of 0.46 mm. and a uniformly coefficient of 1.51. The operation of the plant has been directed by Mr. James M. Caird, consulting engineer, of Troy, N. Y., and the following notes regarding the results obtained have been taken from his report to the company for the year ending March 31, 1911.

The total amount of water filtered was 1,508,787,278 gal., and of this quantity 1,484,939,891 gal. was delivered to consumers. The number of filter washings during the year was 1,448 and the percentage of wash water 1.58, as against 2.96 per cent. during the previous year. The turbidity of the lake water in parts per million averaged 11.3 ranging from 180 to 0; 0.64 grains per gallon of sulphate of alumina and 0.053 grains per gallon of calcium hypochlorite were used. The turbidity was over 50 parts per million on 43 days or 11.8 per cent. of the year while during the previous year it was over 50 on 29 days, or 7.9 per cent. of the time. The filtered water, Mr. Caird reports, has been practically free from turbidity during the entire year. The color of the raw water averaged 9.3 parts per million ranging from 75 to 0. There has always been more than sufficient alkalinity in the raw water to decompose all the sulphate of alumina required for proper coagulation. The alkalinity of the Lake Ontario water averaged 85.7 parts per million and the hardness 106 parts per million.

The average number of bacteria per cubic centimeter in the unfiltered water was 5,330, ranging from 75,482 to 40. The bacteria in the settled water averaged 30, ranging from 278 to 1 per cubic centimeter. The bacteria in the filtered water averaged 13 per cubic centimeter, ranging from 472 to 1. The coagulation basins removed about 99.44 per cent. of the bacteria, the filters 56.67 per cent, making the total

bacterial removal 99.76 per cent. The bacteria per cubic centimeter in the unfiltered water was above 1,000 on 183 days, or 58 per cent. of the time, above 5,000 on 128 days, or 35 per cent. of the time, and above 10,000 on 78 days, or 21 per cent. of the time. The bacteria in the filtered water were less than 100 per cubic centimeter on 363 days, or over 99 per cent. of the time and under 25 on 325 days, or 89 per cent. of the time.

During the year *B. coli* were present in 451 out of 1,067 samples of raw Lake Ontario water; of 1,067 samples of filtered water *B. coli* were present in six samples. The total removal of *B. coli* for the year was 98.7 per cent.

During the year additional baffles were placed in the settling basins and the efficiency increased from 89.12 per cent. to 99.44 per cent. The increase in the basin efficiency lessened the work of the filters, and according to Mr. Caird should reduce the cost of operation by reducing the amount of wash water at the filters.

Water consumption at Springfield, Mass., a city of 88,926 population, averaged 119 gal. per inhabitant daily during 1910. Mr. Elbert E. Lochridge, chief engineer, states in his last annual report that 45.35 per cent. of the consumption is metered.

The Root River bridge is constructed over the Root river in the township of Tarantorus, Ontario. At this point a big jam caused a washout at the old bridge, and the old structure was extended to cross the new channel. A new reinforced concrete girder bridge of 30 feet clear span is constructed over the new channel, and an 8 foot concrete arch was constructed on the old channel. The abutments are concrete. The abutments and wing walls are on hard pan foundations. The 6 inch concrete floor is reinforced with No. 6 floor mesh, and is supported by concrete girders 26 in. deep, reinforced with Kahn bars. The two middle girders are 16 inches wide and the two outside girders are 14 inches wide. The bridge and culvert are supplied with a pipe railing. Considerable filling was necessary, as the old bridge was 64 feet long. The bridge, culvert and filling cost \$2,575. The work was done under the supervision of J. O. Coates, Foreman Public Works. This is a class of structure that might profitably be adopted for highway bridges up to 35 foot span. The construction is simple; no skilled labor is required other than a good concrete man. The bridge is comparatively cheap and is everlasting.

If you have a wall of brickwork, and the bricks are very soft, then broom down and apply a size of acid water, just enough muriatic acid to sour the water. Let this be rinsed off with clear water, let it dry, then apply all the raw oil the wall will take. This is for a first-class job, and the oil will prevent the chipping of the brick afterwards. The oil makes the soft bricks harder, and also waterproof. Hard bricks will not need so much oil. Where the wall has been filled with raw oil the first coat of paint should be of good quality, and according to what the finish is to be; if to be painted like wood, it should be thinned with oil and turpentine until the last coat, which should be done with all oil. But if a dead brick finish, then use all turpentine color, for the finish, though the priming may be all oil, and the next coat or two, half and half, as the dead effect is surer on a partly lustrous ground, or on a perfectly full lustre.

Transcontinental Viaduct at Winnipeg

Details of Noteworthy Work now well under way—Difficulties Encountered at the Seine River—Heavy Piling Required—Crossing Nine Streets

The last gap in section F. of the Transcontinental Railway is being rapidly closed up. It is the stretch of about five miles between Transcona and Winnipeg. The original survey of the entry into Winnipeg called for level crossings through Elmwood and St. Boniface. This plan was objected to from several quarters, notably the C. P. R., the city of St. Boniface and the C.N.R. The railway companies objected because of the several crossings which would be

of the Red, several streets are crossed, each being spanned by a plate girder bridge.

The Seine River proved a difficult piece of work, for the approaches were bad and the bottom poor.



Piers of the Transcontinental viaduct at the crossing of the Seine River in St. Boniface.

made of their lines, and the city because of the many streets which would be cut.

When the matter was brought to the attention of the Railway Commission a change was ordered, and the high level plans, as finally prepared, were approved. These called for the abandonment of several miles of work already completed by J. D. McArthur, up to the city limits of St. Boniface. The new line swings slightly to the north after leaving Transcona and by an easy grade rises sufficiently high to go over all of the existing railway lines and streets.

The building of this huge viaduct has called for tremendous expenditures of money and labor. The majority of the piers and retaining walls are now in position and as soon as the main dump is ready, steel laying will be begun. At the east end of the new bridge across the Red River built at the foot of Lombard street in Winnipeg, the line crosses Tache avenue, the street being bridged with a single span. Between that point and the Seine River, a tributary



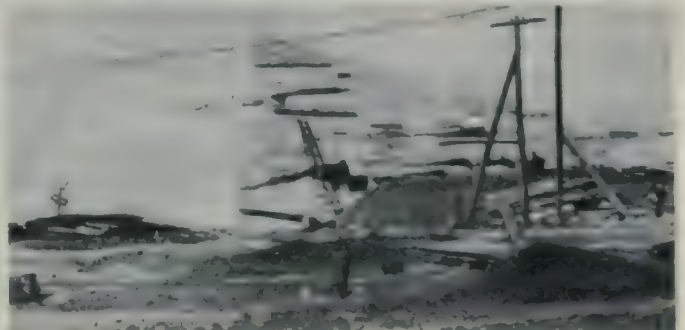
The temporary framework for lifting parts of the lift span into position.

Heavy piling had to be driven to secure proper bearing surface, and on this solid monoliths of concrete have been built up. At this point there are two spans with approaches carried on steel piers with concrete footings.

A couple of hundred yards east of the Seine the big dump begins which carries the road until prairie level is reached. A temporary "peg leg" bridge of



Temporary trestle for building the dump of the viaduct



Terminal pier of the big dump, showing side retaining walls.

rough timber has been erected to facilitate the handling of the gravel of which the dump is being made, and twelve locomotives supplied by three steam shovels are placing the material as rapidly as it can be hauled into place. It will take about 500,000 cubic yards of gravel to complete this stretch alone.

There are also several stretches of this high dump between streets in St. Boniface which will have to be completed, and in all there are nine streets to be crossed. Once the dump has been completed it will be a simple matter to place the bridge spans, but there is little possibility of the line being completed before fall. The bridge across the Red River is almost finished there being but a few minor touches



Combination retaining walls and piers at Tache Ave.

on the lift span. No especial haste is being made as the Canadian Northern are making slow progress on their section of the approach from the West. Their bridge across the Assiniboine River, east of the depot, has been hung up for several weeks. Deck plate girders were placed across the river, but many complaints were made with regard to the blocking of the river for navigation. The company are now waiting for the steel for the lift section. They have not started work on the subway across the south end of Main street, and complaints about the character of the work proposed for that point are now before the Railway Commission.

Canadian Railroad Construction

Railroad contractors in Canada have had no reason to complain over scarcity of work this season. The C.P.R., Grand Trunk Pacific and the Canadian Northern have been particularly active and let contracts this year for many hundreds of miles of new construction work. That the many contracts already let are by no means the end of the present season's construction plans is shown by the fact that tenders are now being publicly asked for two of the largest contracts of the year. One of these contracts calls for the construction of three sections of the Canadian Northern Ontario Railway, a subsidiary line of the Canadian Northern. The sections on which tenders are being asked are: from Port Arthur to a point on the boundary line between the Districts of Thunder Bay and Algoma; from the end of section 1 to Kapuskasing Lake; and from Kapuskasing Lake to Sellwood Junction. Tenders for these three sections are to be received at Toronto, not later than July 1. The tenders are to include cleaning, grubbing, grading, bridges, track laying, etc., and all of the work is to be completed by October 1, 1913. The other contract for which tenders are now being asked calls for the construction of a 185-mile section of the Hudson Bay Railway, from Pass Mission to Thicket Portage.

This railway is being built under the auspices of the Dominion Government, and the tenders will be received until August 1 by the Department of Railways and Canals at Ottawa. Tenders on the remaining sections of this railway will probably be asked early next year. In addition to the above, surveys have been practically completed for the construction of the Halifax & Eastern Railway and for the line around the north shore of the Bras d'Or Lake in Nova Scotia, which will be an extension of the Intercolonial system. Tenders for these works are to be asked at once. This work will also be done under the direction of the Department of Railways and Canals.

The Black Sturgeon Lake Bridge

The Black Sturgeon Lake bridge is constructed across the Black Sturgeon Lake, in the township of Mellick, Ontario. The bridge will afford the settlers in the township of Mellick access to Kenora. The bridge is a pile trestle 292 feet long, and consists of 17 spans, 15 feet centre to centre. The bents are of piles, 5 piles in a bent. The floor of the bridge is 14 feet above the water level. Cribbs are built at each end on rock foundations. The caps and stringers are flatted pipe, and the covering is flatted tamarac 5-in. thick. The bridge is supplied with a substantial railing—posts 3 x 4, braces 2 x 6, and hand and hub rail 3 x 6, all of tamarac. The flooring is fastened down with half-inch spikes, 10 inches long. Caps are drift-bolted with 5-8 drift bolts, 18 in. long. The entire cost for work and material was \$1,179.

C.P.R. Bridge at Lachine

The Foundation Company, Limited, on June 1st launched the first of a series of pneumatic caissons in connection with the foundations for the double tracking of the C. P. R. bridge across the St. Lawrence at Lachine. This caisson is quite different in construction and method of handling from that usually employed in such work. The caisson is built on a pontoon made in halves, the two parts being bolted together. After the caisson is constructed to the re-



Pneumatic Caisson

quired height the pontoon is towed to the pier where it is to be sunk. The bolts holding the pontoon together are then pulled out and the water let in, which causes both the pontoon and the caisson to sink. While sinking, the two parts of the pontoon gradually separate, allowing the caisson to settle into position exactly where desired. In connection with this work the Foundation Company has finished two abutments on the north side, two land piers and ten river piers. There are still seven river piers to be put in.

Dust and Its Prevention on City Streets

The Sources of the Trouble and Methods of Alleviation—Frequent Flushing Essential—Palliatives Wrong in Principle—Use of Light Oils

By Arthur H. Blanchard

Public nuisances shall not be tolerated within the city limits is a phrase to be found on all our municipal statute books, and yet repugnant, dirty, dusty streets are characteristic of practically all of our cities. Why should a people who spend vast sums of money for public improvements which add to the comfort of mankind submit to streets covered with dust and dirt of all kinds? One reason is that the large majority of the people of this country do not appreciate that it is economically possible to have clean and practically dustless streets and those who are familiar with cities where clean streets are the rule rather than exception have not the courage of the convictions to make an emphatic protest to those responsible or to carry the issue to the polls if necessary. The present is an opportune time for vigorously attacking the broad problem of prevention of dust on city streets, since it is slowly becoming recognized that clean streets contribute not only to the healthy condition of a city but also play an important part in attracting capital and desirable residents. One must have a callous mind indeed who can drive through the streets of Dresden at any time of the day and not be impressed with the spotless, dustless condition of the streets of that municipality and not feel that it is a desirable place in which to live.

The Sources of Dust

Before considering the effects of dust and the methods of alleviating the nuisance caused by its presence a study of the sources from which street dust arises may be of interest. A self evident source of dust is the mechanical abrasion by traffic of the road or street surface. It is manifest that the degree of abrasion will depend upon the amount and nature of the traffic, the kind of materials used, and the method of construction and maintenance employed. Other sources of street dust depending upon traffic are the deposition of dirt which has adhered to the wheels of vehicles coming from adjacent earth, gravel, or macadam streets, from the leakage of the contents of loaded vehicles both in transit and while loading and unloading, and from the excrement of animals. All street dust is by no means the result of traffic. In sections where shade trees are common a source of dust is to be found in the decay of twigs, bark, and leaves, while pollen, seeds, and spores of various plants are further sources. Mineral matter applied to certain street surfaces to prevent slipperiness is a constant source of dust. Dust resulting from manufacturing enterprises frequently forms a very considerable part of street dust. Mills where pulverizing is carried on, textile establishments and foundries are prolific sources of dust, while soot and fine ashes from chimneys find their way to the streets. From the nature of these sources it is apparent that the composition of street dust is extremely varied and complex.

Dust exerts a considerable pathogenic influence aside from its acting as a conveyor of disease germs. Various delicate membranes are irritated by the simple mechanical action of the dust, with the result not

only of local inconvenience but many times of general debility. The membranes of the respiratory organs are susceptible to this influence, especially if a person be asthmatic. The membranes of the eye are also frequently seriously irritated by dust. In the sections where the dust problem has been successfully solved physicians report a marked falling off in the number of cases of conjunctivitis.

Methods of Prevention

In considering the problem of dust prevention on city streets it is advisable to classify the public ways under two general heads, business and residential streets, and to further differentiate between residential streets which are narrow, heavily shaded with trees and bordered with residences, and those streets which are more or less open.

There is one way and only one way to satisfactorily prevent dust on bituminous, cement-concrete, brick, wood block and stone block pavements which are subjected to excessive horse drawn vehicle traffic. That method consists in removing the dung of animals and other street refuse by hand sweeping during the day, mechanical sweeping of the streets at night, which should be preceded by sprinkling, and finally flushing with water to remove fine dust and thoroughly cleanse the surface of the pavement. Under certain conditions dependent upon the amount and character of traffic and the uses to which the street is subjected it is feasible to omit the mechanical sweeping. It must be realized that it is absolutely impossible to economically remove fine dust by either hand or mechanical sweeping. The use of the so-called dust palliatives and surface treatments on pavements subjected to heavy mixed traffic is entirely wrong in principle, as sanitary conditions require the constant removal of filth from streets, and if this is removed periodically by flushing the effectiveness of these processes is curtailed. Again, periodical watering of pavements to lay dust throughout the day is fundamentally wrong, as the fine dust which necessitates sprinkling should have been removed.

However, bituminous, cement-concrete, brick and wood block pavements may be used on streets subjected primarily to motor car traffic and light horse drawn vehicle traffic such as boulevards, open intra-urban trunk lines, etc. In many cases flushing is not necessarily a prerequisite to cleanliness. Generally patrol hand sweeping throughout the day will be sufficient.

Residential streets may be built with bituminous surfaces or as bituminous pavements, dependent upon local conditions. On this class of street the traffic is usually comparatively light from the standpoint of city traffic. If such streets have a surface coat of the proper kind of asphaltic material the dung of animals and other refuse can be removed by patrol hand sweeping, while the nature of the surface will be such as to absorb fine dust and render the street practically dustless.

For macadam streets in poor condition for superficial treatment or when financial conditions do not

render expedient the use of surface treatments and patrol sweeping, recourse must be had to the use of palliatives such as light oils or light tars. To attain successful results it is necessary that light products having the proper chemical and physical properties should be used in small amount periodically during the season of dust.

In slum residential districts the streets, unless subjected to heavy horse drawn vehicle traffic, should, provided grades will permit, be constructed of water-bound macadam with a superficial coat of refined tar or as bituminous pavements with a seal coat of refined tar. The gradient, however, may require the use of an asphaltic-tar compound or an asphalt for the superficial or seal coat. These forms of construction will give a sanitary surface, one from which excess dirt, dung of animals and refuse can easily be removed by patrol hand sweeping, and which during the night can be thoroughly cleansed by flushing. It should be noted that the nightly flushing with water will add materially to the comfort of the people by perceptible cooling of the atmosphere during the hot summer nights.

In closing it is paramount to emphasize the fact that economical and efficient results will only be attained by municipal ownership of the requisite plant equipment and a well organized force of competent workmen.

Prices on Earthwork Overhaul

The practice of naming a flat price on earthwork overhaul in drawing up contract forms is one which was introduced years ago a price being inserted which was then fair payment for that subdivision of the work, but in many cases to-day it is still adhered to, irrespective of changes in conditions, with the result that payment on this item is not on the same calculated, businesslike basis as the rest of the contract. This clause appears most frequently in railroad contract forms, a price of one cent per cubic yard for each one hundred feet of overhaul being specified. If this practice is analyzed and compared with the method of contracting for other items, it is readily seen that a revision should be made to afford adjustment for varying conditions. It the contractor is to submit a proposal with prices for the various units of work to be performed, he should name the prices on all items. If the engineer or owner fixes the price on the one item, overhaul, which is as much subject to variation as others, it would seem equally reasonable that he should fix the prices on all the work. Then a contractor could look over the list of prices and decide quickly whether or not he wished to look at the work on the ground and consider taking the contract. The prices named might alone cause him to go back home and give no more consideration to the work. This method might throttle competition in a way, for the only competitive bidding could be on the length of time needed to finish the job. Nearly every contract states that "time is the essence of the contract," and as time means money, much is saved to the owner by doing the work in a short period of time. If the prices are fixed, then the variable element would be entirely confined to the time of completion.

It is not usual in sub-letting work to name the prices to be paid. This is done either by setting a price for each class of work, or taking off a given percentage from the general contractors' prices. Sub-

contractors can then either reject the work or accept it.

To have live competition prices should not be set in the contract. Thus it follows that it is as much of a mistake to name a price for overhaul as it is for excavation or concrete.

A uniform price of one cent for overhaul to-day is entirely out of proportion to costs. It is true that in bidding many contractors still name this price, but for team work especially, it is done through lack of careful consideration. In many cases this price will not cover the extra cost of overhaul by teams. But in the case of team work the inapplicability of this price shows up most strongly.

In most sections of the country, teams now bring a price of from five to six dollars per day. At six dollars a day of ten hours, the cost of a team is one cent per minute. A two horse work team will travel under ordinary conditions two hundred feet per minute. Thus a team consumes a minute to carry its load one hundred feet, and to return over the same distance in the empty. The time of dumping need not be considered. Thus with teams at one cent per minute, the cost of carrying a load one hundred feet is one cent. In wheel scraper work, the loaded scraper seldom carries more than a third of a cubic yard place measurement, so three trips are necessary to carry a cubic yard. This makes the cost three cents per cubic yard per hundred feet of haul. Even with teams as low as three dollars per day the cost is one and one-half cents.

If dump wagons are used the cost is less. A wagon rated as one and one-half cubic yards capacity carries only about one cubic yard place measurement. This makes a cost of one cent per cubic yard per hundred feet, but as wagons are not always loaded well, and time is lost in watering horses and in other ways, the cost is always in excess of this price. This shows the fallacy of a price of one cent being named.

A contractor should make a reasonable profit on every item of his work to enable him to make a balanced bid. It is only in exceptional cases that excavated material can be hauled a hundred feet for one cent per cubic yard. This low price is a relic of the times when a team and driver could be hired for \$2.50 for ten to twelve hours. Most frequently it operates to the detriment of the contractor, but sometimes also a fixed price causes a loss to the owner. In either case it introduces an element which is not subject to individual computation and bidding, the uncertainty of which should be removed from the contract.—The Contractor.

The South River bridge, Nipissing Township, Ont., is of steel and concrete. It comprises one steel span 80 feet long, with two reinforced concrete approach spans 30 feet long, making the entire length 140 feet. The steel span is supported on concrete pedestals, which rest on a concrete base. On the southwest side the concrete base is supported on a pile foundation. The floor joists are supported by an 18 inch curtain wall between the pedestals. The shore ends of the concrete approaches are supported on light concrete abutments, with wing walls. The steel span was supplied and erected by the Hamilton Bridge Works Company for \$1,677. Twisted steel bars were used for reinforcement in the concrete beams in the approaches and No. 6 expanded



New Medical Building, McGill University, Montreal

metal floor mesh was used in the floor reinforcement. The pile foundations were prepared under the supervision of D. H. McIntosh, Foreman Public Works, and James Leitch, C.E. The concrete work in the piers and approaches, and the laying of the concrete floor, were done under the supervision of S. W. Butt, Foreman of Public Works. The cost of the bridge complete was \$5,498.

New Medical Building, McGill University

The new medical building at McGill University, Montreal, was formerly opened on June 5th by His Excellency, the Governor-General. The site on which the structure is erected was donated by Lord Strathcona, who also gave over half a million dollars for the construction and equipment of the new building.

The architectural style of the new building is an adaptation of the English collegiate. It is the largest building of the University group, having a total

through vestibules finished with grey sandstone, with vaulted terra cotta ceilings, to the staircase halls, the walls of which, as well as the corridors, are lined with low glazed terra cotta, to a height of 8 feet. Two separate staircases, finished with ornamental balustrades of wrought iron, with marble steps of ample width, lead to the upper floors.

The museum, facing on Pine avenue, is three storeys in height, and is entered from each floor of the main building. The open well for light in the centre is finished in low glazed terra cotta, surmounted by a leaded glass dome, with an outer dome of prism glass. The doors are of mosaic, with marble borders, and the cases for specimens are made of steel.

The building is heated by hot water from the university's own plant.

The architects for this building were Messrs. Brown & Vallance, the general contractor was Mr. E. G. M. Cape, and the following were sub-contractors: Mr. George Roberts, carpentering; and Mr. F. A. McKay, architectural iron work.



New Medical Building—front view, south side

frontage on Pine avenue and on the campus of 268 ft., 4 in. It is built of Montreal limestone and the construction is fireproof throughout. The roof is covered with green slate and copper flashings. The corridors of the building have dull glazed terra cotta walls and mosaic floors, with marble borders. The other floors are all of hardwood. The finish throughout is white quartered oak.

The entrances from the Campus and from University street are by broad flights of granite steps,

Dump car bodies were altered so as to be readily lifted from the trucks by derricks and dumped as skips, in the excavation of a part of the North Shore channel of the Sanitary District of Chicago. This was done to meet a condition where the settlement and flowing of the soft clay on the dump made it difficult to maintain dumping tracks near its edge. Travelling derricks, standing on the solid fill and advancing with it, lifted the car bodies by means of a gear of chains, with a spreader bar, engaging hookeyes at the ends and one side. The dumping door on that side was permanently fastened in the closed position, while the other retained its swinging arms. The hinged door was held by a line in the chain gear so that it swung open in the usual way when a trip line at the opposite closed side tipped the body toward it to dump. The car bodies were swung out beyond the solid fill, dumped and returned to their tracks.

The British-Canadian Ship Building & Dock Company has been organized in London, Eng., with a capital of \$10,000,000. Sir Henry Pellatt, of Toronto, is chairman. The company has secured a site of over 300 acres at Sydney, N.S., for new shipbuilding yards, docks and shops. The estimated cost of the plant which it is proposed to erect there is \$6,000,000.

Notes on Reinforced Concrete Design

A Few Points Affecting the Engineer and Contractor—Reduction of Live Load Insufficient to Overcome Settlement of Footings—The Bending Moment*

By C. S. L. Hertzberg.

In designing reinforced concrete structures one is continually meeting minor problems, upon which very little satisfactory information can be obtained from the numerous treatises on the subject. In the following paper I shall endeavor to enumerate a few points in design which are sometimes apparently not given the attention they deserve.

Footings have probably given more trouble to the designer, the erecting contractor and the owner, than anything else in connection with reinforced concrete. Unequal settlement in footings is responsible for numerous unsightly deformities and cracks and some collapses.

The common type of reinforced concrete column footings is, of course, easily dealt with, and differs from a plain concrete footing only in its being designed as a flat slab to resist bending instead of being sloped off as a pedestal. In this type of footing the centre of pressure coincides with the centre of gravity of the footing area, and the required size is formed directly from the load to be carried and the resisting power per square foot of the soil. Trouble is sometimes caused by having a footing too large in comparison with the size of the other footings in the same building. This is particularly liable to happen in the design of wall column footings in the following manner:—

If the footings are designed to carry the total dead and live load, figuring each floor of the building fully loaded, then the interior footings will, under probable loading, not stress the soil as highly as will the wall column footings. The reason for this is, of course, that the load figured to come on the wall column footings is usually about 70 per cent. dead load (which is present under all conditions) and 30 per cent. live load (which is never all there), while that figured on the interior column footings is generally about 40 per cent. dead and 60 per cent. live. As the live load on the footings of a building of five storeys or more is never more than 50 per cent. of the total live load, it will readily be seen that the pressure per square foot is less on interior footings than on exterior ones.

As all soil is compressed under any loading, the interior footings will not settle as much as the exterior ones, and the result is sometimes the cracking of floor beams and slabs.

The difficulty is overcome, to a certain extent, by the custom of reducing the live load by about 50 per cent. in buildings of over a certain number of storeys. This, however, would appear to be insufficient, and it would seem that either a greater reduction should be figured in designing interior footings, or else no reduction at all should be allowed in figuring exterior column footings. It would also appear to be wise to even add a small percentage on corner column footings, as a much larger portion of the wall coming on these is dead weight.

It very often occurs that the footings under wall columns cannot be built to extend beyond the outside line of the column. In cases of this kind some sort of combination footing should be used. This is sometimes done by carrying the column in question on a cantilever beam, pinned down at the other end by one of the other columns. In this type care must be taken to reduce the footing under the

second column in proportion to the upward thrust from the end of the cantilever beam.

A simpler method of treating the above is as follows:—

Consider the wall column in question and the nearest interior column as acting together on a combined footing. Figure the loads coming on both columns and find the position of their resultant load. Add the two loads and divide by the soil value per square foot. This will give the required footing area. Design a footing of this area and varying in width from one end to the other in such a way that the centre of gravity of the area will coincide with the point of application of resultant from the two column loads. The thickness of the footing and the reinforcing material must now be designed, treating the footing as an inverted beam, supported at the two columns and resisting the upward pressure of the soil, which will be of an intensity per square foot equal to the soil value, minus the weight per square foot of the concrete in the footing.

The above method can be used for designing combination footings for any number of columns.

Figure 1 shows a footing of this type designed to carry the four columns indicated, whose loads were (1) 267,000 lbs., (2) 347,000 lbs., (3) 248,000 lbs., (4) 197,000 lbs. The soil value assumed was 5,000 pounds per sq. ft. Column 1 was a corner column, 2 and 3 were wall columns, and 4 was an interior column. The footings could not extend beyond the lines a b and a c. The footing was designed as follows:—

Sum of column loads=1,095,000 lbs.

Sum of moments about side a b=10,272,166 foot
10272166

pounds. Therefore centre of pressure is $\frac{10272166}{1095000} = 9$
1095000

ft. 4½ in. from a b.

Taking moments about line a c, we find centre of pressure is 7 ft. from a c.

This locates the point x, the centre of pressure.

109500

Area of footing required $\frac{109500}{5000} = 219$ square ft.

5000

The lengths 18 ft. 6 in. and 14 ft. of the sides a c and a b are now arbitrarily assumed.

Area of rectangle a b c d=259 sq. ft.

Area of footing required =219 sq. ft.

Area to be deducted = 40 sq. ft.

Deduct area e f g h 7x6 = 42 sq. ft.

Let x = distance from a c to centre of gravity of area to be deducted.

Let y = distance from a b.

$259 \times 7 - 217 \times 7$

Then x = $\frac{42}{42} = 7$ ft.

42

$259 \times 9.25 - 217 \times 9.38$

And y = $\frac{42}{42} = 8$ ft. 7 in.

42

which locates the position of the area of e f g h, which will give a footing whose centre of gravity coincides with the centre of pressure x.

The footing was then designed for bending by treating

* Before the Canadian Cement and Concrete Association.

it as four beams between the four columns, figuring on 5,000 pounds per square foot upward pressure, minus the weight of the concrete in the footing.

While the centre of pressure will, of course, shift under different conditions of column loading, still the variation cannot be sufficient to cause a serious settlement of any part of the footing.

In some cases it is very difficult to economically combine a wall column footing with any other footing. Where this is the case the footing is increased towards the inside of the building and along the wall. When this done the

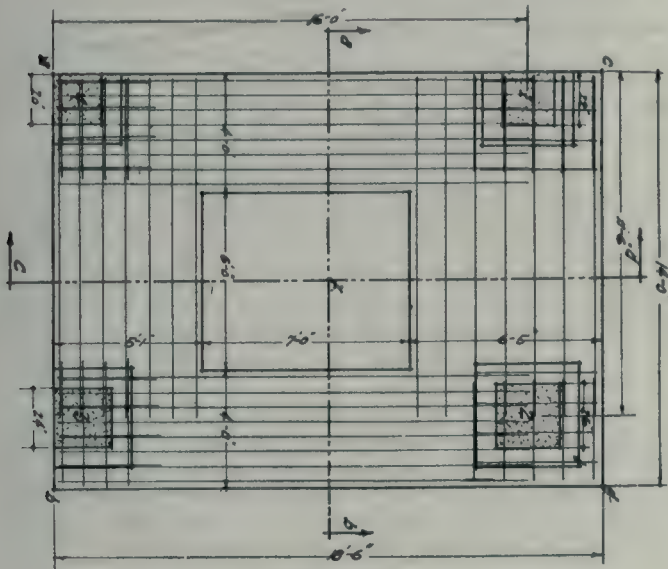


Fig. 1—Plan.

column must, of course, be tied in at the top and figured to resist the bending caused by the eccentric loading on the footing. This bending is generally increased by the bending moment from the eccentricity brought on the column from the floor loads.

A point in designing reinforced concrete which is often overlooked is the bending produced in wall columns carrying long span beams. This moment seldom gives trouble in the lower tiers of columns in a building of any considerable height, as in such cases the columns are so heavily loaded that the eccentricity is not sufficient to produce actual tension in the outside of the column.

The common practice of designing wall columns 20 per cent. heavier than interior columns does not always overcome this tendency to crack from bending, as the extra strength is not applied in the proper place.

Consider the roof columns of a building of considerable width in which the roof beams span from side to side with no intermediate support. The usual custom is to carry the column reinforcement to within a few inches of the top of the roof slab, and to bend the anchor bars of the beams down into the columns the usual depth to prevent cracking in the upper surfaces of the beams near the ends. In a building designed in this way the result is pretty sure to be cracks across the outer surfaces of the columns immediately under the level of the bottoms of the beams, even though the roof be under no load other than the dead load of the structure itself. The reason for this is that the beam deflects under its own weight and the weight of slab carried. This deflection produces a tension in the upper surface of the beam at the end, which tension is also present at the outer surface of the column where it is altogether liable to produce large cracks. These cracks can be seen in many buildings. They should be provided against by increasing the reinforcing steel in the outer side of the col-

umn. This reinforcement should not be stopped at the roof level, but should be bent in along the upper surface of the beam. The use of plain steel rods for reinforcement in these columns (if the same are not bent over as described) increases the liability to crack, owing to the fact that they must be embedded to a greater distance than deformed bars in order to develop their tensile strength. Cracks of this nature are, of course, more unsightly than they are dangerous, for beams supported in this manner are usually designed as non-continuous over the supports and should be of the required strength whether pinned down to the columns or not. However, the bond with the column is an added strength to the beam and should be preserved.

The placing of brackets under a beam of the above description does not overcome the difficulty, and is, in my mind, poor practice. The brackets tend to spread the columns by causing the beam to act as an arch whose thrust is not properly taken care of, and cracks will very likely occur on the outer surface of the columns under the brackets. This construction acts, to a great extent, like a roof truss without a tie rod.

Reverse bending should be given particular attention in the design of highway bridges where heavy moving loads have to be provided for. In short span culverts where a flat slab is used this reverse bending at the abutments, if not properly taken care of, may result in a failure which has all the appearance of a shear failure, and such it may be after a certain point, although it has probably started in tension cracks in the upper surface of the slab.

Consider a culvert, say 12 feet clear span, to be designed to carry a 15-ton road roller. The slab is designed as non-continuous, and enough steel is inserted in the bottom to give a resisting moment to properly take care of the total maximum bending moment liable to come on the culvert. In all probability the concrete itself will figure to take care of all the shear at 50 pounds per square inch, and therefore no extra provision is made against failure through shear.

At first glance this culvert would appear to be properly designed to insure against failure from any cause, for, as the slab is not figured continuous over supports, it does not seem necessary to put any steel in the top of the slab at the abutments. This conclusion would be safe if the slab were cast separate from the abutments, but if (as is nearly always the case) the abutments and slab are monolithic the following is liable to occur:—

A heavy vibratory load comes to the centre of the span and produces considerable deflection, and as the slab is tied



Fig. 2—Section on Line A-B.

down to the abutment, tension is produced in the upper surface of the slab and on the outer surface of the abutments. The slab, being thinner than the abutment, cracks on the top just inside the line of the abutment. Then as the load approaches this point the shear is increased and the cracked concrete is probably not capable of resisting this shear and collapses. This failure might have been prevented in three ways, namely, by the use of top steel, by the use of steel shear members, or by having a complete horizontal joint between the slab and abutment.

The advantages of what is known as flat ceiling construction are many, the most desirable among them being

the appearance produced and the economy in floor height. The chief disadvantage in the most common types is our lack of scientific data on the subject. In a well-known type opinions differ nearly 100 per cent. as to the bending moment to be figured in slabs under the same loading. In the Engineering Record of 24th December, 1910, there is an account of some measurements made to obtain the strain existing in different portions of a flat slab floor under working loads. From these strains the existing stresses are figured. The results of these measurements appear to indicate that some designers are over-sanguine about the carrying capacities of this type of floor.

A more conservative design of flat ceilings is effected by increasing the width of the beams and decreasing their depth until the underside of the beam is flush with the underside of the slab. The slab in these cases is usually made up of small reinforced concrete joists, with tile fillers in between and two or three inches of concrete over the top to aid in compressive resistance.

In this type of floor the stresses are known and the strength can be figured along the same lines as the ordinary slab and beam construction. The tile fillers are placed as much as possible below the neutral axis of the slab, so as not to decrease the compressive resistance of the concrete, and of course they decrease the dead load of the floor. This type of floor is not as economical in steel as the usual slab and beam construction on account of the decreased

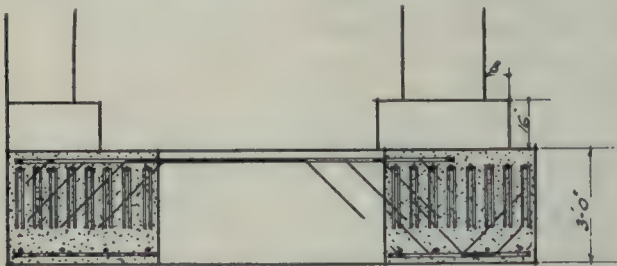


Fig. 3.—Section on Line C-D.

arm of the resisting couple of the steel in tension and the concrete in compression.

Two-way reinforcement in a rectangular panel, designed according to the accepted theory of reductions in bending moments, effects economy in concrete only. If the bending moments each way be reduced in the usual manner

B_1

of multiplying by ——— for the shorter span and by

$A_1 \times B_1$

A_1

——— for the longer where A represents the shorter span

$A_1 \times B_1$

and B the longer, the steel may be slightly reduced by placing less near the edges of the panel than near the centre. This reduction is, however, offset by the fact that, in using bar reinforcement the amount of resistance of the upper layer of steel is decreased by the decrease in the resisting arm of the forces. The saving in concrete is, of course, effected by figuring it to take its full working compression, in two directions at right angles to one another.

Before closing I would like to enter a plea for the standardization of unit stresses and formulae in reinforced concrete design throughout Canada. Some things, of course, cannot be standardized, but such points as ratio of the moduli of elasticity of steel and concrete, the allowable working compressive strength of concrete, both in bending and in direct compression, the limits of tee action, etc., might be definitely settled and adhered to by all designers. If it is safe in one city to design a continuous beam uniformly loaded to resist a bending moment of one-twelfth WL, then it is equally safe to do the same in the next city,

despite the fact that the second city insists on it being designed for one-eighth WL. Other points might also be straightened out, such as whether a specification should insist on using 12 for the ratio of the modulus of elasticity of steel to that of concrete, when in another part it calls for a working stress of 350 pounds per square inch for the concrete in a column and 10,000 pounds for compressive steel embedded in the same column.

Pushing the G. T. P. Main Line

It is expected that great progress will be made this summer upon the construction of the G. T. P. main line through the mountains. Last summer operations were delayed owing to the shortage of both supplies and men on the eastern and western slopes. The closing of the Skeena river a month earlier than usual last fall shut supplies out on the Pacific side, and made the usual winter operations on such cuttings and tunnel work almost impossible. However, contractors made a special effort during the winter to get in supplies and succeeded in placing large deposits along the route, which can be drawn upon for summer work. An abundance of labor is available for work on the eastern side of the mountain and prospects are good for a fair number of laborers being obtained for summer operations on the Pacific side.

It is expected that before operations are held up by the arrival of winter the two ends on the line will be driven far into the mountains from both ends and will be brought so closely together that the following summer the gap will be spanned and the two ends joined, thus completing the western through line from Winnipeg to Prince Rupert.

Rails and Fishplates Required for South Australian Railways

Tenders will be received at the office of the South Australian Government's Supply and Tender Board, Adelaide, up to 3 p.m. on July 4, 1911, for the supply and delivery of: 5,565 tons steel rails, 80 lbs. per lineal yard; 820 tons steel rails, 50 lbs. per lineal yard; 188 tons steel fishplates, for 60-lb. rails; 51 tons fishplates, for 50-lb. rails; 97 tons steel fishplates, for 41-lb. rails.

The 80-lb. rails and the fishplates for 60-lb. and 41-lb. rails to be delivered upon trucks on wharf of Port Adelaide, the contractor paying the wharfage; the 50-lb. rails and fishplates for same to be delivered upon trucks on railway wharf at Port Pirie, the contractor paying the wharfage, 1s. per ton. Customs duty will be paid by the South Australian Government.

The Brush Electrical Engineering Company, whose Canadian agents are the Canada Ford Company, Montreal and Winnipeg, are now executing in the steam turbine department of their Loughborough works, orders for government, municipal, and electric companies' stations, including two sets of 1,200 kw. for the Admiralty, three of 1,200 kw. for Edinburgh, two of 3,000 kw. for the North Metropolitan Company, one for 2,000 kw. for the Birmingham and Midland Company, one of 1,000 kw. for Walthamstow, one of 650 kw., and another of 400 kw. for Luton, one of 450 kw. for Kettering, and one of 300 kw. for Banbury, in addition to many others for private industrial undertakings.

St. Boniface, Man., is establishing a new record this season for expenditure on municipal work. About \$250,000 will be spent on bitulithic pavements, \$200,000 on sewers and \$75,000 on the waterworks. A large sum will also be spent on smaller contracts and improvements.

Montreal—The Commercial Metropolis

An Excellent Report:—Progress Satisfactory, Labor Troubles Nil, Contracts Plentiful, Numerous Large Building Projects Approved—The Work in Hand

Special to the Contract Record

Office of the Contract Record,

Montreal, June 17, 1911.

There seems to be no lull in the activity in connection with real estate and building operations in Montreal and vicinity. Rapid progress is being made on all the buildings under way, no labor difficulties having developed up to the time of writing.

Montreal High School to Build

One of the most interesting features of the last few days was the sale of the Montreal high school and the purchase by the school commission of a property on which they will erect a new building to replace the one now occupied by them on Peel street. The purchaser of the present building was Mr. J. C. McGreevy, of Winnipeg. The area is about 95,000 square feet and the price paid, \$1,500,000. The new school property is on University street, between Sherbrooke and Milton streets, adjoining the Diocesan Theological College. It is the intention of the commissioners to make a thorough inquiry into the best methods of school construction and as soon as arrangements can be made to erect one of the best planned and equipped high schools in the Dominion. It is not known what the purchaser of the old high school property intends to do with it. It is situated just north of St. Catharine street and in rear of the stores of John Murphy & Company and other prominent merchants. There is a suspicion in the minds of business men that eventually this whole block will come under the control or ownership of a single person or corporation and will probably be the site of a great departmental store.

Another deal that indicates a vision of the future and faith in the commercial metropolis of the Dominion is the sale of Knox Church on Dorchester in rear of Y. M. C. A. About a year ago the Sun Life Assurance Company of Canada purchased the Y. M. C. A. property and now they have purchased the church property to prevent, as they say, its purchase by speculators who might use it for some purpose that would detract from the value of the handsome building which the company intends to erect facing on Dominion Square. The price paid for the church was \$150,000. The area of the land is 150 by 80 ft.

Theatre Projects

The increase in the number of theatres in the city of Montreal within recent years has been almost phenomenal, and still there are others projected. A week or two ago the announcement was made that the Sparrow Amusement Company had secured possession of a site on St. Catharine street near the Theatre Francais on which would be constructed a theatre with a seating capacity of 2,100 people. It is announced that this place of amusement will be open for business in October. The latest theatre project, however, is the erection of a new fireproof building at the corner of St. Catherine and Maisonneuve streets. Thé proprietor is Alderman J. A. E. Gauvin. This theatre will hold 1,250 people. The property will have a frontage of 85 feet on St. Catherine street and 126 feet on Maisonneuve street. It will be constructed of brick and stone with concrete foundations and fireproof foundations in the interior. In addition to the entrance on St. Catherine street, which will be large and attractive, there will be three stores. Over the stores will be a number of offices. This portion of the building

will be five storeys high. The top storeys will be available for light manufacturing. The entire cost of the building is estimated at \$155,000. Mr. C. Bernier is the architect. The contract has not yet been let. Several old stores were demolished and removed to make room for this splendid new structure.

Another example of improvement is seen at the corner of Craig and St. Alexander streets where a splendid property which for the past forty or fifty years, has been used as a wood-yard, is about to become the site of the new "Herald" building. Excavation work was commenced a few days ago by the contractors, the Bishop Construction Company, Limited, of Montreal and Toronto. The property has a frontage of 80 feet on Craig street and 148 on St. Alexander street. It will be seven storeys high and thoroughly fireproof. Reinforced concrete will enter largely into the construction with brick backing. The front of the building will be faced with first quality brick with ornamental iron and terra cotta trimmings. There will be an unusually large amount of window space on all sides of the building and the ornamental panels between the windows of the different floors will be of cast iron. The partitions will be of concrete on expanded metal. The windows will all be constructed with metal sash. The sides of the elevator walls will be of wired glass. The stairways will be of reinforced concrete with slate treads. The roof will be tar and gravel. The architects are Messrs. Brown & Vallance.

Building Inspector Chausse to Have Adequate Assistance

At last it looks as if Mr. Alcide Chausse is to have a reasonable amount of assistance in the performance of his duties as building inspector. The announcement is made that an examination will be held at the city hall on June 20th for the purpose of finding a suitable assistant head for this department. Several applications have been received and the appointment cannot come too soon. It is sincerely hoped that a really competent man will be selected and that this will be only the first of a number of appointments that will be made to bring the building inspection department up to a reasonable state of efficiency. The department has always been under-staffed, so that no matter how good or efficient, or diligent the inspectors might be they could never keep up with their work. Still there has been no public criticism on this point, but the complaint on all sides has been that there were not inspectors enough to maintain a proper oversight of the rapidly expanding operations throughout the city.

Following up a campaign recently carried on in the local newspapers, on the subject of fire escapes, Mr. Chausse has sent out a large number of notices to factory proprietors and others, ordering them to construct approved fire escapes on their buildings and that in a manner that will be of practical use when they are in place. The complaint of the chief of the fire department recently was that a large number of fire escapes were not easily accessible from the upper windows and in other cases the bottoms of the ladders were in lanes or back yards surrounded by other buildings or fences or blocked up by other means. Mr. Chausse has been paying special attention to these conditions and recently sent out 25 notices in one day asking people to remedy certain defects in their apparatus. In a few cases where notices

were received ordering the erection of fire escapes the parties notified, wrote to the building inspector saying that they had ordered fire escapes, but the factories although overworked were unable to turn out the apparatus fast enough.

The school trustees of Outremont recently purchased 60,000 square feet of land on Lajoie street for school purposes. A large up-to-date school will be erected in this locality as soon as the necessary arrangements can be made.

The Long Pointe Board of School Commissioners are having plans prepared for the erection of two schools in that ward. One will cost \$20,000 and the other, which will be a three-storey fireproof structure, will cost \$40,000.

Proposed Montreal Hippodrome

Good progress is reported in connection with the proposition to erect in Montreal an immense hippodrome for the accommodation of amusement companies that hitherto have been unable to perform in Montreal except in tents. This structure is being erected at the corner of St. Catherine

around the seated portion of the auditorium will be a promenade 18 feet wide and 300 feet long which will provide room for 3,500 more, making ten thousand people in all who will be able to witness the largest performances. The stage will be 150 feet wide by 116 feet deep. It will have a moveable floor which can be instantly removed and under which there will be a tank of water 44 feet by 80 feet and 14 feet deep. The proscenium opening will be 44 feet by 80 feet. The tower will be constructed to serve numerous useful purposes. On the second floor will be a room known as the "surprise" room. It will contain the latest electrical appliances and the walls will be beautified by various examples of the decorator's art. The third floor of the tower will be reserved for the board of directors and the fourth for the shareholders. On the fifth floor will be a fashionable restaurant furnished in the style of Louis XVI. This room will be 180 feet above the level of the street. From the windows and the galleries surrounding it a magnificent view of the St. Lawrence and the city of Montreal will be obtained. This room will be surmounted by the main dome which will be constructed largely of glass and will be brilliantly illuminated with myriads of electric lights. Two elevators will convey patrons to these places of interest.

The material used principally in the construction of this immense auditorium will be Kittling yellow brick with sandstone trimmings. The windows will have metal sashes. The stairs will be of iron, with marble treads and bronze handrails and balustrades. The floors will be in mosaic with marble base and dadoes. Notwithstanding that the building is practically fireproof it will be supplied with fire escapes on three sides. Tenders will be called for shortly.

Dominion Express and Other Big Buildings Under Way

Excellent progress is being made on the new Dominion Express building and the transportation building situated on the northwest and southeast corners of St. James and St. Francois Xavier streets. Cement floors have been put in for several storeys in the Dominion Express building and at the time of writing the stone work on Fortification Lane and St. Francois Xavier street is nearly up to the St. James street level. The first section of steel work has nearly all been placed in the transportation building. Reinforced concrete foundations form the bases of these iron columns and it is expected that this huge metal skeleton will grow up very rapidly to the ten storey height which it is planned to reach. On the opposite corner the work of demolishing the front of the general post office has been commenced. A side entrance is being constructed on the St. Francois Xavier street side which will enable the public to reach the receiving and mailing wickets without too much inconvenience. The plans for the new structure have been prepared by Mr. Theo. Daoust, architect, and show a fireproof structure with quite an altered and improved front. The general contractor is Mr. Joseph Bourke.

The steel work of the annex to the General Hospital is now practically all in place and good progress is being made with the stone, brick and concrete construction in the lower storeys. The corner stone was laid on June 5th when His Excellency, the Governor-General, officiated, and a large number of prominent citizens were present to witness the interesting ceremony which took place on the ninetieth anniversary of the establishment of the institution.

The walls of the new Central Y. M. C. A. building on Drummond street are now about half way up and the proportions of the building begin to be apparent to the passer-by. Good progress is also being made with the Westmount and Annex branches.

The excavation work for the new East End Post Office at the corner of St. Catherine and Plessis streets is now near-



Front Elevation Montreal Hippodrome

street and Papineau avenue by the Montreal Hippodrome Company, Limited. Messrs. H. H. Brosseau & Company, real estate brokers, are the promoters. The building is to be ready for opening in February next.

The plans are being prepared by Mr. Theo. Daoust, architect, St. James street. The St. Catherine street frontage is 150 feet and that on Papineau avenue, 300 feet. Over the main entrance will be a tower surmounted by a dome that will reach the total height of 250 feet from the sidewalk. It will be 40 feet wide at its base, while the main vestibule will be 36 by 38 feet. The globe surmounting all will be supported by four magnificent statues of Atlas, each 18 feet high, and will be illuminated with powerful lights.

The ground floor of the plan shows two stores in the front, one on each side of the main entrance. The main hall will have a seating capacity of 6,500, two and one-half times larger than any theatre at present in Montreal, and

ly completed and it is expected that good progress will be made in connection with the superstructure from now on.

The Montreal Terra Cotta Lumber Company has commenced operations in connection with the establishment of an extensive up-to-date terra cotta plant at Lakeside, a few miles west of Montreal on the property known as the Goldstein farm. This farm consists of 46 acres and was purchased last November by Senator Desjardins, president of the company. The property runs back for the greater part of a mile from a bluff some 60 feet high which fronts on the C. P. R. line. The clay formation goes to a depth of some 40 feet below the level of the railway track, making the depth of clay probably 100 feet throughout the entire area of the farm, which, it is estimated, will give the company as much material as they will be able to work up in the next fifty years. The C. P. R. is building a siding from its main line to the site of the terra cotta yard. Tenders are being called for the kilns, and the plans for the dryers are nearly ready. The most up-to-date machinery on the market is being purchased for delivery whenever the machinery buildings shall have been completed. It is estimated that the total cost of the plant will be in the vicinity of \$150,000. The intention is to have it ready for operation this fall, but little work will be done apart from testing the machinery, etc., until next spring. The company's property in Maisonneuve will be sold and their operations concentrated at the Lakeside property. The capacity of the plant will be from twelve to fifteen cars a day. Crude oil will be used for firing or kiln burning and the machinery will be run by electric power supplied by the Montreal Light, Heat & Power Company. Seventy-five men will be employed. As terra cotta is entering more and more into fireproof building construction every year its importance can scarcely be over-estimated and the move made by this company in securing the property for their new plant must be regarded as a very wise one.

Chalet Apartments, Montreal

The Chalet apartments, which are being erected at the corner of Prince Arthur street and Oxenden avenue, Montreal, represent the most advanced type of modern fireproof, sound, roof, and damp-proof construction. The building will contain 26 residential suites. It will be four storeys in height besides the basement. Each floor is arranged in six apartments of seven rooms each. The building has a frontage on Prince Arthur street of 76½ feet and on Oxenden avenue of 106 feet. The facing will be of red brick with handsome trimmings in rustic effects. The main entrance will be spacious and artistic; the various departments will be provided with heavy, roomy, balconies of solid oak which will enable the tenants to enjoy the outside air whenever the weather is favorable. The architectural design is of the Swiss Chalet character and the entire construction is to be carried out in reinforced concrete.

The Chalet apartments will be absolutely fireproof. Messrs. R. P. & H. A. Adams, the architects and proprietors, having decided to admit of no fire risks in the construction of this building. There will be no wooden studs throughout the entire structure. All the partitions will be of metal, cement and terra cotta. Those between the various apartments are being constructed of four-inch hollow terra cotta blocks, giving insulation from sound as well as being fireproof. The partitions between the various rooms of the same suite will be constructed of Kahn Hy-rib metal sheeting, plastered with Portland cement mortar to a thickness of two inches. No wooden laths will be employed. All outside walls are lined with hollow partition blocks, making the driest and warmest wall possible. The basement walls are thoroughly damp-proof. The stairways will be of iron with marble treads.

The floors are constructed according to the Kahn three-tile system in which hollow partition tile are used in conjunction with reinforced concrete to form a cellular floor, mostly air spaces, in this case ten inches thick. This arrangement gives a very stiff floor, incombustible and impervious to sound; it also obviates the necessity for beams projecting below the ceiling. The floors will be finished in hardwood laid on cinder concrete over the fireproof surface already described. As there can be no circulation of air from the under side, this wood could only burn slowly, if at all. The reinforced concrete columns supporting this structure have been made strong enough and are arranged to carry two additional storeys when required.

The structural design and the reinforcing steel hy-rib sheeting and terra cotta partition tile were furnished by Mr. G. B. Reynolds, engineer and sales agent in Montreal for the Trussed Concrete Steel Company.

The general contractors for this structure are Messrs. Byers and Anglin. They commenced tearing down the old building on the site on May 10th and have made splendid progress during the first month. There is every prospect of their finishing the building in the fall, the intention being to have the apartments ready for occupancy by the beginning of the new year. The cost is estimated at \$150,000. The electric wiring is being done by Mr. W. J. O'Leary, and the plumbing and heating by Messrs. Hickey & Aubut.

The "Coronation" building is the name chosen for a new four-storey structure to be erected at the corner of St. Catherine street west and Bishop street for Mrs. D. E. Borrie. The property has 74 feet frontage on St. Catherine street and 110 feet on Bishop street. The ground floor will be occupied by six stores. The total height of the building will be 60 feet. The base will be of Montreal limestone, while above the first floor art stone will be used with ornamental iron facades. The store entrances will be very attractive. In addition to the features already mentioned the plans show accommodation for fifty offices in the block. The architects are Messrs. McDowell & Henderson, of Guy street; the general contractor is Mr. G. W. T. Nicholson, Eastern Townships Bank Building; and the sub-contractors Messrs. D. M. Long, carpenter work; R. D. Clark & Sons, plastering; D. A. Bethune, heating and plumbing; John Wilson, painting; Phoenix Bridge Company, iron work. The Calkins Tile & Mosaic Company will supply the tile and marble. The foundation will be of concrete on piling. The total cost is estimated at between \$70,000 and \$75,000.

The contractors are just putting the finishing touches on a French Methodist Church at the corner of Ontario and St. Andre streets. The structure is in red brick and will cost between \$15,000 and \$20,000. A feature of the building, which is somewhat in the nature of an experiment, is the flooring of "Terrano." This is believed to be one of the first instances of the use of this material in a church, or similar public building. The architects were Messrs. Peden & McLaren, and the contractors Messrs. Peel & Peel, masonry; D. V. Smith, carpentering; J. A. Alexander, painting and glazing; John Date, plumbing and heating; Metal Shingle & Siding Company, roofing; E. A. Gregory, electric lighting.

Our Chicago contemporary, Engineering-Contracting, has decided to substitute the conjunction "and" for the hyphen. In future, therefore, it will be known as Engineering and Contracting. The reason for the change is that the hyphenated name has been understood by quite a few people to mean only contracting for engineering works, whereas it was intended to denote the co-ordinate branches of engineering and contracting.

Winnipeg—The Hub of Western Activity

City Building Code and Public Health Act at Variance—All Branches of Trade Busy—Progress on Larger Contracts—Crop Prospects

Special to the Contract Record

Winnipeg, June 16, 1911.

Winnipeg's building trades had something of a shock a little less than a month ago when it was discovered that there was considerable variance between the city building by-laws and the new Public Health Act passed by the provincial government at the last session of the house. In this act provision was made to prevent the too great crowding which is recognized as one of the objectionable features of city life. It has been the practice to build apartment blocks and tenement houses to cover the whole of the lot, and the civic authorities were the first to recognize the growing danger. They drafted a by-law which specifies upon what percentage of the lot the owner may erect such buildings.

This spring the Manitoba Government also took this

is the worst in Canada to handle. Supplies of material are coming in rapidly and there has been no trouble from this cause, nor is there likely to be any.

Progress on Larger Work

The greater portion of the work on the new Transcontinental Railway bridge across the Red River at Winnipeg has been completed. The main steel has all been placed and little remains now except the installation of the lifting machinery and the weighting of the counterpoise. The steel gang is pushing the viaduct south to connect with a second gang which is building northward from the Union depot. A strike and the non-arrival of steel are stated as the causes of the tie-up on the bridge across the Assinaboine. The blocking of navigation at this point by the sections a!



Another view of the Transcontinental Railway Bridge across the Red River

matter up, among others when they were drafting a new Public Health Act. Recognizing that proper sanitation and supply of pure air were impossible where congestion of buildings existed they inserted a similar clause, but with a greater percentage of clear space.

This spring plans were made for the erection of a large number of apartment blocks and architects proceeded along the line of the city bylaw. Later it was discovered that their plans did not agree with the provincial act and for a time there was consternation, as something over a million dollars' worth of buildings were involved. To make these comply with the Act would have involved the redrawing of all plans and considerable delay in starting work. The government was approached with the result that it has been decided that the Act will not come into force until July 1, this permitting the plans already completed to be filed and passed upon by the building inspector.

Unskilled Labor in Demand

There is a great rush in building circles at present and all classes of artisans are well employed, while unskilled labor is in great demand. The contractors who laid down their foundations last fall are making excellent progress but the heavy rainfall of the last three weeks has greatly hampered excavation work, for Winnipeg dirt when it is wet,

ready installed will be brought to the attention of the railway commission.

Delivery of steel has begun at the Sterling Bank building on Portage avenue and it is expected that this structure will shortly be above the street level. The foundations have not been completed and because of the delays the contractors have been put to considerable expense in shoring the excavation. The steel delivered is second in size only to that placed in the Bank of Montreal building, and the plans call for a structure of truly magnificent proportions.

The Bank of Montreal on the Main-Portage corner is getting along rapidly. One of the huge pillars has been carried up to the cornice level on the front, so that it is now possible to get something of an idea of what the finished structure will be. At the same time interior work is being rushed with all possible speed. The stonework of this building is the most massive yet attempted in Winnipeg, the granite blocks for the bases of the pillars weighing 18 tons apiece, necessitating great care in the placing.

The contractors for the addition are now testing the foundations of the Somerset Block. A load of 180 tons of pig iron is being applied to some of the pillars. If they sustain this weight without undue deflection construction will be proceeded with at once. The piling for the foundations

of the new Y. M. C. A. building is practically completed, and the masons will be at that job within a few days. The plans for the new Free Press building will be completed in a few days and contracts will be called for at once. At the Bank of Commerce building the foundations have been completed and the steel for the first floor is in position. These foundations are among the heaviest yet attempted in the city for the structure will be a most massive one with solid stone front and heavy interior construction.

Transcona Shops To Cost \$6,000,000

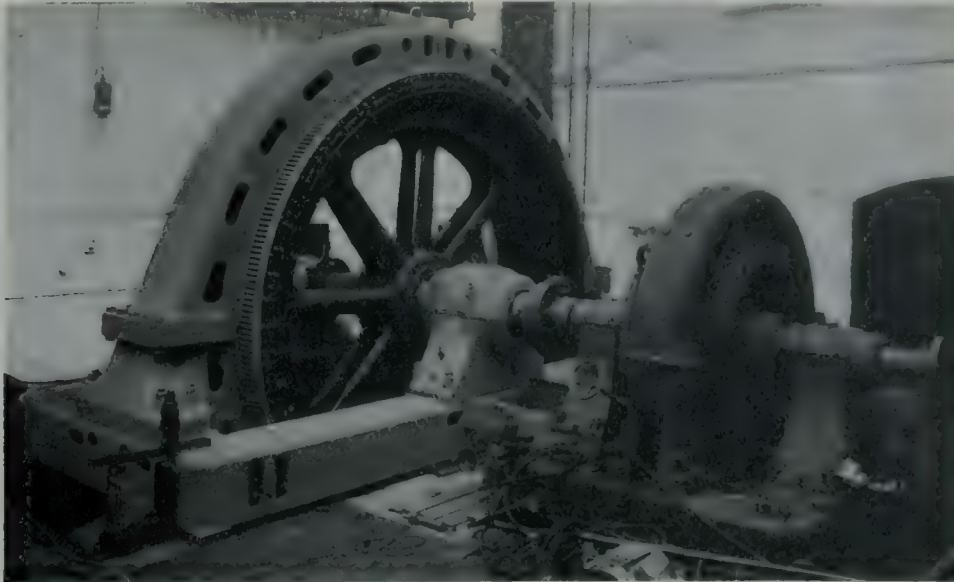
The new shops at Transcona, near Winnipeg, for which tenders are being called by the commissioners of the Transcontinental railway comprise eleven buildings in addition to the indirect heating plant, the yard crane runway and the sewer system. The eleven buildings include lumber sheds, scrap platform and storage bins, freight car shop, planing mill, paint storehouse, coach paint shop, coach shops east and west, car department office, and motive power office. Contractors are asked to tender on these additions in bulk.

It is expected that the cost of these new buildings with their equipment, will run close to \$2,500,000, which will bring

undertaken. There is a delay at the plant due to the decision of the engineers to strengthen some of the dams and retaining walls, but in the meantime the installation of turbines, generators and transformers is progressing rapidly. Officials are chary of expressing any idea as to when it will be possible to place the plant in commission, but the general impression is that December will see it in full swing.

A Great Crop in Prospect

Crop conditions and prospects have had a great deal to do with the present building situation, for with the vanishing of fears of early drought has come the desire to rush to completion many of the buildings planned last winter. Conservative estimates place this year's crop at 200,000,000 bushels of wheat with even average weather from now until harvest. Soaking rains have occurred, with the result that the crop can now go well into July without further moisture. The grain has a splendid stand and is deep rooted with a vigorous growth. The Red River valley country has suffered somewhat from excessive rain, but this will hardly affect the grand total of production. It is one of the most



Winnipeg Hydro-Electric Plant.—One of the big generators in position on the testing bed at the works of Messrs. Vickers, Sons & Maxim, Sheffield, England

the cost of all the structures to over six million dollars.

The details of the shop plant were developed, and the actual construction is being carried out under the supervision of Frank W. Walker, M. E., superintendent of terminal shops for the Transcontinental Railway.

Hundreds of Houses Going Up

In the outer residential districts there is a great rush in construction and it is not over-estimating to say that there are several hundred houses on the way. Many of these are outside the city limits but the municipalities are making preparations to install local improvements, so that the tenants will not suffer from the handicap of lack of water, sewers, light, roads and sidewalks. It is highly probable that several of these suburban districts will be taken into the city in the near future.

Hydro-Electric Development

Down town the civic hydro-electric power department are making rapid progress in laying down their distributing system. Conduits are now being put down on McDermott avenue connecting with the King street distributing station, and the Portage avenue conduits will be the next un-

promising seasons which the West has had in many a long year, and the only dangers now to be avoided are burning winds and rust.

In view of this prospect the railway companies are now at work making preparations to market the grain, which will call for a considerable addition to their rolling stock and motive power. This year the movement will be greatly expedited by the advance in railway work. The G. T. P. will have its line from Winnipeg to Fort William in good operating form, and the C. P. R. double track to Brandon will be ready to relieve the congestion there. The north line through Yorkton will also handle a larger proportion of the yield from that district. The banks are also starting their plans for the financing of the movement, but this feature never causes any worry in the Canadian grain-growing districts.

L.H.S.

Mr. McGillivray, Good Roads Commissioner for Manitoba, returned recently after a visit to Minneapolis, Chicago and Port Arthur, Ont., undertaken for the purpose of inspecting various classes of paving material.

A New Type Grab Bucket for Excavating, Dredging and Unloading Plants

The large amount of dredging for rivers and harbors and the extensive excavations involved in modern construction, as well as the large quantities of bulk material handled nowadays have called for and brought into use a great variety of digging and carrying buckets. Hitherto it has been considered that the clam-shell and the orange-peel types of bucket were the most suitable for this work. Lately a device has been invented by H. P. Andresen that comes under the nomenclature of the "grab" bucket. In principle of operation as well as in construction it is different from other buckets. It is generally admitted that the best style of bucket should have powerful digging action, positive opening power, be light in weight, simple in construction and easy to operate. These qualities and more are claimed for the Andresen-Evans grab bucket. For dredging and excavating and handling bulk material, such as ore, coal, sand, stone, etc., this bucket has demonstrated its superiority



Where Andresen-Evans Grabs are built for the Canadian Market.

from an operating standpoint for the following reasons:

First, the path of travel of cutting edges and the inclination of trays are such as to cause the scoops to dig into and not out of the material.

Second,—Direction of pull of the closing chains draws the scoops down into the material.

Third,—Wide opening, 50 per cent. greater than Clam

Shells. This means that actions set forth in 1st and 2nd take place over a stroke one-half longer, and therefore, the Grab is a better filler; the wide opening is of especial advantage in unloading boats, barges or cars, reducing hand shoveling to a minimum and getting loads where Clam Shells would not.

From a constructive point of view it will be noticed that it is not a blacksmith's job with a lot of forging, pins, etc., but is built of structural shapes and plates solidly riveted together and braced in all planes, consequently keeping in alignment no matter how severe the service conditions. The cost of maintenance, therefore, is also very low. The drum is of cast steel and the few bearings required all have long, phosphor-bronze bushings.

This grab bucket consists of a central frame and two braced scoops. The lower part of the central frame carries the differential drum which is so placed that the closing chains give a downward pull with a large leverage through the stroke. At its upper corners long bearings, for the shafts upon which the scoops swing, are placed. These shafts are separated by a considerable distance so that the already wide opening is greatly increased. This separation of the pivots has the effect of giving a long, strong, cutting motion which has been aimed at by all inventors and manufacturers of excavating machinery. The action of the two scoops is not unlike the action of two dippers of a dipper dredge. The back of the scoop is usually left open; so, when they come together there is no pressure tending to pack the contents or to break friable material, such as coal. The wide opening is especially desirable in cleaning up boats or barges. In some cases the cost of labor for cleaning up has been reduced by one-half.

The removal of quicksand from under water has heretofore proven very difficult when orange-peel and clam-shell buckets have been employed; consequently such material has been most successfully handled in the past by very expensive hydraulic or dipper dredges. The Andresen-Evans grab bucket has clearly proved its ability to handle such material in the most satisfactory manner. This grab has demonstrated that it will handle more material, in proportion to the weight of the bucket, than any other make. The bucket is not dependent upon its weight to dig; consequently it need not be dropped upon a pile in order to get initial penetration as is required with most buckets when digging in difficult material. The dropping of heavy buckets into most kinds of material results in both wear and break-



The Andresen-Evans 4-line grab bucket—8 cubic yard type "A."



The Andresen-Evans grab bucket in operation.

ages which are practically eliminated in the case of this bucket.

The bucket is made in sizes varying in capacity from one to eight cubic yards. It is built for two, three or four line operation. The large size bucket shown in the illustration is an eight cubic yard grab having the great reach of 22 feet between the cutting edges. These buckets can be operated in connection with any of the double drum hoisting plants commonly used by contractors or as used on ore and coal handling docks.

On a recent test in unloading a large lake steamer of West Virginia splint coal, which is the most difficult coal to dig that is mined, the grab bucket averaged 62 per cent. more coal per trip when taking out the material from directly under the hatch and 71 per cent. more per trip when cleaning up, than a well-known clam-shell bucket of the same rated capacity. One of the largest dredging and sand



The Andresen-Evans type "A" grab bucket loaded and closed.

handling concerns in Canada purchased one of these grabs last summer, which did so much better work than other types being used that they have since placed an order with Mr. Andresen for five additional buckets.

At one plant of a large steel company a four-cubic yard Andresen-Evans grab is handling more material than two three-cubic yard buckets of another make.

Although this grab bucket has been on the market only a little over two years, it is now in service at numerous places from Port Arthur, Ont., in the north to Galveston, Tex., in the south, Baltimore in the east to reclamation work in New Mexico in the west. It is in use in five plants of the United States Steel corporation; is used by the United States government and has been ordered recently by the Canadian government. It is the new principle of operation that has earned the above record.

It is being sold for the Canadian market by H. P. Andresen, Liverpool and London and Globe Building, Montreal, and in the United States by the Andresen-Evans Company, Chicago, Ill.

Personal News and Notes

Mr. J. M. Nelson, for 34 years assistant engineer to the Montreal Harbor Commissioners, has resigned.

Out of a total of \$516,000 of paving work at Montreal, for which tenders were called, the city bid successfully for work aggregating in value \$120,000.

The bricklayers of Calgary, Alta., have turned down an offer of the masters of 66¼ cents an hour. It is said to be their intention to hold out for 70 cents.

From Hull, Que., comes the rumor of a new cement company comprised of local men and capitalized at \$50,000. Property is stated to have been secured just outside the city limits.

The municipalities of St. Johns and Iberville, Que., have effected an arrangement for the erection of a reinforced concrete bridge across the Chambly canal. The cost of the undertaking is placed at \$154,000.

The Fraser Valley Tile & Cement Company have purchased an extensive site at Sapperton, where they will at once commence the erection of a large cement plant, the machinery for which has already been ordered.

The John Galt Engineering Company, of Winnipeg and Toronto, have been appointed consulting engineers on the new sewer system at Cranbrook, B. C. The estimated cost of the undertaking is in the neighborhood of \$100,000.

The city council of Victoria, B. C., have appointed Mr. Wynn Meredith consulting engineer in charge of the Sooke Lake scheme of water supply. Mr. Meredith will receive \$1,000 a month and will furnish a competent field engineer.

At a meeting of the Master Plumbers' Association at Fort William last week, the name of the organization was changed to the Canadian Society of Sanitary Heating Engineers. The next year's convention will probably be held in Montreal.

W. S. Harvey, A.M.I.C.E., A.M.I.M.E., of the Engineering Staff of the Main Drainage Works, Toronto, was married at St. Paul's, Lachine, P. Q., on Tuesday, June 6th, to Miss Lina Vivian, third daughter of George Haddock, Esq., Hull, England.

Ex-City Engineer Antonisen, of Port Arthur, was presented by his staff with an illuminated address and a diamond tie pin, upon his retirement. The presentation was made by Mr. Antonisen's former assistant, Mr. Jones, who has now succeeded to the post of City Engineer.

The substructure of the new Cambie Street bridge at Vancouver (described in detail in our last issue) is about completed and the resident engineer, Mr. C. P. Moss, expects to see the whole work finished by August. Operations have been delayed considerably by the strike.

A Seattle contractor, Mr. Matthew Dow, was last week awarded the contract for a \$300,000 concrete wharf and warehouse for the Grand Trunk Pacific Railway at Vancouver. It is probable that Mr. Dow will also receive the contract for an office and store building for the same company.

The Canadian Mineral Rubber Company are making enterprising arrangements for carrying out their contract for 36 miles of paving at Victoria, B. C. They expect to put 600 men on their pay roll at Victoria with a wage disbursement of at least \$3,000 a day. They hope to finish the work within one year.

One of the busiest firms in the Queen City at the present time is R. Robertson & Sons, Limited, masonry contractors. They are making excellent progress on the museum for the University of Toronto, and also on the power house for the central heating plant of the same institution. At present they are just completing the pathological building for the Toronto General Hospital. Among their most

recent successes may be mentioned the Servants' Home at the Toronto General Hospital (architects, Darling & Pearson), and a 6-storey warehouse for M. Rawlinson (architects, Wickson & Gregg).

It is stated that a company capitalized at half a million dollars is about to locate at Hull, Que., to manufacture a mine tester, a new invention of Mr. Chas. Demerais, of Hull. Work is to be started soon upon the erection of a \$100,000 plant. It is proposed also to build a plant in the United States at a cost of \$250,000.

Edward O. Fuce, town engineer of Galt, Ont., was born in Kent county, Ontario, in the year 1882. After a preliminary course in the public schools he attended the Chatham



Town Engineer Fuce, of Galt, Ont.

Collegiate Institute for three years, and in 1900 matriculated from the Jarvis Street Collegiate, Toronto. Mr. Fuce entered the University of Toronto (Faculty of Applied Science) in the fall of 1900 and graduated with honors in 1903. His first professional experience was obtained with Mr. W. M. Davis, C.E., then of Berlin, Ont., but now city engineer of Prince Rupert, B.C. During his connection with Mr. Davis he was engaged on general municipal and street railway work.

In June, 1904, Mr. Fuce became resident engineer of the Galt sewerage system and he conducted a branch office in Galt for Mr. Davis until August, 1907. Of the various work which came under the supervision of Mr. Fuce during that time may be mentioned sewer construction in Galt, costing approximately \$250,000; sewage disposal system, \$20,000, and a bridge on the Grand river, \$12,000. Mr. Fuce also had charge of the Preston waterworks system and of the preliminary work for the Preston sewerage system.

In August, 1907, Mr. Fuce was appointed engineer of the Galt sewerage system and in that year he opened an office in Galt for the purpose of engaging in private practice. He was appointed town engineer of Galt in 1910, with the privilege of continuing his private practice. Among the commissions which have been entrusted to Mr. Fuce since 1907 are two reinforced concrete buildings, 96 x 380 feet, for the Union Stock Yards at West Toronto; sewerage system, sewage disposal works and waterworks system for the town of Wingham; Fergus, Ont., waterworks system (preliminary work); sewage disposal plant for Trinity College at Port Hope, Ont., and a number of reinforced concrete bridges.

In addition to his work at Galt, Ont., Mr. Fuce is at

present engineer for the townships of McKillop, Tucker-smith, Colborne, Wawanosh, Beverly and North Dumfries; also for the Wingham, Ont., and Fergus, Ont., waterworks systems, and for the Galt, Preston and Hespeler Electric Railway. Mr. Fuce is an Ontario Land Surveyor and an associate member of the Canadian Society of Civil Engineers.

C. P. R. Offices at Liverpool, Eng.

The Liverpool, Eng., headquarters of the Canadian Pacific Railway Company are now situated in the new Royal Liver Building. The white lines shown on the near corner of the building in the accompanying photograph indicate the location of these offices as shown by photographs at the Canadian headquarters in Windsor Street, Montreal. These offices are described as occupying the basement and first floor in this portion of the building.

The Royal Liver building, built and owned by the Royal Insurance Company, has just been completed and is an ornament to the ancient city of Liverpool. It occupies a commanding situation on the river front a very short distance from the Princess landing stage and the Riverside Station. Opposite are the handsome offices of the Liverpool Harbor Commissioners. A prominent feature of this massive office building is the immense clock towers which are said to contain the largest timepiece in the world—larger even than "Big Ben." Another feature not less interesting is the figure of a stork of the species known as the "Liver," which surmounts each tower. This bird, which is now practically extinct, is said to have made its



Royal Liver Building, Liverpool Office of the C. P. R.

home in the swamp which formerly occupied the site on which Liverpool was built and from it the city took its name as also did the Royal Liver building. The C. P. R. offices have been finished and furnished in palatial style corresponding with their surroundings and the important interests they represent in the midst of business concerns of world-wide reputation and first rank importance. Naturally most of the business done here will be in connection with the C. P. R. steamship service, but all the interests of the C. P. R. and its service in connection with Canadian traffic and Canadian development, so far as Liverpool is concerned, will be concentrated in these offices.

Contracts Department

News of Special Interest to Contractors, Engineers, Manufacturers and Dealers in Building Supplies.

Information for insertion in these columns is invited from Architects, Contractors, Engineers, etc.

Waterworks, Sewerage and Roadways

Cowansville, Que.

Under consideration, sewerage system. Owner, Municipality of Cowansville, Que.; mayor, W. F. Vilas. Estimate on installation of sewerage system. Committee composed of mayor and councillors. John McCabe and G. F. L. Fuller appointed to obtain them.

Cranbrook, B.C.

Tenders called for sewerage. Owner, Corporation of Cranbrook, B.C.; city clerk, T. M. Roberts; consulting engineers, The John Galt Engineering Co., 317 Portage avenue, Winnipeg, Man. Supply and delivery of 36,500 lin. ft. of vitrified tile sewerpipe, etc. Specifications at offices of the consulting engineers. Tenders received until 20 o'clock, July 8, by city clerk. Advertisement in "Tenders and For Sale Department" of this issue.

Dundas, Ont.

Tenders called for dredging—Dresden canal. Owner, Board of Works and Property Committee, Dundas, Ont. Chairman, Wm. Lawson, Dundas, Ont. Removal of 27,500 cu. yds. of material involved in contract. Plans, etc. at office of J. J. Armour, C. E. Work to be done in accordance with the Jennings award. Tenders received by the chairman until June 25th.

Edmonton, Alta.

Machinery required for waterworks extensions. City engineer, A. J. Latornell, Edmonton. Two 6,000,000 gallon pumps. One pump 400 ft. head, steam turbine drive; one 80 ft. high speed engine drive. Specifications will be prepared and published at an early date.

Edmonds, B.C.

Tenders called for steel pipe. Owners, Corporation of Edmonds, W. Griffith, clerk, municipal hall; engineers, Cleveland & Cameron, 506 Winch Bldg., Vancouver. Specifications obtained from engineers on payment of \$20, refunded on presentation of tender.

Halifax, N. S.

Tenders to be called for sewer pipe. Owner, City of Halifax. City engineer, F. W. W. Doane; 2,400 feet 24 in. x 30 in., also 1,400 feet 30 in. concrete sewer pipe. Council will be asked to authorize purchase at next meeting.

Contemplated cement walks, \$1,990. (South Park street). Owner, City of Halifax. City engineer, F. W. W. Doane. Laying 1,000 feet cement walks. To be submitted for consideration of council.

Contemplated cement walks, \$5,750. Owners, City of Halifax. City engineer, F. W. W. Doane. Sidewalk has been ordered by council. Report later.

Hamilton, Ont.

Tenders called for cement walks and curb. Owner, City of Hamilton, Ont. S. H. Kent, city clerk. Engineer, A. F. Macallum, Hamilton. Cement walks and curbs done by Hamilton Board of Works. Tenders called for Friday, June 16th, close Wednesday, 21, 5 p.m. By-laws passed and enrolled June 12th. Details and description of work furnished on request.

Estimates being prepared for waterworks extension, \$1,000,000. Owner, City of Hamilton. City clerk, S. H. Kent; city engineer, A. F. Macallum. Engineer, W. Chipman, Mail Building, Toronto, is preparing estimates.

Lethbridge, Alta.

Cement sidewalks, \$21,963. Owner, City of Lethbridge, Alta. Engineer, H. W. Leech, acting city engineer, Lethbridge. Contractor, Forest City Paving Co., Lethbridge, Alta., and Regina, Sask. About 22,000 sq. yds. of walk and 15,000 feet curb.

A, street grading; E, storm sewer; D, sanitary sewers; C, water mains. Owner, City of Lethbridge. Engineer, H. W. Meech, acting city engineer, Lethbridge. Contractor, N. K. Boyd, Winnipeg, Man. lump sum bid on contracts A.C.D. and E., \$119,596. A=130,000 cu. yds. B=3/5 miles. D=7 miles (approx). C=10 miles (approx). Bids of other contractors tendering furnished on request.

Cement pipe, \$10,667.99. Owner, City of Lethbridge, Alta. Engineer, H. W. Meech; act. city engineer, Lethbridge. Contractor, Forest City Paving Co. London, Ont., Regina, Sask., and Lethbridge, Alta. This pipe is substituted for vitrified tile piping for store sewer. It has not been definitely decided whether it will be used or not. About 14,000 ft., size 12x36 in. required.

McLeod, Alta.

By-law to be submitted for waterworks and lighting system. Party interested, Municipality of MacLeod; E. F. Brown, clerk. To raise \$46,000 for extension and construction of municipal system of waterworks and enlargement of electric lighting system; \$23,000 for extension of sewer system. The vote will take place on June 23rd.

North Battleford, Sask.

Tenders called for waterworks extension, \$10,000. Owner, Corporation of North Battleford; engineers, Cote & Nevill, Edmonton, Alta. Required, hydrants, pipe, valves. Tenders received by city clerk until June 30. Specifications mailed to bidders handling these lines of materials.

Niagara Falls, Ont.

Tenders called for pavement. Owner, City of Niagara Falls, Ont. Engineer, J. C. Gardner, Niagara Falls, Ont.; concrete sidewalks and curb—50,000 sq. ft.

walk, 2,500 ft. curb. Tenders called until June 17th by W. J. Seymour, clerk.

New Glasgow, N. S.

Water pipe required waterworks system. Town clerk, James Roy, New Glasgow. 9,000 ft. of water pipe is required at once.

Tenders called for waterworks, \$200,000. Owner, Town of New Glasgow. C. A. Mitchell, engineer, Bank of New Brunswick Building. Tenders received until 3 p.m. June 25 for 12,600 feet 22 in. steel pipe southerly from present pumping station.

Olds, Alta.

Contemplated waterworks, \$30,000. Owners, Municipality of Olds, Alta. Sec.-treas., R. L. Earl, Olds. Construction of waterworks considered. Engineer not selected yet.

Oshawa, Ont.

Tenders called for sedimentation tanks. Owners, Town of Oshawa; W. E. N. Sinclair, B.A., mayor. Consulting engineer, Frank Chappell, Oshawa. Construction of screening chambers, sedimentation tanks, sludge beds and all appurtenances thereto. Plans, etc., at office of Contract Record, 220 King street West, Toronto, and office of the consulting engineer. Tenders received until noon July 1.

Port Arthur, Ont.

Tenders called for pavements. Owner, Corporation of Port Arthur. J. McTeigue, city clerk; city engineer, J. Antonisen. Tenders received until 6 p.m. June 24th, for paving with asphalt block, sheet asphalt and bitulithic and laying and paving street car tracks according to engineer's plans. Further instructions as to specifications from city engineer, Port Arthur.

Tenders called for pavements. Owner, Corporation of Port Arthur, Ont. City clerk, J. McTeigue, Port Arthur. Asphalt block, sheet asphalt bitulithic, laying and paving street car tracks. Bay street about 4,784 sq. yards pavement; 2,930 lin. ft. curb and gutter; 3,166 sq. yds. track construction. Algoma street pavement, 4,100 sq. yds. curb gutter, 2,060 lin. ft. track construction, about 3,378 sq. yds. Similar tenders for Pearl street south, Cameron street, etc., with varied quantities. Tenders received until June 24, by city clerk.

Quebec, Que.

Tenders called for waterworks. Owner, City of Quebec, Que. Waterworks Engineer, J. Gallagher, Que.; trenching and pipe laying required for extension of water and drainage in certain streets of city. Tenders received by Waterworks Engineer until June 22, 4 p.m.

Proceedings of Council, waterworks. City engineer, W. D. Baillairge, Que. Authorized construction and laying of new water main, 40 in. diameter, between

Lorette and Quebec, cost taken from authorized loan. 8 in. water pipe laid in nine streets before said streets are paved with permanent materials. Cost provided for.

Rannoch, Ont.

Tenders called for Youngson creek drain. Owner, Township of Blanshard, Ont.; Jno. H. Jameson, Rannoch, clerk. Plans, etc., at office of the clerk; a marked cheque for ten per cent. of amount of contract to accompany each tender. Tenders received by clerk until 5 p.m., July 1.

St. Thomas, Ont.

Tenders called for reinforced coagulating basin. Owner, Waterworks Commission, St. Thomas; Geo. E. Crocker, chairman. Tenders called until 5 p.m. June 24th for construction of a reinforced concrete coagulating basin, capacity, 400,000 gallons, at St. Thomas waterworks.

Sydney, N. S.

Paving materials required for pavements. Owner, City of Sydney, N. S. 2,400 sq. yds. of concrete. Estimate cost, \$1.80 per yd.

Specifications in progress for pavements. Owner, City of Sydney, N. S. City engineer, D. McD. Campbell, Sydney, N. S. Engineer authorized to prepare plans, etc. Length of required paving, about 1,600 ft.; street from curb to curb, 40 ft.; concrete base and a 3 in. surface of macadam with a bituminous binder. Tenders called on completion of specifications. Additional information later.

Thorold, Ont.

Tenders called for sewerage works. Owner, Town of Thorold, Ont. Clerk, D. J. C. Munro; A. McCulloch, mayor. Engineer, Chipman & Power, Mail Building, Toronto; labor and materials required for system of sanitary sewers comprising about 13,000 lin. ft. of pipe sewers. Plans at office of the engineers. Tenders received by town clerk until 8 p.m. June 26th.

Toronto, Ont.

Tenders called for pumping station. Owner, City of Toronto; mayor, G. R. Geary. Mason work, carpenter work, galvanized iron and roofing, gas fitting, and plumbing, plastering, painting and glazing. Plans, etc., at office of city architect, City Hall. Tenders received by G. R. Geary, chairman Board of Control, until noon June 29th.

Tenders called for main drainage. Owner, City of Toronto; G. R. Geary, chairman Board of Control; low level interceptor; section No. 43, 244 lin. feet 4 ft. 9 in. circular brick in tunnel; storm overflow sewers; Wilton, Sec. No. 1, 4,449 lin. ft. average nominal size 5 ft. x 5 ft. 6 in., brick or concrete in tunnel Wilton, Sec. No. 2, 3,562 lin. ft., average nominal size 4 ft. x 4 ft. 3 in. brick or concrete in tunnel. Plans etc., on file at office of Contract Record, B. 34 Board of Trade, Montreal and Main Drainage Works, Toronto. Tenders received by chairman Bd. of Control until July 4.

Vancouver, B. C.

Tenders called for excavating machinery. Owner, City of Vancouver; city clerk, W. McQueen. City engineer, F. Fellows. Tenders are being called until

June 26th for the purchase of excavating machinery.

Sewer pipe wanted for sewerage department. Owner, City of Vancouver; city clerk, W. McQueen, Vancouver; city engineer, F. Fellows. Tenders are being called by the city engineer's office for the purchase of sewer pipe until June 26th.

Tenders called for sewer supplies and excavating machines. Owner, City of Vancouver; city clerk, W. McQueen, Vancouver. Supplies in connection with sewer construction; machines suitable for excavating trenches. Contractors to supply their own specifications and plans. Tenders received by city clerk, until 2 p.m. June 27th.

Welland, Ont.

Tenders called for street paving. Owner, Town of Welland, G. R. Boyd, clerk. Town Engineer, D. T. Black. Asphalt block, vitrified brick, taralithic and bitulithic with brick between car tracks and extending 18 inches on outside of rails, on 6-in. foundation. Proprietors of patented pavements are requested to furnish special specifications. Tenders received until noon, June 30th, by town clerk.

Walkerville, Ont.

Bids to be received for street paving and curb, \$79,000. Owners, Town of Walkerville. Engineer, Owen McKay, Walkerville, Ont. Asphalt block on a 6 in. concrete foundation and reinforced concrete. About 25,000 yds. of the former and two or three blocks of the latter, on Sandwich street, Argyle, Monmouth and Devonshire roads, and Victoria avenue. Money for the work was voted by the ratepayers Saturday, June 10th. Tenders will be called at once, the work to be completed this year.

Windsor, Ont.

Tenders called for street paving and curb, \$20,000. Owner, City of Windsor, clerk, S. Lusted; engineer, M. E. Brian, city engineer. 12,000 yards concrete pavement with curb on Gladstone and Curry avenue, Ashby alley and Pelissier street. Tenders called June 14, to be closed June 27.

CONTRACTS AWARDED

Brampton, Ont.

Paving, general contractor, G. Fielder, Chatham, president, Tarlithis and Construction Co. Work will be begun at once.

Cranbrook, B. C.

Sewerage system, \$94,000. Owner, City of Cranbrook; mayor, Mr. Hunt. Contract for installation, John Galf Engineering Co., 215 Kennedy Building, Winnipeg, Man. The system to be installed by November 30, 1912.

Edmonton, Alta.

Street paving. Owners, City of Edmonton, Alta. City engineer, A. J. Latornell. Contractor, Bitulithic and Contracting Co., Edmonton. \$2.98 per sq. yd. for paving; gutter .65 lin. ft. Other prices ranged from \$2.85 to \$2.65 and .68 to .78 respectively.

Minnedosa, Man.

Contract awarded for paving, \$7,000. Owner, Municipality of Minnedosa, Man. Gravel, granite and cement 35,000 sq. ft.

Railroads, Bridges and Wharve

Brandon, Man.

Tenders called for passenger depot, \$60,000. Owner, Canadian Pacific Railway, Winnipeg, Man.; division engineer, F. Lee, Winnipeg; re-building of major portion of depot, 3 storeys, cut stone and brick, steam heating, electrical work, roofing and sheathing paper. Tenders received until 12 K. June 28, by division engineer. Tenders called June 13.

Clifford, Ont.

Tenders called for bridge. Owner, county of Wellington, Ont.; chairman, Boundry Line Bridge Com., H. Graef, Clifford. Clerk, W. D. McLellan, Harriiston, Ont. Construction of one 10-ft. span flat top concrete bridge and one 45-ft. span steel bridge on concrete abutments for county of Wellington. Plans, etc., for both concrete and steel work at office of W. D. McLellan. Tenders received by W. D. McLellan until June 23rd.

Dalhousie, Restigouche Co., N. B.

Tenders called for breakwater. Owner, Department of Public Works, Ottawa. Secy., R. C. Desrochers. Construction plan, etc. at offices of E. T. P. Shewen, district engineer, St. John, N. B. Geoffrey Stead, district engineer, Chatham, N. B., and on application to the postmaster at Dalhousie, N. B. Tenders received by secretary until July 5th.

Edmonton, Alta.

Bridge. Contractor, Connel Spencer Construction Co., Edmonton; engineer, A. T. Latornell, city engineer. Substruction of east end bridge; concrete \$10 per yd. forms and copper dams \$3 per ft., excavating, \$1.50.

Fort William, Ont.

Excavation started for freight sheds. Owners, Grant Trunk railway, Fort William, Ont. Ground being broken. Information regarding construction, etc. later.

Golden, B. C.

Tenders to be called for bridge, \$25,000. Owners, Department of Public Works, Victoria, B. C.; engineer, J. E. Griffiths, public works engineer, Victoria, B. C. New swing bridge across Columbia river, 42 miles south of Golden to provide facilities for settlers of Windermere district. Definite date bids called not ascertained. Report later.

Granby, Que.

Contemplated bridge, (9th Range, tp. of Granby). Owner, Township of Granby, Granby. One span, 35 ft. width 16 ft., stone foundation. Bridge to be erected within the next two months. Prices solicited. For further information address A. J. Gendreau, mayor, Mawcook, Que.

Halifax, N.S.

Tenders called for piers and sheds, deep water terminals, I.C.R. Owner, Department of Railways and Canals, Ottawa; secretary, L. K. Jones, Ottawa; construction of reinforced cement; concrete pier and sheds at the deep water terminus, Intercolonial Railway. Plans, etc., at office of chief engineer, Department of Railways and Canals; office of the chief engineer, I. C. R., Moncton, N.B.; consulting engineer, J. Kennedy, Montreal. Tenders received by the secretary until noon, July 20th.

Harriston, Ont.

Tenders called for bridge. Owner, township of Minto. Clerk, W. D. McLellan, Harriston, Ont. One 32-ft. concrete girder bridge and one 70ft. span steel bridge on concrete abutments for township of Minto. Plans, etc. for both concrete and steel work at office of W. D. McLellan. Tenders received by W. D. McLellan until June 23rd.

Lethbridge, Alta.

Contemplated power house equipment. Owner, Town of Lethbridge; superintendent, Arthur Reid, Lethbridge. The installation of street railway will necessitate extension to boiler room and power house and installation of four boilers, extension to present economizer and coal conveyor, electrical unit and steam driven exciter, a sub-station and car barn, a motor generator and switching apparatus.

Lindsay, Ont.

Tenders called for bridge, (Mud Lake Narrows). Owner, township of Carden, Co. of Victoria; clerk, J. R. McNeillie, Lindsay. Steel and concrete; 2 steel spans with concrete floors, 60 ft. over all, 14 ft. roadway one 120 ft. span; stone piers to receive one 120-ft. span; stone filling of approaches. Plans, etc. at office of county clerk, Lindsay and Whitby. The committee claims the right to accept tender for either two spans or one; 3 piers or two, etc. Tenders received until July 5th by county clerk.

Markham Township

Tenders to be called for bridge, \$2,800. Owners, County of York, H. G. Ramsden, clerk, Toronto. Engineers, Bowman & Connor, 36 Toronto street, Toronto. Steel concrete abutments 40 ft. arch. Tenders received after June 26th, by engineers.

Melford, Guysboro Co., N.C.

Tenders called for wharf. Owner, Department of Public Works, Ottawa, Ont.; secretary, R. C. Desrochers, Ottawa, Ont.; wharf and stone approach. Plans, etc., at the office of E. G. Millidge, district engineer, Antigonish, N.S., and on application to the postmasters at Mulgrave, N.S., and Guysboro, N.S. Tenders called until July 5.

Niagara Falls, Ont.

Equipment required for cableway. Owner, J. E. Gardner, Niagara Falls, Ont. Full cableway layout.

Ottawa, Ont.

Tenders called for protection works. (Soulanges Canal). Owner, Department of Railways and Canals, Ottawa, secretary, L. K. Jones, Ottawa. Plans etc. at office of the chief engineer, Department of Railways and Canals, at office of the superintending engineer of the Quebec canals, 2 Place d'Armes, Montreal. Tenders received until June 27th by L. J. Jones.

Oshawa, Ont.

Tenders called for bridge, (4th concession East Whitby). Owner, Village of Cedardale, Ont. Reeve, H. Gifford, Cedardale; engineers, Bowman & Connor, 36 Toronto street, Toronto; 36x20 ft. concrete arch bridge. Tenders received by William Purves, Columbus, Ont., until noon, June 30th.

Port Arthur, Ont.

Tenders called for railroad. Owners, MacKenzie, Mann & Co., Ltd., Toronto. Tenders to include clearing, grubbing, grading, bridges, trestles, culverts, masonry, fencing, telegraph line, track-laying and ballasting. Plans, etc., at offices of MacKenzie, Mann & Co., Ltd., 1 Toronto street, Toronto. Tenders received by MacKenzie, Mann & Co., until July 1st. Section covered—Port Arthur to boundary line between end of Sec. 1, Kapuskasing lake; Kapuskasing lake to Sellwood Jct.

Redditt, Ont.

Tenders called for station buildings. Transcona, Man., (National Transcontinental railway). Owners, commissioners Transcontinental railway, Ottawa, Ont. Plans, etc., at office of Gordon Grant, chief engineer, Ottawa, Ont., and of Mr. S. R. Poulin, district engineer, St. Boniface, Man. Tenders received by sec, until July 11.

St. Mary's, Ont.

By-law carried for bridge, \$5,000 (over Trout Creek on Wellington street N.). Owner, town of St. Mary's, Ont. Clerk, Thomas M. Clark.

Sydney, N.S.

Specifications in progress for bridge, Washington Brook, Whitney. Owners, Corporation of Sydney; engineer, D. McD. Campbell, Sydney; steel, 200 feet length, 26 feet width; contractors to furnish complete stress sheets and detail drawings showing sectional area and dimensions of all parts, members of structure and mode of construction. Tenders will be called on completion of specifications.

St. John, N.B.

Tenders called for harbor, Courtenay Bay. Owner, Department of Public Works, Ottawa, Ont.; secretary, R. C. Desrochers, Ottawa; construction of breakwater, wharves, dredging of channel and basin; also filling shown on plan; also construction of dry dock and ship repairing plant (first class). Plans, etc., at offices of the district engineers at St. John, Halifax, N.S.; Montreal, Que.; Toronto, London, Ont., and at the office of the High Commissioner for Canada, London, Eng. Tenders received by secretary until 4 p.m., August 10.

Thornhill, Ont.

Tenders called for bridge, township of Markham). Owner, Markham township. Engineer, Bowman & Connor, 36 Toronto street, Toronto; steel superstructure with concrete abutments for a concrete arch. Township of Markham near Thornhill. Tenders received by clerk of Markham township, Unionville, Ont., until June 30th. For further information apply to engineers; T. Paget, Thornhill.

Toronto, Ont.

Tenders called for seawall, Lake Ontario, vicinity of exhibition grounds. Owner, City of Toronto, Ont.; chairman of Board of Control, F. S. Spence, City Hall; city engineer, C. H. Rust, Toronto. Construction of seawall. Specifications on application to the Department of Railways and Bridges, City Engineer's Office. Tenders received by the Chairman, Board of Control, until noon, July 3rd.

Plans for 2 bridges, engineers Bowman & Connor, 36 Toronto street, are now preparing plans and specifications

for two bridges in Wellington and Peel counties. Supplementary report later.

Trail, B. C.

Tenders to be called for bridge, \$150,000. Owners, Department of Public Works, Victoria, B. C.; engineer, J. E. Griffiths, Public Works engineer, Victoria, B. C. New bridge across Columbia at Trail. Authority given to instal fixed centre span, but piers to be of sufficient strength to support steel towers should it be decided to replace fixed with a movable span. Date bids to be called not ascertained. Report later.

Vancouver, B.C.

Proposed work, bridge, delta District Parties interested, municipalities of Delta, Richmond and City of Vancouver, city clerk, W. McQueen; proposition to ask provincial government to have estimates made for construction of bridge to connect the above municipalities. Endorsed by a representative meeting. Those interested are: Alds. McMaster and Campbell, Vancouver city council; A. G. McCandless and W. Skens, board of trade, Vancouver; W. A. Kirkland, Delta Council.

Winnipeg, Man.

Tenders called for car shops. Owners, Commissioners of the National Transcontinental Railway, Ottawa. Secretary, P. E. Ryan, Ottawa. Construction and erection complete. Plans, etc. at offices of chief engineer, Gordon Grant, Ottawa, or S. R. Poulin, district engineer, St. Boniface, Man. Forms of tender to be supplied by W. T. Press, mechanical engineer, Ottawa.

Whitby, Ont.

Under discussion, bridge, \$5,000. Owner, County Council; J. E. Farewell, K.C., County Clerk, Whitby; engineer pro tem, F. Chappell, C.E., Oshawa, Ont.; present steel future, either steel or concrete, 1 span, 67 feet, width 18 ft. to 20 ft., foundation, concrete abutments. It is possible that alternative designs will be called for concrete abutments wanted certain. Permanent engineer not yet appointed. Chappell to report.

CONTRACTS AWARDED**Lethbridge, Alta.**

Grand stand, \$26,010. Owner, City of Lethbridge, Alta. Architect, E. E. Carver, Lethbridge, Alta; general contractor, Smith Bros. & Wilson, Lethbridge; wood construction 360 x 75.

Toronto, Ont.

Contract awarded for railway, (between 180-200 C.N.R. Toronto-Ottawa branch). Owner, MacKenzie, Mann & Co., Toronto street, Toronto. General contractor, E. MacKenzie, 88 King street E., Toronto; sub-contractors, P. W. MacLean, Brechin. Mile 180-182 1/4: Paul Allan, Chaffie's Lock Mile 182 1/4-182 3/4: L. MacLean & R. MacIsaac, Brechin. M. 183 1/4-185 1/4: D. J. O'Donnell, Toronto; A. O'Donnell, Beaverton and S. MacKenzie, Elgin; M. 185 1/4-189 1/2: Stewart & Hart, Portland, Ont.; M. 189-196: Chas. A. Cook, Brechin; M. 196-200: all of Ont. C.N.R. Can Northern Ont. Ry.

Vancouver, B. C.

Concrete wharf and warehouse. Owner, Grand Trunk railway, head office, Montreal, Que. Contractor, M. D. W. Seattle, Wash. U.S.A. The company is considering the erection of a similar wharf and warehouse in Victoria, B.C.

Public Buildings, Churches, Schools, etc.

Brandon, Man.

Plans completed for Fraternal Temple, \$6,000. Owner, Fraternal Hall, Ltd. Brandon; architect, plans have been prepared jointly by local architects and definite information not yet available. A site has been purchased and letters patent granted.

Brantford, Ont.

Contemplated hospital addition, \$100,000. Parties interested, Hospital Board and County and City Councils. To provide additional accommodation, city will be asked to vote \$90,000, county \$10,000 approximately. Vote will be taken shortly. Supplementary report later.

Dunnville, Ont.

Tenders called for school plumbing. Owner, Board of Education, Dunnville, Ont. Chairman, Thos. Marshall, Dunnville. Sec. Bldg. Com., W. G.H. Gilpin, Dunnville; plumbing of new high school; also of the public school. Plans, etc. with chairman. Tenders must be made in separate enclosures; received by the secretary after June 12th, until June 27th.

Fort William, Ont.

Tenders to be called for Y. M. C. A., \$75,000. Owner, Y. M. C. A., Fort William; architect, R. E. Mason, Fort William; 3 storey solid brick, 100 x 100 ft., cement foundation, cut stone, structural iron, fire escapes, fireproof doors, electrical work, steel beams, iron columns. Tenders called in about ten days. If bids are within limit, may build 4 storeys. Supplementary report later.

East Sherbrooke, Que.

Work in progress for fire hall, \$5,000. Owners, City of Sherbrooke; architect, L. N. Audit, Sherbrooke. City are building by day labor.

Glencoe, Ont.

Tenders called for school. Owner, Aldeorough township. J. A. McRae, sec.-treas., Wardville, Ont. Tenders received until June 24, 1911.

Hamilton, Ont.

Plans being prepared for school, Maple avenue. Owner, board of education, Hamilton, Ont.; architect, A. W. Peene, Hamilton; two storeys, brick and stone, steam heating, electric lighting, stone foundation. Date for receiving tenders not decided yet. Supplementary report later.

Plans being prepared for school, Trolley street. Owner, board of education, Hamilton; architects, Stewart & Witton, Hamilton, Hamilton & Provincial Loan Building, Hamilton. Two storeys, 20 rooms, brick, steel and stone, steam heating, electric lighting, stone foundation. Date for receiving tenders not decided yet. Supplementary report later.

Architect to be chosen for public school. Owners, Board of Education, Hamilton. Building Committee authorized to engage architect to prepare plans for a 10-room school on Maple avenue and to call for tenders.

Haileybury, Ont.

Tenders called for school, (Rorke avenue). Owner, Separate School Board, Haileybury. Sec.-treas., G. T. Smith. Architect, A. D. Pillar, Haileybury. Plans, etc., at office of the archi-

tect. Tenders received until June 20, by sec.-treas.

Hardieville, Alta.

Tenders to be called for school, \$8,000, (4 miles north of Lethbridge). Owner, Lethbridge public school board. Architects, Messrs. Whiddington Bros., Lethbridge, Alta.; lumber construction, concrete foundation, hot air heating, electric light, standard plumbing, shingle roof, 1 storey, electrical work 100 x 50.

Kelwood, Man.

Contemplated school, \$8,000. Owner, Kelwood School Board. Debentures to be voted for June 15, 1911. Report later.

Lennoxville, Que.

Plans in progress for academy, \$18,000. Owner, Protestant School Commission, Lennoxville; architect, J. W. Gregoire, Sherbrooke; 3 storeys, stone and brick, 54x85, stone foundation, electric light. Tenders received after July 1. Time to close not fixed yet.

Merritt, B. C.

Tenders called for hospital, \$16,000. Owners, Hospital Board, Merritt, B. C. Architect, Blackmore & Birds, Loo Building, Vancouver; 2 storey, concrete foundation, frame construction, raecolithor terrazzo tiling, hospital type plumbing fixtures, hot water heating. Tenders received now by architects.

Montreal, Que.

Tenders called for church, (corner of Durocher street and Fairmount avenue. Owner, Baptist Congregation, Montreal. Architect, J. E. Adamson, St. Catherine street W., Montreal. Stone and brick 65x100 ft., seating capacity, 1,000. Tenders will be called next week. Building to be completed about Jan. 1, 1912.

Meaford, Ont.

Tenders called for public school. Owner, Meaford Public School Board. Sec., C. T. Sutherland, Meaford. Addition of 2 rooms to school. Plans, etc., at office of the secretary. Tenders received until June 23rd by the secretary.

Moose Jaw, Sask.

Contemplated new post office, \$300,000. Owners, Dominion Government, Ottawa. Bids will be called for in about two weeks. Report later.

Plans in progress for church, \$120,000. Owners, Trustees Presbyterian church; architect, F. Glemenshaw, Regina. Plans are being prepared but work will not commence until location of new building is decided.

Tenders called for school, \$100,000. Owner, Moose Jaw School Board; architect, R. G. Bunyard, Moose Jaw; 2 storeys and basement, reinforced concrete and brick 137x82 concrete foundation fan system, heating, electric light, gas, iron roof, interior finish, oak and fir. Tenders called June 12, close about the 26th.

Niagara Falls, Ont.

Plans wanted for hockey rink, \$7,000. Owners, Niagara Falls Hockey and Athletic Club, Ltd., Niagara Falls, Ont. Secretary, R. C. Macfarlane. Size of ice space 75 x 180 ft., seating capacity not less than 2,500. Plans to remain property of designer, same to be returned to unsuccessful competitors. 2½ per cent. paid to the successful architect for

plans, etc. Designs received by secretary until and including July 5th.

Newdale, Man.

Tenders to be called for school, \$12,000. Owners, Municipality of Newdale. Sec.-treas., Johnson; architect, W. A. Elliott, Brandon, Man.; one storey brick and stone, 64 x 36; Muller hot air heating. Pitch roof. Plans accepted June 6. Tenders called June 20, close June 27th. Received by owners.

Okotoks, Alta.

Contemplated school, \$25,000. Owner, Board of Education, Okotoks. Architect, not yet chosen; brick, stone foundation, 2 storey, hot water heating, modern plumbing.

Red Deer, Alta.

By-law submitted for grading, \$3,000; isolation hospital, \$6,000; sewer extension, \$7,000; cement sidewalks, \$6,000. Party interested, Municipality of Red Deer, Alta. Secretary-treasurer, A. T. Stephenson, Red Deer, Alta. By-law will be submitted on June 26.

Regina, Sask.

Tenders called for addition to school. Owner, Regina Public School, Regina. Sec.-treas., J. H. Cunningham, Regina. Architects, Messrs. Sharon & Darrach, 1745 Scarth street, Regina. Plans, etc. at office of the architects. Tenders received by J. H. Cunningham until 12 noon, June 26th.

Renfrew, Ont.

Tenders called for addition to Collegiate. Owners, Renfrew School Board. Sec.-treas., Geo. Eady, jr., Renfrew. The addition to be used as a gymnasium. Plans, etc., with J. D. McNicol. Tenders received until June 16th, by Geo. Eady.

St. John, N. B.

Contemplated garbage disposal plant \$50,000. Owners, City of St. John. City engineer, William Murdock. Enquiries being instituted.

St. Charles, Kirkfield Park P. O. Man.

Tenders called for municipal hall. Owners, Rural Municipality of Assiniboia. Sec.-treas., Frank Ness, Kirkfield Park P. O., St. Charles, Man. Architects, Messrs. Hooper & Hooper, 303 McIntyre Block, Winnipeg. Brick veneer. Plans, etc., at office of the sec.-treas., and at office of the architects. Tenders called until June 22, by sec.-treas.

Sarnia, Ont.

Tenders called for rink. Architect, R. W. Fawcett, Sarnia, Ont. Curling rink. Plans are ready and can be seen at office of architect. Tenders received by architect until 6 p.m. June 22nd.

Snowflake, Man.

Tenders called for school. Owner, Snowflake Consolidated S. D. No. 1111. Sec.-treas., Jas. Fyfe, Snowflake. Construction, brick. Plans, etc., at the Builders Exchange, Winnipeg, or with the sec.-treas. Tenders called until June 24, by the sec.-treas.

St. Thomas, Ont.

Tenders called for public school. Owner, Board of Education; sec.-treas., H. W. Talman, 460 Talbot street; architect, J. T. Finlay, Southern Loan Chambers, St. Thomas. Masonry, carpentry, slating, plumbing, plastering, painting, hot-

air heating, electrical and galvanized iron work. Plans, etc., with architect.

Toronto, Ont.

Tenders to be called for additions to schools, \$100,000, Manning avenue and Essex street. Owner, Board of Education, Toronto; secretary, W. C. Wilkinson, City Hall, Toronto; superintendent of buildings, A. E. Bishop, Toronto. Three storey brick and stone, each; Essex street, 9-room addition; Manning avenue, 6-room. The completion of Manning avenue includes a separate building for domestic science and manual training departments of 2-storey. Cost includes above with midsummer repairs. Tenders called within two weeks.

Plans in progress for church. Owner, Northern Congregational Church, Toronto. Architect, Wickson & Gregg, 59 Yonge street, Toronto. Site has been purchased and plans are being prepared. Supplementary report later.

Tenders called for Clubhouse, \$70,000. Owner, Ontario Club, Toronto; architect, Sproat & Rolph, 90 Yonge street, Toronto. Tenders called for structural iron for use in renovation of old Standard Bank building, from June 12, to 17.

Tenders called for church and Sunday School, (corner of College and Montrose). Owner, West Presbyterian Church, Toronto. Architects, Gordon & Helliwell, Confederation Life Building, Toronto. Various trades required. Tenders received by the architects until noon June 24th.

Tenders to be called for parish house, \$50,000. Owners, Warden of St. Stephens Church, College street, Toronto. Architects, Edwards & Saunders, 18 Toronto street, Toronto; brick, stone foundation, hot water heating, electric light, slate roof, 2½ storeys. Plans have been approved and tenders will be called shortly.

Tyvan, Sask.

Tenders called for public school. Owners, Board of School Trustees. Sec.-treas., R. H. Wayland, Tyvan; 4-room, brick veneer. Plans, etc., with sec.-treas., and H. W. Hilton, Tyvan. Tenders called until June 17th by sec.-treas.

Victoria, B. C.

Tenders to be called for public building. Owners, Provincial Government, Victoria, B. C. Architect, F. M. Rattenbury, Victoria B. C. Addition to two wings to be devoted to library purposes. 4 storey, stone construction, with steel frame. Tenders called shortly.

Vancouver, B.C.

Contemplated school, (Shaughnessy Heights. Owners, Western Residential Schools, Ltd., (capital \$200,000.) Probable architects, McLure & Fox. About 18 months will be required to complete plans. Rev. John McKay, D. D., Vancouver, is interested.

Plans being prepared for church, \$70,000, Pendrell and Thurlow streets. Owner, First Congregational Church; architect, Sharpe & Thompson, 536 Hastings street, Vancouver; brick and stone, seating capacity 700. Plans are nearly completed.

Excavation tenders called for general hospital. Owners, General Hospital Board; Geo. Haddon, secy., Vancouver. Architects, Messrs. Grant & Henderson,

Williams Building, Vancouver. Tenders for excavation were called for June 9th.

Viriden, Man.

Time extension on tenders for municipal building. Owners, Town of Viriden, Man., Town Clerk, J. F. C. Menlove, Viriden; architect, W. A. Elliott, Brandon. Building 60 x 107, 2 storeys and basement, brick on concrete foundation, to be used for court room, offices and opera house. Tender to be accompanied by marked cheque of \$600. Plans, etc., at offices of the architect and town clerk. Tenders called until 6 p.m., June 30th, by town clerk.

Westmount, Que.

Equipment wanted for fire station. City Engineer, A. Currie, Westmount, Que. Combined chemical and hose wagon of the motor type. Tenders called for construction of station in about two weeks.

Winnipeg, Man.

Tenders called for fire stations. Owner, City of Winnipeg, Man. Sec. Board of Control, M. Peterson, 405 Builders Exchange, Winnipeg. Supply of labor and materials required in erection of Fire Stations No. 12 and 13. Plans at office of the architects. Tenders received by the chairman, Board of Control, until June 29th.

Westmount, Que.

Tenders to be called for fire station. Owner, Corporation of Westmount; architect, City Engineer Currie, Westmount; 47 x 77 ft., brick foundation, hot water heating, electric light, cement work, cut stone, brick, fireproofing, electric bells, reinforced concrete. Tenders will be called in about two weeks.

Windsor, Ont.

Plans being prepared for Masonic Temple Building, \$60,000. Owners, Masonic Temple Association of Windsor; architects, Jacques & Williamson, Windsor, Ont., 4 storey brick building, 100 ft. square, ground floor, for stores, offices and lodge rooms on upper floors. Tenders probably called in about a month. Supplementary report later.

CONTRACTS AWARDED

Cranbrook, B. C.

Indian school, \$100,000, (St. Eugene Mission, near C.) Owner, Indian Industrial School, Cranbrook. General contractor, John Wood, Fernie, B. C.

Fort William, Ont.

Public school, \$45,000. Owner, Board of Education; architect, R. E. Mason, Fort William; general contractor, R. McLeod, Fort William, 65 x 60, 2 storeys solid brick. Tenders for heating, plumbing and lighting called in about 10 days.

Guelph, Ont.

Isolation Hospital, \$18,000. Owner, City of Guelph; architect, Mr. Tanner, Guelph; 2 storeys and basement, solid brick, 40x80; general contractor, P. H. Secord & Sons, Brantford; heating, Stevenson & Malcolm, Guelph; plumbing, not let. Building to be completed October 9, 1911.

Montreal, Que.

School, \$15,000, (434 St. Charles Borromeo street). Owners, Seminary of Sulpice, 66 Notre Dame West. Architects, E. Payette, 103 St. Francois

Xavier, Montreal. General contractor, O. Lemay, 147 Cherrier; stone and brick, 50x36, 2 storeys.

St. George, Ont.

Church, \$14,200. Owner, Baptist Church, Dr. Patten, chairman Building Committee. Architects, Taylor & Taylor, Brantford; basement stone, balance brick, 450 sittings. Mason, Thos. Hull, Lynden; carpenter, plasterer, iron, stone, sheet metal, F. M. Misener, Jerseyville, Ont.; heating and plumbing not yet let.

Residences

Fort William, Ont.

Plans prepared for residence, \$22,000. Owner, W. J. Ross, Fort William, Ont; architect, R. E. Mason, Fort William, Ont.; dressed stone, concrete, cut stone, brick, mantels, plate glass, art glass. Building commenced within next week or so. No. bulk tenders called for.

Montreal, Que.

Tenders called for apartments. (St. Urbain street). Owner, Melbourne Apartments; architect, Joseph Perrault, 2,106 Park avenue, Montreal. Dressed brick and sand stone, concrete piles for foundation, hot water heating, electric lighting, gravel and tar roofing, 4 storey Siggwart concrete floors, fireproof, fireproof stairways, steel frame. Tenders received until June 21st, 5 p.m.

Tenders called for apartment house, architect, Joseph Perrault, "Fairmount Court," 2106 Park avenue, Montreal. 24 apartments contained. Plans, etc., at office of the architects. Tenders received until June 21 by architects. Newcastle, N. B.

Plans in progress for residence, \$10,000. Owner, James Rundle, Newcastle, N. B.; architect, H. H. Mott, St. John, N. B. Tenders called shortly. Will be built by day work.

Toronto, Ont.

Tenders called for residence. Owner, C. F. Richardson, Toronto; architect, Sharp & Brown, 18 Wellington street E. Toronto; brick, brick foundation, hot water heating, electric lighting, shingle roofing, Georgia pine finish, 40x28, electrical work, mantels. Tenders received until June 16th.

Specifications completed for 11 residences, \$11,000. Owner, W. Ridout, 1636 Queen street east. Private plans, rough cast, brick foundation, gas lighting, shingle roof, two storeys, 40 x 41. 7 detached and 4 attached dwellings. Building will start shortly.

Contemplated residence, \$4,000. Owner, Dr. Slade, Toronto; architect, H. Bryan Gilbert, 47 Wellington street east, Toronto; brick, brick foundation, hot water heating, gas and electric lighting, slate roof; hardwood interior finish, 2½ storeys; mantels, plate glass. Owner at present in England. Tenders called on his return.

Tenders called for residence, \$4,000. Owner W. Charles, Baine avenue, Toronto; architect, Sharp & Brown, 18 Wellington street east, Toronto; brick, brick foundation, hot air heating, electric light, shingle roof, 2½ storeys, 42 x 24. Tenders received after June 15, until June 23rd.

Plans prepared for residence, \$2,500. Owner and builder, G. A. McTaggart,

Tenders and For Sale Department

TOWN OF OSHAWA, ONT.

Sedimentation Tanks, etc.

Sealed tenders, accompanied by a marked cheque for \$500 will be received up to Saturday noon, July 1st, 1911, for the construction of screening chambers, sedimentation tanks, sludge beds and all appurtenances thereto.

Plans and copies of specifications are held for inspection at the offices of the "Contract Record," 220 King street west, Toronto; the "Canadian Engineer," Church street, Toronto, and the office of Mr. T. Aird Murray, C.E., Consulting Engineer, Lumsden Building, Toronto.

Copies may be obtained from the Town Engineer, together with forms of tender, upon deposit of a fee of \$1.00, which will be returned when plans are returned.

W. E. N. SINCLAIR, B.A., L.L.B.,
Mayor.

FRANK CHAPPELL,
Town Engineer.

Town Hall, Oshawa.



Department of Railways and Canals

Intercolonial Railway

Improvements at Halifax

Sealed tenders addressed to the undersigned and endorsed "Tender for Pier and Sheds," will be received at this office until 12 o'clock noon of the 20th day of July, 1911, for the construction of a reinforced cement concrete pier and sheds at the Deep Water Terminus of the Intercolonial Railway, at Halifax.

Plans, specifications and form of contract to be entered into may be seen and full information obtained on and after the 20th day of June, 1911, at the office of the Chief Engineer, of the Department of Railways and Canals, Ottawa, Ont., and at the office of the Chief Engineer of the Intercolonial Railway at Moncton, N.B., or at the office of the Consulting Engineer, Mr. John Kennedy, Montreal.

Parties tendering will be required to accept the fair wages schedule prepared or to be prepared by the Department of Labor, which schedule will form part of the contract.

Contractors are requested to bear in mind that tenders will not be considered, unless made strictly in accordance with the printed forms, and in the case of firms, unless there are attached the actual signature, the nature of the occupation, and place of residence of each member of the firm.

An accepted bank cheque for the sum of \$25,000, made payable to the order of the Minister of Railways and Canals must accompany each tender, which sum will be forfeited if the party tendering declines entering into contract for the work, at the rates stated in the offer submitted.

The cheque thus sent in will be returned to the respective contractors whose tenders are not accepted.

The cheque of the successful tenderer will be held as security, or part security, for the due fulfilment of the contract to be entered into.

The lowest or any tender not necessarily accepted.

By order,
L. K. JONES,
Secretary.

Department of Railways and Canals.
Ottawa, June 5th, 1911.

Newspapers inserting this advertisement without authority from the Department will not be paid for it.

24-25

Tenders for Bridges

Tenders will be received by the undersigned until Saturday, July 1st, for the concrete work for a steel bridge to be erected in the Township of Burford, Ont.

Plans and specifications may be seen at any time at my residence, Cathart, Ont.

WM. MILMINI,
Reeve.

24-25

Steam Shovels

We own and have for sale near Buffalo, N.Y., two Vulcan 75-ton 2½-yard steam shovels; late model, with new extra large boilers and in excellent condition; also one 70-ton. These will stand most rigid inspection and we are offering them at unusually low prices. Confer with us.

WILLIS SHAW MACHINERY CO.,
39 So. La Salle Street,
Chicago, Ill.

TOWN OF VIRDEN

Debentures

Sealed tenders will be received by the undersigned until noon Thursday, July 6, 1911, for the purchase of an issue of twenty years debentures of the Town of Virden to the value of \$25,000, bearing interest at 5 per cent. dated July 2, 1911, with equal annual payments of principal and interest.

The said debentures covering the cost of construction and finishing of certain additions to the present municipal building, etc.

Offers to be made payable net, at the Canadian Bank of Commerce, Virden, Man.

Validity of said debentures guaranteed by the Municipal Commissioner of Manitoba. Tenders to be marked "Tenders for Debentures." The highest or any offer not necessarily accepted.

J. F. C. MENLOVE,
Sec.-Treas Town of Virden.

Virden, Manitoba. 24-25

Tenders Wanted

Sealed tenders will be received by the undersigned, up to Friday, June 23rd, at one o'clock p.m., for the construction of one 10-foot span flat top concrete bridge and one 45-foot span steel bridge on concrete abutments for the County of Wellington, also one 32-foot span concrete girder bridge and one 70-foot span steel bridge on concrete abutments for the Township of Minto.

Plans and specifications for both concrete and steel work can be seen at the office of W. D. McLellan in the Town of Harriston, where the tenders will be opened.

The lowest or any tender not necessarily accepted.

Tenderers will be required to furnish satisfactory security for the fulfilment of their contracts.

H. GRAEF,
Chairman Boundry Line Bridge.
Clifford, Ont.

W. D. McLELLAN,
Clerk of Minto,
Harriston, Ont.

24-25

TOWN OF THOROLD PROVINCE OF ONTARIO

Sewerage Works

Notice to Contractors

Sealed tenders will be received by the Town Clerk until 8 p.m. on Monday, June 26th, 1911, for the labor and materials required for the construction of a System of Sanitary Sewers, comprising about 13,000 lineal feet of pipe sewers.

Plans and specifications may be seen at the office of the Engineers, Mail Building, Toronto.

Deposit cheque for \$1,500 required for labor, and \$500 for sewer pipes.

The lowest or any tender not necessarily accepted.

A. McCULLOCH, Esq., Mayor,
Thorold, Ont.

CHIPMAN & POWER, Engineers,
Toronto, Ont.

D. J. C. MUNRO, Esq., Town Clerk,
Thorold, Ont.

CITY OF PORT ARTHUR

Tenders for Pavement

Sealed separate tenders, endorsed on envelope, "Tender for Paving," will be received by the undersigned up to 6 o'clock p.m. of Saturday, June 24th, 1911, for the paving of streets in the city of Port Arthur as undernoted:—

1. Bay street, Cumberland to Algoma:
With Asphalt Block, Sheet Asphalt and Bitulithic, and laying and paving street car tracks according to Engineer's plans, etc.

Estimated quantities:—
Pavement, approximately 4,784 sq. yds.
Curb and gutter, approximately 2,930 lin. ft.
Track construction, approx. 3,166 sq. yds.

2. Similar tenders for Algoma st., Bay to John:
Estimated quantities:—
Pavement, approximately 4,100 sq. yds.
Curb and gutter, approximately 3,060 lin. ft.
Track construction, approx. 3,378 sq. yds.

3. Similar tenders for Algoma st., John to Queen.
Estimated quantities:—
Pavement, approximately 1,685 sq. yds.
Curb and gutter, approximately 940 lin. ft.
Track construction, approx. 845 sq. yds.

4. Similar tenders for Pearl street, South Water to Court:—
(No Street Car Tracks)

Estimated quantities:—
Pavement, approximately 4,360 sq. yds.
Curb and gutter, approximately 1,836 lin. ft.

5. Similar tenders for Cameron street, Cumberland to Court:—
(No Street Car Tracks)

Estimated quantities:—
Pavement, approximately 1,780 sq. yds.
Curb and gutter, 1,340 lineal feet.

This latter street to include tender for construction with RocMac.

All tenders must include construction of proper curbs and gutters.

Further instructions as to specifications and forms of tender may be obtained from the City Engineer.

A marked cheque for ten per cent. of the estimated amount of contract must accompany each tender.

The lowest or any tender not necessarily accepted.

J. McTEIGUE, City Clerk.

Corporation Offices, Port Arthur,
June 10th, 1911.

24-25

Bridge Tenders Bridge Tenders CITY OF TORONTO

Scaled tenders will be received by William Purvis, Esq., Columbus, Ontario, for the building of a 36 x 20 foot concrete arch bridge on the fourth concession East Whitby, near Oshawa, up to noon on Friday, June 30th.

For further information apply to the undersigned.

BOWMAN & CONNOR, Engineers,
24 25 36 Toronto Street, Toronto.
H. GIFFORD, Reeve,
Cedardale, Ont.

TENDERS

Scaled tenders addressed to the undersigned will be received until 5 o'clock p.m. on Saturday, June 24th, for the construction of a reinforced concrete coagulating basin, of a capacity of approximately 400,000 gallons, at the St. Thomas Waterworks.

Plans and specifications may be seen and form of tender obtained at the office of the City Engineer.

The Commission does not bind itself to accept the lowest or any tender.

GEO. K. CROCKER,
Chairman Waterworks Commission.
St. Thomas, June 9, 1911. 24-25

CITY OF CRANBROOK, B.C.

Sewer Works

The Corporation of the City of Cranbrook invite tenders for the supply and delivery of the following:

36,500 lin. ft. of vitrified tile Sewer Pipe, from 18 in. to 6 ft. diameter, also Y Junctions, 123 Cast Iron Manhole Covers, also Catchbasin Covers and Flap Valves.
800 Barrels Portland Cement.

Specifications and all information may be obtained at the offices of the Consulting Engineers, The John Galt Engineering Company, 317 Portage avenue, Winnipeg.

Tenders should be in the hands of the undersigned not later than 20 o'clock on Monday, 3rd July, 1911.

The lowest or any tender may not be accepted.

THOS. M. ROBERTS,
City Clerk.
Cranbrook, B.C. 25 25

TENDERS

for Steel and Concrete Bridge

Mud Lake Narrows

TOWNSHIP of CARDEN

County of Victoria

Tenders will be received by the undersigned until Wednesday, July 5th, 1911, for the following works:—

1. Two steel spans with concrete floors, each 60 feet over all, 14 feet roadway between curbs, to carry a 10-ton roller at least, and to be approved by the Engineer of Highways of the Department of Public Works of Ontario.
2. One 120 feet span, same width and relative strength.
3. Three concrete piers to receive two 60-ft. spans.
4. Two concrete piers to receive one 120-ft. span.
5. Stone filling of approaches.

Plans and specifications may be seen at the office of the County Clerk, Lindsay and Whitby.

The committee claims the right to accept a tender for either two spans or one span; three piers or two piers and to decline any or all of the tenders.

J. R. McNEILLIE,
Clerk, County of Victoria.
Lindsay, June 12, 1911.

Scaled tenders will be received by the Clerk of Markham Township, Unionville, Ont., for the building of a steel superstructure with concrete abutments for a concrete arch in the Township of Markham, near Thornhill, up to noon on Friday, June 30th.

For further information apply to

BOWMAN & CONNOR, Engineers,
24-25 36 Toronto Street, Toronto.
J. PAGET,
Thornhill, Ont.

Tenders

will be received to June 28th instant by the undersigned to make about 20,000 feet of Cement Sidewalk in the Village of New Hamburg, three-inch concrete 1 to 8—and 1-inch finish 1 to 2.

The lowest or any tender not necessarily accepted.

WILLIAM MILLAR,
Clerk.

New Hamburg, June 14, 1911.

Tenders

Scaled tenders addressed to the undersigned and endorsed "Tenders for Pipe, Trenches, etc.," will be received until noon of Wednesday, the 28th day of June, instant, for the excavating, laying and refilling of about 17,200 feet of eight-inch cast iron water pipes, for Lachute Waterworks.

Specifications prepared by William Kennedy, Jr., C.E., may be obtained from the undersigned on application.

JAMES W. RAITT,
Secretary-Treasurer.
Lachute Town, P.Q.

Lachute, June, 15, 1911. 25 25

Tenders

will be received by J. F. C. Menlove, Town Clerk of Virden until 6 p.m., Friday, June 30th, for all the work in connection with the erection of a municipal building to be used for court room, offices and opera house, size 60 x 107, two stories and basement, to be of brick on concrete foundation.

Each tender must be accompanied by a marked cheque of \$600.

Lowest or any tender not necessarily accepted.

Plans and specifications may be seen at the office of W. A. Elliott, Architect, Brandon, and with the undersigned.

J. F. C. MENLOVE,
Town Clerk,
Virden, Man. 25 25

Contractors' Material IN CANADA

Brown Locomotive Crane, 10 ton capacity, at 14 feet. Overhauled.

Canadian Rand New Giant Rock Drill, No. 431, tripods and weights.

Ingersoll "Little Giant" Rock Drill, No. 34, tripod and weights.

Cooper No. 1 Small Rock Drill, with tripod.
6 x 4 American Steam Pump, Valve, piping and elbow.

New Size B Pulsometer Pump
30 h.p. Upright Boiler, 46 in x 10 in., complete.

Seven for stone crusher, 24 in. x 6 ft.

Have you anything to sell? Write us
THE MALES COMPANY,
No. 82 Lerit Building,
Cincinnati, O.

Tenders

For the

Construction of a Seawall

In Lake Ontario, in the Vicinity of the Exhibition Grounds.

Tenders will be received by registered post only, addressed to the Chairman of the Board of Control, City Hall, Toronto, up to noon on Monday, July 3rd, 1911, for the construction of a Seawall in the vicinity of the Exhibition Grounds.

Envelopes containing tenders must be plainly marked on the outside as to contents.

Specifications and forms of tender may be obtained on application to the Department of Railways and Bridges, City Engineer's Office, Toronto.

The tenderers shall submit with their tenders the names of two sureties (approved of by the City Treasurer not members of the City Council, or Officers of the Corporation of the City of Toronto, or in lieu of said sureties the bond of a guarantee company, approved of as above said).

The lowest or any tender not necessarily accepted.

F. S. SPENSE,
Chairman of the Board of Control.

City Hall, Toronto,
June 14, 1911. 25 25

TOWN OF WALKERVILLE

Tenders for Sidewalks

Scaled tenders will be received by registered post, addressed to the undersigned up to noon on Monday, the 3rd day of July, A.D. 1911, for the construction of pavements in the Town of Walkerville, as follows:—

Concrete pavement and concrete curb on Biant street from Kildare road to Argyle road.
Tuscarora street from Devonshire road to Victoria road.

Catarqui street from Devonshire road to West Town line limit.

Cedar block pavement and concrete curb approaches to overhead bridge on Grand Trunk Railway from Devonshire road to Victoria road.

Niagara street from Kildare road to West Town Line limit.

Asphalt Block Pavement
Victoria road from Sandwich street to Assumption street, repaving with Asphalt Block.

Walker road from Sandwich street to Canadian Bridge Works.

Monmouth road from Wyandotte street to Niagara street.

Argyle road from Grand Trunk Railway to Niagara street.

Kildare road from Catarqui street to Niagara street.

Victoria road from Assumption to Wyandotte.

Sandwich street from Devonshire road to East Town Line limit.

Tuscarora street from Walker road to Devonshire road.

Catarqui street from Walker road to Devonshire road.

St. Mary's Gate from Argyle road to Kildare road.

Plans and specifications may be seen on application to Owen McKay, C.E., Walkerville, Ont.

Tenders must be accompanied by a marked cheque payable to the Town Treasurer equal to two and one-half per cent. of the amount thereof.

Should any party whose tender is accepted fail to execute the necessary contract and bond for the due fulfilment of the same his deposit will be forfeited to the Town.

Deposit of unsuccessful tenderers will be returned.

The lowest or any tender not necessarily accepted, the names of two responsible persons willing to act as sureties must accompany tender.

CECIL H. ROBINSON,
Town Clerk.

Notice to Contractors

Township of Blanshard

Sealed tenders addressed to the undersigned will be received up to 5 o'clock p.m., Saturday, July 1st, for the Construction of the Youngson Creek Drain in the Township of Blanshard. Plans, files and specifications of said Drain can be seen at Clerk's Office at Rannock, in the said Township. A marked cheque for ten per cent. of contract must accompany each tender. The lowest or any tender not necessarily accepted.

JNO. H. JAMESON,
Clerk, Township of Blanshard.

25-26



Notice to Contractors

The time for receiving tenders for the laying of between three thousand and three thousand five hundred feet of rivetted steel pipe, six feet pipe, six feet in diameter, in Lake Ontario, for the Waterworks Department, has been extended to Monday, July 3rd, 1911, 12 o'clock noon.

Specifications and forms of tender may be obtained at the office of the City Engineer, Toronto.

F. S. SPENCE (Acting Mayor),
Chairman Board of Control.

City Hall, Toronto,
June 15th, 1911.

25-25



Department of Railways & Canals, Canada

Soulanges Canal.

NOTICE TO CONTRACTORS

Sealed tenders addressed to the undersigned and endorsed "Tender for Protection Works," will be received at this office until sixteen o'clock on Tuesday, June 27th, 1911.

Plans, specifications and form of contract to be entered into can be seen on and after the 9th instant, at the office of the Chief Engineer of the Department of Railways and Canals, Ottawa, and at the office of the Superintending Engineer of the Quebec Canals, 2 Place d'Armes, Montreal, Que., at which places forms of tender may be obtained.

Parties tendering will be required to accept the fair wages schedule prepared or to be prepared by the Department of Labor, which schedule will form part of the contract.

Contractors are requested to bear in mind that tenders will not be considered, unless made strictly in accordance with the printed forms, and in the case of firms, unless there are attached the actual signature, the nature of the occupation, and place of residence of each member of the firm.

An accepted bank cheque for the sum of \$8,000 made payable to the order of the Minister of Railways and Canals must accompany each tender, which sum will be forfeited if the party tendering declines entering into contract for the work at the rates stated in the offer submitted.

The cheque thus sent in will be returned to the respective contractors whose tenders are not accepted.

The cheque of the successful tenderer will be held as security, or part security, for the due fulfilment of the contract to be entered into.

The lowest or any tender not necessarily accepted.

By order,
L. K. JONES,
Secretary.

Department of Railways and Canals,
Ottawa, June 9th, 1911.

Newspapers inserting this advertisement without authority from the Department will not be paid for it.

25 25

TO CONTRACTORS

Sealed tenders will be received for all trades required in the erection of an office building in King street, up to noon on June 30th, 1911.

The lowest or any tender not necessarily accepted.

F. S. BAKER, Architect,
Traders Bank Building,
Toronto, Ont.

25-26

CITY OF MOOSE JAW Saskatchewan

TENDERS

Sealed tenders addressed to the undersigned City Clerk will be received in the Council Chamber, Moose Jaw, up to 8.30 p.m. on Monday, July 24th, 1911, for the supply of the following electrical apparatus:—

Contract A.

Fifty 6.6 Ampere, Direct Current, series, Metallic flame arc lamps, complete with globes, etc.
Fifty Absolute cut-out hangers.
One Current Regulator, 50 lamp circuit.
One Mercury Rectifier, 50 lamp circuit.
One Control panel with switches, 50 lamp circuit.

Contract B.

Fifty ornamental arc lamp standards.
Full particulars and specifications may be obtained from J. D. Peters, Electrical Superintendent, Moose Jaw, Sask.

The lowest or any tender not necessarily accepted.

25-27

W. F. HEAL,
City Clerk.



Sealed tenders addressed to the undersigned, and endorsed "Tender for Harbour Works in Courtenay Bay, St. John, N.B.," will be received until 4 p.m., on Thursday, August 10th, 1911, for the construction of a Breakwater, Wharves, for the Dredging of a channel and basin, and for the Filling shown on plan and also for the Construction of a Dry Dock and Ship Repairing Plant of the First Class under "The Dry Docks Subsidies Act, 1910.

Plans, specification and form of contract can be seen and forms of tender obtained at this Department, at the offices of E. T. P. Shewen, Esq., District Engineer, St. John, N.B.; J. K. Scammell, Esq., District Engineer, St. John, N.B.; C. E. W. Dodwell, Esq., District Engineer, Halifax, N.S.; A. R. Decary, Esq., District Engineer, Post Office, Quebec, Que.; J. L. Michaud, Esq., District Engineer, Merchant's Bank Building, St. James Street, Montreal, Que.; J. G. Sing, Esq., District Engineer, Confederation Life Building, Toronto, Ont.; H. J. Lamb, Esq., District Engineer, London, Ont.; and at the office of the High Commissioner for Canada, London, Eng.

Persons tendering are notified that tenders will not be considered unless made on the printed forms supplied, and signed with their actual signatures, stating their occupations and places of residence. In the case of firms, the actual signature of the occupation and place of residence of each member of the firm must be given.

Each tender must be accompanied by an accepted cheque on a chartered bank, payable to the order of the Honourable the Minister of Public Works, for the sum of five hundred thousand dollars (\$500,000), which will be forfeited if the person tendering decline to enter into a contract when called upon to do so, or fail to complete the work contracted for. If the tender be not accepted the cheque will be returned.

The Department does not bind itself to accept the lowest or any tender.

By order,
R. C. DESROCHERS,
Secretary.

Department of Public Works,
Ottawa, June 9, 1911.

Newspapers will not be paid for this advertisement if they insert it without authority from the Department.

25-26

Plans Wanted

Competitive designs will be received by the undersigned up to and including July 5th, 1911, for a skating and hockey rink, size of ice space 75 x 180 feet, and seating capacity to be not less than 2,500, building to cost approximately \$7,000. Plans to remain the property of the designer, same to be returned to the unsuccessful competitors.

Two and one-half per cent. will be paid to the architect whose designs are accepted, for working plans and specifications.

R. C. MACFARLANE, Secretary,
Niagara Falls Hockey & Athletic Club, Ltd.,
25-26 Niagara Falls, Ont.

TOWN OF WELLAND

Street Paving

Sealed tenders, Envelopes must be plainly marked on the outside, the contents, Tenders will be received until 12 o'clock noon on Friday, the 30th day of June next, for paving the following street in the Town of Welland.

East Main street from Helms avenue to Muir street.

Muir street from East Main street to Division street.

West Main street from Canal Bridge to Frazer street.

Tenders are invited for Asphalt Block, Vitri-fied Brick, Taralithic and Bitulithic, with brick between car tracks and extending 18 inches on the outside rails, on 6-inch Concrete Foundations.

Proprietors of patented pavements are requested to furnish their special specifications.

An accepted bank cheque for \$1,000 must accompany each bid.

The lowest or any tender not necessarily accepted.

Further particulars can be obtained from Town Engineer's office.

GEORGE R. BOYD,
Town Clerk.

Town Clerk's Office,
Welland, June 12, 1911.

25-25

St. Catharine's Water Works

Tenders

Sealed tenders addressed to "The Chairman of the Commission," marked "Tender for Pipe Laying," or "Tender for Tunnel," will be received up to noon on Thursday, July 13th, 1911, for—

Section "A."

4,200 lineal feet Rock Tunnel, 5 ft. x 8 ft.

Section "B."

Excavation and pipe laying 5,000 ft. 24 in. and 30 in. cast iron pipe. 36 in. cast iron intake pipe. Concrete intake and Valve Chambers. Building auxiliary reservoir.

Section "C."

Excavation and pipe laying 15,000 ft. 24 in. cast iron pipe.

Specifications and plans may be seen and forms of tender obtained at the office of the Waterworks Commission, City Building, James street.

The Commission reserves the right to reject any or all tenders, or to accept any tender which shall appear in its interest.

ALEX. MILNE,
Superintendent.

St. Catharines, Ont.
June 17th, 1911.

25-26

Bridge Tenders

Alternative tenders will be received by the Clerk of Markham Township, Unionville, Ont., for the building of a steel superstructure with concrete abutments, or a concrete arch in the Township of Markham, near Thornhill, up to 9.30 on Friday, June 30th.

For further information apply to

BOWMAN & CONNOR, Engineers,
36 Toronto Street, Toronto
J. PAGET, Thornhill, Ont.

24-25

For Sale

Steam and Electric Machinery displaced by Niagara Power. One 125 horse power, one 225 Compound Condensing Wheelock Engines in good condition. Boilers, 14 ft. x 60 in. and 12 ft. x 48 in. complete with iron work and steam connection. Condensers, heaters, belt tighteners, pulleys and shafting. Direct Current Electric Dynamos and Motors from one to eighty horse power. Bargain prices. Write for particulars.

W. R. REYNOLDS,

Supt., Power & Light Commission,
Ingersoll, Ont.

25-27

Positions Wanted

Advertisements under this heading one cent a word per insertion. Box No. ten cents extra

Position Wanted

Englishman wants job in Building Trades, twenty years experience, used to handling large quantities of men. Can prepare plans, specifications and estimates for all classes of work, up to date Sanitary Engineer, good references; age 37 years. Apply Box 288, Contract Record, Toronto, Ont. 25-25

Positions Vacant

Stone Masons Wanted—A few good stone masons wanted, to build random Ashler stone work, required at the building of a Parish Hall, for All Saints Church, Collingwood, Ontario. Apply Philip C. Palin, Architect, Collingwood, Ont. 25-26

Residences

(Continued from page 59)

Tenders to be called for residence, \$9,000. Owner, Mr. Humphrey, Toronto; architect, Curry & Sparling, Toronto; 2½ storeys, brick and stone, 86x38, brick foundation, hot water heating, gas and electric light, slate roof, interior finish hardwood. Tenders called shortly. 268 Dovercourt road, Toronto; architect, P. H. Finney, 437 Victoria street, Toronto; brick and stone, stone foundation, hot air heating, combination lighting, felt and gravel roof, 2 storey, 31x20. Owner will build shortly by day labor.

Tenders called for residence on Danforth avenue, \$8,000. Owner, P. H. Lambert, 97 Anne street, Toronto; architect, A. Trainer, Grace street, Toronto; brick and stone, stone foundation, hot air heating, felt and gravel roofing, gas lighting, 2 storey 30x36. Tenders are called and will close June 20th.

Tenders called for residence, \$12,000, (Indian and Bedford roads). Owner, F. Everist, Gwynne avenue; architects, Gordon & Helliwell, Confederation Life Building, Toronto; brick and stone (cut) stone foundation, hot water heating, gas

and electric lighting, slate roofing, modern plumbing, structural iron, skylights, mantels, 2½ storeys, 58 ft. 3 in. x33 ft. 2 in. Tenders received after June 13, close June 17th.

Contemplated residence, \$40,000, north Toronto. Owner, W. M. Boulthée, York Mills, Ont; architect, H. S. Townsend, 15 Gerrard street east, Toronto; brick and stone, stone foundation, Slate roofing, 2½ storeys. Plans have not been started.

Tenders called for residence, \$8,000. Owner, Mrs. Armour, Toronto; architect, J. F. Page, Confederation Life Bldg., Toronto; 2½ storeys, 30 x 40, brick construction, brick foundation, hot water heating, electric lighting, shingle roofing, hardwood interior finish. Tenders called until June 21.

Plans prepared for residences, \$6,400. Owner and builder, R. Larkin, 81 Hogarth avenue; rough cast and brick front, brick foundation, hot air heating, gas and electric lighting, modern plumbing, felt and gravel roofing, 2 storey 38 x 32 ft. 6 in. Building will commence in a few days.

Tenders to be called for residence, \$6,500, (42 Silver Birch avenue). Owner, J. D. Lea, Sherbourne street; brick, stone foundation, hot water heating, electric lighting, slate roof, hardware interior finish, 2½ storeys, 56 x 32. Tenders called in about 10 days by Aldridge & Son, the masonry contractors for balance of work.

Plans prepared for residences, \$4,500, pr. semi-detached, Ellerbeck avenue. Owner, architect and builder, W. W. Hiltz, 682 Broadview avenue; brick and stone, stone foundation, hot-air heating, combination lighting, felt and gravel roof, 2½ storey 40 x 33. Owner will build shortly by day labor.

Tenders to be called for store and apparatus, \$4,000, (Wellesley and Bleeker streets). Owner, W. T. Tidy, Wellesley street; architect and builder, A. E. Cale, 91 Bleeker street; brick and stone, stone foundation, hot water heating, gas and electric lighting, felt and gravel roof, maple flooring; 2 storeys 18 ft. 9 in. x 54. Tenders will be called shortly for everything but carpenter work.

Heating required for garage, \$4,000, (157 Sherbourne street). Owner, W. C. Bailey, King Edward hotel; architect, W. C. Bailey, King Edward Hotel; brick, concrete foundation, felt and gravel roofing, 2 storey. Building will commence in a few days. Heating contract not yet let.

CONTRACTS AWARDED

Montreal, Que.

Residence, \$17,000, (Pine avenue). Owner, architect and general contractor, H. C. Hitch, Coristine Building, Montreal; 2 storey, stone front brick, 25 x 50.

Residence, \$25,000, Island street near Centre. Owners, Catholic School Commissioners, Montreal; architect, Joseph Sawyer, 407 Guy street; contractors—stone work, Fillon Freres; brick work, S. Marchesault, 8 Pacific avenue; carpentry, Lamarre Freres, 596 St. Patrick street; painting and glazing, J. Guy, 325 Workman; plastering, A. Cusson, 40 Laporte avenue; roofing, etc., T. Lessard & Sons, Ltd., 191 Craig east, all of Montreal.

9 dwellings, \$12,000, (Christophe Colomb street). Owner, architect and gen-

eral contractor, P. J. Charlebois, 1234 St. Hubert street, Montreal; 3 storeys, brick and wood, 75 ft. frontage x 40 ft. deep.

Shediac, N.B.

Addition to New Sherbrooke House, \$15,000 (Depot street). Owner H. Higgins, St. Johnsbury Vt.; architect, C. E. White, Sherbrooke, Que.; 1 storey added. Brick, 80x40; general contract let June 8 to Sherbrooke Construction Co. Building to be completed Aug. 20th.

Shediac, N. B.

Residence, \$16,000. Owner, R. C. Tait, Shediac, N. B.; architect, H. H. Mott, St. John, N. B.; 2 storeys 50 x 100; general contractor, Arthur P. LaBlanc, Moncton, N. B. Heating and plumbing awarded to Hagen & Co., Amherst, N.S.

Toronto, Ont.

Residence. Owner, D. G. Anderson, 95 Westmoreland ave., Toronto; architect, W. Belfry, Victoria street; general contractor, R. C. Cummings, 1684 Dundas street, Toronto; brick and stone, 32 x24, 2 storey.

Business Buildings and Industrial Plants

Brantford, Ont.

Manufacturing plant, \$60,000. Owner, Waterous Engine Works Co., Brantford; general contractors, Schultz Bros., Brantford; iron work, Hamilton Bridge Works, Hamilton. Construction, brick, galleries and floors, reinforced concrete, 110 x 240, 1 storey and gallery; heating contract not let yet. General contract let June 12th. Building to be completed Sept. 1st. Foundation already in.

Calgary, Alta.

Tenders called for Bank—alterations and additions. Owner, Bank of Nova Scotia, Eighth avenue, Calgary. architects, F. J. Lawson, Norman Block Calgary. Plans, etc., at office of the architect. Contractor to furnish marked check for 5 per cent. of amount of tender. Tenders received until June 27th, by architect.

Edmonton, Alta.

Tenders called for business block, \$50,000. Owner, Hart Bros., Edmonton; architect, H. A. MaGoon, cor. Jasper street and 3rd street; supply of triangular mesh reinforcing steel for concrete floors required. Tenders received by H. A. Magoon until June 20th.

Building in progress for cold storage plant, \$75,000. Owner, Swift Canadian Co., Edmonton; concrete reinforced, concrete foundation, tar and gravel roof; 2 storey planned for, brick, electrical work, refrigerator. Four more storeys may be added later.

Hamilton, Ont.

Store, \$6,000. Owner, E. Ruddy, Hamilton; architects, W. A. Edwards, 7 Hughson street, Hamilton; general contractor, Geo. Mills & Evans, Hamilton. Masonry, carpentry, cement and plastering let to Mills & Evans. Plumbing, sheet metal, iron work and stone work to be let.

Tenders called for two stores, \$6,000. Owner, J. Morrow, Hamilton; architect, Stewart McPhie, Hamilton; brick, concrete foundation, steam heating, electric lighting, 2 storey shingle roof, cut stone, structural iron, plate glass. Permit granted. Tenders received after 10 days.

London, Ont.

Tenders called for factory, \$7,000, York street. Owner, Spring Bed & Mattress Co., York street, London; architect, Watt & Blackwell, 54 Bank of Toronto Chambers, London; 3 storeys, 53 x 67 ft., brick and metal, steam heating, electrical work, composition roof, freight elevators, structural iron, vaults, fireproofing, asbestos materials. Heated by steam from another plant. Tenders received until June 22.

Tenders called for storage building, \$3,000, York street. Owner, Spring, Bed & Mattress Co., York street, London; architect, Watt & Blackwell, Bank of Toronto, London; two storeys, 40 x 52, brick and metal, cement and brick, steam heating, electric lighting, shingle roof. Tenders called until June 26.

Montreal, Que.

Tenders called for terra cotta plant, \$150,000. Owners, Montreal Terra Cotta Lumber Co. Location, at Lakeside near Montreal; kilns, machinery and dryers required. Bids will be called for kilns at once. Received at 26 Board of Trade Building, Montreal.

Tenders to be called for theatre and stores, \$155,000. Owner, J. A. E. Gauvin, 850 St. Catherine E., Montreal. Architect, C. Bernier, 70 St. James street, Montreal; brick and stone, 85 x 126 5 storeys, capacity 1,250; 3 stores in front; offices and light manufacturing plants over them.

Niagara Falls, Ont.

Equipment required for manufacturing plant. Owner, Beaver Manufacturing Co., Niagara Falls, Ont. Manager, W. E. Jennings, Niagara Falls, Ont. Tin box machinery. Apparatus required at once.

North Battleford, Sask.

Tenders called for bank. Owner, Imperial Bank of Canada, N. Battleford; architects, Barnes & Gibbs, Imperial Bank Building, Edmonton. Plans, etc., at bank, offices of the architects, and at Builders' Exchange, Sask. Tenders received by architects until noon June 19.

Orangeville, Ont.

Destroyed by fire—business building, \$60,000. Owner, Hurdall Novelty Furniture Co., Orangeville; 3 storey 55x111, wing 45x55, engine house 28x30, 2 storey.

Oshawa, Ont.

Equipment required for business building. Owners, Queen City Oil Co., Bay street, Toronto, general manager, A. S. Rogers; engineer, S. Jackson. Equipment to be installed, 4 steel oil tanks, 11.5 ft. diameter, 20 ft. high. Construction of storage plant and stables to commence within one week by day work.

Revelstoke, B. C.

Sawmill burnt—loss \$40,000. Owners, Bowman Lumber Co., subsidiary comp. of Dominion Sawmills & Lumber Co., Ltd. Mill and plant entirely gutted. 600,000 feet storage logs burnt. Loss covered by insurance. Questionable whether they will rebuild.

St. John, N. B.

Tenders called for addition to brush factory. Owners, T. S. Simm & Co., St. John; architect, F. Neil Brodie, St. John, N. B., power house, boiler house, and machine shop 48 x 55. Tenders to be called this week.

Sherbrooke, Que.

Plans in progress for store, \$12,000. Owner, P. T. Legaru Sons, Que.; architect, J. W. Gregoire, Sherbrooke; 2 storeys, brick and stone, 60x100, stone foundation, electric light. Tenders received after July 1st. Time to close not fixed yet.

Sackville, N. B.

Specifications completed for addition to foundry. Owner, Emerson & Fisher, St. John, N. B.; small addition to plant of Enterprise Foundry Co., at Sackville, N. B. Tenders called shortly.

Toronto, Ont.

Tenders called for factory, (Symington avenue). Owner, W. D. Beath & Son, 193 Terauley street, Toronto; architect, and builder, W. Siddall, 75 Yonge street, Toronto; steel and concrete, concrete foundation, electric lighting, concrete, felt and gravel roof, 1 storey 130x52, fireproof doors. Structural iron and 2,200 ft. metal sash and wire glass required. Tenders close June 20th.

Tenders called for stores, \$3,500 (Gerard and Erie). Owner, H. B. Bishopric, 61 Heath street; architect and builder, J. L. Hill, 154 Wheeler avenue, Toronto; 2 storey, frame, concrete foundation, hot air heating, gas and electric light, tar and gravel roof, 53 ft. 9 in. x 26. Tenders called for all but carpentering about June 16th.

Tenders called for warehouse, \$40,000, Bay and Wellington. Owner, W. R. Brock Co., Ltd., Wellington street, Toronto; architect, A. R. Denison & Stephenson, 20 King street west, Toronto; 4 storeys and basement, 108 ft. 8 in. by 49 ft. 1 in., brick, stone foundation, steam heating, felt and gravel roof, structural iron, skylights, metallic lath, Tenders received until June 20, by the architect.

Mr. Percival R. Moses, E.E., 366 Fifth avenue, New York, has been retained as consulting engineer for a large departmental store, and desires to specify British or Canadian materials. He is open to receive information and catalogues relating to the following: marine type boilers, 250 h.p. each; ventilating fans (Sirocco and propeller types); air washers; tempering coils; w. i. pipe; heating system (vac. return); caskets; valves (globe and gate for 125 lbs. and for pressure and radiators) (relief valves); steam transformers; insulating covering; registers and register faces; automatic pump control; mtoors; steam pumps; back pressure valve; grease separator and return tank; hot water heater; reducing valve; blow-off tank; steam separators; pump governor; water weigher; damper regulator; exhaust head; oil cabinet; absorption type refrigerating plant (operative by exhaust steam at 15 pounds or less pressure with condensing water 70 deg. or less); mechanical stokers for bituminous coal; fire brick; dynamo (300 kilowatt, 110 volt, direct connected, 150 r.p.m. (3)); switch and control panels and panel boxes; storage battery (140 amperes, 8 hours, 110 volts) for equalizing elevator demand and for some night lighting; push switches; conduit and outlet boxes; receptacles; telephones; show window reflectors; time and watchman's clock system; fire alarm; 500 h.p. moderate speed Corliss valve engines (3); vacuum cleaning machine; arc lamps; tungsten and carbon filament bulbs; hose for fire system and for vacuum cleaning sys-

tem; sprinkler heads and system; air compressors; toilets; lavatories; urinals; drainage pipe and fittings; water meters.

Victoria, B. C.

Tenders called for office building. Owner, Dominion Trust Co., 328 Hastings street, Vancouver, B. C.; architect, H. S. Griffith, Dom. Tr. Bldg., Vancouver, B. C.; general contractor, N. Griffiths Steel Construction Co., 198 Hastings street west, Vancouver, B. C. Tenders on the sub-contracts for building to be erected in Victoria will be let shortly.

CONTRACTS AWARDED**Brantford, Ont.**

Factory warehouse. Owner, Massey-Harris Co., Brantford; contractor for foundation, A. J. Cromar, Brantford; concrete foundation, 162 x 66, basement, about 400 cubic yards of concrete. Contract let June 13th. Building to be completed July 15th.

Hamilton, Ont.

Factory, \$100,000. Owner Underground Cable Co., Pittsburgh, Pa.; architects, Prack & Sons, Welland, Ont. brick, concrete, steam heating, electric light, tar and gravel roof, 3 storeys 100x250, fire escapes, steel beams iron columns, structural iron, fireproof doors, freight elevator. Tenders closed June 14th.

Moose Jaw, Sask.

Printing shop, \$25,000. Owner, Times Printing Co., Ltd., Moose Jaw; architect, Storey & Van Egmond, Regina; 3 storeys mill construction; general contractor, Peter Lyall & Co., Montreal. No information as to sub-contractors. Report later.

Office and warehouse, \$20,000. Owner, Massey-Harris Co., Ltd., Regina; architect, R. G. Bunyard, Moose Jaw, 3 storeys and basement, brick and stone, 28x98. General contractor, A. B. Fleming, Regina, Sask, awarded June 6, 1911.

Medicine Hat, Alta.

Furniture store, \$23,000. Owner, Beveridge Furniture Co., Medicine Hat; architect, W. T. Williams, Medicine Hat; 2½ storeys, brick and stone, 44 x 130. General contractor, A. P. Burns, Medicine Hat. Building to be completed October 1.

Office building. Owners, News Publishing Co., Medicine Hat; architect, W. T. Williams, Medicine Hat; 2 storey, brick and stone, 50x50. General contractor, Hotson & Leadie, Medicine Hat. Building to be completed Oct. 1.

Montreal, Que.

Warehouse, \$16,000. Owners, The Star Publishing Co., St. James street, Montreal; architect, McVicar & Heriot, Montreal. General contractor, Reid, McGregor & Reid, Crescent and St. Catharine street west.

4 stores, \$60,000. Owner, Mrs. D. E. Dorvil, 859 Tupper street, Montreal; architects, McDawell & Henderson,

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Grey street, Montreal; 4 storeys brick and stone 74x110; general contractor, G. W. T. Nicholson, Eastern Townships Bank Building, Montreal. Sub-contractors, carpentering, D. M. Long; plastering, R. D. Clark & Sons; heating and plumbing, D. A. Bethune; painting, Jno. Wilson; iron work, Phoenix Bridge Co. All firms in Montreal.

Bank, \$7,000 (Mount Royal avenue E.) Owner, Montreal City and District Savings; architect, A. H. Lapierre, 30 St. James street, Montreal; contractor, M. Huberdeau, 622 de Montigny, Montreal; brick and stone face, 26x52, 3 storey.

Business building, Craig street. Owner, The Herald Co., Ltd., St. James street, Montreal; architects, Brown & Vallance, St. James street, Montreal; General contractor, Bishop Construction Co., Montreal and Toronto.

Power Plants, Electricity and Telephones

Blyth, Ont.

By-law to be submitted for electric light steam pump, \$5,000. Party interested, Village of Blyth; clerk, A. Elder, Blyth. By-law to be submitted on June 27th.

Edmonton, Alta.

By-law to be submitted for hydro-electric plant, \$100,000. Owners, City of Edmonton, Alta; city engineer, A. J. Latournell, Alta., first of five yearly instalments of equal amounts to develop the Athabasca water power, estimated at 10,000 h.p. Government has granted the city the privilege of using the Grand

Rapids, 190 miles north of city. By-law will be submitted on June 17th.

Earlwood P. O., Sask., via Wapella, Sask.

Tenders called for telephone system. Owner, Fairmeade Rural Telephone Co., Ltd. Chairman, W. G. Hodgins, sec-treas., H. R. Dring, Earlwood. Construction of two circuits in rural telephone system, 23 miles (more or less). Completion by September 1st. All material and labor to be furnished by contractor. Tenders received by secretary-treasurer, Earlwood, until July 1st.

Hamilton, Ont.

Debenture by-law for municipal power plant, \$502,878. Owner, City of Hamilton, Ont. By-law being prepared to be submitted to ratepayers for power to raise debentures for electric power and light municipal plant. Work will begin at once if by-law carries. Details of estimates of engineer furnished on request.

Moose Jaw, Sask.

Tenders called for supply of electrical apparatus. Owner, City of Moose Jaw, Sask.; W. F. Heal, city clerk; city engineer, J. M. Wilson. Contract A.—50 6.6 ampere, direct current series, metallic flame arc lamps, complete with globes, etc.; Contract B.—ornamental arc lamp standards. Full particulars obtained from J. D. Peters, electric superintendent, Moose Jaw. Tenders received by city clerk until 8.30 p.m. Advertisement in Tenders and For Sale Department of this issue.

Vernon, B.C.

Proceedings of council—new dynamo, \$6,000. Clerk and treasurer, D. G. Tate,

Vernon. Purchase of dynamo; by-law will be presented to ratepayers to carry out electric light extensions.

Wetaskiwin, Alta.

Machinery required for power plants. Engineer, Geo. Taylor, Wetaskiwin, Alta. Gas engine driving alternator; also air compressor, motor driven. Specifications mailed on application.

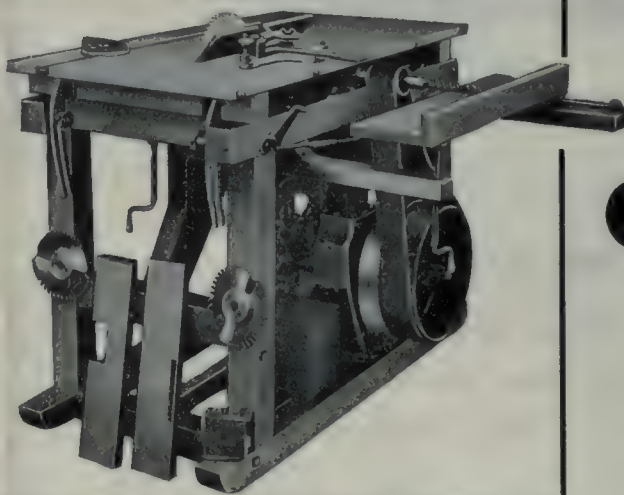
Windsor, Ont.

Business opportunity, power building for manufacturing; secretary board of trade, A. W. Jackson, Windsor; urgent demand for space; American manufactures starting in leased premises to test market, all available buildings in city now leased and more than a dozen companies seeking locations. Suitable building can be purchased with excellent arrangement for supplying power, or new building would be paying proposition. Detroit power buildings charging 30 cents a foot for space yearly and 5 cents per kilowatt hour for power. Address A. W. Jackson, for further information.

Miscellaneous

Windsor, Ont.

Contemplated, purchase of new fire equipment, \$17,000. Owner, City of Windsor, Stephen Lusted, City Clerk; Ald. T. J. Eansor, chairman fire committee. Proposed new equipment, combination auto driven apparatus, 700 gallon capacity pump, chemical and hose, 80 horse power, combination auto driven apparatus, chemical and hose, 80 horse power, 1,000 feet of new house; hose repairing kit; smoke protector.



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Contract Record

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A Fair Field for All

The members of the Toronto Board of Education last week established for once an excellent precedent in awarding a contract for school furnishings to the lowest tenderer despite the proposal to pass this over in favor of the next lowest bid submitted by a local firm. Hitherto it seems to have been the custom in many large cities to have taken bids from outside firms merely for the guidance of local concerns—or perhaps as a “blind.” We have always advocated very strenuously that when outsiders are invited to tender on equal terms they should have equal chances of obtaining the contract. If they are not wanted to figure and if they stand no chance of doing so successfully, intimation to such effect should be contained in the call for tenders. It is gratifying to know that in Toronto at any rate it is coming to be seen that there is no justification for procedure of this kind. Nothing checks the progress of a city in contracting circles so effectively as unfair awards. It means the freezing out of the really competent men, and worse, it places a premium upon collusion and monopoly.

The letters by “Engineer” and Peter Gillespie, published in this issue, will doubtless be read with some interest by at least one person,—City Architect McCallum. No civic official could fail to profit by the wholesome advice tendered by “Engineer.” The same writer has also something to say concerning the provisions of the building by-law in regard to concrete work, and further, concerning the carrying capacity of steel beams.

Mr. Gillespie refrains from entering into a very detailed discussion of affairs, but he criticises the general principle adopted by the city architect in giving “interviews” to the daily press. He says very properly that the technical press is the only quarter in which technical matters should be discussed. We would commend to Mr. McCallum’s serious consid-

eration the closing sentence in Mr. Gillespie’s second paragraph.

Mr. McCallum would be well advised to make further study of the qualifications of the various members comprising the Citizens’ Committee before giving further “interviews.”

Necessity for Co-operation Among Engineers, Contractors and Manufacturers

By A. C. Koenig, A. M. Soc. C. E.

The engineer, the consulting specialist, the manufacturer and the contractor are each important parts of the machine, which should be operated in the interests of those who ultimately pay the bill, and harmonious co-operation between all of these parts is essential for the attainment of the highest efficiency in the final results.

Engineers’ specifications were formerly so strictly drawn and contained so many “reservations” (to use a mild term) which were subject to the sole interpretation of the engineer, that the “personal equation” was the controlling element in their practical execution.

Contractors’ Rights and Wrongs

These “reservations” and indefinite general instructions were merely shields behind which an engineer could hide his limitations of exact knowledge and experience, and placed the burden of expense for “experimental” construction upon the contractor. The contractor was required to furnish the practical knowledge of details which the engineer lacked, and he frequently paid the penalty of reconstruction on portions of the work with which, in the absence of definite specifications, he had foolishly proceeded according to his best judgment, thus affording the advantage of “hind-sight” to the engineer, and enabling him to make practical observations on this “experimental” construction, thereby determining “the method in which the work should properly be done,” and to order it thus.

In drawing up specifications, engineers always appropriated the power to “make or break” the contractor, unless the matters involved in controversy were of sufficient importance to seek adjustment in a court of equity. It behooved the contractor, therefore, to invoke the powers of diplomacy (often of dishonesty and subterfuge) to adjust this unfair balance—to “wine and dine” the engineer, to assume a subservient attitude, to take advantage of opportunities to secure a laxity of inspection, to give subtle guidance to the engineer’s interpretation of the indefinite clauses—in fact, to exercise all of the ingenuity of natural diplomacy to cause a shifting of the centre of oscillation of the pendulum of unfairness, from the position of unfairness against him, to a position of unfairness in his favor, and against him, and against the “owner,” who would thus pay the penalty of an unfair contract in illegitimate profits on inferior workmanship and materials.

Under such conditions successful contracting on a large scale required men of broad mental calibre, with qualifications which generally made them superior to the average engineer in all respects, except the matter of “book-learning,” which expression aptly described the meaning and status of education in the conceptions of those who looked upon mathematical and theological knowledge as accomplishments of doubtful practical value.

Good Engineers—Poor Contractors

Engineers who are attracted by the large profits which contractors frequently made, and who persuaded themselves to engage in the degrading business of contracting, temporarily, for the purpose of acquiring sufficient wealth to enable them to pursue their professional career thereafter with comfortable absence of financial worry, generally found that it was impossible for them to adapt themselves to the complete reversal status which such unfair conditions necessitated, therefore failure was inevitable. Thus arose the popular belief that the training of an engineer absolutely unfitted him for the business of contracting.

Such failures, however, resulted in permanent good, because they served to make their victims broader-minded engineers by giving them an insight into the unfairness of the handicap under which an honest contractor was compelled to struggle to save himself from ruin, thus hastening evolution toward present conditions.

Various phases of engineering-contracting now involve the highest degree of special technical training, and many large manufacturing and contracting concerns not only employ men of the highest order of technical attainments, but also maintain courses of special instruction, with practical technical apprenticeship, for the further development of men who enter them employ after securing a preliminary education at some technical school.

Manufacturers' Catalogues of Scientific Value

Conspicuous examples of the marvelous development which has resulted from this policy are furnished by the large electrical concerns, steel mills, bridge and structural shops, etc. Catalogues of machinery, materials, and engineering specialties are no longer compiled on the principle which governs the production of a mining prospectus, but generally contain reliable, practical information of scientific value.

The province of the engineer in large undertakings has become largely that of determining the general requirements of local conditions, and serving the best interests of his clients by preparing a general design, or construction plan, which embodies a judicious selection, and proper combination of materials, machinery and special appliances, which have been perfected and standardized by specialists.

Frank cooperation between the engineer and various manufacturing concerns is therefore an important element in the attainment of the best results in any large undertaking. The engineer of limited experience should not attempt to make definite decisions regarding the type of machinery, and the details of arrangement and installation with the specialists, or "experts," who are employed by all reliable concerns for that purpose. Keen competition makes the interests of the manufacturer practically identical with those of the engineer and his client in the attainment of the highest degree of economic success in the final results.

Therefore, in all phases of professional activity, cooperation is the keynote of success.

Uniform Building Laws

The lack of uniformity existing in the laws enacted to regulate and govern the construction of buildings throughout the country has probably occasioned as much confusion and trouble as the fact that the greater majority of them have not been dictated by

profound knowledge or even, in all cases, an earnest desire to render the greatest possible measure of protection and benefit to the greatest possible number of citizens, says the American Architect. Of course, there is no reason than can justify the use of certain materials under certain conditions in one city and their rejection under similar conditions in another. Obviously, one authority or the other is in error, with the result that architects and others connected with building enterprises are reaching a point where they feel little respect for the building laws of any city.

If it were possible, and there appears to be no insuperable obstacle to such a plan, to draft comprehensive rules governing the use of structural materials in buildings and then enact those rules into laws applicable throughout an entire State, it would seem that some progress had been made. It is readily apparent that certain restrictions as to character of buildings permissible in certain localities would be necessary, but a considerable degree of uniformity might be secured if such features as allowable stresses in various materials, ingredients of mortars and concretes, the bearing power of different classes of materials encountered in foundations, requirements of sanitation and many similar matters were determined. It might also be feasible to define the various styles of construction and classify the buildings belonging to the various types prescribing the construction of each. To each individual community might safely be left the determining of limits within which only buildings of fireproof or other class could be erected. Also other matters, such as heights, court areas, etc., which would depend largely on local conditions and might vary greatly with them, could not well be included in a general code, but such features are not the cause of present unsatisfactory conditions.

A distinctively progressive step has been taken in Pennsylvania. A joint resolution providing for the appointment of a commission to investigate the manner of construction of buildings in the State and to determine the strength and character of materials in order to safeguard the health and life of persons occupying the same and to codify the laws in relation to buildings has been introduced into the Senate. The resolution has received the approval and endorsement of the Pennsylvania State Association of the American Institute of Architects, which endorsement also carries a suggestion that the appropriation feature of the bill appears inadequate to defray the expenses of the far-reaching inquiry necessary to the proper carrying on of a work of the magnitude and importance contemplated by the bill. It is to be hoped that this resolution will gain passage and that the action of Pennsylvania will be a forerunner of similar actions throughout the country. The subject is unquestionably of first importance, not only to the architect and those directly engaged in building, but to the public at large.

It is expected that the Canada Cement Company will, before long, enter into closer working arrangements with the Associated Portland Cement Manufacturers' Association, which recently announced its intention of establishing works and depots in various foreign countries. Canada is not included, as the directors contemplate arrangements with the Canada Cement Company which will obviate the necessity of fresh works in Canada. There is, however, no proposal that the Canadian company become an integral part of the English concern.

Toronto's Defective Building By-Law

Pertinent Observations by "Engineer" and Mr. Gillespie—What Mr. McCallum's Investigation Costs the City—Function of the Technical Press

"McCallum Sticks to Guns"

Editor, Contract Record:—In your issue of June 14th you call attention to an interview with the city architect on the proposed revision of the building by-law. This was reported in the Telegram of June 6th. under the caption, "McCallum Sticks to Guns." The interview closes with the following statement by Mr. McCallum, referring to reinforced concrete construction: "I know that the formula which I demand is safe and that it will stand the test, and I intend to insist on it."

It is to be hoped that the city architect has not been correctly reported. When the Memorial of the Citizens' Committee, asking for a revision of the building by-law, was presented to the Fire and Light committee it was referred to Mr. McCallum with instructions to investigate the complaints and report in two months. He accepted the commission under protest, stating that he could not possibly get together sufficient information to report in that time.

The Fire and Light Committee paid a great compliment to Mr. McCallum in thus placing him as judge over the critics of his own work. He is not showing a proper appreciation of their action if he is willing to announce his decision in the press at a time when he is supposed to be just starting his investigations. It is reasonable to expect that his subsequent study of the subject will be biased.

Expensive Deliberations

The Citizens' Committee have estimated that the present by-law compels the needless expenditure of a million dollars a year on the part of building investors. Mr. McCallum's two months would thus cost \$167,000. If a decision has been reached the Fire and Light Committee should call for a report at once.

Mr. McCallum is showing great courage in "sticking to his guns." When the matter was first referred to the Fire and Light Committee, it was suggested as a fair solution of the difficulty that it be referred to two or three local engineers not identified with either the committee or the city architect's office. No such engineers could be found. The Engineers' Club, the Toronto branch of the Canadian Society of Civil Engineers, and the Canadian Cement and Concrete Association had all identified themselves officially with the Citizens' Committee. Their practising members had all been active in the agitation for revision.

The next idea was to appoint engineers from the staff of the School of Practical Science. This, too, was impossible. The Dean of the Engineering Department had been appointed on the committee to represent the Canadian Society of Civil Engineers. The lecturer on Applied Mechanics is one of the representatives of the Canadian Cement and Concrete Association and the lecturer in Strength of Materials is secretary of the committee. It was impossible, therefore, to nominate competent local engineers who were not already committed for revision. Clearly

Mr. McCallum stands alone in his opinion of the by-law.

Crude Provisions for Concrete Work

Mr. McCallum states that he favors the present provisions in the by-law in regard to reinforced concrete construction because they are safe. The committee states that they are merely crude.

For example:—In the end of a reinforced concrete beam, the stresses result largely from the tendency of particles to slip by each other along an approximately vertical plane. This stress is called shear. In the bottom and top of the beam are horizontal bars used for reinforcement. These bars cannot be regarded as of any value in resisting shear, because if the beam should crack and start to fail they would easily bend and tear out from the concrete on one side of the crack. In spite of this, the building by-law allows these to be considered as resisting shear to the extent of 10,000 pounds per square inch. Thus far, this has led to no trouble in Toronto, because other provisions of the by-law are so burdensome that very few reinforced concrete structures are built here, and because the engineers who built these few followed standard practice wherever possible instead of the building by-law.

The provision regarding columns is another case to the point. A column is reinforced with steel rods placed vertically. The distribution of load between the vertical bars and the concrete can best be understood by comparing them to two spiral springs of different stiffness, one placed inside of the other and both supporting a common load. Obviously the load would be divided between the springs in proportion to their relative stiffness. Now the same thing occurs in a reinforced concrete column. The by-law states that the stiffness of a square inch of steel shall be regarded as twelve times the stiffness of a square inch of concrete. In other words the steel shall be given twelve times the load per square inch that is given the concrete. Just over the page it is stated that concrete in compression shall carry 350 lbs. per sq. in. and steel in comparison 12,000 lbs. per sq. inch. The ratio here is one to thirty-four, instead of one to twelve. The general practice is one to fifteen with 7,500 lbs. per square inch as the limiting stress on the steel. A column designed according to the by-law, therefore, will be safe or dangerous according to the percentage of the total load carried on the steel at the excessively high stress of 12,000 lbs. per square inch. That Toronto has, thus, far, had no disasters on this account is due to the intelligence of reinforced concrete designers, and not to the conservatism of the by-law. Mr. McCallum is mistaken in taking to himself the credit for our immunity.

Carrying Capacity of Steel Beams

Mr. McCallum in his interview appears greatly aggrieved at the attitude of the Citizens' Committee in criticising his formula for the carrying capacity of steel beams. He says that the formula in the by-law is copied from the New York by-law and that he

should not be blamed if it is not satisfactory. That is true. Mr. McCallum's interpretation of this formula, however, is all his own. There is no authority for this interpretation either in the by-law or in engineering practice, and for it Mr. McCallum must stand solely responsible.

Briefly, the difficulty is regarding the meaning of the term "net area" when applied to the flange of a built-up steel girder. Theoretically, if there were no rivet holes taken out of the steel it would be one-sixth of the area of the web plate plus the area of the flange angles and plates riveted to them. Good practice, however, allows for possible rivets in the web plate by taking one-eighth of this area instead of one-sixth, and deducting theoretical holes from the flange angles and plate each one-sixteenth of an inch larger than the actual holes that have been punched. Occasionally, when designing for very severe usage in railroad bridges, the eighth of the web area is not considered, but this practice never extends to building work. Both the Dominion Government and the C. P. R. consider the web area.

Mr. McCallum, however, not only refuses to consider any part of the web area, but even refuses to consider the legs of the flange angles which are riveted to the web. The justification of the present standard practice in the design of steel girders, lies in the fact that there is no recorded instance in all the world of a steel girder thus designed and built with ordinary steel having failed under the load it was intended to carry. Mr. McCallum's interpretation of this clause, therefore, does not increase the safety of buildings in Toronto. But it does increase the cost of building by hundreds of thousands of dollars annually.

Toronto could well afford to pay a million dollars if by so doing she could secure an intelligent and properly administered by-law.

Yours truly,
"ENGINEER."

The Function of the Technical Press

University of Toronto, June 20, 1911.

Editor, Contract Record:—I have read with much interest your editorial on "Toronto City Architect on the Safe Side" in your issue of the 14th instant.

Whether the City Architect intended it or not, the impression which the general reader must have obtained from the various "interviews" which have appeared from time to time in the city dailies, is that the Citizens' Committee which prepared and presented the Application for the revision of the Toronto Building By-law, were endeavoring to force the City Architect to sanction the use of inferior building materials and to accept flimsy and unsafe types of construction. This is most unfortunate. As a member of the Citizens' Committee, knowing something of the powerful influences that on similar occasions in other places have been brought to bear by those commercially interested, I can say without fear of contradiction that no committee in its deliberations could have escaped with less sinister interference than this one. The dominating motive was a desire to secure "a reasonable, safe and workable by-law." These "interviews" should never have gotten into the daily press since their effect is generally to mislead. The writer is pleased to observe that the Chairman and Secretary of the General Committee who may perhaps be regarded as the spokesmen for the others, have up

to the present refused to let themselves be quoted through that medium. The technical press is the channel and the only one through which such grievances should have been aired. Surely too, the city architect can find in the list of those who served, a sufficiently large number of reputable, competent and disinterested citizens to assure him that a sincere attempt at honesty was made.

The fine recommendations regarding reinforced concrete on page 48 et seq. of the memorial, are in general accord with the recommendations of the Joint Committee on Concrete and Reinforced Concrete of which such men as W. K. Hatt, Richard L. Humphrey, A. N. Talbot, L. S. Moisseiff, F. E. Turneaure and others are members. This Committee after months of diligent study and research has endorsed certain principles of design which it would seem, the City Architect has decided to ignore.

Mr. McCallum is no more anxious to secure careful inspection than is the Citizens' Committee. He will recall this as one of the topics especially emphasized the Secretary of the General Committee in his brief address on the morning on which the memorial was presented to the Fire and Light Committee of the City Council. One of the shortcomings of the present arrangements at the city hall is that the architect's department has been insufficiently manned to give the careful scrutiny that building operations require. Still, an excessive amount of material and a surplus of dead weight is a very questionable method of securing safety. What we want in Toronto is an up-to-date impartial building by-law and the committee doubtless cares very little who drafts it so long as the work is in competent hands.

Very truly yours,

Peter Gillespie.

Increase Sale of Brick

Brick is the aristocrat of building material. It has a known pedigree which goes back to a day more than three thousand years before Christ, when the Assyrians reared their terraced temples and palaces in Western Asia.

In Ur of the Chaldees, whence Abraham went into the reaches of Canaan, in Ninevah, and in Babylon, the important buildings were made of brick.

Brick may reach a venerable old age, but it never reaches the state of decrepitude. Brick comes from the bosom of Mother Earth in the form of plastic clay; it is hardened by the most powerful agency in the world—fire, and is proof against the further encroachment of fire. It defies wind and rain. It is as enduring as the earth itself.

Then let us consider why builders should use brick. There are many reasons, but I will mention only a few. They are durable, being better than iron, as they do not rust. Brick buildings practically need no repairs. Brick are manufactured almost everywhere and can be bought at reasonable prices. They do not decay. By their use the best buildings can be constructed at a very moderate cost. They do not twist, shrink, or crack. They will not disintegrate or crumble. Brick lend themselves to artistic designs of great variety. The brick building is fire-proof.

These vital points in favor of brick, it would seem, would be convincing and that every one would use brick rather than lumber, where it is possible to do so. Why is it, that this is not true?

Chiefly because the vast majority of people are under the impression that brick buildings cost much more than frame buildings. In fact, the general idea is that the cost of brick buildings is almost prohibitive.

Perhaps it is natural that we, who were born and have grown up in the land of wooden houses, should take this type for granted. But on account of the fact that lumber is daily becoming scarcer and more expensive, making the cost of a house of brick very little more than of cement or wood. The Building Brick Association of America recently undertook to determine something definite regarding this matter.

Economy of Brick in Residence Work

For this purpose a modern eight-room frame house of good design was chosen, and plans and specifications were prepared by a well-known and competent firm of architects. These plans and specifications were submitted to five well-known contractors, and each fully advised of the object of the investigation.

Each contractor was given the same information and instructions, and each took plenty of time to figure with care, with the following results:

Taking a weather boarded house as a standard, they found that a house complete with the outside walls 10 inches thick of brick, would cost an advance of 6.5 per cent. over the weather-boarded house; that a house with 12-inch thick brick walls would cost an advance of 10.7 per cent. over the weather-boarded house; that a house of stucco, on hollow clay block, would cost 4.9 per cent. in advance of the weather-boarded house; that a house of stucco, on frame, would cost an advance of 2.5 per cent. over the weather-boarded house; and that a house with 4-inch brick veneer, on hollow clay blocks, would cost an advance of 7.7 per cent. over the weather-boarded house.

In these estimates, face-brick were figured to cost \$17.50 per M. and common brick \$9.00 per M., which cost in Macon \$14.00 and \$6.00 respectively.

By the above figures you will note that there is only a very small difference between the different modes of construction in point of cost.

These figures are absolutely correct, and the contractors' bids with their offers to build this identical house at the figures named can be had. Notwithstanding these facts and figures, thousands of wooden houses are being erected every year. Why? Because the public does not know the truth.

Does Advertising Pay,

How are we to educate the people? By intelligently and carefully prepared advertising matter, which will present "Facts in Favor of Brick." We are sometimes asked "Does advertising pay?" In fact, we sometimes ask ourselves the question.

Name for me fifteen articles that you purchase somewhat regularly, and I will show you that not less than ten of these articles are widely and constantly advertised. How about that hat; those shoes; those collars, shirts and underwear; that suit of clothes. What is your favorite brand of cigars, soap, baking powder, coffee?

Do you buy known of unknown hardware? Are you influenced to a certain, in fact to a large extent, by the effect of someone's advertising? Take an inventory of all the purchases you make and tell me

how few of them include absolutely unheard of unknown articles.

"The man who whispers down a well,
About the goods he has to sell;
Won't reap the shining, golden dollars,
Like him who climbs a tree and hollers."

Do you know that our fires destroy annually nearly, if not quite, as many buildings as we erect? In America the fire loss during the year 1907 was \$2.51 per capita. In Europe in the same year the loss was only 33 cents per capita, nearly eight times as much in America as it was in Europe. In America we use 500 feet of lumber per capita, and Europeans use only 60 feet per capita. Europe uses brick.

Only one word more. Let me say to those of you who handle brick: The best way to sell brick is to always carry a stock of them. You can't sell what you haven't got.—By W. E. Dunwody, in Brick.

Crossman System of Sludge Treatment

Past failures have not discouraged those who are laboring on the problem of recovering a part, at least, of the valuable matters in sewage. One of the latest propositions is that of Dr. J. Grossman, a trial of which at Oldham, England, is said to have been very successful. The town has for years been compressing its sludge and filling low land with it, but all available land has now been filled. Dr. Grossman proposes to dispose of it as follows:

By my method the expensive and disagreeable process of filter pressing is altogether eliminated. The settled sludge passes continuously and automatically into a specially constructed drying machine, which delivers it straight into a retort in a dry state, and in which it is mixed automatically with a small quantity of sulphuric acid and subjected to the action of superheated steam. The latter carries away with it all the greasy matter contained in the sludge. This is collected in tanks, and being rich in fatty acids finds a ready sale.

The residue in the distillation retorts is discharged as a fine, dry, brownish powder, free from smell, and contains nitrogen, potash and phosphoric acid mixed up with humuslike earth, which renders it extremely valuable as a manure, being sterilized by the superheated steam. It is free from seeds, germs, or bacilli; it can be stored or used on land without creating a nuisance. The process is continuous and automatic, and thus very little manual labor is required.

The sludge dried in my drying machine is so rich in fat and other combustible matter that mixed with a little coke it can be used as fuel for drying a further quantity of the sludge, and in that case a cake of the same consistency as obtained from the filter presses at a cost of 3s. 6d. for pressing alone can be produced at a cost of 9d. per ton. It is computed that 400,000 tons of soap are used every year in this country, practically all of which finds its way into the sewage, and the recovery of fat alone from that source is sufficient to effect a considerable saving in the present mode of sludge disposal. Besides this, my method yields a cheap manure, valuable for agricultural purposes, and obviates all the nuisance and danger to health arising now from present processes of sludge disposal.

All of which seems practicable, provided the sludge can be dried at a low enough cost. But this detail has so far proved the financial obstacle to success in all similar methods of utilizing sewage solids.

The building permits issued in New Westminster during the month of May totalled \$269,000, the largest in the history for any one month.

Concrete Blocks as a Building Material

Waterproof, Fireproof and Permanent Construction on Inexpensive Lines—Artistic Possibilities—Use somewhat retarded by Unreasonably Strict City Ordinances

Specially Contributed by Robert F. Havlik*

Concrete is being used in nearly all construction work of to-day, but when the average man thinks of concrete in a building, he pictures a very massive structure in which this material is used for the foundations, floors or columns, and in many cases as being surrounded with a veneer of brick or terra cotta; he seldom thinks of it as being used where an artistic effect is desired.

When concrete block is mentioned the average person thinks of a material that is used for the foundation under frame houses. Occasionally we meet a broad minded man who concedes that the concrete block has great possibilities and who can see where-in it can be used for producing very artistic effects.

In the use of concrete blocks, someone had to blaze the way, and as usual that very someone was naturally the venturesome spirit—the soldier of fortune,—who, with vivid imagination saw an easy way

ly made, artistic concrete block is making its wild-fire sweep in both this and the old world.

No one questions the superiority of reinforced concrete over most building materials where immense strength and permanency are desired, and yet a great many people condemn the concrete building block as unsafe from a structural standpoint, not realizing that the concrete block can be made just as strong as reinforced concrete.

In spite of all that has been said against concrete blocks, the fact remains that they possess a great many advantages that no other materials have. It is only the uninformed that condemns the concrete block. This statement is made advisedly. Any informed person knows that concrete blocks, on account of being made as a small unit, can be inspected as often and as carefully as desired. They can be molded to produce any effect wished for; will permit of any



Molsons Bank. Revelstoke, B. C. : architect, A. F. Dunlop, Montreal; contractors, Byers & Anglin, Montreal: cost complete, \$20,950.



Residence of Thos. L. Dates. Owen Sound, Ont. : architect, L. C. Van Leyen, Detroit, Mich.; contractor, E. Martyn, London, Ont. ; cost, \$5,650.

of making money—he overlooked the requirement of knowledge of the business, the ingredients, the mixture, moisture required, proper curing necessities, etc.; hence there was produced the gray, unsightly, water-absorbing concrete block, the use of which, here and there, has caused condemnation and been held up to ridicule by those interests which are fighting everything that is concrete, because their toes are being so severely stepped upon. And still the way was blazed and the trail of the past few years has widened into so great an avenue of use that even with thousands of concrete block plants operated by men of brains, capital, and experience, the demand is immeasurably greater than the supply, and even against the fearful odds of past blunders, the proper-

color scheme, and also of figured effects which would be out of the question in cut stone work, on account of prohibitive cost.

It is a well known fact that there are many buildings made of molded concrete products which look and are just as good as any cut stone buildings. Since this is true it is poor reasoning that will condemn the concrete block on account of the fact that some very inartistic buildings have been produced—buildings in which so called rock faced blocks have been used to the exclusion of all else.

There is no reason why all concrete blocks cannot be made just as good as the best. The mere fact that one or two buildings of reinforced concrete have failed, or that a number of buildings of brick have failed, does not condemn the use of either of these materials, and by the same process of reasoning sim-

*Engineer, Ideal Concrete Machinery Company, London, Ont. and South Bend, Ind.

ilar failures of concrete blocks should not condemn their use.

The beautiful work which is being done with concrete blocks in different localities proves conclusively that molded concrete blocks are suitable for all classes of buildings.

Where common bricks have been used in the past, common unfaced concrete blocks can be used for the same purpose, and it will be found that they absorb less moisture than the common clay brick. Where better class bricks have been used, the ordinary faced concrete block can be used for the same purpose at much less expense. The same is true of pressed brick or tooled stone. Where they have been used in the past the fine grades of concrete blocks would be found fully as good, and in many respects better, and certainly far less expensive.

Nowadays there is much talk about waterproof structures. Years ago this was seldom thought of in brick and stone work, and yet, this is demanded wherever concrete is used. To meet this problem many waterproofings have been devised. Some of these are good, others are worthless. Wherever a manufacturer wishes to make an absolutely waterproof product, he can do so with proper care and selection of materials and the use of a reliable waterproofing.

No brick or stone is absolutely waterproof. Nearly all of these will absorb at least three per cent. of water, and many will absorb as much as fifteen to twenty per cent. when immersed in water. It is, therefore, evident that since a concrete building block can be produced that is absolutely waterproof, it certainly possesses a big advantage over all other building material.

Where a few years ago concrete blocks were used only for foundations or underground, they are now being used in some of the very best buildings, such as bank buildings, store buildings, costly residences, Carnegie libraries, etc. They form structures that are cool in summer and warm in winter, that can be made absolutely waterproof and that can be made in any shape or form desired. These facts should prove to the most sceptical that the concrete block has a great field and a great future.

A recent innovation in the concrete block is that of stucco applied to the same. For such purpose the concrete block is admirably adapted, inasmuch as it forms a structure that is fireproof throughout, permanent and comparatively inexpensive. Stucco blocks are made without facing and can be turned out at a very low cost. They require only one or two coats of stucco, whereas the building that is built of frame and covered with wood or metal lath usually requires three coats of stucco. Such buildings are not fireproof, inasmuch as a fire usually starts on the inside of a building, and this being the case, it would burn out the frame work and with this destroyed the outside shell would collapse, as it would not have sufficient strength to support the building. Thus, when concrete blocks are used for this purpose, the construction is improved immensely and the building is permanent.

Another innovation in this class of work is, that of white faced blocks and also the granite blocks. White faced blocks are being used quite extensively and closely resemble the natural light-colored sandstones and limestones; in fact, any natural stone effect can be reproduced in concrete blocks by the use

of white cement and the proper aggregate for the facing.

The granite faced concrete block stands in a class by itself. Blocks so made meet the approval of any architect, and at the same time they are not an imitation of any other building material. They have an appearance that is distinctly characteristic of concrete. In such blocks the cement is washed or scrubbed away from the surface of the block, thus exposing the crushed granite. Similar effects can be produced by the use of other crushed stone or specially selected pebbles.

Much has been said against the use of rock faced blocks, and justly so, but it is high time that we forget about the rock faced block and commend the use of bush hammered, small panel, plain, vertical and horizontal tooled blocks instead, inasmuch as they are being used very extensively at present. Some of the best buildings that have been put up in recent years are built of blocks of these designs.

The buildings shown in the accompanying views are only samples of the fine work that is being put up throughout the entire country of molded concrete building blocks. Under molded concrete building blocks I include all molded concrete products, whether they be hollow or solid blocks, or ornamental products, as what is true of one is equally true of the other.

In large cities the use of concrete building blocks is hindered a great deal on account of the very strict ordinances regulating their use. This, I am sure, is due more to lack of knowledge of the strength of concrete building blocks than to a wish to favor some other building material.

Where this question has been investigated, cities have adopted ordinances requiring a crushing strength of 1,000 lbs. per square inch of net cross sectional area of the block as used in a building. This is absolutely fair and all blocks should conform to this specification, but when they do there is no reason why such blocks, 8 inches thick and with not over 33 per cent. air space, should not be used in buildings of any reasonable height, providing the proper factor of safety is used in figuring the allowable loads on them.

Assuming a crushing strength of 1,000 lbs. per square inch of gross cross sectional area and a safety factor of 5, an ordinary building with bearing walls not over 25 feet apart, would have to be eight or nine storeys in height before the safe allowable loading on the blocks would be exceeded, and this is only true of blocks 28 days old. It is a well known fact that concrete increases in strength with age and as the blocks become older, say six months, there will be an increase of at least twenty per cent. in their strength, making the actual crushing strength at six months about 1,200 lbs. per square inch of gross area, thus still further increasing the factor of safety from five to six. As the blocks get older the factor of safety will continue to increase, so that the building is safer two or three years after it is put up than when it is first built.

The city of Winnipeg is making a special test of Westrumite paving with a view to specifying that material for a considerable amount of work. Alderman Douglas and other members of the Winnipeg Board of Works, recently paid a visit to Chicago and other cities where Westrumite is reported to be giving satisfaction.

Characteristics of Wood Stave Pipe

Features Worth Noting, With Some Examples of Use and Cost for Water Supply—Notes on Pressure and Carrying Capacity*

By T. C. Hatton

There are two distinct forms of wood stave pipe in common use. One is termed "continuous" and the other "machine made." Both are built of the same character of wood, and the staves are of equal thickness for like pressures. Those built into "continuous" pipe are made of uniform thickness throughout their lengths, with a bead on one longitudinal edge and with a saw kerf at each transverse edge into which a metal plate is inserted to make a water tight joint. The bead on the longitudinal edge serves to make a water tight joint by being squeezed into the face of its neighboring stave when the iron bands surrounding the pipe are cinched up. The staves are made in unequal lengths to enable joints to be broken in constructing the pipe. The staves are held together by round iron or steel bands of such diameters and spacing as will retain the pressures required, each end of the bands passing through a malleable iron shoe and having a thread to which a nut is fitted. Thus the staves can be brought together so close that no leakage can occur unless it oozes through the grain of the wood.

This form of wood pipe is built in the trench, and from 16 in. to any diameter required, but is more commonly used for pipes over 24 ins. in diameter. It has one special feature well worth noting, if the pipe leaks at any point in the longitudinal joints, these leaks can be easily stopped by cinching up the bands near the leaks or if some defect shows up in the pipe line a few years after building, sections can be easily removed and replaced, by substituting new staves, or new bands.

The staves built into "machine made" wood pipe have two beads upon one longitudinal edge and two corresponding grooves in the other longitudinal edge. The beads are a little larger than the grooves, thus insuring their being totally filled and made water tight. At one end there is a tenon, cut 4 ins. long, where the staves are one-half the thickness of the balance of the walls of the pipe. On the other end there is a chamber cut 4 ins. deep. The tenon is smaller in diameter at the end than at the shoulder and when driven into the chamber makes a water tight joint, even though the two shoulders are not in perfect contact.

The staves are cut radially to correspond with the diameter of the pipe, and are held together by a steel band, steel wire or copper clad wire. This band or wire is wound spirally upon the pipe by a machine. The high tension produced by the machine squeezes the beads into the grooves making a longitudinal joint that cannot leak so long as the elastic limit of the band is not overcome.

Where steel is used for banding the pipe it is run through a bath of warm asphalt, which adheres to its surface, thus protecting it from any water which might ooze through the grains of the wood. After the pipe is wound, and the tenon and chamber cut, it is rolled in a bath of hot asphalt which adheres to

the outside of the steel and wood protecting them from outside oxidizing agents. It is then rolled in a bed of sawdust. This sawdust enters into the asphalt and forms a protection for it in shipment and handling.

"Machine made" wood pipe are made in lengths from 5 to 12 feet and shipped to the work ready to be laid. They are laid by driving one piece into another until the two shoulders are in contact, or nearly so. No skilled labor is required; the inspector standing on top of the trench can readily observe whether the pipe has been driven home by observing the two shoulders. This form of pipe is made for diameters from 3 ins. to 36 ins. Either form can be laid around curves of from 90 to 200 ft. radius, according to the diameter of the pipe.

Withstands Pressure Up to 200 lbs.

One of the usual questions asked is, "What pressure can wood stave pipe safely withstand?" The proper reply to this is that the tensile strength of the material composing the bands represents the pressure the pipe will stand. Wood pipes are made to withstand pressures up to 200 lbs. per sq. in., so far as the writer knows. The more the pressure under which the pipes are subjected, the more steel or wire is required to band them together.

As the tensile strength and elastic limit of iron and steel are well known, it becomes a simple matter of computation to determine the gage and spacing of the bands to make a wood pipe which will withstand any pressure up to 200 lbs. Beyond this pressure it is likely the water would waste through the pores of the wood so that a higher pressure would not be economical or practicable.

The writer has experimented with wood pipe up to a direct pumping pressure of 300 lbs., without fracturing the pipe. This experiment was made to ascertain what a pipe built for pressures up to 100 lbs. would do if it was subjected to a water hammer equal to three times the pressure. At 250 lbs. the water oozed through the walls of the pipe. At 300 lbs. it spurted in small streams at a few of the longitudinal joints, with a few leaks at the transverse joints. The pressure was suddenly removed to nothing and gradually brought up to 100 lbs. with the result that the leaks stopped. This showed that, while the steel bands had been stretched, the elastic limit had not been overcome, and the pipe would, under such conditions as frequently exist in a long pipe line, safely withstand a wide range of pressures suddenly applied.

Pressures from 100 to 150 lbs. are common in machine made wood pipe, while continuous pipe of large diameter is successfully operating under pressures from 80 to 130 lbs.

Assuming that wood stave pipe is laid where it will be constantly subjected to water pressure the life of such is entirely dependent upon the life of the material with which it is banded. While the life is somewhat problematical there are well known illus-

*Before the Annual Convention of the American Waterworks Association, June 1911.

trations where steel banded pipe has been in continuous operation for 50 years without apparent deterioration. While the writer has industriously made inquiries wherever such might be expected to give reliable information he has failed to learn of a single case where steel bands have given way on machine made pipe.

The engineer who designs a continuous wood stave pipe provides for at least a factor of safety of 3 in. determining the size and spacing of his bands. The manufacture of machine made pipe provides for an equal factor of safety. Now when steel or iron corrodes it does so by pitting, and thus it is reasonable to assume that two-thirds of the cross-section of the steel can oxidize before the band will fail under ordinary conditions. From the writer's observation sheet steel, such as composes the bands of machine made wood pipe, pits in irregular spots, and never on a straight line, thus the band may be two-thirds gone before the pipe will fail.

Where oxidizing agents are known to exist, such as in salt marshes, through salt water or sulphur deposits, the pipe should be banded together with copper clad steel wire. This copper clad wire is cheaper than solid copper wire. It has an elastic limit of about 50,000 lbs. per sq. in., a tensile limit of about 90,000 to 100,000 lbs., and a coefficient of expansion less than two-thirds that of copper. Thus it becomes a product equal in strength with the steel and far better than copper. The writer knows of several cases where copper clad steel wire wound wood stave pipe has been successfully used where cast iron and steel pipe were very unsuccessful.

Carrying Capacity of Wood Pipe

The claim is made by wood pipe manufacturers that wood pipe has greater carrying capacity than cast iron pipe of equal diameter, and from a few well conducted experiments this claim seems reasonable. Marx, Wing and Hoskins conducted careful experiments to determine the coefficient of friction in wood pipes.* They found that coefficient n amounted to .009. Mr. Campbell on the El Paso and Southwestern Ry. pipe line, heretofore referred to, found the value of n in 13,200 ft. of 10-in. wood pipe to be .00866, and in 47,500 ft., of 16-in. wood pipe to be .0092.² Mr. Campbell had exceptional facilities for determining the true values of n which are rarely found in actual practice.

The value of n in new cast iron pipe has been determined repeatedly and found to be .012. From the results of these experiments it appears quite true that a wood pipe has greater capacity than cast iron of like diameter. For instance a 12-in. wood pipe with a loss of head of 8.85 ft. per 1,000 will carry approximately 2,025 gals. per minute, whereas a new 12-in. cast iron pipe under the same loss of head will carry about 1,810 gals. per minute. A 30-in. wood pipe under a loss of head of 2.05 ft. per 1,000 will carry about 11,600 gals. per minute, whereas a 30-in. cast iron pipe under the same head will carry about 8,810 gals. per minute. The longer the cast iron pipe is used the less its carrying capacity, under frequent conditions. The capacity of wood pipe does not diminish with age, the inside perimeter becoming smoother from use.

So far as the writer's knowledge goes there have been very few well conducted observations made of the leakage from wood pipe lines. From general observations made by the writer of lines in operation,

no leaks of any significance have been apparent. Mr. Campbell, however, conducted careful observations on his lines, and states that, after two years, there was no material leakage in the 10 miles of 10-in. and 16-in. wood pipe line between the source of supply and the reservoir, which pipe was working under a maximum pressure of 130 lbs. That in the 12.6 miles of 11-in. and 12-in. pipe lines below the reservoir, and subjected to a less pressure, the 11-in. line leaked 17,046 gals. per mile and the 12-in. about 3,702 gals. per mile. Along the railway, when the maximum pressure was 130 pounds the 11-in. pipe leaked 120 gals. per mile, and 8½-in. and 7½-in. pipe leaked 268 gals. per mile. It occurs to the writer's mind that if there were 103.4 miles of wood pipe in this installation wherein the maximum leakage was 268 gals. per mile, and 8.6 miles wherein the leakage amounted to 17,046 gals. per mile, there must have been some defective joints or pipes in the latter section which needed looking after, that if 90 per cent. of the whole line was practically water tight, the other 10 per cent. could easily be made so. However, from the result of the careful observations made by Mr. Campbell, it seems reasonable to assume that wood pipe, properly made and laid, can be made water tight under a pressure of at least 130 lbs.

This subject may be concluded by considering the difference in cost in installing wood stave and cast iron pipe. The difference is made up of several items, as, for instance: the cost of the two characters of pipe delivered f.o.b. cars at nearest railway point. Hauling pipe alongside of trench, width and depth of trench. Laying pipe, etc.

The difference in cost of furnishing and delivering the two characters of pipe at railway points is largely dependent upon the difference in diameters of the pipes to be used. The larger the diameter the greater the difference. The difference in weights per foot of pipe also increases in direct ratio to the increase in diameters. Therefore the cost of transporting wood pipe from railway to trench is from one-third for wood pipe 8 ins. in diameter to one-sixth for wood pipe 30 ins. in diameter of the cost of transporting cast iron. To overcome frost conditions the wood pipe need not be built as deep as cast iron pipe, as wood is a good non-conductor and can be laid closer to the surface of the ground without being damaged by frost. In laying wood pipe no bell holes are necessary, and this item of cost is eliminated, which, in rock excavations, becomes a very important item. As there is no lead and hemp used in laying wood pipe these items of cost are eliminated, as is the cost of melting lead, transporting and furnishing fuel, and caulking joints.

While it is impossible to compile a table showing the difference of cost between furnishing and laying the two characters of pipe which will fit conditions existing generally, it can easily be determined at a glance that there is a difference in favor of wood pipe; that this difference depends upon the size of the pipe, and that it can easily be determined for each locality when freight and labor charges are known.

Examples of Cost

A few instances of known costs might be interesting. The 23 miles of 30-in. continuous wood stave pipe laid for supplying Yynchburg, Va., with water, under the direction of Mr. James H. Fuertes, M. Am. Soc. E. E., cost, for furnishing and laying pipe, exclusive of trenching and backfilling, from \$1.82 to

\$2.10 per lin. ft., depending upon spacing of bands. This wood was shipped from the Pacific Coast at a freight rate approximately \$300 per car.

The 42-in. continuous wood stave pipe laid at a supply main for the Atlantic City Water Works, under the direction of Mr. Kenneth Allen, M. Am. Soc. C. E., cost, exclusive of trenching and backfilling, \$2.25 per lin. ft.

The 42-in. continuous made pipe line laid under direction of the writer for Carney's Point, N. J., cost, exclusive of trenching and backfilling, \$1.32 per lin. ft.

Comparing the above costs with the cost of cast iron pipe of equal diameter, delivered f.o.b. cars at railway point, and the cost of lead and hemp for making joints, omitting transportation charges from railway to trench, laying charges, extra excavation for bell holes, fuel for lead melting, caulking and handling cast iron pipes.

The 42-in. cast iron pipe would cost at \$22 per ton \$6.11

The 30-in. cast iron pipe would cost at \$22 per ton 3.47

The 24-in. cast iron pipe would cost at \$22 per ton 2.43

The difference in cost of laying wood and cast iron pipe including trenching and backfilling, and under exactly the same conditions, is well set forth in Mr. Campbell's paper above referred to.

He states that the 384,300 ft. of wood pipe from 11 to 3½ inches in diameter were laid at an average cost of \$0.0472 per lin. ft., whereas the 101,200 ft. of 12-in. cast iron pipe, including lead and hemp, were laid at an average cost of \$0.2343 per lin. ft.

It is not the writer's purpose to recommend to his colleague, who may be interested in laying supply mains, for water works, wood stave pipe under all conditions, but to suggest that, after knowing the conditions, he look into the advisability of using wood stave pipe, study its applicability to the existing conditions, including the comparative cost with cast iron or steel pipe, keeping his mind open to recommending the installation which will best suit the conditions, and he will find many circumstances when he can save his client's money and secure for him equal service.

Reinforcement of Steel Just Beneath the Top Surface

We are accustomed to think of concrete pavements as being of very recent development, yet in 1885 Codrington, the British authority, published the following in the Encyclopaedia Britannica:

"Concrete macadam, formed by grouting with lime or cement mortar a coat of broken stone laid over a bed of stone previously well rolled, has been tried as an improvement on an ordinary macadamized surface, but not hitherto with much success."

Concrete, or concrete macadam, is an ideal pavement in many respects, but, due to its comparatively slight tensile strength, the surface is apt to become pitted with holes when subjected to heavy traffic. Once the pitting starts, wear is very rapid, for the edges of a chuck hole in concrete crumble away with greatest ease. It is this that accounts for the very slow progress that concrete has made as a wearing coat for pavements.

The writer has made a number of experiments

with concrete slabs reinforced just below the surface with wire mesh and expanded metal. Concrete slabs thus reinforced show far greater resistance to impacts of hammers or chisels than concrete not provided with surface reinforcement. This fact, coupled with a consideration of the theory of impact stresses upon a surface stratum, leads the writer to believe that great progress in concrete roadway construction may occur if subsurface reinforcement, as we may term it, shall be applied. This subsurface reinforcement, be it understood, in nowise resembles the reinforcement that concrete slabs are given on the lower side, for the object of that is to take the tensile stresses that occur when the slab acts like a beam. The subsurface reinforcement which we suggest is of an entirely different nature. Its object is to distribute surface impact stresses over an area of concrete sufficiently large to prevent rupture of the surface, and the consequent formation of pits or chuck holes. Moreover, even were pitting to occur, such a subsurface reinforcement would prevent the rapid enlargement of the hole.

In considering the various forms of subsurface reinforcement, it has seemed to the writer that heringbone lath offers an excellent shape for the purpose. Possibly a corrugated wire mesh or an expanded metal bent so as to form close rows of pyramidal points would serve better. This is a matter for experiment under traffic conditions.

The objection has been raised that when the concrete wears down sufficiently to expose such a reinforcement, the steel would quickly wear so as to leave projecting "spikes" that would injure rubber tires. This objection would probably be met by applying a fresh layer of cement mortar to replace the worn out concrete. The use of a wash, like "Ransomite," would serve to bond the new mortar to the old. Concrete, however, does not wear with rapidity, except by crumbling from the edges; and if the formation of holes could be prevented by subsurface reinforcement a long life would be reasonably certain.

In a recent consular report mention was made of a foreign pavement consisting of small steel fragments (turnings from lathes, etc.) and cement mortar, which was said to possess great resistance to destruction under traffic. Such a pavement is, in a way, a concrete having a subsurface reinforcement, but of a kind that might be too expensive for general use.

Concrete railway ties have frequently failed because of the crumbling of the concrete directly under the rail. This too might be prevented by a subsurface reinforcement of the kind here suggested.—Engineering and Contracting.

Col. Geo. W. Goethals, chief engineer of the Isthmian Canal, had a pet parrot which he admired greatly because of its cleverness and remarkable qualities. The parrot, however, had an embarrassing habit of repeating remarks it heard, and besides had a noisy and boisterous disposition. One day when it had been particularly boisterous, Colonel Goethals' negro attendant overheard the colonel say: "You old bird I'll have you fried if you don't stop talking." The next day when the colonel sat down to luncheon he had what appeared to be a fried chicken placed before him. "This chicken has a queer taste," he said to his negro, when he sampled it. "Dat ain't no chicken, boss," the negro replied; "dat's dat 'er parrot. It didn't stop talkin'."

Erection of Steel Towers for Hydro-Electric Power Commission

The Hydro-Electric Power Commission transmission line from Niagara Falls to Toronto enters the latter city from the west, passing along the north shore of Lake Ontario, thence across the easterly end of Humber Bay and through the National Industrial Exhibition grounds to the sub-station at the foot of Strachan avenue. This route involved the construction of eighteen towers in Lake Ontario in from three to six feet of water. With the exception of four towers, which were somewhat protected by the sea wall recently completed by the city of Toronto, the work was exposed to the severe storms that occur in this locality.

The line is carried on steel towers from 200 to 350 feet apart, each tower being carried on four con-

reinforced with 1 in. square rods running from top to bottom, and the corners towards the lake are protected by 4 in. x 4 in. angles bedded in the concrete.

On account of the danger from storms, as much as possible of the work was carried on from the shore, the material being transported to the work over light wooden trestles. Concrete mixers and boilers were erected at points along the shore and were moved from time to time as the work progressed. These boilers also supplied steam to the syphons used for unwatering the cofferdams. By adopting this method of carrying out the work, the contractors, the Foundation Company, Limited, were comparatively independent of weather conditions, having nothing out in the lake that could not be replaced quickly if carried away by storms. The wisdom of this policy was amply proved by the fact that several storms were passed through without serious delay to the work or loss to the contractors.

The ground overlying the rock was composed of boulders, gravel, sand and clay. The open cofferdam method was adopted, the cofferdams being construct-



Completed steel tower

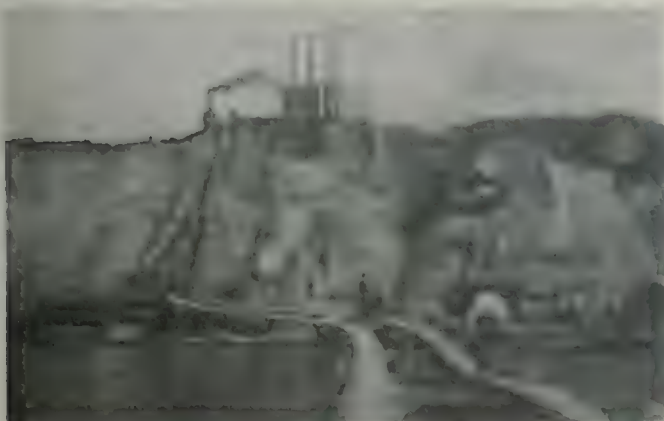
crete pedestals, eight feet square at the base, three feet square at the top, and rising to a height of fifteen feet above the normal level of the lake. Except for those towers protected by the sea wall, and in a few instances in which hardpan was encountered, the concrete pedestals are carried down to rock, and the spaces between and around each of the four pedestals forming a set are filled with heavy rip-rap, as an additional protection against the heavy ice which forms along the shore of the lake. Each pedestal is



Weighting and puddling cofferdam

ed of 2 in. T. & G. sheeting braced on the inside by 6 in. x 6 in. rangers, with 4 in. x 6 in. outside walings to serve as guides while the sheeting was being driven. They were floated into place and weighted down with bags of sand and rip-rap. After the sheeting had been driven, the outside was puddled with clay handled by scows which were loaded at the cliffs along the shore. This type of cofferdam was used by the contractor for the nine easterly towers which, being exposed to the most severe storms, were carried down to rock or hardpan. No trouble was experienced in unwatering the cofferdams so that the rock could be properly cleaned and the concrete deposited in the dry.

In the face of the many difficulties and unfavor-



Contractor's plant on Cliff Road



Erecting forms at tower 400

able weather, the work was completed in remarkably short time, notwithstanding about two weeks' delay at the commencement of the work on account of changes in location of the towers.

The nine easterly towers were constructed by the Foundation Company, Limited, Bank of Ottawa Building, Montreal, for the F. H. McGuigan Construction Company, general contractors.

Efflorescence on Brickwork

The film of earthy salts which frequently appears on the surface of brickwork, and is known as efflorescence, detracts considerably from the pleasing appearance of the work, while the crystallisation of salts within the pores of the bricks tends to cause disintegration by action akin to that established by frost. Moreover, efflorescence may cause damp places on the structure affected, destroying plaster and paint applied after the process has commenced.

Efflorescence may be due to the presence of undesirable material either in the bricks or the mortar, or in both. Although far more common on quite new than on older walls, the deposit may be formed on any brick surfaces liable to be affected by the infiltration of water, and is always at its worst near eaves, rainwater heads, window sills, and other places where rain is afforded opportunity for soaking into the bricks.

The deposit is generally white, but may be yellow or green, according to the composition of the clay used in brickmaking. It is merely a film of soluble salts carried by water from the interior to the exterior of the bricks, and made evident by crystallisation on evaporation of the water.

Chemical analysis shows that the composition of the crystals varies considerably according to circumstances. They generally consist of sulphates, such as potassium sulphate (K_2SO_4), sodium sulphate (Na_2SO_4), calcium sulphate ($CaSO_4$), magnesium sulphate ($MgSO_4$). In bricks made from clay found near the sea, chlorides are sometimes present, as potassium chloride (KCl) and sodium chloride (NaCl); while other clays furnish compounds such as potassium carbonate (K_2CO_3), sodium carbonate (Na_2CO_3), sodium nitrate ($NaNO_3$), ferrous sulphate ($FeSO_4$), and aluminum sulphate ($Al_2(SO_4)_3$).

With the exception of calcium sulphate, all the salts mentioned are readily soluble in water, most of them exceedingly so, as may be seen by the following table:—

Salt	Solubility in cold water		
Potassium sulphate	1	in	12
Potassium chloride	1	in	3
Potassium carbonate	1	in	1
Sodium sulphate	1.18	in	1
Sodium chloride	1	in	3
Sodium carbonate	1	in	2
Sodium nitrate	1	in	1
Calcium sulphate	1	in	500
Magnesium sulphate	1	in	3
Ferrous sulphate	1	in	2
Aluminum sulphate	1	in	2

Notwithstanding the relative insolubility of calcium sulphate, this compound is the most fruitful cause of efflorescence, which is far less readily washed off by rain than that resulting from the more soluble salts.

The existence of efflorescent substances in bricks is due to one or more of the following conditions:—

- (1) The use of clay containing soluble salts.
- (2) The use of clay tempering water containing soluble salts.
- (3) The formation in the kilns of soluble salts by the oxidation of minerals in the clay, or by the reaction of sulphurous kiln gases on the clay.
- (4) The introduction of soluble salts into the bricks after burning, generally from the mortar employed.

Surface clays usually exhibit a higher percentage of earthy salts than other deposits, and the same may be said of clay which has been covered by sea water, clay containing iron pyrites, or ferric desulphide (FeS) being another undesirable variety.

Even in cases where the clay is of approved quality, foreign substances of deleterious character are sometimes introduced which result in the formation of salts giving rise to efflorescence. One example of such treatment is the use of ashes with the object of preventing shrinkage, and another is the adoption of sulphurous coal for burning.

It also happens occasionally that kiln-burnt bricks are impregnated with soluble salts either in consequence of badly-designed plant, or of inefficient management. Thus, after the dried bricks have been "crowded" into the kiln and the process of heating up has been commenced, if the fires are kept only just high enough to evaporate the moisture in proportion to the chimney draught, the process is unattended with prejudicial conditions. But if the moisture is evaporated too rapidly for the capacity of the shaft, the surplus vapour in contact with the bricks may absorb sulphur from the gases, resulting in the formation of sulphuric acid, which by combination with the carbonates and other salts will give rise to soluble sulphates, the most general cause of efflorescence.

Various methods are adopted for eliminating substances calculated to give unsatisfactory results. In clays capable of vitrification the risk of efflorescence can be obviated by thoroughly vitrifying the bricks, and thereby converting objectionable salts into permanent silicates.

Clays known to contain soluble earthy salts can be rendered harmless by washing, but this method is commercially impracticable in the case of low-priced bricks. By exposing such clays to the weather for six months or more, rain and snow are utilized as cleansing agents, although it must be noted that this mode of treatment may have the effect of converting insoluble into soluble salts.

Chemical treatment is a more scientific expedient, performed in the case of clays prepared by the wet process by adding to the water used in the washmill such chemicals as will react upon the soluble sulphates and precipitate harmless compounds, the chemicals most generally employed being barium chloride and carbonate resulting in the precipitation of barium sulphate ($BaSO_4$), which is the only soluble to the extent of 1 part in 400,000 parts of water by weight. Even if soluble sodium salts are present, they would simply be converted into carbonate or chloride by the corresponding barium compounds, and being very soluble these salts would be removed by rain quite readily if brought out by efflorescence on the surface of brickwork.

Chemical examination and purification of the water used in brickmaking are quite as necessary as treatment of the clay. Being perfectly simple and very inexpensive, the operation should never be ne-

glected as good clays are frequently contaminated by saline water.

Efflorescence resulting from the introduction of soluble salts into the bricks after burning is usually due to the use in mortar of lime containing magnesia and other bases, which enter into combination with sulphur in the fuel employed for calcination, and form soluble sulphates. These are dissolved by water during the process of mortar mixing, and often find their way into the bricks, emerging later as efflorescence. Similar trouble may also be occasioned by the action of sulphurous gases from coal and coke burned in stoves for warming buildings, the effect being to form sulphates which may appear on the surface of the exterior brickwork.

From the foregoing it is evident that efflorescence can be absolutely avoided by the employment of suitable bricks and mortar, by taking care to see that roofs, cornices, and gutters are watertight, and by preventing leakage of any kind from steam and water pipes in ducts within the walls.

In cases when efflorescence occurs despite all reasonable precautions, the first thing to do is to stop any leakage of water into the brickwork, and if the trouble is caused by the penetration of rain from the outside the surface may be treated by the application of alternate washes of soap and alum solutions, the former in the proportions of 2.2 lb. of hard soap per gallon of water, and the latter in the proportions of 1 lb. of alum per gallon of water. Instead of using common alum or potassium aluminum sulphate ($K^2Al^4SO^4$) it is more economical and at the same time more efficacious to employ aluminum sulphate (Al^3SO^4) in the alum wash.

Surface deposits due to calcium sulphate, and, therefore, not carried away by rain, can be removed by scrubbing the face of the work with hydrochloric acid diluted with about five times its volume of water. Before the acid is applied the brickwork should be thoroughly moistened, and all traces of acid removed, after treatment, by washing the surface with water.

A reinforced concrete ice house was recently erected in Philadelphia with sheet cork as the insulation throughout, instead of wood and mill shavings, sawdust, and the like, which have generally been used. The insulation of the ceiling consists of 3-in. cork boards, attached with cement to the under side of the reinforced concrete slab. The walls are insulated with two layers of 2-in. cork boards, with all joints broken; and the floors with two layers, laid in hot asphalt on a concrete base. The finish on the sheet cork and walls and ceiling is Portland cement; for the floor finish a concrete and cement floor is laid directly on the cork.

The Rydal Bank bridge over the Thessalon River was the largest of the works undertaken last season by the Ontario Department of Public Works. It consists of a steel span 120 feet long, and a concrete trestle approach at each end 30 feet long, making the overall length 210 feet. The steel span is supported on concrete columns which rest on a concrete base constructed in 8 feet of water. The bottom is soft and treacherous, and a pile foundation had to be provided for the piers. An 18 in. curtain wall is constructed between the concrete columns to carry the steel floor joist and the concrete beams of the approach. The approaches have a 6 inch concrete floor, supported by

concrete beams, which rest on the piers and light shore abutments. The two middle beams are 16 inches wide and 24 inches deep. The beams are reinforced with Kahn bars, supplied by the Trussed Concrete Steel Company, of Walkerville, at a cost of \$268. The concrete floor of the bridge is reinforced with expanded metal. The steel span was supplied and erected by the Dickson Bridge Works Company, of Campbellford, at a cost of \$3,010. The pile foundations were prepared and the concrete work, the laying of the floor, and the grading done under the supervision of J. O. Coates, Foreman Public Works. The full cost of the bridge will amount to \$10,000.

Proposed New Fire Station at Westmount

The accompanying illustrations are reproduced from the preliminary plans for the proposed Upper Level Fire Station at Westmount, Que. Plans were prepared by Mr. Archibald Currie, city surveyor, and the first sod was cut by Alderman Jones, chairman of the fire committee, on the 13th inst. The excavation is being done by the City Surveyor's department. Working drawings and specifications are now being



Proposed Firehall at Westmount, Que.

prepared and tenders for the erection of the building will be called for in about a couple of weeks. The building, as a whole, will be of fireproof construction, steel and brick. The exterior will be of brick and Roman stone. The ground floor will be used entirely for fire wagons, including one automobile wagon. Accommodation is provided for eight horses. There is also a general office at the southeast corner of this floor. On the second floor quarters are provided for the officer in charge, these consisting of five rooms and bath apartments. The accommodation for the men includes a large reception and billiard room, reading room, action room, four bedrooms, lavatory, showers, etc. The hose tower is shown at the rear of the building.

Mr. W. H. Cushing, of Calgary, states that he considers the present year will establish a new record for consumption of lumber on the prairies, the demand now being large and likely to increase after the harvest. In regard to Alberta he never saw better crop prospects than at the present time, and the amount under acreage is greater than last year by close to twenty per cent.

Reinforced Brickwork

The pioneer of reinforced brickwork was Cottancin, a French engineer. More recently the claims of reinforced brickwork have been advocated by two or three specialist firms and used with considerable advantage in the construction of walls and floors in industrial and other buildings. The latest application of the same principle is exemplified by various river and canal banks in France, which are faced with reinforced brickwork, as illustrated in Figs. 1 and 2. The bricks are pierced by two holes for galvanized iron or copper wires, and are set as follows:—The

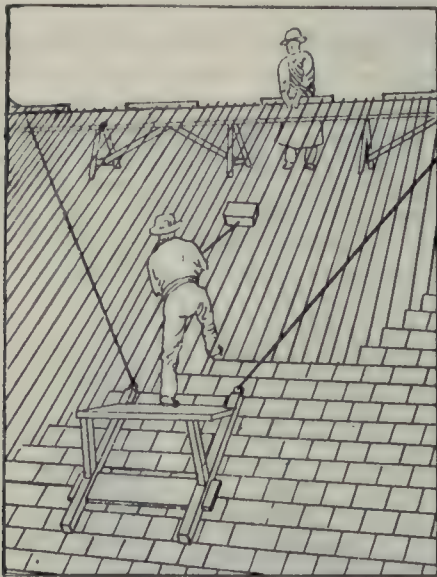


Fig. 1—Laying Reinforced Brick Slope.



Fig. 2—Details of Reinforced Brickwork.

slope to be protected is finished to the required gradient, and the reinforcing wires are secured to a cable stretched along the bottom of the slope. The free end of each wire is then attached to a horizontal frame at the top of the slope, where the bricks are threaded on the wires and slid down to the bricklayers. When the work has passed beyond reach from ground level the layers stand upon a small platform, as shown in Fig. 1, and on completion of the facing the upper ends of the wires are securely anchored. The system of reinforced brickwork here briefly described has been adopted on the Ile des Ravageurs at Asnieres, on the Sensee Canal, near Aneux, and in the Vaux Valley near Pontoise. It has also been found useful as a means of protecting sand-dunes at the Pointe de Grave and at Sonlac.

Machine for Breaking Up Concrete Road Bases

A machine for breaking up concrete road bases which, it is claimed, can do the work of 20 men in about a quarter of the time required for hand labor, has lately been built in England. In cases where concrete bases 12 to 18 in. thick have to be broken up by manual labor the length of time the traffic is in-

terrupted becomes a very serious consideration, according to "Engineering," and the new machine is designed to meet just this condition. The framework of the machine is mounted on 9-in. rollers and supports a steam hammer which can be moved transversely or longitudinally, as may be required, by means of hand-operated screws. The frame is 12 ft. long, and can accommodate 24 chisels in all, spaced 12 in. apart longitudinally and 18 in. apart laterally. These chisels are held in place by cross-bars inserted in the framework and so tapered that a tap with a hammer on the thin end immediately releases the bar, when it can be withdrawn and the chisel lowered to within a few inches of the road surface. The frame can be raised or lowered as required, by means of vertical screws on the rollers, worked by hand, the arrangement being such that when the machine is drawn from point to point the wheels are screwed down so that the frame clears the roadway by a sufficient distance. When ready for use the machine is placed in position and the framework lowered so that the girders rest on the roadway. The chisels are then placed in position and the steam applied to the hammer by a flexible pipe attached to either a boiler on a separate carriage or to the boiler of a small traction engine used for conveying the machine from point to point.

The weight of the hammer adopted in the present design is 400 lb.; the cylinder is 8 in. in diameter and has a length of 38 in., which will allow an initial stroke of 1 ft. 3 in. when driving a chisel 2 ft. long. By this arrangement the force of the blow gradually increases as the chisel is driven down, owing to the increase travel of the piston, which moves under a constant steam pressure of 70 lb. per square inch. The power is considered to be more than ample for driving a cold steel chisel, say 4 in. square, into concrete. When all the chisels required are driven home the machine is moved further along the road and takes up a new position for the next cutting operation. The chisels that have been driven in are then removed. If these chisels should become fixed in any part of the concrete not properly broken up they can be easily removed by the use of hand-hammers. The machine has an overall width of 6 ft. 6 in.; a total length of 14 ft. 9 in., and weight 5 tons.

The Magnetawan River bridge, at Perry Township, Ontario, is a single steel span, 50 feet long, with a concrete approach span 26 feet long at each end. The floor is concrete, 102 feet long over all. The bridge trusses rest on concrete pedestals 3 feet square; the steel joists are supported by a curtain wall between the pedestals; the shore ends of the concrete beams rest on small abutments. There are no wing walls used, and the earth is allowed to fall to a natural slope. This form of construction was found to be more economical than using heavy abutments and wing walls. The concrete approach consists of four reinforced concrete beams 24 inches in depth. The two centre beams are 16 inches wide, and the outside beams 14 inches wide. The beams are reinforced with one-inch twisted steel bars, and the 6-inch concrete floor is reinforced with No. 6 expanded metal mesh. The steel span was supplied by the Western Bridge and Equipment Company, of Chatham, for \$750. The reinforcing cost \$118, and the substructure, concrete approaches, grading, etc., cost \$1,598. The work was carried out under the supervision of J. W. Hackner, civil engineer.

Comparative Merits of Steel and Cast Iron Pipe *

By Allen Hazen

That which follows relates only to large mains, which I shall define provisionally as mains 36 in. in diameter and larger. About twenty years ago steel plates became available in large sizes and at comparatively low prices, and these at once largely replaced wrought-iron for such pipes. Pipes made from steel plates had advantages and soon found extended application in the construction of the large water mains that were then demanded in increasing numbers to meet the needs of growing populations and the increased per capita use of water.

From that time to the present the relative merits of cast-iron and steel for large water pipes has been discussed. Much has been said upon both sides. The author will not attempt to enumerate all the arguments that have been used, but only to present the salient features of the case as they present themselves to him, under the conditions that now exist in the northeastern states.

Steel costs more per pound than cast-iron, but it is stronger and in some respects more reliable. A steel pipe $\frac{1}{4}$ -in. thick may be, and often is, stronger than a cast-iron pipe 1 in. thick, and is commonly cheaper. When steel has replaced cast-iron in pipe it has simply done what steel has done in a hundred other directions in buildings, in machinery, and wherever a higher form of metal has advantages more than commensurate with its increased cost.

In the past a comparison of the two materials for large pipe lines has often rested upon a consideration of the relative durabilities, real or supposed, taken in connection with the relative costs. The steel pipe has been assumed to be less durable, because the metal was thinner and would rust through quicker. But it was much cheaper. For instance at Springfield (Mass.) for twelve miles of 42-in. pipe for which competitive bids for steel and cast-iron pipe were obtained in 1908 the relative costs were in the ratio of 2 for steel to 3 for cast-iron. Cast-iron would have cost \$600,000. It was actually laid in steel at a cost of \$400,000. This ratio is probably not far out of the approximate relative costs of the two materials for large pipes under considerable pressures under the conditions that have ruled in the last few years.

The matter has frequently been presented in this way: the money saved by using steel pipe in a certain case, amounting let us say to one-third of what would be the cost of a cast-iron pipe line, of 50 per cent. of the cost of the steel pipe line, if put at interest at prevailing rates would amount to enough to lay a new line of steel pipe at the expiration of some arbitrary period for which it is assumed that the steel pipe will last. The period assumed in making this calculation has seldom been less than 25 years or more than 40 years. In many cases this calculation has been made and the steel pipe has been put in with the belief that it was better business to use it even though it rusted through and ceased to be serviceable at the end of the relatively short period assumed for its life.

Large pipes, as defined in this paper, are most frequently used in the supply pipes of a water-works system, and less frequently in the distribution, and in such supply mains other conditions than the wearing out or loss of strength of the metal commonly limit the useful life of the pipe.

Reduction in pipe capacity and increase in (water) demand limit the time that a given pipe will by itself perform the functions for which it was laid, and when, because of these, it ceases to be able to perform its work another line may be laid to help it out. When this occurs the first line may be considered to have lost a part of its value,

and it may then be worth only the difference between what it would cost to lay a new main to supply the whole service in connection with it. This will commonly be only a fraction of first cost. Much of the value is then gone although the pipe may be physically sound.

These practical considerations in most cases limit the full useful life of steel and cast-iron pipe in supply mains of growing cities to periods below the term during which the shell is sound.

The oldest steel pipe lines now in use are about twenty years old. They are still in good condition. Little has been spent upon them for repairs, and there is every prospect that they will continue in useful service for a long time. Curiously, it is some of the more recently laid lines that have given most trouble from deterioration.

Liability to Perforation of Steel Pipe

The weakness of a well-made steel pipe is its liability to perforation. The experience of the last years has emphasized this, and recognition of a weakness is the first step in correction it.

Perforations of steel pipe are caused in two ways:

(1) Mechanically. The escape of a small quantity of water through an accidental opening (at a high velocity because the pressure in the pipe is great) results in eddy action on the outside of the pipe which gathers grains of sand and brings them forcibly against the outside of the pipe, and in a comparatively short time cuts the steel and makes a perforation of sufficient size to be an important leak.

The remedy is to test the pipe under more than full pressure before the trench is backfilled, to calk it tight and to make the joints so substantial that there will not be chance for openings to occur.

(2) Chemically. It is a curious property of steel plates that corrosion is not equally distributed, but is concentrated in small places. Once in a while there is a place which for some reason corrodes more rapidly than the rest of the plate, and where finally the steel will be eaten entirely through, making an opening which allows the escape of water. There is clearly some imperfection in the steel plate which allows the corrosion to take place which finally results in perforation, while 99 per cent. of the surface of the plate remains entirely free from deep corrosion.

The writer believes that in many cases there is a reason for preferring steel to cast-iron which is more important than the saving in cost, namely, the greater strength and reliability of steel. This greater reliability is due largely to the fact that steel is malleable, and therefore capable of being bent and deformed by settlement in the trench and movements under external forces without breaking or reduction in strength, whereas corresponding forces acting upon cast-iron pipe would break it.

Cast-iron pipe in the past has been commonly designed with a thickness of wall sufficient to resist, at an assumed tensile strength, and with an assumed factor of safety, the internal pressure of the water in the pipe, with a further allowance for water ram, and generally with a further arbitrary addition to the thickness of the walls to cover inequalities in casting.

The actual test and proof of the formulas that have been used in making this calculation is that the pipe designed by them has in general been satisfactory in service, and the percentage of breakage in actual use has been small.

It is to be noted, however, that most of the experience relied upon in reaching this conclusion relates to pipes smaller than 36 ins. in diameter. That relating to large cast-iron pipes, although considerable, is by no means as great.

It now seems that the forces taken into account in the

formula are not the only ones that tend to break and that do break cast-iron pipe. In addition, there are internal stresses due to the unequal cooling of the casting; there are stresses that grow out of the fact that the pipe is unequally supported along its length and acts as a beam between points of support, and especially there is the weight of the backfill in the trench carried on the top of the pipe and transmitted through the sides of the pipe to the material underneath. The tendency of this load is to break the pipe.

Analysis of Stress

Prof. Talbot of the University of Illinois has investigated the amount of stress produced by fill on pipes of cast-iron and other materials by embedding them in sand and loading them to the point of destruction, and has recorded amounts of load or fill required to break them under various conditions.

The important matter for us in that the stresses that result from these other forces are cumulative to a considerable extent with those resulting from the internal pressure of the water in the pipe.

In a paper recently presented to the New England Water Works Association I attempted to analyze some of these stresses. I will not repeat at this time what is there printed; it will suffice to say that the stresses resulting from the load of backfill are important in pipes of large sizes and make a difference in the thickness of walls required. In other words, large cast-iron pipe designed by the formulas that have been used are not as strong in proportion as small pipe designed by the same formula.

Practical experience seems to bear this out, for there have been relatively more breaks in large cast-iron water pipes than in small ones. Statistics are not easily obtained of sufficient completeness to be of value, but I think almost any water-works superintendent who has had 48-in. or 60-in. cast-iron pipe in his system, or even 42-in. pipe, will support the proposition that the destructive breakage of such pipe has been greater proportionately than with small pipe.

Further, the possibilities of damage with breaks in the large pipes are greater. It is possible in a few minutes to do thousands of dollars worth of damage by one break in a large pipe in a populous district.

Although steel pipes have been designed with nominal factors of safety no greater than those used for cast-iron pipe, when all the conditions are taken into account the actual factors of safety have been greater. With hundreds of miles of steel pipe in service in the last twenty years, nearly all of it in large sizes, there have been but few recorded breaks, and, so far as the author knows, not a single case of a break of a destructive character; no such record can be shown for cast-iron pipe.

With cast-iron pipe, in case of breakage the side of a pipe blows out, and all the water that the pipe is capable of carrying is discharged until the reservoir is exhausted or the supply shut off. On the other hand, the few breaks that have occurred with steel pipe have resulted in comparatively small openings which allowed the escape of some water, but not by any means the full discharging capacity of the pipe.

The perforations of steel pipe that have sometimes occurred and that have been much talked about in the last years, resulting from the rusting or other corrosion of the metal and going entirely through the plate in some cases, result in a relatively small leak which does not interfere with the continued operation of the pipe, and which leak can be easily, completely and permanently repaired without shutting the water off.

It is to be noted that such breaks as have occurred in steel pipes most frequently during laying or preliminary

testing, and less frequently in lines in actual service, have occurred, as far as the author knows, always where plates or lock bars or some other part was of steel that was relatively hard. The mild steel is the most malleable, and although it has the lowest tensile strength it makes the most reliable pipe. If there is breakage or trouble look out for hard steel that has escaped the inspector, or that was near the upper limit of tensile strength allowed under the specifications. For the greatest safety, use soft steel.

Steel pipe is made at the present time in two principal patterns, namely, with double-riveted joints and with lock-bar joints. The lock-bar pipe is believed to be fully equivalent in smoothness to cast-iron pipe, and will carry the same amount of water as cast-iron pipe of the same size. Double-riveted pipe, on the other hand, on account of the projecting rivet heads and the other irregularities of joints, has a greater frictional resistance. To obtain the same carrying capacity double-riveted pipe should be 4 per cent. greater in diameter than either the lock-bar or cast-iron pipe.

The circular joints of both double-riveted and lock-bar pipe are commonly made in this country by riveting. This makes what is known as continuous riveted pipe. With change in temperature the pipe tends to expand or contract, but is held by the earth and prevented from doing so, and the tendency is converted into stresses which tend to stretch or compress the steel, but which with good design never reach objectionable proportions. As these stresses are in all cases at right angles to those resulting from the pressure of water in the pipe their existing does not affect the strength of the pipe directly, although they may tend to bring out any weak points, and accumulating with other stresses they may have been factors in the production of such few breaks as have been noted with steel pipe.

These temperature stresses must be frankly recognized and provided for at every point. Overlooking them may mean disaster. The details of the joints and connections also must be very carefully studied and must be good.

The design of steel pipe has been standardized in the same way that cast-iron pipe has been standardized. More skill is required to reach a good and safe design with it. Fortunately the early lines of steel pipe were designed by able men and the precedents then established were good. It is for us to see that they are maintained, and that necessary precautions are not omitted.

Pipe 30 ins. in diameter can be successfully riveted in the field, although the space inside is rather small for good workmanship; 36-in. pipe is more easily riveted, and this marks the ordinary minimum limit of steel pipe as now made.

Cast Iron Costly in Larger Sizes

Generally speaking, with increasing size, cast-iron pipe increases in cost more rapidly than steel pipe. The saving to be made by using steel pipe as compared with cast-iron is relatively small for 36-in. pipe, and would probably disappear with 30-in. pipe under present conditions; it increases rapidly for 48-in. and larger pipe. This is true even with the methods of calculating the thickness of wall of cast-iron pipe that have been used in the past. When Prof. Talbot's work is taken into account, and the increased thickness logically called for is allowed on the larger sizes of cast-iron pipe, the difference will become greater.

There is a limit to the thickness of castings that can be advantageously used. A large pipe with very thick walls is probably relatively less strong and reliable than one with thinner walls because the internal stresses in the thick casting are greater and there is more likelihood of its going to pieces from its own internal stresses, acting either

by themselves or in conjunction with other stresses from external sources.

When all these matters are taken into account large cast-iron pipe for considerable pressures will increase in cost as rapidly as the square of the diameter of the pipe. In other words, there will be relatively small saving by using very large lines of cast-iron pipe as compared with several lines of smaller diameter.

In our practice in the last years we have seldom considered the use of cast-iron pipe more than 36 ins., or at most 42 ins., in diameter. In nearly all cases we have felt that it was better business to use steel pipe where most capacity was required, or otherwise to divide the line.

Sometimes we have surrounded steel pipe with concrete, thereby adding to its stability and durability. The cost has been increased, but not so as to equal that of cast-iron pipe.

Causes of Cracking in Cement Pavements

In a paper presented at the annual meeting of the Michigan Engineering Society, Earle R. Whitmore, city engineer of Port Huron, Mich., discusses at length the causes of the cracking of cement grouted brick pavements and suggests remedies.

The causes observed by Mr. Whitmore are five in number, and are as follows: Frost, expansion, settling of the sand cushion, settling of the subgrade, and contraction between transverse expansion joints. These are arranged in what he regards as the order of their importance and frequency of occurrence.

Frost

According to Mr. Whitmore's observations, frost is generally, if not always, the cause of the longitudinal cracks appearing at or near the crown of the pavement. In support of this theory, he gives arguments essentially as follows:

Such cracks invariably make their first appearance when the snow goes off in the spring, and are then small.

Where the subgrade is clay, cracks occur in pavements provided with ample expansion joints along the curb, as well as in those without expansion joints.

Where the subgrade is sand, and on well drained fills, cracks are not found, even where no expansion joints are provided.

The cracks follow the line of travel where the snow is packed and the frost penetrates deepest. Where there are car tracks in a street and the subgrade is a material that retains water, there is usually a crack along the driveway on each side of the tracks. Where other streets cross the paved street, the cracks do not continue across the intersection, presumably because the travel across the street and around the corners packs the snow, so allowing the frost to penetrate over such a large area that the pavement is raised evenly and is not broken. Where, however, a street joins the paved street but does not cross it, the cracks run off toward the curb as they approach the side street, continue across it and come back to the centre beyond the side street.

If a careful examination be made of the concrete foundation under one of these longitudinal cracks, it will be found that the concrete is also cracked.

Mr. Whitmore then points out the failure of many otherwise excellent specifications to make proper provisions for drainage and so minimize the danger from frost.

To prevent cracking because of the action of frost, Mr. Whitmore recommends that when the subgrade is clay suitable drains be placed about 3 ft. below the tops of the curbs and the trenches filled with coarse material such as cinders or small field stone. These drains should then be connect-

ed with sewer inlets. He does not favor the use of cross drains. Mr. Whitmore states that he does not consider his observations sufficiently final to warrant the omission of expansion joints next to the curb since they are so generally specified, but states that it is his personal opinion that they are seldom of use except in very wide pavements. Once a crack is started, he says, it doubtless widens because of expansion and contraction, but he states that he has never seen a crack of this kind that appeared to have been caused originally by expansion.

Expansion

Damage to pavements by expansion, according to Mr. Whitmore, is comparatively slight and easily repaired, though sometimes spectacular when caused by the buckling of the pavement. Where there is no abrupt change of grade that allows the pavement to buckle, his observations indicate, he states, that the filler between the courses is sometimes crushed in places and the cracks make diamond shaped or triangular divisions on the surface, seldom breaking a brick but following the joints. If there is a bend or an angle in the street the effect of the expansion will be carried to that point and the angle will be crowded considerably out of line.

These zigzag cracks are inconspicuous as a rule, but according to Mr. Whitmore, tend to shorten the life of the pavement by allowing water to penetrate, and by forming starting points for the cracks caused by the jarring of heavy traffic. As a remedy, he recommends the providing of frequent transverse expansion joints formed by laying several courses about $\frac{1}{4}$ inch apart and filling the joints with a bituminous filler before grouting the rest of the pavement. Mr. Whitmore holds that a single expansion joint $\frac{1}{4}$ inch or more in width is advisable because the passage of loaded vehicles causes a jar that soon loosens the adjacent bricks; because in warm weather the bituminous filler in a wide joint is apt to run from the crown toward curbs; and because the expansion sometimes forces together the bottoms of the blocks next the joints while the tops are still held apart by earth and other material forced into the joint, with the result that the bricks heave up next the joints.

Settling of the Sand Cushion

Cracks due to the settling of the sand cushion, according to Mr. Whitmore, result from several causes. Those enumerated by him are substantially as follows:

When spread on a macadam foundation the sand is apt to work down into the interstices in places, so causing unequal settlement and the cracking of the pavement. This could probably be avoided, he says, by filling and rolling the foundation in about the same manner as if it were to be finished macadam roadway, but such procedure would not usually be economical. He holds that except under unusual conditions, a good concrete foundation is the most economical in the long run.

If, in laying the concrete foundation, sufficient care is not exercised to make the surface parallel with the required pavement surface, the sand cushion will be of varying thickness and will be likely, therefore, to settle unevenly.

If the foundation be laid properly, but the cushion carefully luted, or laid with a templet and the templet not carried back and drawn over the surface several times, the surface will invariably be wavy and the cushion of unequal thicknesses. According to Mr. Whitmore, it is a serious mistake to leave the cushion uneven and depend upon the rolling to level it, for, though the roller will probably make it appear even, some of the blocks will be well bedded while

others will receive practically no benefit from the rolling and will settle later under the traffic.

If the sand be partly dry and partly moist when spread, the cushion will settle unevenly. A pile of sand is often moist on the outside and dry inside, or vice versa, and, according to Mr. Whitmore, when such sand is used it should either be dried or, perhaps, moistened uniformly.

Cracks caused by the settling of the sand cushion, according to Mr. Whitmore, usually divide the surface into approximately rectangular areas varying in size from two or three bricks to several square yards. The cracks do not extend across the bricks. The rectangles go down under traffic heavy enough to break the grout, or, if the traffic is not heavy enough to break the bond, an arch is formed, which gives rise to the rumbling noise so often noticed.

The proper thickness of the sand cushion, Mr. Whitmore states, has been the subject of much discussion. He believes that if it be properly laid, any thickness from one inch to two inches is suitable. He also holds that a sand cushion properly and carefully constructed is as good as a mortar bed, and perhaps better.

Settling of the Subgrade

The settling of the subgrade, like that of the sand cushion, Mr. Whitmore attributes to several causes. Pavements laid across fills are apt to settle, and very wet and undrained subgrades are likely to produce the same result. Only great care, he states, will prevent the first, and suitable side drains will usually remedy the second trouble. Another cause cited is the improper filling of trenches opened for various purposes. Too great care, he says, can not be exercised in backfilling such trenches.

Contraction Between Transverse Expansion Joints

The contraction between transverse expansion joints, according to Mr. Whitmore, results in the formation of fine cracks that are hardly noticeable unless outlined by moisture. When the expansion joints are placed at considerable distances apart, these cracks appear at intervals, he states, and follow the grouted joints from curb to curb. Where the expansion joints are 50 ft. apart two of these cracks appear in each 50-ft. section, dividing it into length of about one rod. He believes that chacking from this cause can be avoided by placing transverse expansion joints at intervals of about 15 ft., in which case it would be necessary to fill only one or two joints at each place with bituminous filler.

Canadian Railroad Development

Locating engineers of the Grand Trunk Pacific are reported to be working on a branch line from the new transcontinental route in Alberta up into the Peace River country.

The Canadian Pacific Railway has issued and sold in London \$6,161,000 additional consolidated 4 per cent. debentures stock. The proceeds are to be used for the construction of 553 miles of branch lines in Manitoba, Saskatchewan and Alberta.

H. M. E. Evans, Edmonton, Alto., acting on behalf of a syndicate of British capitalists, has applied to the city council of Saskatoon, Sask., for power rights on the Saskatchewan River at this point, and also for a 20-year franchise for a street railway. The syndicate proposes to expend \$2,000,000. The scheme includes the taking over of the charter of the Saskatchewan Power Company, a local corporation, which obtained a franchise to dam the river 12 miles north from the Dominion government three years ago.

The Saskatchewan government has approved a change in the route of the Grand Trunk Pacific between Moose Jaw

and Regina. The present status of work on this line in Saskatchewan is as follows: Grading on the line from Qu'Appelle to Regina will be completed by the first week in July. Steel laying will be completed three weeks later. The grading gang when it reaches Regina will start immediately on the G. T. P. line from Regina to the border. A grading gang has reached Edenwold, 24 miles from Regina. Grading on the Moose Jaw-Regina G. T. P. line is going ahead rapidly.

The Bruce Mines & Algoma Railway Company, now operating between Bruce Mines and Rock Lake, Ont., has been purchased by George P. McCallum and H. Appleton, Sault Ste. Marie, Mich., and plans are under consideration for extending the line to a connection with the Grand Trunk Pacific, a distance of 350 miles. It is reported that the Fidelity Trust Company, Montreal, Que., will act as financial agents of the reorganized road and will underwrite a bond issue amounting to \$6,000,000. The road as extended will intersect the Soo branch of the Canadian Pacific, the main line of the same road at Ridout, and the Canadian Northern, now under construction, and connect with the Grand Trunk Pacific one hundred miles west of Cochrane. After the road crosses the Canadian Pacific main line it enters the great clay belt, which will thus be opened up to settlement and cultivation. A branch will run into the Porcupine district. It is expected all of the preliminary work will be done so that the work of actual construction may be started on August 1.

A Montreal Inspection Company

The Dominion & European Inspection Company, of Montreal, has been reorganized quite recently and its offices are now located at 318 Lagachetiere street west, in charge of Mr. Bertram W. Seton (general manager), and Mr. John Hammersley-Heenan, A. M. Can. Soc. C. E. Hitherto the company's operations have been carried on principally in Great Britain and the continent of Europe under the firm name of "E. G. Carey," Inspecting and Consulting Engineers: head office, Uddingston, Glasgow, Scotland. The firm has had extended experience in all branches of engineering work, including bridges, steel buildings, steel wharves and jetties, pontoons, docks, dredges, floating rock cutters, railway plant of all kinds, including rails and accessories and cars of various classes, waterworks machinery and plant, steel and cast iron pipes, etc.

Of the scores of large contracts carried out by the firm it may be sufficient to mention the inspection of the Forth bridge, the largest cantilever structure in the world, which was entrusted to Mr. E. G. Carey. The company have an efficient staff and are open to undertake similar inspections in Canada. Associated with the firm are analytical chemists for cement testing, etc., and consulting engineers who have made a special study of building and other foundations, the best methods of sinking, where difficult conditions obtain, and the most satisfactory construction in all branches. Also, they have the most improved instruments for measuring and recording vibrations in buildings, etc. They are prepared to make accurate reports and advise as to changes when necessary.

The National Fireproofing Company's publication, "Building Progress," is one of the brightest publications of the kind we know. It is issued every month and each number contains several up-to-date articles dealing with practical phases of construction. "Building Progress" should appeal alike to the architect, builder and owner. Copies may be obtained from the Toronto office of the National Fireproofing Company in the Traders Bank Building.

Personal News and Notes

The estimated cost of the proposed new G. T. P. dock at Prince Rupert is \$2,500,000. Plans for the structure have been finally approved by the company's officials.

Mr. T. Aird Murray, consulting engineer, Toronto, has submitted his report on the Melfort, Sask., water supply. Mr. Murray was in Melfort for several days last week.

The building permits issued at Moose Jaw, Sask., last month totalled \$298,950, compared with \$207,000 for May, 1910, and \$61,500 for May, 1908. The total for 1911 to date is approximately \$750,000.

The building trade at Welland, Ont., reports operations seriously delayed by a scarcity of brick. Not only local brick but pressed brick from outside points is very hard to obtain.

Mr. C. M. Drewitt, 678 Spadina avenue, Toronto, was awarded first place in the competition recently conducted by the Model Homes' Association of Ottawa. Messrs. H. Carter and H. C. Beckett, Toronto, were next in order of merit.

The Alberta Pressed Brick Company, Calgary, Alta., has purchased a site for the erection of a plant. J. W. Farner, engineer of the company, states that the capacity of the plant will be 40,000 brick a day. Provision will be made for large extensions at an early date.

The new city engineer of Lethbridge, Alta., is Mr. H. F. Merryweather, who has been appointed at a salary of \$5,000 a year. For the last 30 years Mr. Merryweather has been city engineer of Denver, Colorado, during which period that city has increased in population from 50,000 to over 200,000.

City Engineer Fellowes, of Vancouver, has submitted plans for four bridges over the C. N. R. tracks in the east end of the city at Hastings, Pender, Harris and Keefer streets. The longest bridge, 1,200 feet, is at Hastings street, and the shortest, 777 feet, at Pender street. The total cost to the city will be from \$244,000 to \$434,000, according to the type selected. The designs were issued from the office of Messrs. Waddell & Harrington, of Kansas City.

Messrs. J. G. Hargrave & Co., Winnipeg, have been awarded the contract for a new line of railway in the west. The new road will leave the main line of the Canadian Pacific between Medicine Hat and Calgary, near the station at Bassano, and will run through a district into which large numbers of settlers have gone this year. It will be forty miles in length and will connect with the recently constructed line which runs north from Langdon on the main line and then east to Standard.

One of the graduates of the engineering department of the University of Michigan this year was Lillian Pearl McOmber. Lillian P. has the distinction of being the first of either sex to obtain the degree of Bachelor of Science in Agricultural Engineering. According to a recent dispatch from Ann Arbor, Miss McOmber "is of average height, blonde, with a matchless complexion and great violet eyes." She has specialized in steel structural work and it is said to be her intention to enter a New York city office. We wish her every success.

Mr. Alexander Milne, the newly elected president of the American Waterworks Association has for the past ten years occupied the position of engineer and superintendent of the waterworks department at St. Catharines, Ont. He was born at Aberdeen, Scotland, in 1860 and came to Canada with his parents in 1875. After coming to Canada, Mr. Milne took a 4-year apprentice course, af-

ter which he served for a number of years on railway construction in the engineering organizations of several companies. He has been in municipal engineering for the past 24 years. At St. Catharines Mr. Milne has deservedly earned much credit for developing the waterworks system to its present state of efficiency. He has often been asked to take charge of large waterworks systems in the United States, but has always declined in favor of remaining at his home in the Garden City. Mr. Milne has held many important offices in the organization of the American Water Works Association. In 1904 he was a member of the Finance Committee, and has subsequently held in turn each of the five vice-presidencies. He was elected president for the coming year at the recent convention of the association held in Rochester, N. Y. He is also a member of the Canadian Society of Civil Engineers.

Canadian City Engineers

A. Benzie, St. Catharines, Ont.

Mr. D. Benzie, who has been city engineer of St. Catharines, Ont., for the last five years, is a native of Scotland, having been born at Carnoustie in Forfarshire 32 years ago. He received his early education at the Dundee High School and later graduated in civil engineering from Dundee College (St. Andrew's University). Mr. Benzie entered upon his professional career as a member of the staff of Mr. R. Blackadder, Dundee, and Messrs. J. & A. Leslie & Reid, of Edinburgh, with whom he gained considerable experience in road and street construction, sewerage and waterworks. Afterwards he became engaged with the Caledonian Railway Company (Northern division, Perth), having charge of the laying out of several railway extensions and the renewal of



City Engineer Benzie, of St. Catharines, Ont.

steel bridges and stations. In 1903 he was appointed resident engineer on the main drainage system of Aberdeen, a contract involving the expenditure of over one million dollars. Later, he was appointed chief engineer of the Aberdeen "City Improvement Department." In spite of his advancement in Scottish municipal service, however, and of his inherent love for the land of the heather, Mr. Benzie turned

his attention to the Canadian field and came west in June, 1906. Arriving at Toronto he quickly obtained an appointment as assistant engineer in the city roadways department. In July, 1906, Mr. Benzie was appointed city engineer of St. Catharines.

Since his arrival at St. Catharines, Mr. Benzie has succeeded, after much effort, in revolutionizing the old sewerage system. During his tenure of office many of the business and residential streets have been paved with asphalt block, brick and bitulithic. Also, under Mr. Benzie's supervision a number of granolithic sidewalks and fine boulevards have been laid, these contributing materially to the appearance of the city.

Mr. Benzie is an associate member of the Canadian Society of Civil Engineers and a member of the Aberdeen Association of Civil Engineers.

The engineering reputation of the Garden City is quite safe in the hands of City Engineer Benzie and St. Catharines is to be congratulated upon having secured the services of an engineer with such eminent qualifications for municipal work.

Master Builders of Windsor, Ont.

The Builders' and Contractors' Association of Essex was organized on April 10, 1908. Its headquarters are located in the Thompson Building at Windsor, Ont. Membership in the association is limited strictly to contractors in some branch of the building trade. Supply men are not eligible. In this respect the association differs from the builders' exchange throughout the country. The Windsor body is comprised of 40 members or firms. The officers for the present year are: President, U. F. Dumouchelle; vice-president, T. W. Brook; secretary, G. W. Freeman. The meetings of the association are held on the first and third Tuesdays of each month.

The efforts of the association are directed toward the encouragement and protection of the building and contracting interests; the establishment and maintenance of uniformity in trade, building and commercial usages; the



Mr. D. F. Dumouchelle, President

strongest objection to identifying itself with any foreign body. Anything of an international character it holds inculcation of just and equitable principles in regard to disputes.

The association has not affiliated with the C.N.A.B. for the reason that it prides itself upon being a separate

and distinct body of master builders. And it entertains the as a proposition of doubtful benefit. From what we learn we believe that the association might be induced a little later on to become affiliated with a national body, but only if such an institution were organized solely from the ranks of strictly master builders.

During the summer the association arranges enjoyable little outings for its members on the Saturday half holidays, which commenced this year on the 17th inst., and will continue until Sept. 16th. The opening event of the kind was held at the Island View Hotel, opposite Belle Isle, Detroit Park, and on the river bank above Walkerville, Ont. Sides were chosen for quoits and the victims paid



Mr. G. W. Freeman, Secretary

for the winners' suppers as well as their own. Those present as guests upon this occasion were the secretary of the Detroit Builders' and Traders' Exchange and the secretary of the Detroit Employers' Association.

Among the important contracts for steel framing secured this season by J. Coughlan & Sons, Vancouver, may be mentioned the World building, 20 storeys; Dawson building, 8 storeys; H. O. Lee building, 7 storeys; Metropolitan building, 10 storeys; Holden building, 10 storeys; F. D. Boucher building, 10 storeys. The past month witnessed the completion of the Metropolitan and Holden buildings; the commencement of the erection of the Dawson building and the finishing touches on the World building. Steel for the Lee and Boucher buildings is now being fabricated. When completed, the World building will be the highest steel frame structure under the British flag. All the details of design and execution are the product of Messrs. Coughlan & Sons' shops, Vancouver. The firm informs us, by the way, that there is always employment for good structural shop hands.

E. F. Dartnell, Montreal, has recently booked the following order for the Shawinigan Water & Power Company's new power house at Shawinigan Falls: about 60,000 enamelled brick, 130,000 buff Kittanning vitrified brick, and 25,000 "tapestry" brick.

E. F. Dartnell, Montreal, is supplying 21,000 "tapestry" brick for a dwelling on Pine avenue. Nobbs & Hyde, architects; H. C. Hitch & Company, contractors.

Contracts Department

News of Special Interest to Contractors, Engineers, Manufacturers and Dealers in Building Supplies.

Information for insertion in these columns is invited from Architects, Contractors, Engineers, etc.

Waterworks, Sewerage and Roadways

Brandon, Man.

Plans and estimates being prepared for sewer. Owner, City of Brandon, Man.; city engineer, R. E. Speakman; city engineer instructed to prepare plans and estimates at once for deepening and enlarging sewers on Rosser avenue. Supplementary report later.

Projected work, waterworks, \$100,000. Owner, City of Brandon, Man. Engineer, R. E. Speakman, Brandon. Sedimentation basins. Engineer now preparing report and estimate. Owing to low temperature in winter, basins will be protected against frost thus accounting for high estimate of cost.

Tenders called for machinery for waterworks. Owner, City of Brandon, Man. Engineer, R. E. Speakman, Brandon; electrification of present steam plant; two 2,000,000 gallon variable speed pumps, also a Diesel Oil Engine. Pumps to be suitable for electrical operation. Tenders to be called at once, received by R. E. Speakman until about July 4th.

Edmonds, B. C.

Tenders called for valves (water supply) No. 2. Owners, Corporations of Edmonds; W. Griffiths, clerk. Engineer, Cleveland & Cameron, 506 Winch Bldg., Vancouver, B. C. Supply of about 138 sluice and special valves, varying in size from 3 to 24 in. Particulars at office of engineers. Tenders received until July 24th, by clerk.

Goderich, Ont.

Equipment wanted for sprinkling system. Owner, Kensington Furniture Co. Goderich; F. W. Rumball, Lon. Owner, Goderich Organ Co., A. Sanders, manager, Goderich. These two firms are contemplating the installation of sprinkler systems in their factories now being re-built after partial destruction by fire. Machinery portion not damaged in either case.

Hamilton, Ont.

Equipment required for road building, \$3,000 (Easholme Survey, E. Hamilton). Owner, J. W. Gage, Chancery Chambers, Hamilton; city engineer, A. F. Macallum, Hamilton. Required graders, granolithic sidewalk, drain covers. Tenders will be called in about six weeks. Information obtained from J. W. Gage, Hamilton.

Work in progress for trunk sewer, \$110,000. Owner, City of Hamilton. City engineer, A. F. Macallum. Reinforced concrete, 2,286 ft. long, 78in. diameter. Work just begun by Hamilton board of works.

Lachute, Que.

Tenders called for waterworks. Owner, Corporation of Lachute, Que. Secretary-treasurer, James W. Raitt, Lachute Town. Engineer, W. Kennedy,

C. E., Montreal. Excavating, laying and refilling of about 17,200 ft. of 8 in. c.i. water pipes. Specifications prepared by W. Kennedy, obtained from secretary-treasurer. Tenders received until noon June 28th, by secretary-treas. Advertisement in "Tenders and For Sale Department" of this issue.

Nanaimo, B. C.

By-law to be submitted for sewer extensions. Owner, Corporation of Nanaimo; city engineer, A. G. Waters, Nanaimo. By-law to be submitted on June 29th. F. G. Pete, returning officer. The electric power by-law will also be submitted.

New Westminster, B. C. (West End).

Owner, City Council. Engineer, J. W. B. Blackman, C. E., New Westminster; earthen pipe, size, 6 in. to 14 in., length 8 miles. Tenders called probably in June.

New Westminster, B. C. (Sapperton).

Owners, New Westminster City Council. Engineer, J. W. B. Blackman; city offices, New Westminster. Earthen pipe sewers, size 6 in. up, length about 10 miles. Work will probably commence next year.

Ottawa, Ont.

Tenders called for road making. Owners, City of Ottawa, Ont. (Carling avenue and Queen street). Engineer, N. J. Kerr, City Hall, Ottawa, Ont. Six inch concrete, two inch asphalt, 5,650 also 3,810 sq. ft. concrete, 12-inch gutter, 85 sq. ft. sidewalk replaced, 93 lin. ft. stone headers. Tenders received until June 27th, 1911.

Prince Rupert, B. C.

Proceedings of council; waterworks & power plant. Owners, City of Prince Rupert, B. C. City Engineer, W. M. Davis; consulting engineer, R. H. Thomsom, Seattle, Wash. Report of W. M. Davis endorsed by R. H. Thomsom, with the exception of the substitution of 18 in. pipe for 24 in. Proposed hydro-electric plant to develop power for lighting purposes for city, about 835 h.p. Council decided to prepare necessary by-law for expenditure.

Quebec, Que.

Council proceedings, paving. Owners, Corporation of Quebec. City engineer, W. D. Baillairge, Quebec. Asphalt work. The contract awarded to Messrs. Falardeau & Cie on May 31st has been cancelled by council and authority given to call for new tenders. Ebano and Bermuda asphalt favored by council.

St. Thomas, Ont.

Tenders called for waterworks. Owners, City of St. Thomas. Engineer, Mason H. Baker, City Hall, St. Thomas. New work reinforced concrete, coagulating basins, cost not estimated yet. Basins capacity 400,000 gallons. Plans, etc. at City Engineer's office. Tenders

received until June 24th by G. & R. Crocker, chairman Water Bd., City Hall, St. Thomas.

St. Catharines, Ont.

Tenders called for waterworks. Owner, Corporation of St. Catharines, Ont. Supt. of Waterworks, A. Milne, St. Catharines. Sec. A. 4,200 lin. ft. rock tunnel 5 ft. x 8 ft.; B., excavation and pipe laying, 5,000 ft.—24 in. and 30 in. c.i. pipe; 36 in. c.i. intake pipe; concrete intake and valve chambers. Building auxiliary reservoir. Sec. C., excavation and pipe laying 15,000 ft. 24 in. c.i. pipe. Specifications, etc., at office of Waterworks Commission, City Building. See advertisements in "Tenders and For Sale Department" of this issue.

Sydney, N. S.

Tenders called for paving. Owners, City of Sydney, N. S. (Charlotte street) City clerk, Jas. S. Curry, Sydney. Plans, etc., may be seen at the office of the Contract Record, 220 King street west, Toronto, and also obtained from the City Engineer, D. McD Campbell, Sydney. Tenders received until July 4th, by clerk until 5 p.m.

Toronto, Ont.

Extension of time (tenders) for waterworks. Owners, City of Toronto, Ont. Chairman, Board of Control, F. S. Spence, Toronto. Between 3,000 and 3,500 ft. of rivetted steel pipe, 6 ft. in diameter. Specifications at office of City Engineer C. H. Rust. Tenders received until July 3rd by chairman board of control.

Whitby, Ont.

Tenders to be called for cement sidewalk. Owners, Corporation of Whitby, Ont. Town clerk, Joseph White, Whitby. Tenders to be called next week for about 40,000 ft. Specifications at office of town clerk.

Westmount, Que.

By-law carried for road and sewers, \$500,000. Owner, City of Westmount; City Engineer, A. Currie. The loan has been authorized and work will be done under direction of city engineer.

CONTRACTS AWARDED

Edmonton, Alta.

High pressure turbine, \$47,500. Owners, City of Edmonton, Alta. Engineer, J. C. Hefferman, Edmonton. 2,000 kw. high pressure turbine. Successful contractor, Canadian Westinghouse Co. head Canadian Branch, Hamilton, Ont. The Allis Chalmers Bullock of Milwaukee refused the contract, which has since been awarded as above. Apparatus required Nov. 30, 1911.

Halifax, N.S.

Waterworks. Owner, City of Halifax, N.S.; engineer, F. W. W. Doane, City Hall; contractor, W. S. Craig, 316 Upper Water street, Halifax. Installation of 2,200 water meters at 80c. per

wiped joint. Contract was awarded on June 6th to John McFatrige at 60c., which has been withdrawn.

Work has commenced on the sewerage contract in Lancaster which is to cost \$50,000. Contractors (North street district), Pollock & Corey; (septic tank) John A. Wheaton & Son, James E. Kane & Co.

New Westminster, B. C.

Paving. Engineer, J. W. B. Blackman, A.M.C. Inst. C.E., New Westminster. Successful contractor, T. R. Nickson, Vancouver, 162 Western Vancouver, at \$33,500, granite setts. Other contractors, Larson & Petterson, \$37,787 and La Placa Bros., \$39,805, both of Vancouver. Powers Contracting Co. \$43,493, Hassam Paving Co. \$47,431, and H. N. Smith \$63,863, all of New Westminster. Awaits approval of property owners. Bids opened June 12th.

Railroads, Bridges and Wharves

Aldermere, B. C.

Tenders reported for railroad. Owner, Grand Trunk Pacific Ry., President, C. M. Hays, Montreal. General manager, E. J. Chamberlain, Montreal; Chief Engineer, B. B. Kellither, Montreal, Que. Tenders will be called shortly for construction of 410 mile gap between Aldermere and Tete Jaune Cache.

Brandon, Man.

By-law carried for purchase of street rails, etc. Parties interested, City of Brandon, Brandon Gas Co. and street railway. Votes taken in favor of extension of franchise of the Brandon Gas Co. and authorization of debenture issue for \$25,000 for purchase of rails for street railway. Voted June 15th.

Plans changed for railway construction. Owner, Brandon, Can. Pacific Ry., Can. Northern and Great Northern roads. 1½ miles, survey made. Transfer line to connect all 3 railroads. Route reported in former announcement changed by Railway Commissioners.

Chilcoten, B. C.

Tenders called for suspension bridge, (Cariboo District). Owner, Public Works Department, Victoria, B. C. Pub. Works engineer, J. E. Griffiths, Victoria, B. C. Required—Metal and bolts, delivery at Ashcroft by Sept. 15. Specifications at Department, at office of E. McBride, Rd. Supt., Vancouver, or Government agent, New Westminster. Tenders received by Public Works Engineer until June 30th.

Churn Creek, B. C.

Tenders called for bridge (suspension, over Fraser River). Owner, Public Works Dept., Victoria, B. C. Public Works engineer, J. E. Griffiths, Victoria. Cables and accessories and metal required, delivery at Ashcroft, B. C., on or before Oct. 31st. Specifications at the offices of the engineer, Victoria, B. C., and E. McBride, Road Supt., Vancouver. Tenders received by P. W. Engineer until July 10th.

Chatham, Ont.

Christianson Motor Co., of Milwaukee, plan to merge with the Swift Motor Works, enlarge the plant, instal new machinery, etc.

Edmonton, Alta.

Plans being prepared for subway. (Jasper street). Owner, City of Edmonton, Alta. Engineer, A. J. Latourne, Edmonton. Construction concrete. The Can. Pac. Ry. Co. are preparing plans and will call for tenders at a later date.

Hamilton, Ont.

Plans being prepared for bridge, \$30,000. (Birch avenue). Owner, Toronto, Hamilton & Buffalo, Ry., Hamilton. Engineer, Lathem and City Engineer, Hamilton. One span, 66 ft. width 25 ft. Bridge ordered to be built, city to build abutments, railway superstructure of steel. Work suspended, dispute over land. Supplementary report later.

Contemplated electric railroad. (Hamilton to Galt). Owner, Dom. Power & Transmission Co., Hamilton, Ont. Partial surveys have been made. Dom. Power & Transmission Co. announce they will build if Hamilton does not pass municipal power by-law to be voted on in August.

Montreal, Que.

H. Forget, 1956 Dufferin street, has plans completed for erection of building of twelve flats, 100 x 40, on Christopher Columbus street. Cost, \$12,000.

Montreal Locomotive Works, Ltd., Ottawa Bank Building, have had plans prepared by American Locomotive Co. for factory at Longue Point. Cost, \$34,000. Percy Webb, manager.

Port Stanley, Ont.

Department of Public Works have forwarded completed plans for construction of breakwater. Estimated cost \$60,000. Work to be completed this summer. A new pier is also planned.

Sydney, N. S.

Contemplated bridge, \$7,000. (Whitney avenue). City Engineer, D. McD. Campbell. Steel construction, 200 ft. length, 26 ft. width. Owner, Corporation of Sydney, N. S.

St. John, N.B.

D. Alexander & Son, Campbellton, has had plans prepared by F. Neil Brodie, St. John, for a 2-storey brick store, 25 x 90 feet; day labor.

The Gordon Nail Works have decided to move to Calgary, being unable to make satisfactory arrangements with the city for the lease on which their property is situated.

Tenders closed yesterday at noon for the purchase of the plant, machinery, and building of the A. E. Hamilton, Ltd. No bids came to hand and the property may be disposed of otherwise.

Toronto, Ont.

Contemplated bridge (across the Don, near Russell Hill). Owner, County of York. Engineers, Barber & Young, Adelaide street, Toronto; concrete bridge, 60 ft. arch. Plans and specifications to be prepared within a week or so.

Tenders called for subway. (Jane St. West, Toronto). Owners, Can. Pacific Railway—Ontario Division. Div. Engineer, A. L. Hertzberg. Construction of concrete abutments required in connection with Jane street subway. Plans, etc. at office of Res. Eng., Fullington, Room 605 Union Station, Toronto. Tenders received until June 30th by Div. Engineer.

Township of Amaranth, Ont.

Tenders called for bridge. Owners, County of Dufferin; engineer, F. Barber, 57 Adelaide street east, Toronto; construction of concrete abutments for steel bridges; Miller's Creek Bridges, Lot 26, Con. 10; McConachie's Bridge, Lot 6, Con. 9. Plans, etc., at office of the engineer. Tenders received until noon, June 30, by F. Barber.

Vernon, B.C.

Tenders called for station. Owner, Canadian Pacific Railway; Div. Engineer, H. Rindall, Vancouver. Plans, etc., at office of H. Rindall, or resident engineer, Revelstoke, or station agent, Vernon.

Vancouver, B.C.

It is reported that the R. V. Winch Co. Winch Bldg., are considering large additions to wharves and sheds along the C. P. R. stock sheds.

The Hudson Bay Co. have purchased a site on Douglas, Harold and Fisguard streets, in Victoria, for about \$225,000, and intend building a large department store.

Windsor, Ont.

Plans being prepared for public dock. (Foot of Church street). Owners, Dominion Government, Ottawa. Engineer, Major Charles Lamb, government engineer, London, Ont. Dock to be of concrete. Government has granted \$30,000 for the work this year. Further grants expected next year. When completed with warehouse, it is estimated the entire work may cost \$100,000.

CONTRACTS AWARDED

Thetford Mines, Que.

Freight shed, \$5,500. Owner, Quebec Central Railway, Sherbrooke, Que; architect, L. N. Audet, Sherbrooke, Que.; general contractor, Mr. Goff, Thetford Mines. Contract let June 20th, building to be completed September 1st.

Public Buildings, Churches, Schools, etc.

Amherstburg, Ont.

Specifications in progress for Carnegie library, \$8,500. Owners, Public Library Board, Amherstburg. Secretary, S. McGee, Amherstburg, Ont. Architect, R. W. Crane, Windsor, Ont. Material, stone and pressed brick (stone has been bought by the board). Roof, galvanized tin.

Brandon, Man.

Tenders called for system of lavatories, \$8,500 (Exhibition Grounds). Owner, Western Agricultural Association, Brandon. Architects, W. A. Elliott, Brandon. Two frame buildings, each containing 24 closets; c.i. white enameled troughs called for, plumbing and connections with sewer. Tenders called June 21.

Tenders called for Exhibition buildings, \$4,000. Owners, Western Agricultural Association, Brandon; architect, W. A. Elliot, Brandon. One storey, 100 x 30, frame, pitch roof. Tenders received until June 24th.

Barrie, Ont.

Tenders called for school addition, \$40,000. Owner, Board of Education,

Barrie, Architects, Stewart & Witton, Hamilton. 2-storey and gymnasium, brick and steel, stone foundation, steam heating, electric lighting, tar and gravel roof, interior finish Georgia pine, cement work, cut stone, brick, tile, fireproofing, reinforced concrete, metallic lath, structural iron, ornamental iron, weather strips, fireproof doors, pipe covering, electrical work, electric bells, roofing, sheathing or deafening paper, steel beams, plate glass. Time for calling for tenders not decided yet.

Campbellton, N.B.

Tenders called for theatre, \$8,000. Owner, H. A. Marcus, Campbellton, N.B.; architect, R. A. Frechette, Moncton, N.B. One storey, 45 x 96 feet, brick, steam heating, electric light, pine finish (interior), cement work, fireproofing, reinforced concrete, fire escapes, freight elevator, sidewalk lift sheet metal work, metal ceiling, cornice, plate glass, plastic relief work. Tenders received after July 3rd.

Danvers, Man.

Tenders called for school. Owners, Public School Board. Sec.-Treas., R. Hjelmeland, Danvers, Man. Plans, etc. on application to W. Mann, Minnedosa, and Harrison's lumber yard, Neepawa, or R. Hjelmeland, Sec. 15, 18 W. Tenders received by the sec.-treas. until July 5th.

Edmonton, Alta.

Tenders called for passenger elevator, \$15,000. (Parliament Building.) Owner, Provincial Government, Edmonton. Architect, A. M. Jeffries, Edmonton. 4 passenger elevators. Tenders received until June 30th by Deputy Minister of Public Works.

Fort William, Ont.

Tenders to be called for hall, \$50,000. Victoria avenue. Owner, Oddfellows Order, Fort William. Architect, Hood & Scott, Fort William. Two storeys, 66 x 100, brick and stone, concrete foundation, tar, gravel and iron roofing, cement work, cut stone, structural iron, steel beams, iron columns. Tenders will be called for in the near future.

Guelph, Ont.

Plans being prepared for Y. M. C. A. building, \$50,000. Tenders received after July 30, approx., close in about a week. Architect, Mills & Hutton, Hamilton, 4 storeys, 96 x 53, stone foundation, brick and steel, steam heating, electric light, felt and gravel roof, interior finish oak, cement work, cut stone, marble terra cotta, tile, mantels, fireproofing, metallic lath, structural iron, fire escapes, cornice or skylights, weather strips, pipe covering, electrical work, electric bells, roofing, sheathing or deafening paper, steel beams, iron columns, ornamental columns or caps, plastic relief work plate glass, prismatic glass.

Haileybury, Ont.

Tenders called for church furnishing. Owner, Roman Catholic Cathedral. Architect, E. Payette, 15 St. James St., Montreal. Pews are required just now. Other furnishing later. Tenders received by architect until June 22.

Kara, Ont.

Tenders called for public school. Owner, Public School Board, Kara. Architect, J. A. Ewart, Ottawa. 2 storey 40 x 80, cement block, concrete foundation, metal roofing. Tenders received

until June 27th by C. G. Lindsay, Kara, Ont.

Megantic, Que.

New tenders called for church. Owner, Roman Catholic Church, Lake Megantic; architect, L. N. Audet, Sherbrooke, Que., and J. A. Godin, 229 St. Denis street, Montreal, Que. Stone foundation, cut stone, brick and terra cotta, electric light, art glass. Tenders were called before; none accepted. Tenders received until July 1. New plans.

Moncton, N.B.

Tenders called for fire station, \$14,000. Owners, City of Moncton; architect, R. A. Frechette, Moncton. Two storeys, 40 x 60, brick and concrete, stone foundation, steam heating, electric light, enamel iron plumbing, rubberoid roofing, spruce interior finish, cut stone, fireproofing, reinforced concrete, metallic lath, structural iron, ornamental iron, metal ceiling, sheet metal work, electric bells, steel beams, telephone system. Tenders received until June 30th.

Nelson, B.C.

The Board of Education are contemplating the establishment of a mining school, cost \$20,000. Hon. H. E. Young, Minister of Education.

Niagara Falls, Ont.

Tenders called for school. (Barker street). Owner, Public School Board. Secretary, Geo. Mortimer, Niagara Falls, Ont. Alterations and addition. Revised plans, etc. at office of the secretary. Tenders received by G. Mortimer until 6 p.m., July 3rd.

Newmarket, Ont.

Tenders to be called for public building, \$5,000. (addition to Industrial Home). Owner, County of York, Toronto street, Toronto. Architect, O. E. Tench, Newmarket. 2-storey, brick, steam heating, slate roofing. Plans have been prepared. Tenders will be called shortly.

North Vancouver, B. C. (Ridgeway Avenue).

Tenders to be called for school. Owner, Public School Board. Architect, Claude P. Jones, Pender street, Vancouver. Tenders will be called shortly.

Ottawa, Ont.

Tenders called for church. Owner, Congregational church, Ottawa. Architect, A. A. Leb Week, Can. Life Bldg., Ottawa. 96 x 60 frame and brick, stone foundation, hot water heating, electric light, shingle roof, cement work, artificial stone, electrical work, steel beams, art glass, leaded glass. Tenders close June 27th.

Prince Albert, Sask.

Tenders to be called for receiving station, \$12,000. Owner, City of Prince Albert, Sask. Consulting engineers, C. H. & P. H. Mitchell, Traders Bank, Toronto. Construction of building, brick and concrete; supply of two large 3-phase transformers, switchboards, etc. Tenders received in about a week by C. O. Davidson, Prince Albert, Sask.

Renfrew, Ont.

Tenders extended for addition to collegiate. Owner, Renfrew School Board. Sec.-treas., Geo. Eady, Jr., Renfrew. Architect, J. D. McNicol, Renfrew. The addition to be used as a gymnasium.

Plans, etc. with J. D. McNicol. Tenders received until June 23 by Geo. Eady.

Saltcoats, Sask.

Tenders called for town hall. Owner, Corporation of Saltcoats; sec.-treas., C. E. Boake, Saltcoats. Architects, Storey & Van Egmond, Regina and Saskatoon. Brick veneer. Plans, etc. at office of sec.-treas., and at office of architects. Tenders received until July 4th by C. E. Boake.

Shawinigan Falls, Que.

Tenders called for post office, \$45,000. Owner, Federal Government, Pub. Works Dept., Ottawa, R. C. Desrochers, secretary. Architects, Asselin & Anger, 17 Place d'Armes, Montreal, Que. Stone and brick foundation, hot water heating, electric light. Plans, etc. at the office of architects, at the office of the same firm, Three Rivers, Que., and at the Department. Tenders received by secretary until July 5th, 4 p.m.

Saskatoon, Sask.

David Webster has plans prepared for a new 12-room school, also an apartment house. Cost \$35,000; stone and pressed brick.

Tenders to be called for hospital, \$150,000. Owner, Roman Catholic Church; architect, E. & W. S. Maxwell, 6 Beaver Hall Square, Montreal; brick and concrete. Tenders will be called in about two weeks' time.

St. John, N.B.

President Twitchell, of the Twitchell Lumber Company, of New Hampshire, is believed to have completed negotiations for the purchase of the Scott Lumber Company's lands in this province and the Victoria Mills in Fredericton. The Twitchell Co. have had an option for some time.

St. Andrews, N.B.

The Board of Education will appoint a committee re the erection of a new school. Dr. Carter, chief superintendent of education.

Toronto, Ont.

Tenders called for addition to schools, \$100,000. Owner, Board of Education, Toronto; secretary, W. C. Wilkinson, City Hall, Toronto; enlargement of Essex street and Manning avenue schools; steam heating and plumbing, cabinet work, mid-summer repairs, tinsmith, stove and furnace work, iron stairs, iron fences, hydraulic hoists, lawn mowers, hose and hardware, linseed oil, turpentine, white lead, floor oil and lubricating oils. Specifications at office of Superintendent of Buildings, City Hall. Tenders received until noon June 30.

Tenders to be called for alterations to Parish House, \$10,000. Owner, Wardens of Holy Trinity Church, Toronto. Architects, Darling & Pearson, Leader Lane, Toronto; addition 50 x 25, brick and stone, hot air heating, electric lighting, slate roof, sheet metal work, electrical work. Tenders called in about two weeks.

Tenders called for Parish House, \$15,000. (West Toronto). Owner, Wardens of St. John's Church; architects, Symons & Rae, 15 Toronto street, Toronto, Ont. 2 1/2 storeys, 90 x 66, brick and stone, stone foundation, electric lighting, felt and gravel and slate roofing, structural iron, fire escapes, steel

beams. Heating not decided. Tenders received until June 23rd, by the architects.

Plans being prepared for church, \$30,000. (Deleware avenue). Owners, Wardens of St. Mary's Church, Bloor and Deleware. Architect, W. A. Langton, 88 King street E., Toronto. 2-storey, brick and stone, stone foundation, electric lighting. Tenders will not be called before Sept. 1st.

Tilsonburg, Ont.

Authorized by council, re-building school. Owner, Public School Board, Tilsonburg. School solicitor, V. A. Sinclair, Tilsonburg. The by-law to raise \$25,000 for rebuilding of school was passed by the council.

Vancouver, B. C.

By-laws carried for buildings (Municipal), \$80,000. Owner, City of Vancouver. City Clerk, W. McQueen. Construction of jails, etc., \$40,000; isolation hospital, Hast. \$50,000.

Site purchased for synagogue. Owner, Temple Emmanuel Congregation. Plans for financing are under consideration. Report later.

Windsor, Ont.

Contemplated, general hospital, \$80,000. Owner, to be built and maintained jointly by Windsor and Walkerville. Report of investigating committee in favor of \$80,000 structure has been approved and committee is now raising funds. Supplementary report later.

CONTRACTS AWARDED

Brantford, Ont.

Convent, \$7,000. Owners, R. C. Church, Brantford. Architect, R. Clohesy Hamilton, Ont. General contractor, James Wright, Brantford. Carpentry and joiner's work let to John O'Neil, Brantford. 2½ storeys, pressed brick, 45 x 40. Heating and plumbing contract not let yet.

Cobourg, Ont.

Public buildings (heating) Owners, Counties of Northumberland and Durham. Clerk, N. F. MacNachtan, Cobourg, Ont. Successful contractor, Millward & Son, Port Hope, Ont. Rooms to be heated. County offices, Court Room; town offices, opera house, lodge rooms, in Victoria Hall.

Fort William, Ont.

Theatre, \$75,000 (Victoria avenue). Owner, J. C. Murray, Fort William; architect, Mr. Rapp, Chicago; general contractor, Seaman & Penniman, Fort William, Ont. 140 x 93, brick and stone. Contract let June 19th; building to be completed by December.

Fairville, N.B.

Post office, \$17,400. Owners, Dominion government, Ottawa, Ont. Contractor, R. A. Corbett, St. John. Two storeys, 43 x 45, brick and stone. Building to be completed within the year.

Montreal, Que.

The contract for galvanized iron work and ventilation system for Victoria Hospital has been awarded to McFarlane & Doubglas, Ottawa. Cost, \$8,000. James Ballantyne, Montreal, general contractor.

New Westminster, B.C.

Smith & Whittaker have been awarded contract for Lulu Island school, \$3,

500. Plans for two larger schools are being prepared. Special heating system to be installed.

Pincher Creek, Alta.

Public building. Owner, Dominion Government, Ottawa; R. C. Desrochers, Public Works Dept. secretary. Contractor, J. H. Hinton, Pincher Creek.

Shediac, N.B.

Aged People's Home, \$30,000. Owner, Roman Catholic Church, Shediac; architect, R. A. Frechette, Moncton, N.B.; general contractor, S. R. Gaudet, Memramcook, N.B.; three storeys, 100 x 45 x 100 x 40, wood and stone. Contract let June 3, building to be completed March 1, 1912.

Sherbrooke, Que.

Fire hall, \$3,100. Owner, City of Sherbrooke, Que.; architects, L. N. Audet, Sherbrooke; general contractor, Chas. Veneau, Sherbrooke, Que. Contract let June 19, building to be completed October 1st.

Monastery, \$75,000 (Beckett street). Owner, Redemptorist Fathers, St. Anne De Beupre, Que.; architect, L. N. Audet, Sherbrooke, Que.; general contractor, Lefebvre & Bonin, Sherbrooke, Que.; heating contract not let. Contract awarded June 20, building to be completed August, 1912.

Residences

Brandon, Man.

Plans prepared for apartment block, \$70,000. Owner, A. E. Bullock, Brandon, Man. Architect, T. Sinclair, Brandon. 3 storeys, 100 x 65, Ferro concrete, Ferro concrete foundation, steam heating, electric light, maline plumbing, flat roof, cement work, cut stone, brick, reinforced concrete, structural iron, fire escapes, fireproof doors or windows, electrical work, telephone system, electric bells, roofing, interior finish undecided. No contract for construction will be let. Owner is contractor.

Brantford, Ont.

Extension of time for residence, 10,000. (Dufferin avenue). Owner, W. B. Preston, Brantford, Ont. Architect, L. D. Barber, Brantford, Ont. 40 ft. x 50 ft. tapestry brick, brick foundation, 3 storeys, slate roof, hot water heating, electrical work, hardwood interior finish. Tenders extended until June 28th.

Brockville, Ont.

Tenders called for residence. (King street East). Owner, Dr. E. B. Moles, Pine street, East. Architect, A. Stuart Allaster, 42 King street E., Brockville. 2½ storeys, 39 x 30, brick and stucco construction, stone foundation, hot water heating, electric lighting, shingles, southern pine, interior finish, cut stone, pipe covering, sheet metal work metallic lath, shingle stain, plate glass, art glass, prismatic glass, iron columns, mantels, cornice roofing, sheathing paper, 1st storey of common brick, 2nd half-timbered effect. Tenders called until June 21st.

London, Ont.

Tenders called for residence, \$10,000. (Bridgeport street). Owner, J. E. Magee, 480 William street, London. Architects, Watt & Blackwell, 54 Bank of Toronto Chambers, London. 2 storey attic

and basement, brick and cut stone, brick and cement foundation, electric lighting, hot water heating, shingle roof, interior colonial finish in white enamel and birch stained mahogany, electrical work, pipe covering, shingle stain, plate glass, mantels. Tenders called until June 30.

Oakville, Ont.

Tenders to be called for residence, 4,500. Owner, T. Thornton, Oakville. Architect, W. H. Mallory, 31 Queen street W., Toronto. 2½ storeys, 32 x 44, brick and stucco and shingle, hot air heating, electric lighting, shingle roof, hardwood floors, hall, etc. Tenders will be called in a few days.

Ottawa, Ont.

Tenders to be called for residence, \$7,000. (Clemow avenue). Owner, Mrs. J. Angus McKenzie, Ottawa. Architect, A. Leb Weeks, Can. Life Building; brick, stone foundation, hot water heating, electric lighting, shingle roof, cement work, mantels, electric bells, shingle stain. Tenders received after next week.

Toronto, Ont.

Tenders to be called for residence, \$2,700 (559 Gladstone avenue). Owner, E. J. Henley, 568 Gladstone avenue, Toronto; architect, Designing & Drafting Company, 36 Toronto street, Toronto. Two storeys, 32 x 20, brick, stone foundation, hot air heating, combination lighting, shingle and felt and gravel roof. Tenders received by owner.

Tenders to be called for residence (Keele street). Owners, F. A. Macabe, 288 Jarvis street, Toronto. Two storeys, 45 x 32 ft. 8 in., brick and stone, stone foundation, hot water heating, electric light, shingle and felt and gravel roof. Tenders to be called for heating, plumbing and lighting.

Specifications completed for residence, \$5,000. (High Park Gardens). Owner, Weismiller & Mackenzie Bros., Queen street, Toronto. Private plans, 2½ storeys, 36 x 36, brick and stone, stone foundation, hot water heating, electric light, slate roof, hardwood finish.

Specifications completed for residence, \$4,000. (Walker avenue). Owner, M. D. Grimshaw, 38 Toronto street, Toronto, 2½ storeys, 38 x 25 ft. 6 in., stone and brick, stone foundation, hot water heating, combined lighting, felt and gravel roofing, hardwood interior finish. Building to be commenced shortly by day labor.

Tenders to be called for residence. (Hurdale avenue). Owner, F. W. Hill, 92 Church street, Toronto. Private plans. 2½ storeys, 28 x 22, brick, brick foundation, hot water heating, electric light, slate or shingle roof, hardwood and pine finish. Carpentry and masonry have been let. Other work not let yet.

Specifications completed for residence, 1 pair semi-detached, \$5,400 (s. s. Nina avenue). Owners, Grimshaw Bros., 38 Toronto street, Toronto. 2½ storeys, brick and stone, hot water heating, combination lighting, slate and felt roof, hardwood interior finish. Building will start about July 1st.

Specifications completed for five pair residence, \$14,000. (Rainsford road). Owners, Grimshaw Bros., 38 Toronto street. Private plans, all 2 storeys, 38 x 34, brick construction, felt and gravel roof, concrete foundation, hot air heat-

ing, combination lighting. Building will be commenced shortly by day labor.

Tenders called for residence, \$3,800. (9 Lynwood avenue). Owner, F. B. Eager, 11 Lynwood avenue, Toronto. Architect, J. H. Galloway, 23 Toronto street, Toronto. 2½ storeys. 36 x 27, brick and stone, stone foundation, hot water heating, electric lighting, shingle roof, oak interior finish, mantels. Tenders called until June 27th by architect.

Tenders to be called for residence, \$6,000. (Eglinton, Ont.) Owner, J. H. Yonge, Grenville street. Architects, W. H. Mallory, 31 Queen W., Toronto. 1 storey, 43 x 55, brick, brick foundation, cement work, hot water heating, combination lighting, Spanish tile roofing, interior finish Georgia pine and hardwood floors, mantels. Tenders received after July 20th.

Vancouver, B. C.

Plans being prepared for apartment house. (Burrard street). Architects, Jones & Aspell, 347 Pender W. Vancouver. 3 storeys. Tenders will not be called for some time. Supplementary report later.

Tenders being called for apartment house. (Cor. Main and Lansdowne). Owner, Mr. Daulphney. Architect, Thos. Hooper, Winch Building, Vancouver. 6 storey 132 x 132 electric wiring, hot water heating, elevators. No special date for calling for tenders has been set.

CONTRACTS AWARDED

Halifax, N. S.

Dwelling house, \$8,000. (Spring Garden road). Owner, C. N. S. Strickland, Halifax. Contractors, Faulkner & McDonald, Halifax.

Montreal, Que.

Eugene Bernier, Maisonneuve, has been awarded the general contract for the erection of a 3-storey brick and wood residence for D. W. Gagnon, 21 St. Julie street. Cost, \$6,000.

Paris, Ont.

Residence, \$3,500. Owner, Geo. A. Clerk, Paris, Ont. Architect, Taylor & Taylor, Brantford, Ont. General contractor, P. H. Secord & Sons, Brantford. 2 storey, brick and stone, 29 x 31. Heating and plumbing not let yet.

Toronto, Ont.

Residence, \$10,000. Owner, W. del Schreiber; architect, A. J. Rattray, 123 Bay street, Toronto. Brick and stone, 2½ storey, dimension, 48 x 46. Mason, R. H. Harman, 156 Dupont street; car-

penter, J. E. Ferris, Princess Theatre; plasterer, A. Petrie & Co., 549 Givens street; heating and plumbing, P. W. Snyder, 201 Pape avenue. Tenders awarded June 15th.

Residence, \$5,000. Owners, C. Knowles, Toronto. Architect, Hy. Simpson, 88 King st. east, Toronto, 2½ storeys 25 x 45; brick and steel. Masonry, Forbes & Son, 65 Lee avenue, Toronto; carpentry, Cairns & Firth, 1 Auburn avenue. Other contracts not let yet.

Business Buildings and Industrial Plants

Amherstburg, Ont.

Business opportunities, small manufactures. Exceptional advantages offer-

ed to small manufacturers locating here. For further information address A. W. Marsh, Amherstburg, Ont.

Brantford, Ont.

Charter applied for. New industry. (Spring street). Owner Brantford Motor Truck Co., Ltd., capitalization \$100,000. (\$20,000 already subscribed). Sales agent, R. A. Bailey, Detroit, Mich. Provincial Directors, J. G. Cohoe, W. T. Henderson, E. L. Gould, J. E. Hammond, A. K. Bunnell, J. S. Dowling, and T. E. Ryerson, all of Brantford. Wilks & Henderson, Brantford, Solicitors.

Edmonton, Alta.

Plans being prepared for business building, \$200,000. (Howard street). Architect, A. M. Jeffries, Edmonton, Alta. 3 storey, 100 x 100, sandstone, concrete foundation, steam heating, electric lighting, tar and gravel roofing. Plans being prepared and tenders will be called in time to commence work this year. Building known as Lands & Titles Building.

Building in progress for offices, \$65,000. Owners, Pheasy & Batson, Edmonton, Alta. Architects, Pheasy & Batson, Edmonton. 5 storeys, brick and stone, concrete foundation, steam heating, electric light, cut stone, fire escapes, vaults, passenger elevator, sidewalk lift, skylights, electrical work, plate glass, steel beams, iron columns. Work has commenced on the block.

Plans being prepared for building, \$40,000. (Jasper street west). Owner, J. E. Wize. Architect, J. E. Wize, Edmonton. 4 storey, 50 x 100, brick, concrete foundation, steam heating, electrical lighting, steel beams, iron columns, metallic lath, passenger elevator, tar and gravel roof. This is an addition to the present block, 50 x 100.

Fort William, Ont.

Contemplated, warehouse and offices, \$75,000 (Hardisty street). Owner, Canadian Swift Co. 75 x 100, fireproof construction, cement work, reinforced concrete, freight elevator, fireproof doors or windows, steel beams, iron columns, Chicago firm preparing plans. Supplementary report later.

Proceedings in Council—warehouse, \$100,000. Owner, International Harvester Company. Building Inspector, S. MacNamara. The City Council are favorably disposed towards the application of the International Harvester Co. According to agreement the company will build a large warehouse on C. P. R. property. Supplementary report later.

Halifax, N.S.

Destroyed by fire, lumber mill, \$18,000. Owner, Moir's Ltd., Argyle street, Halifax. Plans for construction will soon be in progress.

Hamilton, Ont.

Equipment required for office building. (Queen and Peter streets). Owner, Taylor Manufacturing Co., Princeton, Indiana, U. S., office furniture and fixtures required, also wood turning machinery, laths, etc. Larger plant to be built later. Products of manufacture store equipment and suit hangers.

Equipment required for office. Owner, Insulated Wire and Cable Co., Hamilton. Required office furniture and electric fixtures. Factory will be built later by themselves.

Equipment required for office. (James street South). Owners, Imperial Bank. Required, furniture, fixtures, adding machine, etc. Particulars secured from head office, Wellington street, Toronto.

Equipment required for business building. (James N.) Owner, Arcade Limited, Hamilton, Ont. Store on James North being re-fitted. Required, counters, fixtures, show-cases, office furniture, chairs, etc. For further information apply to Arcade Limited.

Moose Jaw, Sask.

Tenders called for bank, \$40,000. Owner, Bank of Montreal. Architects, Peden & McLaren, Montreal, Que. 2 storey and basement; 50 x 60, brick and stone, concrete foundation, structural iron, hot water heating, electric lighting, marble, tile, metallic lath, electric bells, plate glass, sheet metal work, steel beams, skylights plate glass, cornice, artificial stone, vaults, interior finish, oak and fir. Tenders received until July 5th. R. G. Bunyard, architect, Moose Jaw, superintending work.

Ottawa, Ont.

Plans completed for business building. Owners, Rolla L. Crain Co., Ltd., Wellington street, Ottawa. Architect, J. A. Ewart, Sparks street. 1 storey 60 x 190, brick, stone foundation, hot water heating, saw tooth roof, electric lighting, sheet metal work, electrical work, steel beams, fireproofing. The R. L. Crain Co. carry on the business of printing and lithographing. The date for calling tenders not set yet. Supplementary report later.

Tenders called for bakery (2 buldgs) Owner, Sinn-Shouldis Ltd., Ottawa. Architect, James Mather, Wellington street, Ottawa. 3 storeys 116 x 96 and 96 x 44, steam heating (2 boilers), electric lighting. Tenders called for plumbing, plastering, painting and electric wiring.

Port Hope, Ont.

Machinery required for canning factory. Owner, the Canadian Cannery Co., Port Hope; manager, D. L. Matthews, Queen street, Port Hope. New and up-to-date machinery will be installed. Supplementary report later.

Steveston, B. C.

Contemplated business business building. Owners, B. C. Telephone Co., Vancouver. Erection of substation at Steveston under consideration. Preparation of plans not commenced; some time before building will commence.

Toronto, Ont.

Tenders called for office building. (King street west). Owner, Standard Chemical Iron & Lumber Co., Toronto; architect, F. S. Baker, 67 Yonge street, Toronto. Two storey and basement, 55 x 60, stone and brick, stone and brick foundation, steam heating, electric lighting, felt and gravel roofing, Georgia pine hardwood finish, cement work, marble, tile, metallic lath, structural iron, sheet metal work, vaults, skylights, iron columns, steel beams, cornice.

Tenders called for stores (Bloor St.). Owner, H. E. Stiles, Chelsea avenue, Toronto. Architect, J. Hunt Stanford, 34 Yonge street, Toronto. 2 storey 24 x 56, brick, stone foundation, hot water heating, combination lighting, shingle roof, interior finish pine and hardwood, plate glass, art glass, shingle stain, man-

Tenders and For Sale Department

TO CONTRACTORS

Sealed tenders will be received for all trades required in the erection of an office building in King street, up to noon on June 30th, 1911.

The lowest or any tender not necessarily accepted.

F. S. BAKER, Architect,
Traders Bank Building,
Toronto, Ont.

25-26

Contractors' Material IN CANADA

Blacksmith drill (power or hand) 10-in. swing.
Leonard Engine (Ball Aut. High Speed).
Sturdevant Steel Fan 35-in. diameter, 12½-in. outlet.

Two Beatty 1-yd. dredges.

One Beatty ½-yd. ditching dredge.

No. 6 Austin crusher, with screen, new 1907, used half time.

No. 5 Champion crusher, also screen.

Eight Steam Drills and one air drill.

50 h.p. Portable steam boiler.

Thirty tons 20 and 25 lb. relaying rails.

Have you anything to sell? Write us.

THE MALES COMPANY,
82 Perin Bldg., Cincinnati, Ohio.

CITY OF TORONTO

Tenders

For the

Construction of a Seawall

In Lake Ontario, in the Vicinity of the Exhibition Grounds.

Tenders will be received by registered post only, addressed to the Chairman of the Board of Control, City Hall, Toronto, up to noon on Monday, July 3rd, 1911, for the construction of a Seawall in the vicinity of the Exhibition Grounds.

Envelopes containing tenders must be plainly marked on the outside as to contents.

Specifications and forms of tender may be obtained on application to the Department of Railways and Bridges, City Engineer's Office, Toronto.

The tenderers shall submit with their tenders the names of two sureties (approved of by the City Treasurer not members of the City Council, or Officers of the Corporation of the City of Toronto), or in lieu of said sureties the bond of a guarantee company, approved of as aforesaid.

The lowest or any tender not necessarily accepted.

F. S. SPENCE,
Chairman of the Board of Control.

City Hall, Toronto,
June 14, 1911.

25-26

Notice to Contractors

Township of Blanshard

Sealed tenders addressed to the undersigned will be received up till 5 o'clock p.m., Saturday, July 1st, for the Construction of the Youngson Creek Drain in the Township of Blanshard. Plans, files and specifications of said Drain can be seen at Clerk's Office at Rannock, in the said Township. A marked cheque for ten per cent. of contract must accompany each tender. The lowest or any tender not necessarily accepted.

JNO. H. JAMESON,
Clerk, Township of Blanshard.

25-26

Bucket Crane

FOR SALE—One full circle, self-propelling, modern 10 to 15-ton capacity Browning size No. 1 Locomotive Crane, standard gauge, 4-wheel truck, 38 ft. steel boom, 8 x 10 engines, equipped to handle Clam or Orange Peel. Will furnish with or without bucket. Attractive price, fine condition, quick delivery. Inspection here.

WILLIS SHAW MACHINERY CO.

39 So. LaSalle Street, Chicago.



Sealed tenders addressed to the undersigned, and endorsed "Tender for Harbour Works in Courtenay Bay, St. John, N.B.," will be received until 4 p.m., on Thursday, August 10th, 1911, for the construction of a Breakwater, Wharves, for the Dredging of a channel and basin, and for the Filling shown on plan and also for the Construction of a Dry Dock and Ship Repairing Plant of the First Class under "The Dry Docks Subsidies Act, 1910."

Plans, specification and form of contract can be seen and forms of tender obtained at this Department, at the offices of E. T. P. Shewen, Esq., District Engineer, St. John, N.B.; J. K. Scammell, Esq., District Engineer, St. John, N.B.; C. E. W. Dodwell, Esq., District Engineer, Halifax, N.S.; A. R. Decary, Esq., District Engineer, Post Office, Quebec, Que.; J. L. Michaud, Esq., District Engineer, Merchant's Bank Building, St. James Street, Montreal, Que.; J. G. Sing, Esq., District Engineer, Confederation Life Building, Toronto, Ont.; H. J. Lamb, Esq., District Engineer, London, Ont.; and at the office of the High Commissioner for Canada, London, Eng.

Persons tendering are notified that tenders will not be considered unless made on the printed forms supplied, and signed with their actual signatures, stating their occupations and places of residence. In the case of firms, the actual signature of the occupation and place of residence of each member of the firm must be given.

Each tender must be accompanied by an accepted cheque on a chartered bank, payable to the order of the Honourable the Minister of Public Works, for the sum of five hundred thousand dollars (\$500,000), which will be forfeited if the person tendering decline to enter into a contract when called upon to do so, or fail to complete the work contracted for. If the tender be not accepted the cheque will be returned.

The Department does not bind itself to accept the lowest or any tender.

By order,

R. C. DESROCHERS,

Secretary.

Department of Public Works,
Ottawa, June 9, 1911.

Newspapers will not be paid for this advertisement if they insert it without authority from the Department.

25-26

Plans Wanted

Competitive designs will be received by the undersigned up to and including July 5th, 1911, for a skating and hockey rink, size of ice space 75 x 180 feet, and seating capacity to be not less than 2,500, building to cost approximately \$7,000. Plans to remain the property of the designer, same to be returned to the unsuccessful competitors.

Two and one-half per cent. will be paid to the architect whose designs are accepted, for working plans and specifications.

R. C. MACFARLANE, Secretary,
Niagara Falls Hockey & Athletic Club, Ltd.,
25-26 Niagara Falls, Ont.

CITY OF MOOSE JAW Saskatchewan

TENDERS

Sealed tenders addressed to the undersigned City Clerk will be received in the Council Chamber, Moose Jaw, up to 8.30 p.m. on Monday, July 24th, 1911, for the supply of the following electrical apparatus:—

Contract A.

Fifty 6.6 Ampere, Direct Current, series, Metallic flame arc lamps, complete with globes, etc.
Fifty Absolute cut-out hangers.
One Current Regulator, 50 lamp circuit.
One Mercury Rectifier, 50 lamp circuit.
One Control panel with switches, 50 lamp circuit.

Contract B.

Fifty ornamental arc lamp standards.
Full particulars and specifications may be obtained from J. D. Peters, Electrical Superintendent, Moose Jaw, Sask.

The lowest or any tender not necessarily accepted.

W. F. HEAL,
City Clerk.

25-28

St. Catharine's Water Works

Tenders

Sealed tenders addressed to "The Chairman of the Commission," marked "Tender for Pipe Laying," or "Tender for Tunnel," will be received up to noon on Thursday, July 13th, 1911, for—

Section "A."

4,200 lineal feet Rock Tunnel, 5 ft. x 8 ft.

Section "B."

Excavation and pipe laying 5,000 ft. 24 in. and 30 in. cast iron pipe. 36 in. cast iron intake pipe. Concrete intake and Valve Chambers. Building auxiliary reservoir.

Section "C."

Excavation and pipe laying 15,000 ft. 24 in. cast iron pipe.

Specifications and plans may be seen and forms of tender obtained at the office of the Waterworks Commission, City Building, James street.

The Commission reserves the right to reject any or all tenders, or to accept any tender which shall appear in its interest.

ALEX. MILNE,
Superintendent.

St. Catharines, Ont.
June 17th, 1911.

25-26

Concrete Abutments

Tenders will be received for building concrete abutments at Armstrong's Bridge on the Perth Waterloo County line, 3 miles south of Millbank.

Letting July 11th, at 2 p.m.

For particulars apply to the Engineers.

BOWMAN & CONNOR,

26-26

Berlin, Ont.

CITY OF SYDNEY, N.S.

Notice to Contractors

Sealed proposals addressed to the Board of Works, and endorsed "Tender for Paving Charlotte Street, Sydney, N. S.," will be received by the City Clerk, at his office in the City Hall, up to and until 5 o'clock p.m., on Tuesday, the Fourth day of July, 1911.

Plans and specifications may be seen at the office of the Contract Record, 220 King street, West, Toronto.

Plans, specifications, forms to tender, contract, etc., and all other information necessary, may be obtained from the City Engineer.

The lowest or any tender will not necessarily be accepted.

JAMES J. CURRY,

City Clerk.

26-26

BOARD OF EDUCATION

Tenders Wanted

Sealed tenders addressed to the Secretary-Treasurer of the Board, will be received until

Friday Noon, June 30th, 1911, for

Enlargement of Essex St. School.
Enlargement of Manning Ave. School.

Steam Heating and Plumbing.

Cabinet Work.

Mid-Summer Repairs.

Tinsmith, Stove and Furnace Work.

Iron Stairs,

Iron Fences.

Hydraulic Hoists.

Lawn Mowers, Hose and Hardware.

Linseed Oil, Turpentine, White Lead.

Floor Oil and Lubricating Oils.

Specifications may be seen and all information obtained at the office of the Superintendent of Buildings, City Hall. Each tender must be accompanied with an accepted bank cheque for five per cent. of the amount of tender or its equivalent in cash. Tenders must be in the hands of the Secretary-Treasurer at his office in the City Hall not later than 12 o'clock noon on the date named, after which no tender will be received. The lowest or any tender will not necessarily be accepted.

W. W. HODGSON, W. C. WILKINSON,
Chairman of Committee. Sec.-Treas.
Toronto, Ont. 26-26

SALESMEN WANTED

TOWN OF OSHAWA, ONT.

Ten Dump Wagon Salesmen. Must have experience in selling contractors and dealers. Are required to go any place in the country where business develops. Good salary to right parties. In answering this ad. state age, where now employed or where formerly employed and reason for quitting or wanting to quit; experience if any, in selling or using dump wagons; salary expected; when can go to work. If know anyone to whom can now sell dump wagons, give names. Give three references and state if can give bond, personal or otherwise. Don't expect reply from this unless your answer to this is complete and your record will show you a successful salesman.

THE TROY WAGON WORKS CO.

26-26

Troy, Ohio.

For Sale

Steam and Electric Machinery displaced by Niagara Power. One 125 horse power, one 225 Compound Condensing Wheelock Engines in good condition. Boilers, 14 ft. x 60 in. and 12 ft. x 48 in. complete with iron work and steam connection. Condensers, heaters, belt tighteners, pulleys and shafting. Direct Current Electric Dynamos and Motors from one to eighty horse power. Bargain prices. Write for particulars.

W. R. REYNOLDS,

Supt., Power & Light Commission,
Ingersoll, Ont.

25-27

Tenders for a Steel Bridge

Sealed tenders marked "Tender for Grand River Bridge," will be received by the undersigned up to one o'clock p.m. Tuesday, July 4, 1911, for the construction of a 115-foot span over the Grand River, about one mile from Walde-mar.

Specifications and forms of tender may be obtained from the undersigned. The lowest or any tender not necessarily accepted.

C. R. WHELOCK,

County Engineer.

Orangeville, Ont.

26-26



Tenders

for Fire Hose, Motor Driven Combination Chemical Engine and Hose Wagon. Fire Alarm Boxes and Wire and Cable for Fire Alarm Telegraph.

Fire Hose, Motor Driven Combination Chemical Engine and Hose Wagon. Fire Alarm Boxes and Wire and Cable for Fire Alarm Telegraph.

Tenders addressed to the undersigned will be received by registered post only up to noon on Tuesday, July 4, 1911, for supplying the articles above mentioned.

Specifications and forms of tender, together with the conditions governing tenders, as prescribed by city by-law, may be obtained upon application at the office of the fire department, Richmond street fire hall, Toronto.

The lowest or any tender not necessarily accepted.

F. S. SPENCE,
President of the Council.

City Hall, Toronto.
June 21st, 1911.

Sedimentation Tanks, etc.

Sealed tenders, accompanied by a marked cheque for \$500 will be received up to Saturday noon, July 1st, 1911, for the construction of screening chambers, sedimentation tanks, sludge beds and all appurtenances thereto.

Plans and copies of specifications are held for inspection at the offices of the "Contract Record," 220 King street west, Toronto; the "Canadian Engineer," Church street, Toronto, and the office of Mr. T. Aird Murray, C.E., Consulting Engineer, Lumsden Building, Toronto.

Copies may be obtained from the Town Engineer, together with forms of tender, upon deposit of a fee of \$1.00, which will be returned when plans are returned.

W. E. N. SINCLAIR, B.A., L.L.B.,
Mayor.

FRANK CHAPPELL,
Town Engineer.

Town Hall, Oshawa.

The Algoma Central and Hudson Bay Railway Company

Tender for Railway Construction

Sealed tenders for the construction of the Algoma Central Railway Extension from Hobon on the C. P. R., northerly to the National Transcontinental Railway at a point approximately 142 miles west of Cochrane, a distance of 101 miles, will be received up to noon July 15, 1911.

The work includes all construction work to sub grade, and in addition, track laying and ballasting in accordance with plans, profiles, forms of tender and specifications at the office of the Chief Engineer, Sault Ste. Marie, Ontario.

All tenders to be marked "Tender for Construction," and to be addressed to R. S. McCormick, Chief Engineer, Algoma Central Railway, Sault Ste. Marie, Ontario.

The lowest of any tender not necessarily accepted.

26-28

TENDERS

for Steel and Concrete Bridge

Mud Lake Narrows

TOWNSHIP of CARDEN

County of Victoria

Tenders will be received by the undersigned until Wednesday, July 5th, 1911, for the following works:—

1. Two steel spans with concrete floors, each 60 feet over all, 14 feet roadway between curbs, to carry a 10-ton roller at least, and to be approved by the Engineer of Highways of the Department of Public Works of Ontario.
2. One 120 feet span, same width and relative strength.
3. Three concrete piers to receive two 60-ft. spans.
4. Two concrete piers to receive one 120-ft. span.
5. Stone filling of approaches.

Plans and specifications may be seen at the office of the County Clerk, Lindsay and Whitby.

The committee claims the right to accept a tender for either two spans or one span; three piers or two piers and to decline any or all of the tenders.

J. R. McNEILLIE,
Clerk, County of Victoria.

Lindsay, June 12, 1911.

Tenders Wanted

Sealed tenders will be received by the undersigned, on or before noon, the 10th day of June, 1911, for the erection and completion for a new church building to be erected by the Chalmers Presbyterian church, Woodstock.

Plans, specifications and further information may be obtained from J. A. McKay, chairman, Building Committee, 119 Oxford street, or at the office of the architects, Chapman, McGiffin and Scott, 59 Yonge street, Toronto.

The lowest or any tender not necessarily accepted. 26-26

TOWN OF MIDLAND Sewerage Works

Sealed tenders will be received by the Town Clerk up to noon of July 8th, 1911, for the labor and materials required for the construction of Sanitary Sewers, comprising about 4,700 lineal feet of pipe sewers.

Plans and specifications may be seen at the office of the Engineers, Chipman & Power, Mail Building, Toronto, or at the Town Clerk's office, Midland.

Each tender must be accompanied by an accepted bank cheque equal to five per cent of the contract price. The lowest or any tender not necessarily accepted.

FRANK R. WESTON,
Town Clerk,
Midland, Ont.

26-26

TOWN OF STEELTON PROVINCE OF ONTARIO

Tenders for Cement Walks

NOTICE TO CONTRACTORS

Sealed tenders will be received by the Town Clerk until 8 p.m. on Tuesday, July 4th, 1911, for the construction of about 72,000 square feet of cement sidewalks and 7,200 lineal feet of cement curb.

Plans, profiles, and specifications may be seen at the office of Messrs. Chipman & Power, Town Hall, Steelton, Ont.

A certified cheque for \$500 shall accompany each tender. The lowest or any tender not necessarily accepted.

JAS. LYONS, Esq., Mayor,
Steelton, Ont.
J. ROBINSON, Esq., Town Clerk,
Steelton, Ont.
CHIPMAN & POWER, Engineers,
Toronto, Ont.

26-26

TOWN OF STEELTON Province of Ontario

Tenders for Storm Sewer, Cement Curb, and Macadamized Roadway.

NOTICE TO CONTRACTORS

Sealed tenders will be received by the Town Clerk until 8 p.m. on Tuesday, July 4th, 1911, for the construction of about 1,050 feet of 12-inch vitrified pipe storm sewer, including catch basins and manholes; about 2,760 feet of concrete curb; and about 6,400 square yards of macadamized roadway.

Plans, profiles, and specifications may be seen at the office of Messrs. Chipman & Power, Town Hall, Steelton, Ont.

A certified cheque for \$500 shall accompany each tender. The lowest or any tender not necessarily accepted.

J. LYONS, Esq., Mayor,
Steelton, Ont.
J. ROBINSON, Esq., Town Clerk,
Steelton, Ont.
CHIPMAN & POWER, Engineers,
Toronto, Ont.

26-26

Tenders for Vault Fitting

Sealed tenders will be received by the undersigned until noon on Tuesday, July 4th, 1911, for steel fittings for the south vault of Registry office for North and East Middlesex, being on Court House Square in the City of London. Vault room 14 ft. by 24 ft.

Plans and specifications of the proposed work to be submitted with tender.

CHAS. TALBOT, County Engineer.
T. E. ROBSON, County Clerk.
London, Ont., June 26, 1911. 26-26

Positions Vacant

Advertisements under this heading one cent a word per insertion. Box No. ten cents extra

Stone Masons Wanted—A few good stone masons wanted, to build random Ashler stone work, required at the building of a Parish Hall, for All Saints Church, Collingwood, Ontario. Apply Philip C. Palin, Architect, Collingwood, Ont. 25-26

(Continued from page 59.)

ties, tile. Owner will call for tenders after June 22nd.

Tenders called for office building. (King street). Architect, F. S. Baker, Traders Bank Building, Toronto. Tenders called until noon June 30, for erection of building. See advertisement in "Tenders and For Sale Department" of this issue.

Tenders to be called for Machine and repair shops, \$2,500. (West Lodge avenue). Owners, Gutta Percha Rubber Co., Yonge street, Toronto. Company engineer, A. Sullivan, 114 O'Hara avenue, Toronto. 2 storey, reinforced concrete, hot water heating, electric lighting, concrete roof. Tenders received after June 24th.

Tenders to be called for warehouse, \$40,000. (O'Hara avenue). Owners, The Gutta Percha Rubber Co., Yonge street, Company's engineer, A. Sullivan, 114 O'Hara avenue, Toronto; reinforced concrete, hot water heating, 3 storey and basement, 170 x 50, electric lighting, concrete and gravel roof. Tenders called after June 24th. Machinery not purchased yet.

Vancouver, B.C.

Plans being prepared for office building (Hastings street). Owner, J. K. Sutherland, 1901 Barclay street, Vancouver; architect, Parr & Fee, 570 Granville street, Vancouver; 6 storeys, store and offices. Tenders for excavation have been called. Supplementary report later.

Plans presented to inspector for three buildings. Building Inspector, Mr. Jarrett. One 7-storey brick block, Granville street, 50 x 120 feet, stores on ground floor and apartments upstairs. Presented by C. F. Perry; two 6-storey brick block, 110 Water street, 33 x 120, cost about \$75,000. Grant & Henderson, 413 Granville street, prepared plans. Owner, A. Williams.

Specifications in progress for warehouse (Alexandra street). Owners, McLennan McFeeley Co., Columbia and Cordova, E. Vancouver. Architects, Parr & Fee, 570 Granville street, Vancouver. 1 storey, 400 ft. long. The plans for large warehouse are indefinite. Tenders on the above had not been called under date of last information.

Tenders to be called for stores, \$7,000. Owner, A. D. Bowlby, Windsor. Architects, Crane & Pennington, Windsor, Ont. 2 storey 48 x 50, brick foundation, hot air heating, electric and gas, composition roofing, Georgia pine interior finish, cement work, cut stone, brick, tile, structural iron, sheet metal work, metal ceiling, skylights, plate glass. Date for receiving tenders not set yet.

CONTRACTS AWARDED

Edmonton, Alta.

Store, \$55,000. (Jasper street East). Owner, Jackson Bros., Edmonton. Architect, A. McGoon, Edmonton. General contractors, Pheasy & Batson, Edmonton, Alta. 3 storeys, brick and stone, concrete foundation, steam heating, electric light, tar and gravel roofing, cement work, cut stone, metallic lath, fire escapes, plate glass, vaults, sidewalk lift. Excavation has commenced.

Hamilton, Ont.

Addition to store, \$8,500. Owner, A. M. Soutar & Co., King and Parke streets, Hamilton. Architect, Stewart & Witton, King and Parke streets, Hamilton. 4 and 5 storeys high, 65 x 30, mill construction. Contract for brickwork let in Mitchell & Riddell, Hamilton, June 15th.

Halifax, N. S.

Warehouse, \$10,000. (Upper Water street). Owner, James Simmond & Co. Contractor, George B. Low, Halifax.

Montreal, Que.

H. Kellert & Sons, Royal Building, have awarded contract to C. E. Deakin for 4-storey light manufacturing building, concrete and terra cotta, 75 x 120, on St. Catharine street. Cost \$50,000.

Ottawa, Ont.

Warehouse. Owners, J. M. Garland & Son, Ottawa. Architect, A. Leeb Weeks, Canadian Life Building, Ottawa. General contractor, A. Garvock, Queen street, Ottawa. 6 storeys and basement, 52 x 66, reinforced concrete, concrete foundation, steam heating, electric light, tar and gravel roofing. Contract let June 18th. Tenders called for plumbing, steam heating, sprinkler system, and freight elevator.

Toronto, Ont.

Warehouse, \$9,000. (479 Wellington street west). Owner, G. B. Meadows, 5 Sussex avenue, Toronto. Architect, W. H. Mallory, 31 Queen West, Toronto. General contractors, Fussell & Thomas, 406 Dupont street, Toronto. 2 storeys, 63 x 48 brick construction. Contract let June 15th.

Power Plants, Electricity and Telephones

Edmonton, Alta.

Report under consideration for gas plant, \$230,000. Parties interested, Edmonton City Council and J. Coates, representing British capitalists. Building 200 ft., provision to be made for installation of sufficient machinery to ensure the manufacture of 125,000 cu. ft. of gas per day and laying of 15 miles of mains. Supplementary report later.

Ingersoll, Ont.

For sale—steam and electric machinery. Owner, Power and Light Commis-

BOILERS



Fitzgibbon Type of Boilers built for McLachlin Bros., Arnprior, Ont.

BOILERS, of All Kinds for Any Service

"Inglis" Boilers are Designed and Built by Skilled and Experienced Workmen.

"Inglis" Boilers are Built of the Best Material that can be procured.

"Inglis" Boilers are Made in Shops Equipped with the Latest and Most Modern Machinery.

Workmanship, Quality, Quick Delivery and Fair Prices, together with Fifty-Two 52 Years' Practical Experience, have made "INGLIS" Boilers the "Standard." Write us for prices.

The John Inglis Company

Engineers and Boilermakers

Limited

14 Strachan Ave., TORONTO, Canada

sion, Ingersoll, Ont. Steam and electric machinery, one 156 h.p.; one 225 compound condensing Wheelock engine in good condition; boiler 14 ft. x 60 ins. and 12 ft. x 48 ins. complete with iron work and steam connection; condensers, heaters, belt tighteners, pulleys and shafting, direct current electric dynamos and motors from one to eighty h. p. For further particulars write W. R. Reynolds, Supt. Power & Light Commission, Ingersoll. See advertisement in "Tenders and For Sale Department" of this issue.

Martintown, Ont.

Negotiations in progress for new telephone company. Owner, Martintown Telephone Co. Pres., A. Climgen; secretary, Hy. Kinloch. Organization of joint stock company to erect and operate lines in this locality in connection with the Bell Telephone. Steps being taken to secure subscribers to stock.

Sarnia, Ont.

Plans will be prepared by the town engineer for the installation of a municipal lighting system. Negotiations are pending for the purchase of the Sarnia Gas & Electric Light Company. A generator will be located at the Sarnia waterworks.

St. John, N.B.

A Toronto concern is asking for privilege of establishing electric power and heating plant at Milltown, N.B. Address town clerk, Milltown.

Vernon, B. C.

Tenders called for generator. Owner, City of Vernon. City Clerk, D. G. Tate. 200 kw.; 3 phase 60 cycle; 2,200 volt with 2 panel switchboard and exciter. Specifications at office of City Superintendent. Tenders received until June 26, by city clerk.

Miscellaneous

Ottawa, Ont.

The following contracts have been awarded by the Public Works Department of the Dominion Government: River Thames, Ont., dredging, to W. E. Finn, of Welland, 35 cents per cubic yard; Eryner's Cove, N.B., wharf, to John J. Kane, St. John, N.B., \$2,998; Point Sapin, Kent County, N.B., breakwater, to Warren Taylor, of Salisbury, N.B., \$16,890; Fassett, Que., wharf, to Thomas Morin and John Morin, of Arnprior, \$5,955; Leve, P.Q., armory, the Ideal Construction Company, Quebec, for \$62,995; Mahone Bay, N.S., dredging, to Beazley Bros., Ltd., Halifax, at 40 cents a cubic yard; Vancouver, B.C., metallic fittings to office of superintendent of railway service, to Eclipse Manufacturing Company, of Toronto, for \$4,495; Little Anse, N.S., break-

Strassburg, Sask.

By-law carried for fire apparatus, \$5,000. Owner, Corporation of Strassburg. Sec. treas., E. F. Steadman. By-law to borrow \$5,000 for purchase of fire fighting apparatus was carried.

Vancouver, B. C.

By-laws carried for engineering, \$1,310,000. Owner, City of Vancouver. W. McQueen, city clerk. Sewers, \$750,000; Seymour water works; extension, \$1,000,000; Hast. Townsite street im-

provements, \$75,000; water system, \$75,000; Clark street and widening, wharves \$35,000; D. L. 301 water system \$115,000; streets \$60,000; street improvements, Seymour \$100,000.

Westmount, Que.

Equipment wanted for fire station. City Engineer, A. Currie, Westmount, Que. Combined chemical and hose wagon of the motor type. Tenders called for construction of station in about two weeks.

Building Permits

Calgary, Alta.

The following building permits were issued recently: P. N. Gordon, \$4,000 house, Twelfth street, between Seventeenth avenue and Colborne Crescent; Alliance Investment Company, \$3,000 house, Twelfth street, between Seventeenth avenue and Colborne Crescent; W. S. McDonald, \$2,500 house, Mount Royal; G. W. Henderson, \$2,500 house, Mount Pleasant; H. Templeton, \$2,600 house, Mission.

Ottawa, Ont.

The building permits issued recently include: W. C. Edwards Co., factory, Green Island, Sussex street, \$15,000; T. J. Somerville, dwelling, Arthur street, \$3,500; James Hill, dwelling, Cartier st., \$4,000; Kastrel Cohen, dwelling, Archibald street, \$5,800; Lincoln Johnson, dwelling, Sunnyside avenue, \$5,000; Solomon Coplan, dwelling, Osgoode street, \$7,000; J. W. Nimmo, dwelling, Carling avenue, \$3,000; S. B. Caldwell, dwelling, Blackburn avenue, \$3,100; F. W. Burn, shop and dwelling, W. E. Noffke, architect, T. C. James and Alex. Christie, builders, \$7,000; Henry Hayley, dwelling, Chapel street, cement veneer, \$3,300; Jas. S. Wilson, dwelling, Chapel street, \$9,500; D. J. Harris, shop and dwelling, Lisgar street, \$5,000; Gilpin & Holcomb, hotel, Sussex street; C. J. Burritt, architect, T. C. James, builder, \$21,000; Chas. Goodall, dwelling, R. E. McKinstry, builder, Woodlawn avenue, \$4,000; A. L. Foster, dwelling, Hopewell avenue, R. E. McKinstry, builder, \$4,000.

Toronto, Ont.

Recent building permits include:—G. Philips, 5 att. 2-storey brick stores and dwellings, Bloor street west, \$17,500. P. H. Lambert, 3 att. 2-storey brick stores and dwellings, on Danforth avenue, \$9,000. A. W. Williams, 2-storey and attic brick dwelling, St. Andrews Gardens, \$5,500. W. H. Wright, 3 att. 2-storey brick dwelling, Cooper avenue, \$6,000. W. E. Galley, 2-storey brick garage, on Sussex and Mews Lane, \$5,000. W. F. McCutcheon, 3 att. 2-storey brick dwelling, on 125-5-7 Perth avenue, \$5,600. J. T. Knifton, 3 det. 2-storey brick dwelling, near Campbell, on S. S. Wallace, \$6,000. H. & C. M. Pascoe, 3 att. 2-storey brick dwelling, on S. E. corner Spruce Hill Road and Sycamore, \$6,500. Syken & Knox, 1 pr. semi-det. 2½ storey brick dwelling, near Bloor, on Pauline, \$5,200. Dr. Clarkson, 1 pr. semi-det. 2-storey and attic brick dwelling, near Abbot, on Indian Road, \$5,000. A. E. Fisher, 2 det. 2½-storey brick dwellings, near Howard Park, on Indian Road, \$6,000. W. H. Wright, 3 att. 2½-storey brick dwelling, near Indian Road, on Indian Crescent, \$7,500. W. D. Beath & Son, 1-storey steel and concrete factory near Kingsley, on

Symington, \$6,000. A. H. Garrett, 2 att. 3-storey brick stores and dwelling, on 600-2-4 Bloor W., \$11,000. D. K. Ridout, 2½-storey brick dwelling, on 484 Avenue Road, \$17,000. G. A. Harper, 2-storey and attic brick dwelling, near Heath, on Warren Road, \$8,500. W. E. Cummer, 2½-storey brick and stucco dwelling, near Queen street, on Balsam, \$6,500. Wm. Pigeon, 3 att. 2-storey stone and brick dwelling, near St. Clair, on St. Clarens avenue, \$5,000. W. Pennock, 4 pr. semi-det. 2½-storey brick dwelling, near Bloor, on W. S. Pauline, \$20,000. L. Schepp, 2-storey brick factory, on 18-20 Spadina avenue, \$8,000. Ansman & Marshall, 2 pr. semi-det. 2½-storey brick dwelling, near Palmerston, in N. S. Palmerston Gardens, \$8,500. F. E. Parsons, 3 att. 2-storey brick dwelling, near Logan, on N. S. Wolfrey, \$6,000. Urquhart & Sharp, 1 pr. semi-det. 2-storey brick dwelling, on 62-64 Symington avenue, \$5,000. R. Lankin, 2 pr. semi-det. 2-storey R.C. dwelling, brick fronts, on 142-8 Curzon street, \$6,400. A. J. Jackson, 2½-storey brick dwelling, on Deer Park Crescent, \$5,800. Henry Wright, 2½-storey brick dwelling, on 582 Avenue Road, \$14,000. Jos. Waller, 1 pr. semi-det. 2-storey and attic brick dwelling, near Callendar, on S.S. Harvard, \$6,000. F. Gordon Osler, 2½-storey brick addition to dwelling on 6 Rose-dale Road, \$5,000. J. H. Young, 2-storey brick apartments, on 48 Grenville street, \$5,200. Chambers & Minaker, 3-det. 2-storey R. C. dwelling, on Sproatt, near Jones, \$5,500. H. M. King, 3 det. 2½-storey brick dwellings, near Wright, on W. S. Indian Road, \$9,000. John New, 3-storey brick apartments, near Sherbourne, on N. S. Bloor, \$15,000.

Vancouver, B.C.

Recent permits include: J. S. Mathers, dwelling, 1343 Maple street, \$3,800; Jas. C. Farlong, dwelling, 2610 McGill street, \$2,500; John F. Ross, dwelling, 510 St. George street, \$3,000; Parker & Allan, dwelling, 2173 Third avenue west, \$2,500; S. MacDermid, dwelling, 1746 Trutch street, \$4,000.

Winnipeg, Man.

Recent permits include: L. Jorunason, apartment house on Furby street and Church avenue, \$35,000. P. M. Clemens, architect. J. Isenberg, apartment house on Church avenue to cost \$30,000. Standard Chemical Iron & Lumber Company, warehouse, Higgins avenue, \$16,000. Foster & Co., two dwellings, McMillan avenue, \$8,500. J. Miles, stores and tenement on Selkirk avenue, cost \$6,000. F. Johnson, double dwelling, Sherburn street, \$3,500. Imperial Oil Co., cooperage building on Alexander avenue, \$3,000. R. Taylor, three dwellings on Dorchester avenue, \$18,000. R. James, two dwellings, Elgin avenue, \$5,600. A. Bercovitch, stores and apartments, Selkirk avenue, \$6,000.

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TORONTO

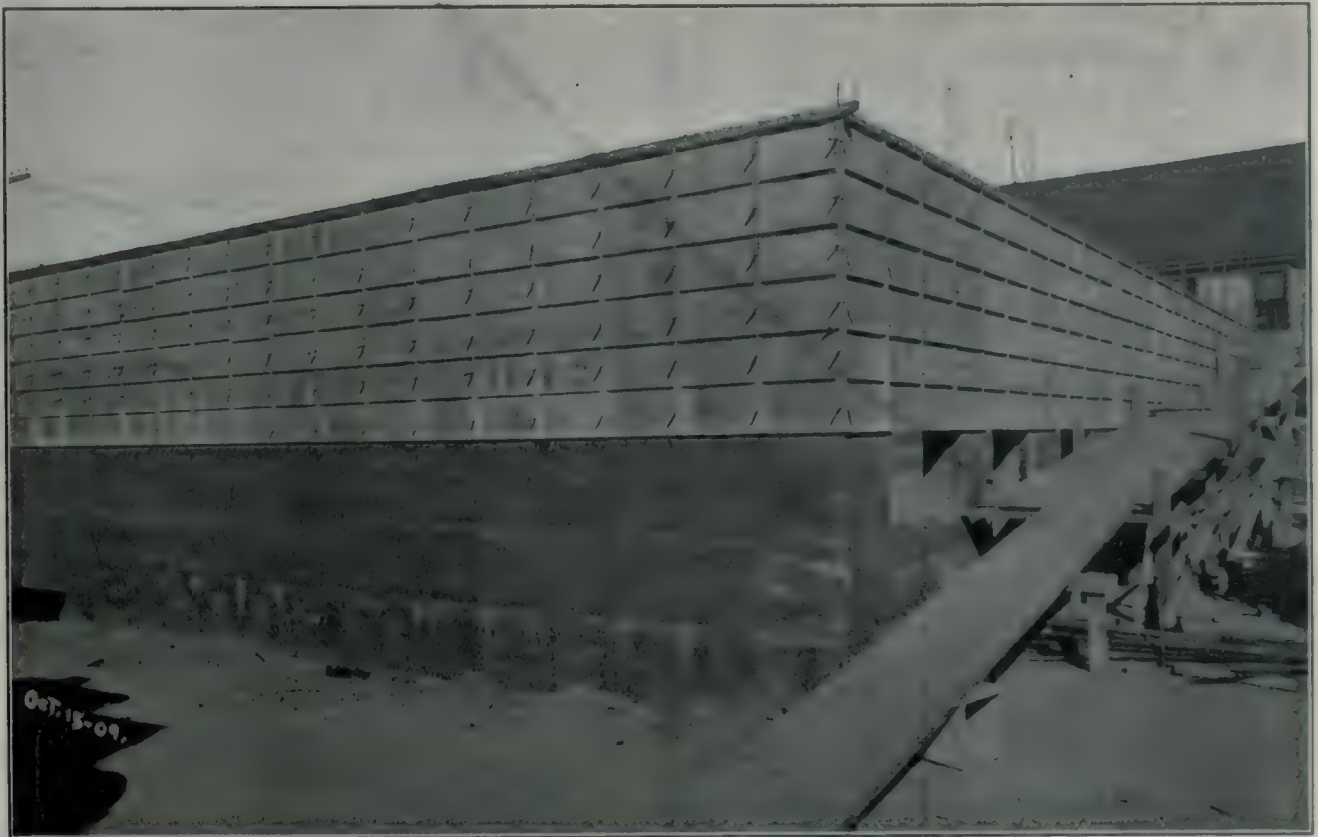
The United States Steel Corporation, at Gary, Ind.;
Stone & Webster Engineering Corporation, Minneapolis, Minn.;
A. Monsted Co., Milwaukee, Wis.;
Geo. B. Swift Co., 903 Security Building, Chicago
Pacific Coast Condensed Milk Co., Seattle, Wash.;
Sheffield Farms-Slawson Decker Co., Amenia, N. Y.; and
Inland Steel Co., Indiana Harbour, Ind.

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"Mimico" Brand Doing Well

The Ontario Sewer Pipe Company, Limited, Mimico, Ont., are working at full capacity to cope with the demands of one of the most active seasons they have yet experienced. A continuous policy of improvement is followed and extensive crushing machinery has lately been installed at the company's plant. The kiln capacity has been increased 15 per cent. this spring. The superintendent of the Ontario Sewer Pipe Company's plant is Mr. Albert L. Garee, who has had thirty years' experience among up-to-date plants in the United States and Canada. About fifty employees are engaged at the plant; about half of these are skilled workmen. The plant is replete with the most modern improvements known in this line of business and is equal to all demands. The output during 1910, which was also a good year, was 700 cars, but this will probably be increased 50 per cent. during 1911. The company has good prospects all through Ontario, but, as intimated above, they anticipate a record season this year in and around Toronto. The demand for "Mimico" brand pipe is growing very rapidly, and the company has good reason to feel some gratification. Mr. A. D. Harris is president of the Ontario Sewer Pipe Company, Limited; R. H. Stelton, general manager, and Andrew Dods, secretary-treasurer.

The definition of rock in sewer specifications recently adopted by the Board of Local Improvements of Chicago is as follows:

Wherever the word "rock" occurs in these specifications it shall be interpreted to mean any material geologically in place and of a hardness when first exposed of three or greater in the scale of mineral hardness, which corresponds to the hardness of the transparent variety of calcite. Other materials shall not be classed as rock, although it may be more economical to remove the same by blasting.

Further clauses relating to rock are as follows:

No claim for an amount of money beyond the contract price of the work will be entertained or allowed on account of the character of the ground in which the trench or other excavations are made, except for the rock cutting heretofore specified.

An additional interesting feature of the specifications, relating to protection against water, is briefly expressed in the following words:

Where the excavation to its entire depth is in wet sand the contractor shall install a pumping system connected with well points so as to effectually drain the sand.

According to a recent dispatch from Vancouver; 32 contracting firms of that city have signed an agreement to maintain only open shops.

E. F. Dartnell has recently booked the following order for the Shawinigan Water & Power Company's new power house, at Shawinigan Falls: 60,000 enamelled brick, 130,000 buff Kittanning vitrified brick, and \$25,000 tapestry brick.

During the month of May the Montreal building inspector's office issued 429 permits for new buildings and 160 permits for alterations. The value of the alterations was estimated at \$278,245, and the new work at \$1,424,895, making a total of 589 permits with a valuation of \$1,703,140. Last year, for the month of May, 329 permits were issued for new buildings and 124 for alterations. The value of the alterations was \$128,585 and of the new work \$1,580,615, making a total of 453 permits at an estimated value of \$1,709,200.

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No. 27

The Decrease in Efficiency of Labor Conditions

It requires but a short perusal of building statistics to confirm what has been frequently stated regarding the costs of construction work. These have been increased during the last five years all the way from 25 to 50 per cent. This is the result of a demand for higher wages and greater outlay for stock and provisions. The prices of many materials of construction are also on the increase. Combined with this comes the intimation that there has been a pronounced decrease in efficiency of labor during this period. This appears to apply to skilled and unskilled laborers alike. The result of this condition of decreasing efficiency with increasing wages weighs heavily in the comparison of construction work of to-day with construction work done a few years ago. The cause is difficult to approach, and no convincing reasons expose themselves. Whether the condition may be traced to lack of interest and incompetency of workmen or foremen, to the excessive increase in the number and magnitude of engineering projects, to the result of organized labor, or to more local or more general causes, it is a question for open study and debate.

Whatever its cause the fact remains, which is the vital thing, and there is no clear reason why it will not continue. This at least is the attitude, we believe, that employers of construction labor must assume. To deal with the new conditions the contractor is obliged to study means of reducing manual labor and methods of more scientific management. Labor saving machinery and tools must take the place of men to the utmost practicable degree, and the usefulness and up-to-dateness of these appliances must be kept constantly under supervision. A wide channel for waste of money through inefficiency may be accounted for by poor and defective tools and cheap, out-of-date

plant. They place a severe handicap on able and skilled laborers.

Men, however, will always count high in construction work no matter how many or what labor saving machines are used and the solution of the problem evidently lies in better management of men. It is obvious that the old rule of "drive 'em" no longer holds good. There must be an incentive greater than the regular daily wage or fear of the boss. The condition is no longer a case of what the contractor wills to do; it is case of what he must do. If it be a new condition it must be met by new methods. The method that promises most is a modification of the time-honored wage system of paying men, the introduction of some sort of bonus system whereby a man will receive payment in proportion to the work done.

When Time Flies

A complaint that is heard quite frequently from manufacturers and contractors for municipal work such as water power plants, sewerage systems, and the like, relates to the short time given them to prepare their bids. Corporations issue a call for tenders which state a time limit frequently less than two weeks from date of issue. When the interested contractors write for specifications several days and often a week elapses before the reply is in hand, providing they do receive a prompt reply, which, owing to press of work in the engineering office is not generally the case. Thus a more distant contractor is obliged to wait while a firm more fortunately placed, geographically, is hard at work with figure and fact. When the required information arrives, owing to the brevity of time remaining before the call for tenders closes, he finds it impossible to do justice to the specifications in hand or to his own organization.

The protest is frequently met with the *sauf* reply that the work is to be executed henceforth with all possible speed and that no delay can occur before construction is under way. Oftentimes a statement is appended to the effect that the greater length of time demanded for preparation of specifications necessarily cuts the contractor's consideration short.

That the preparation of the specifications and plans are given a great deal of time and consideration by the engineers in charge is certainly in the interests of the corporation for whom the work is to be done. But in many cases it may also be to their interest if sufficient time were allowed by them between the publication of their advertisement for bids and the date of letting, to allow for the correspondence more or less necessary to obtain exact data (as specifications are not infrequently lacking in sufficient data for intelligent quoting). One month or six weeks allowed contracting firms in this way would undoubtedly be beneficial to all parties concerned. To the contractor it would allow sufficient time to procure specifications and subsidiary correspondence, consider important matters such as site, accessibility, etc., and submit his tender, without the admonition that one hundred and one points were overlooked in the flurry. Between corporations and contractors or manufacturers such procedure would create clear cut understanding that means a saving of time, mind and money. It is also assuredly in the interest of the corporations as well as the manufacturers and contractors that there should be enough copies of the specifications, tenders, and instructions to bidders, to supply all parties who wish to tender.

"No Canadians Need Apply"

Under this head in another column will be found a communication from Victoria, B. C., bearing upon a recent appointment of a consulting engineer for the Sooke Lake waterworks project. The discussion ensued from the passing of the by-law by the city of Victoria last January for the construction of a 12,000,000 gallon water supply by gravity flow from Sooke Lake, at a cost of \$1,500,000, involving five miles of tunnelling, a service concrete reservoir, and a sub-aqueous crossing of a tidal river. The letter being one of a number of similar tone we withhold signature. Each letter protests vigorously against the failure of the city council to call for applicants for the position.

The Victoria Colonist of June 8, reporting the meeting, has this to say:

The discussion on the appointment aroused considerable feeling and the debate occupied practically the entire time of the meeting.

Alderman Ross asked why the city had not called for applications for the position, and Alderman Langley advocated the appointment of a Canadian engineer, calling the attention of the mayor to a letter which the latter had received in March last from the secretary of the Canadian Institute of Engineers. This communication was to the effect that a Canadian should be appointed to the position, and Alderman Langley thought it surprising that no answer had been vouchsafed by the mayor. The members of the council should have known of this letter. Alderman Langley instanced cases where Canadian engineers had made good, and while he did not wish to say anything about the American applicant, still he believed that a home-grown engineer should be engaged.

Mayor Morley deprecated the importance of the Canadian Engineers' Institute, declaring that from whichever side of the boundary a man came from he did not care as long as the city got results.

Alderman Langley cited Smith's Hill reservoir as an example of United States engineering talent, while Alderman W. F. Fullerton declared that the Canadians in question were capable men, and no one saw them "sending pamphlets around and seeking the job."

The Smith's Hill reservoir project mentioned above, it is stated, has been a failure inasmuch as it has yet to contain a volume of water anywhere near 7,000,000 gallons, for which it was constructed.

The selection for the position was made at the suggestion of the water commissioner, who in his report referred to his comparison of the two proposals as follows: "After careful consideration of the two proposals I am of the opinion that that of the American engineer is the better one, principally on account of its being somewhat cheaper, and I would recommend that it be accepted."

Previous to the final meeting this statement of comparative costs was shown to be incorrect and the proposal of the Canadian application to be the cheaper. The latter requested an opportunity to be present at the meeting, as had already been given to the American candidate for the position.

The feeling is evidently strong among the engineers of Victoria and Vancouver against the methods that their city councils employ in the letting of their work. Among other cases it will be remembered that the Vancouver branch of the Canadian Society of Civil Engineers were obliged to frame a protest early last November when the civic authorities were

on the point of appointing for a term of five years an American firm of consulting engineers without making any enquiry as to the appointment of Canadians. It would appear that Canadian consulting engineers in Canadian cities along the coast are not allowed the same rights by the civic councils as are extended to foreign engineers. The likelihood of local men, already familiar with peculiar location, material and labor conditions, being on hand at all times with everything under constant and efficient supervision, as against a firm with headquarters elsewhere, interests elsewhere, with the mere prospect of Canadian money asserting claim to its attention a few days each month, does not appear to have much weight. This attention usually constitutes the direction of a few suggestions to the foreman on the work, and a look over surface working. Lack of patriotic pride in the progress of Canadian engineering is one thing traceable to several sources. But a strong disposition to altogether ignore already authorized successful Canadian ability is quite another issue, that should be nipped before its prevalence increases, if we would prevent the impression being created abroad that there is dearth of capable engineers in Canada to provide solutions for her engineering problems.

The Laying of Granite Paving Blocks

As a result of investigations into the subject of street paving in Chicago Mr. Samuel Whinery, consulting engineer, of Boston, Mass., has reported to the Commission on City Expenditures that the bad condition of many granite block pavements in that city is due almost wholly to the insecure foundations upon which they are laid. Since granite pavements are designed to carry the heaviest travel he states that they should always be laid upon a good concrete foundation. Where the blocks are set on any other foundation the individual blocks are likely to be forced down by the loads concentrated upon them rendering the surface uneven and causing the pavement soon to become so rough that it must be relaid. Granite blocks seldom wear out, and if they are held rigidly in place, Mr. Whinery states that the pavement will seldom need repairs. If the joints are filled with grout, as recommended by Mr. Whinery, dressing of the sides and ends of the blocks will produce joints as small as from $\frac{1}{8}$ to $\frac{3}{8}$ in., the present requirements in Chicago, will not be necessary. It is important, however, that the tops of the blocks forming the surface of the pavement shall be dressed to a much truer plane than is usually specified or obtained. The grout recommended is composed of equal parts of Portland cement and sand, and the joints are to be completely filled with it. The grout filling will become almost as hard as the granite itself and will not for a long time wear down below the surface of the pavement, and consequently it will remain free from the uneven surface and the roughness resulting from joints open for an inch or more below the surface of the pavement. The grout will also support the curves of the blocks so that they will retain its original comparatively smooth surface for many years. Such a pavement, it is said, will be practically indestructible and much more satisfactory in use than granite pavement as ordinarily constructed in Chicago and other cities.

During the month of May the city of North Vancouver issued building permits to the value of \$2,086. The total for the year to date is \$238,959. J. W. Fugler is building inspector.

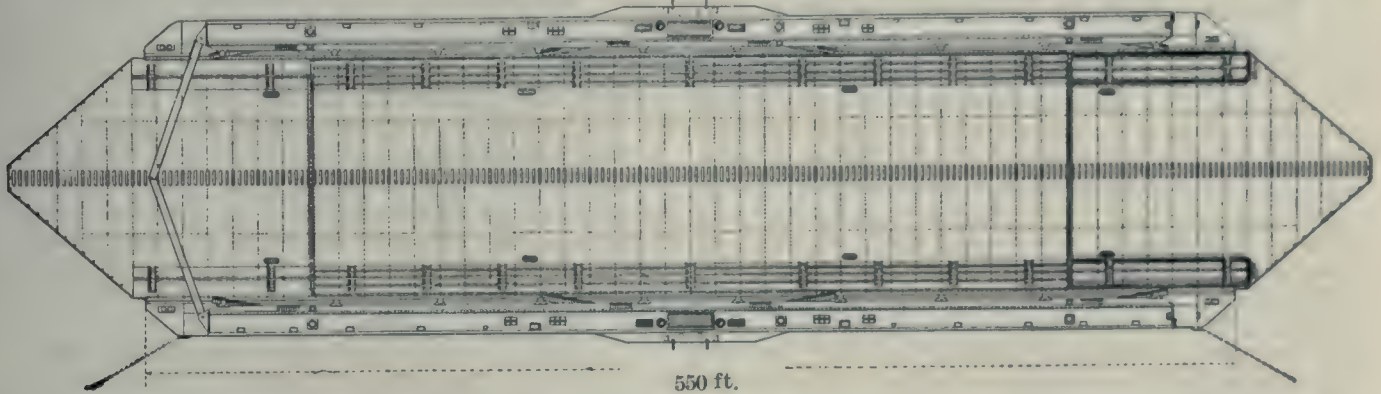
Floating Dock at North Vancouver, B. C.

Special Features for Important Work—Floating Dock versus Graving Dock—Scheme of Mr. Nichol Thompson

Special to the Contract Record

The accompanying diagram shows the self-docking floating dock of 15,000 tons lifting capacity, now being constructed at Roche Point, North Vancouver, B. C. for the Vancouver Dry Dock and Shipbuilding Company. The dock has special features, inasmuch as it is designed as two separate docks, for the ordinary work of the coast, which can be easily and quickly

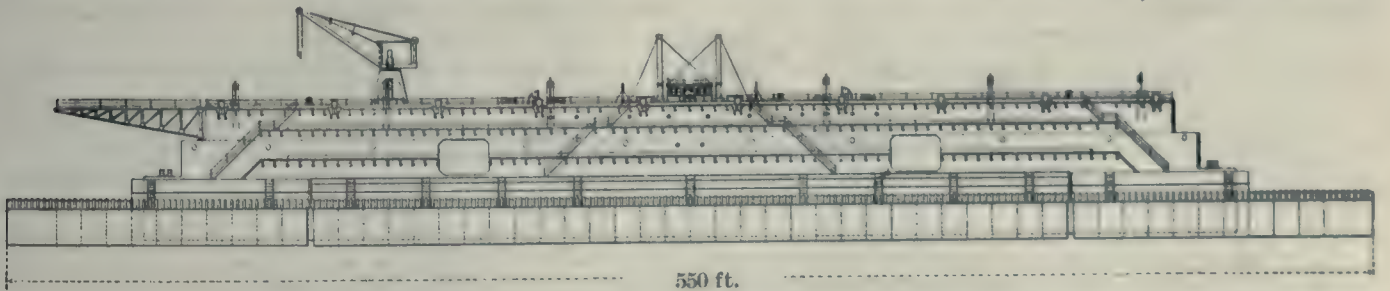
the sides and bottom of the excavation must be water-tight. For this reason, unless dug out in solid rock, or non-water bearing strata, the bottom or sides of the dock are usually lined with stone or brick, or in some cases with concrete or timber. But as a rule, the bottom (or invert) has more to do than this, for the whole dock, with its water-tight sides, bottom and



connected to lift a vessel 600 feet long and weighing 15,000 tons. The cost of this great work will be \$1,250,000 and an amount in excess of this has already been subscribed. The company will be able to tender on any government naval work or battleships.

The growth of shipping of the Western Pacific has been phenomenal in recent years. All the shipyards of British Columbia are busy, and the lack of docking facilities has been a great hinderance and inconvenience, especially to coastwise craft. When it was announced about a year ago that Mr. Nichol Thompson had been successful in floating his scheme to build a floating dock, few realized the magnitude

caisson becomes a "vessel," which when empty of water, will, if the whole dock be in water-bearing ground, tend to rise up or float, just as any other vessel would do. The invert and sides must therefore be so constructed as to oppose a sufficient downward force against the upward water pressure, to prevent their rising or floating. There are several theoretical plans of construction to overcome this difficulty,—all of which are very costly. The dry dock at Esquimalt, B. C., costing some \$20,000,000, may here be mentioned. But whatever the form of construction may be, the end to be obtained is always the same, and in some form or other the lining of the dock has to be



of the great undertaking. Vancouver will soon have a floating dock capable of raising a vessel weighing 15,000 tons. Its length over all will be 550 feet, with 100 foot beam, and 30 feet depth over the sills. The floating dock is considered by naval engineers not to be inferior to the graving dock, which, in its simplest form, is nothing more or less than a hole dug out in the foreshore below high-tide level, with its sea end closed in by a gate or caisson. A vessel is floated into this excavation, the gate closed, and the water pumped out of this huge dug-out, so that the bottom of the vessel is rendered accessible. Now, it is evident that the interior of the graving dock must be kept dry—

made sufficiently strong to resist the upward pressure of the water.

Turning now to the "floating dock," the type soon to be built at Roche Point, Vancouver, B. C., is essentially nothing more than a great box, built of wood, iron, or any other material, which is allowed to fill with water and sink. It is then dragged under the vessel, or the vessel dragged over it. The contained water is pumped out, thereby rendering it buoyant, and if its displacement be sufficient the form rises and lifts the vessel on top of it entirely out of the water. Here no invert is necessary below the water-line, nor are heavy side walls required to hold the dock in

place. The box or pontoon on which the ship rests has merely to be strong enough to carry its weight. The sides or walls, although relieving the pontoon as a girder to some extent, are really only added to regulate its descent and ascent, and to give it the necessary stability in either operation. There is, therefore, no difficulty in handling ships of deep draught on account of the great weight of invert required. All that is necessary is to make the sides or walls a trifle higher in order that a deeper draught of ship can be accommodated, without affecting the cost of the invert.

The foregoing is a digest of some remarks made by Mr. Thompson anent the floating dock compared with the graving dock, which is now being constructed in Burrard Inlet.

Concrete Best for Elevator Enclosure

Recent disastrous fires in so-called fireproof buildings have led to renewed consideration of the materials entering into their construction. Special attention is being paid to the general use of terra cotta or tile blocks for stairway and elevator inclosures, for which they are generally used. The material is conceded to be good for this purpose, but it does not work so satisfactorily when used for mounting fire doors at the necessary openings in such shafts. W. C. Robinson, of the Underwriters' Laboratories, chairman of the committee on fire protection coverings for windows and door openings, of the National Fire Protection Association, declares as his personal opinion that tile and terra cotta blocks are not satisfactory for this purpose. He regards inclosures to vertical openings through buildings as ranking second only to fire walls in point of importance from the fire protection standpoint. Hollow building blocks often fail by the cracking away of the shells from the webs, due to the greater expansion of the shells. It is difficult to properly mount fire doors at the opening of tile and terra cotta shafts, as if structural steel is used, it is apt to expand under heat and cause failing of the tile walls. Mr. Robinson favors the use of reinforced concrete or brick with ample reinforcement properly anchored at each floor, as the materials best suited for elevator enclosures in fireproof buildings.

The Sole Arbitrator?

Another letter appears below commenting upon the attitude City Architect McCallum takes against the Memorial of the Citizens' Committee regarding the building by-law. In it the writer does not hesitate to express his opinion of the misleading effect of the remarks that found their way into the columns of the press, and his conviction that the result of diligent research and careful study by such a competent body of engineers should bear more weight than the readers of the daily press are lead to believe. The letter is as follows:

Toronto, June 27, 1911.

Editor, Contract Record:

It is to be regretted that the City Architect has shown a disposition to deal with the Memorial for a revision of the building code of Toronto in a semi-serious, semi-popular way. The personnel of the committee should have insured better treatment than the handing out of irrelevant arguments to the daily press. Besides, he was asked for an expert opinion

on the Memorial and should not have discussed the matter until he had made his report to the Fire and Light Committee.

From the press reports the City Architect appears to assume that he is to be a final arbitrator in this question of code revision. There is a difference between the making and the administering of any law. When his report is presented if there is any divergence of opinion the question will be discussed purely on its merits. It is not expected that the City Architect's opinion will have and more weight than that of other members of the committee. The city of Toronto cannot be dominated by the opinion of any one official. The Citizens' Committee is just as anxious as the city architect to have the building code so framed as to insure substantial and safe construction. The drawing up of a new code is too serious a matter to be left to an individual and the city is fortunate in having the advice of so many of her prominent architects and engineers given to her gratis.

The committee has discussed the matter purely from a scientific and practical point of view, and was not influenced in its decision by any interests of any particular type of construction. It was for this latter reason that the building codes of American cities were not considered, as well as owing to the fact that the scissors were more prominent than the pen in the drawing up of the same.

The fact that Dr. Galbraith, Dean of the Faculty of Applied Science and Engineering of the University, and member of the late Quebec Bridge Commission, was a member of the committee alone justified the council in ordering a revision of the code. The memorial will not be ignored by the council, or the people will know the reason why.

Building and banking figures in Winnipeg continue to show enormous increases. Up to the first of June, the bank clearings amounted to \$402,853,799, an increase over the first five months of 1910 of \$72,092,094. Continued increase of the same proportions will place the 1911 total well over the billion mark. Building figures are not up to the wonderful record of 1910, but permits for \$5,791,230 worth of new buildings have been granted since the first of January.

A contract for the erection and completion of the new court house and provincial buildings in the city of Revelstoke was awarded to Messrs. Foot & Pradelonie, contractors of Revelstoke, whose tender was the lowest in a numerous list. The contract price is understood to be in the near neighborhood of \$120,000, and the successful tenderers by beginning construction immediately hope to have the building completed and ready for occupancy by the end of November.

Eleven million feet of lumber constitute an order for a single item of material, recently placed with a mill at Revelstoke by an Edmonton building corporation engaged in the erection of residential structures. Judging from the extent of this one purchase by an individual concern, and the fact that lumber is only one of the large number of materials required for work of the character, Edmonton offers a field to which supply firms can well direct their attention. In a rough way, it is estimated that it will require 400 cars to transport the shipment in question.

Sewerage System at Bridgeburg, Ont.

The Result of Recent Agitations in Industrial and Railroad Town—Trunk Sewer and Septic Tank.

Special to the Contract Record.

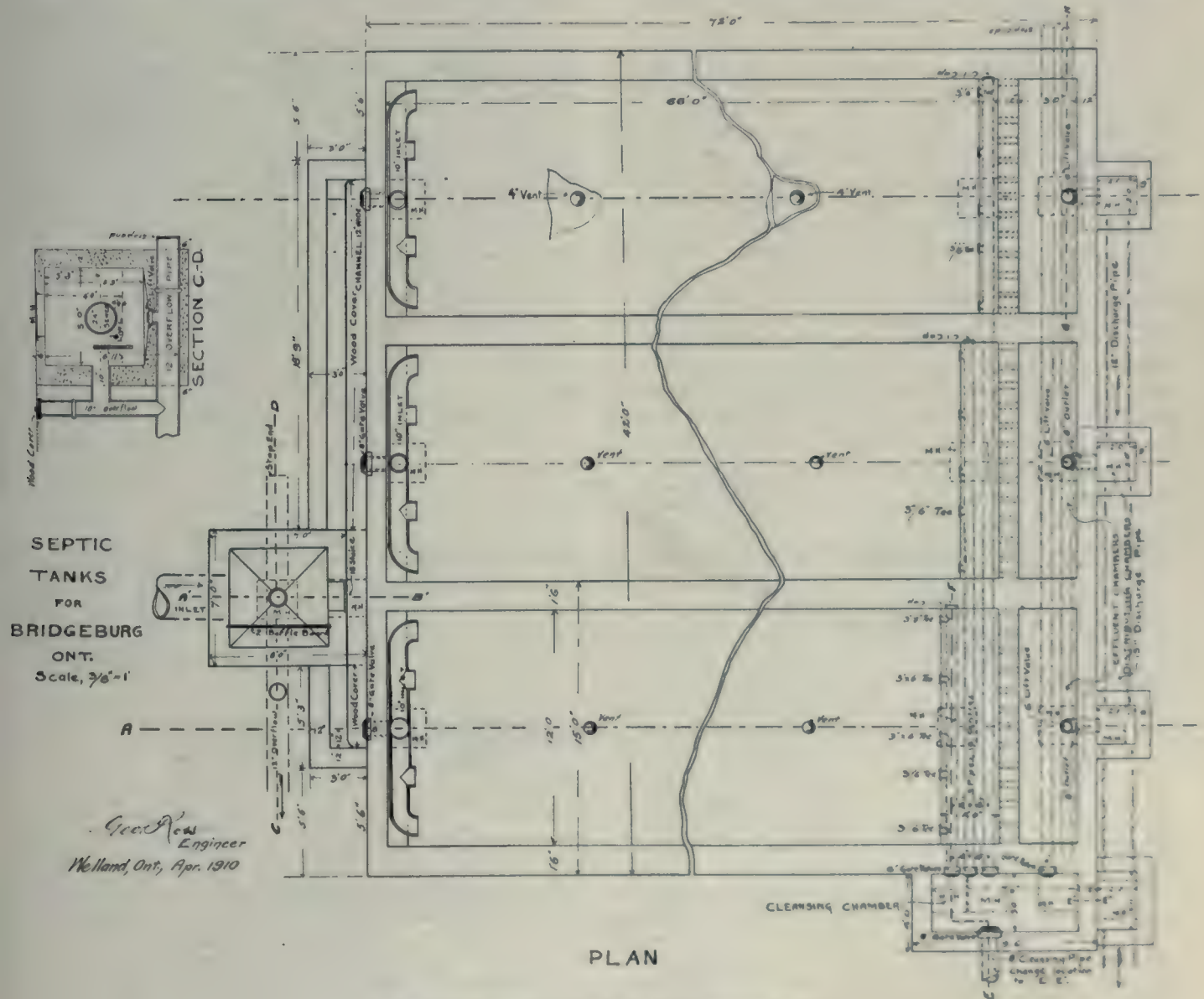
The village of Bridgeburg is situated on the western bank of the Niagara river, opposite Black Rock, and is about one mile north from Lake Erie. This village is an important railroad centre, as the International Bridge, which is simply used for railway traffic spans the river here. Until a short time ago, Bridgeburg was purely a railroad town, but it is now becoming an industrial centre. Pratt and Lambert have a large varnish works in operation and there are also several branches of various classes of manufacturing works.

A few years ago a waterworks system was installed and shortly afterwards an agitation was begun for the construction of a sewerage system, and Mr. George Ross, Consulting Engineer of Welland, Ont.

tario, was employed to make a report on a sewerage system for the whole village.

The Corporation has a frontage on the Niagara River of about a mile and extends westerly from the river somewhat over a mile and embraces within its boundaries 720 acres. Of this area about 250 acres slopes easterly to the river and the remainder slopes to the north and northwest. The portion of the Corporation sloping to the river varies from about sixteen hundred to three thousand feet in width, and the summit has a height of from thirty to about fifty feet above the water in the river.

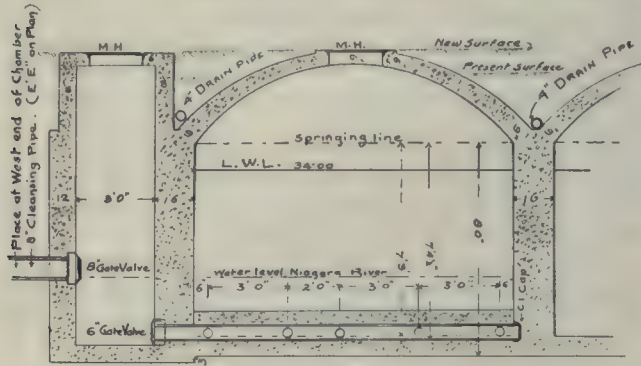
The most closely built up section of the village is situated on the northerly part of the easterly slope, but there is also another populated district on the



Sewerage System at Bridgeburg: Septic Tank

westerly slope to be sewerred to the same same outlet. The central portion of the westerly slope is mainly occupied with railroad yards, and the northwesterly portion, which slopes away from the river is unoccupied.

Mr. Ross submitted his report on a sewerage system for Bridgeburg on the 4th of April, 1907, and recommended the adoption of the separate system and proposed to construct a main sewer along the street fronting on the Niagara River, and all the sewage was to be carried to a common outlet, near the northeast



SECTION E-F.

Cross Section E-F.; Septic Tank.

corner of the corporation. This trunk sewer was to consist of about three thousand feet of 18-inch pipe and three thousand feet of 15-inch pipe; and the easterly slope, or that draining naturally to the Niagara River, was to be served with 8, 10 and 12-inch branches, and for the drainage of the westerly slope submains were to be constructed both along the northerly and southerly boundaries of the town, into which branch sewers were to lead, the intention being to convey the sewage of all these portions of the village that were likely to become populated within the next twenty years to a common outlet, a short distance below the northeast corner of the corporation where a site of five acres was to be purchased for a sewage

thousand feet of 10-inch pipe and twenty-six thousand feet of 8-inch pipe.

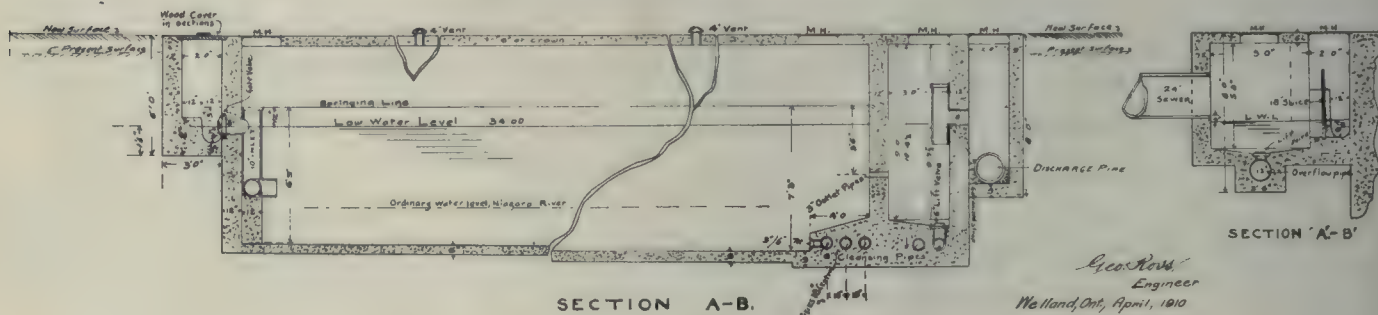
The report of Mr. Ross was printed and distributed among the ratepapers of the village and an agitation was kept up until in 1909 the sum of \$35,000 was voted for constructing the trunk sewer and septic tank, outlet and purchasing the site of the disposal plant.

In the spring of 1910 tenders were called for the construction of the trunk sewer, septic tank and outlet and one or two branches and Mr. John F. Connolly of Toronto was awarded the contract and carried out his work in such a satisfactory manner that several branch sewers have been added to his contract, and by the end of this season nearly the whole of the populated section of the town will be sewerred.

In many portions of the town a shale rock requiring to be blasted is met with, from two to eight feet below the surface, and the greater portion of the sewers were in rock excavation. Mr. Connolly's original contract amounted to the sum of about \$31,000, but additions made during the past season, and to be made during the present season will more than double that amount.

The septic tank consists of a set of three chambers 12 feet wide by 66 feet in length, inside measurements. At the front of the tank there is an inlet chamber five feet by five feet clear, inside dimensions. This chamber has an eighteen-inch sluice leading to a channel or trough which runs in front of the three chambers. At the centre of each chamber is an eight inch gate valve, which may be opened so that sewage can be run into any one or all three of the chambers. After passing through the eight-inch gate valve the sewage for each chamber is led into a submerged ten-inch inlet pipe having four openings into the front of each chamber, and after passing through a chamber the effluent flows through thirteen submerged three-inch pipes into an effluent chamber three feet by twelve feet. From each effluent chamber the sewage passes to a discharge pipe at the rear of the tank, which runs to the river. The average depth of water

SEPTIC TANKS
FOR
BRIDGEBURG, ONT.
Scale $3/8" = 1 \text{ Ft.}$



Cross Section A. B.; Septic Tank.

disposal plant. The report of Mr. Ross was approved by the Provincial Board of Health and permission given to proceed with the work on the condition that a septic tank would be installed as soon as the sewers were constructed and that further purification works should be put in when required by the Board.

The entire system was to consist of about three thousand feet of 18-inch pipe, three thousand feet of 15-inch pipe, eight thousand feet of 12-inch pipe, four

in the tank is six feet and the bottom has a slope to the rear of six inches in length. The outlet pipe from the tank to the edge of the river is a twenty-four-inch vitrified pipe, and the outlet in the river consists of one hundred and forty-eight feet of twenty-four-inch cast iron water pipe laid in a channel excavated in the rock at the bottom of the river. The water at the outlet of this pipe is about twelve feet deep and the current, which has a velocity of five or six miles an

hour, has a trend that carries the sewage away from the shore towards the centre of the river.

The septic tank is so arranged as to keep the sewage at the height of about four feet above the ordinary water level in the river, and as the depth of the sewage in the tank is about six feet, the bottom is below the river level, and as the bottom of the tank was in a shale rock in thin layers, with many seams, considerable difficulty was encountered in keeping the site of the tank free of water, while the tank was being constructed, but by laying tile drains in the bottom and leading these to a pump the water was kept down by a six-inch pump.

The tank is constructed of concrete and the longitudinal outside walls and centre walls of the tank are eighteen inches thick, and the end walls, where owing to the location of chambers, double walls come within a few feet of one another the thickness is twelve inches. The top is arched. The arches are six inches thick at the crown and nine inches at the haunches.

The total cost of the tank complete was about six thousand dollars.

The population of Bridgeburg is about sixteen hundred.

The Strength of Sheet Piling

The magnitude of the stresses in sheet piling, due to bending, depends upon the kind of material retained by it. Sheet piling is generally held in place by a wale at the top, one at or near the bottom of the excavated trench or area, and sometimes at intermediate points. In deriving the following formulas all weights are expressed in pounds per cubic foot, all distances in feet, and all bending moments in pound-feet. A vertical strip of piling 1 ft. wide is considered for the sake of convenience. Experimental investigations are being made by Prof. A. P. Mills at the College of Civil Engineering, Cornell University.

Pressure Due to Water

Let the upper wale be assumed at the water surface and the lower wale at the bottom of the excavation, or at a distance D below the surface of the water, both wales being properly braced. By the methods of mechanics the greatest bending moment is found at a distance $0.577 D$ below the surface, if the piling be treated as a simple beam. This point is farther from the middle of the unsupported length than in any other case where one or more additional wales are employed. The eccentricity may, however, be regarded as offset by the partial continuity of the lower end which penetrates the soil, and thus the greatest bending moment may conveniently be taken at the middle of the unsupported depth.

The value of the greatest bending moment is $3.91 D^3$, the weight of a cubic foot of water being taken as 62.5 lbs. If an additional wale be located at a height C above the bottom one, the greatest bending moment between them is $3.91 (2 C^2 D - C^3)$. In case both the top and the intermediate wales be omitted the bending moment at the bottom is $10.42 D$. If the fluid material retained by the sheet piling is heavier than water the pressures and bending moments are proportionally increased.

Pressure Due to Dry Sand

According to Coulomb's theory the horizontal pressure (lbs. per sq. ft.) for material which assumes a slope of 1.5 to 1 is $W H \tan^2 (45^\circ - \frac{1}{2} R)$, in which W is the weight per cubic foot of the material, H the

depth at which the pressure occurs, and R the angle of repose expressed in degrees. This indicates that the pressure varies directly with the depth as in hydrostatic pressure, but that the unit weight of the material is $W \tan^2 (45^\circ - \frac{1}{2} R)$ instead of W . In the material under consideration it is observed that the trench may be excavated a foot or more below the bottom of sheeting without causing any flow, and hence it may be assumed that the pressure is zero at the bottom as well as at the top.

It has been observed also that the centre of pressure against sheet piling is not at one-third of the depth from the bottom, but more nearly two-thirds of the depth (see "Earth Pressure and Bracing," by J. C. Meem, Trans. Am. Soc. C. E., Vol. 60, and the accompanying extended discussion). It seems, therefore, that the angle of repose for any given material is not constant but varies in some manner, although not directly as the depth. In conformity with these facts R may be taken equal to $90^\circ (H/D)^{0.6}$. The exponent 0.6 is based on the result of observations.

For material having an angle of repose of $33^\circ 40'$, which corresponds to a slope of 1.5 to 1, Coulomb's formula gives a horizontal pressure equal to $0.12 W D^2$, and the overturning moment about the base of $0.04 W D^3$, which is claimed by Sir Benjamin Baker to be double the true value. From the results of Trautwine's experiments on overturning moment due to dry sand, it is computed to be $0.019 W D^3$. By plotting the horizontal pressures derived from the values $W H \tan^2 [45^\circ - 45^\circ (H/D)^{0.6}]$ for different depths, the total pressure for dry sand is found to be $0.029 W D^3$, and the centre of pressure is approximately two-thirds of the depth of the excavation from the base, making the overturning moment $0.019 W D^3$, as before.

For sheet piling resisting the pressure of dry sand when held in position by wales at the top and bottom of the excavation, the greatest bending moment occurs at a distance $0.43 D$ from the top and equals $0.0045 W D^3$. When an intermediate wale is placed at a height C above that at the bottom, the bending moment becomes $0.0045 W C^2 D$.

Pressure Due to Wet Slipping Material

There remains to be considered the wet slipping material which exerts a much greater pressure than dry sand but a smaller pressure than water. Such material produces a considerable pressure at the bottom of the excavation. To meet this condition it may be assumed that the depth at which the horizontal pressure becomes zero is $2 D$ instead of D . When this change is made in the previous value for horizontal pressure the results agree closely with those of observation. The total pressure above the bottom of the excavation is $0.08 W D^2$, and the centre of pressure is at $\frac{1}{2} D$. The overturning moment about the base is then $0.04 W D^3$.

The greatest bending moment on sheet piling supported at the top and bottom only and retaining wet slipping material is $0.013 W D^3$ and occurs at half depth. When an intermediate support is placed at a distance C above the bottom the bending moment is $0.013 W C^2 D$.

Work has been commenced this week in tearing down the walls of the old Guelph county jail buildings, to prepare for the erection of the new jail and jailer's residence. The building has been in use for 70 years.

Rural Highway Conditions in Manitoba

Early Progress Slow Owing to Innumerable Trails—Prairie Surface not Conductive to Concentration of Vehicle Paths. The Importance of Bridges and Culverts

Special to the Contract Record

The feeling that is abroad throughout the civilized countries of the world to-day, anent the importance of good roads to the welfare of the people of a community, is just as intense in the Province of Manitoba, at the present time, as it is in any other part of the Dominion. To be sure, it was only within the past two years that any organized effort was made by the citizens of that province, to impress upon their municipal authorities the desirability of adopting more modern and approved methods of dealing with the road question, but the enthusiasm and energy recently displayed regarding this very important part of the developing of the province will undoubtedly have the effect of elevating the standard of the roads of Manitoba to a position, compatible with the demands of the country and comparable with the advancement of its many excellent institutions.

In early days in the history of the province, it was impossible to carry out a systematic plan of road improvement. The paucity of the population of the country, and the dispersion of these residents in search of suitable homes, over wide areas, rendered very difficult indeed, any systematized effort in building up their roads. It must also be said that in many places this was not necessary. The smooth even surface of the prairie provided excellent accommodation for the intercommunication of the people and for transporting their produce to the nearest market town, and it was not until the areas were settled up and the farms fenced, thereby cutting off many of the old established trails and compelling the traffic to keep to the allowances, set aside by the Government in the survey of the country for road purposes, that the necessity of extensive road construction was made apparent. Again, before the construction of our splendid system of railways, the continuance of the importance of most of the roads to the convenience of the farmers was problematical. New lines were being built at a rapid rate, new villages and marketing places were springing up like mushrooms upon the prairies, which tended to change the direction of traffic, to increase or decrease the amount of some, and in many cases to open up new roads to more readily facilitate the movement of the products of the different communities.

Following the advent of the present system of railways which afford excellent facilities for transporting the products of the province over the long journeys to the markets of the world, arises the necessity of establishing an improved system of common roads, that will afford every means of carrying these products from the farm to the railway, with the least possible expense, with the least possible delay and with the least possible discomfort. Such are the conditions that confront the people in Manitoba to-day. Certain roads owing to their peculiar location have attracted a large amount of traffic upon them, and it is to these that special attention is being directed in order to establish a system of leading trunk roads, that will benefit the greatest numbers locally,

and by their conjunction from a universal system throughout the whole province.

The difficulties in the way of obtaining a system of good roads as above mentioned and which will add considerably to the cost of their construction and upkeep are many. In the first place may be mentioned the lack of suitable material, such as gravel or rock at points where it can be advantageously or economically procured. This is particularly manifest in the eastern portion of the province, and it is felt there more keenly on account of the unsuitableness of the natural soil in that part to provide a road surface with even a limited amount of satisfaction. The Red River Valley soil when influenced by the action of water is perhaps as far renowned for its stickiness, as it is for its productiveness, and in order to build good roads across it, good drainage to relieve the foundation of moisture and a surface dressing of gravel or stone are absolutely necessary. Ten miles to the north east of the city of Winnipeg are large deposits of gravel, and it is from this point that a large section of the country must be supplied with that material necessitating in extreme cases a haul of fifty miles. This, of course, can only be realized by the assistance of railway companies operating there and whereby the material may be distributed at different points of vantage along their line of right-of-way in the district affected. In the western portion of the province the conditions are more amendable. The soil is not of so heavy and retentive a character, and in many places nature has been more kind in distributing useful material throughout it.

Another serious obstacle to be met with in the building of roads over a prairie country is the fewness of natural, well defined waterways or creeks and the inadequacy of some of the existing ones to properly control the water tributary to them. The importance of drainage is just as pronounced to the road on the prairie as it is to the road over any other tract of country, and to secure this, artificial outlets must be provided, if natural ones do not exist. In the past ten years about two and a quarter millions of dollars have been spent in different points throughout the country in improving the natural drainage which has facilitated the matter of road construction to a great extent, besides reclaiming immense areas of valuable low lying land. This work consisted chiefly of improving existing creeks and constructing large channels through which the water could be carried off to the larger rivers of the country. The work is conducted entirely under the Provincial Department of Public Works, and always at the solicitation of the landowners in the districts affected, who assume the full expense of the undertaking.

The cost of creating and keeping up an extensive system of good roads is presumably no greater an obstacle to their attainment in Manitoba than it is in any other part of the country, and it must be admitted that they are an expensive necessity. But it is noticeable that wherever the public is given good

roads to travel upon, whenever they feel so disposed, this regard for cost decreases if kept within reasonable limits. Therefore the aim of the authorities in charge should be to endeavor to return one hundred cents worth of good substantial work for every dollar "put up" by the people. In order to secure this result, the most approved methods must be applied in carrying on the work. The most up-to-date labor-saving machines should be used wherever it is possible to do so, and the work placed under the control of men fully competent to conduct it, in every case, to a successful issue. Road building is a science and it must not be supposed that it can be acquired easily or without a great deal of study and forethought, and the sooner the road authorities cease to act as if they believed that anybody or everybody is capable of spending the funds appropriated for road building purposes, the sooner will more appreciable results be manifested from the energy and money expended in that direction.

Councillors versus Roadbuilders

In the province of Manitoba there are one hundred rural municipalities, with a population ranging from about six hundred to about five thousand in each, besides a large tract of unorganized territory. Each municipality is governed by a Reeve and four or six councillors, half the number of whom are elected for one and two years respectively. These councils have entire control of all the roads in their respective municipalities. At present the system in vogue in the greater number of these municipalities is to distribute a proportionate amount of the money raised for road purposes to each of the councillors, assigning to each the right to expend his allotted proportion in his own ward or district as he sees or wishes so to do. This is as it should not be. Because a man is elected to represent a certain district on the Municipal Council Board to assist in administering the affairs of such municipality in general, it does not follow that he is proficient in the art of road building, or capable of exacting the best returns for the money at his disposal, nor is he in many cases in a position to give a sufficiency of his time to overseeing the work, should he be practically qualified to do so.

No one should be more familiar with the needs of a district or have better knowledge of the ability of such a district to pay for these requirements, than the man elected to represent it on the council's board, but apart from that there are reasons why he should confine his efforts in this work, solely to administrative duties. The condition of many of our roads, after the large sum of money spent on them, say in the last decade, is in itself conclusive evidence that something has been amiss in the methods applied in their construction and upkeep.

It must not be inferred that the province is entirely devoid of good roads. A great deal of good work has been done in the way of effecting adequate drainage and grading up earth roads. This latter work being done in many cases by contract and with grading machines. Again, on the roads leading in to the cities and larger towns, a great deal has been done towards gravelling these and improving their standard. This is certainly a step in the right direction. The development of mechanically propelled vehicles, is to a considerable extent changing the character of the traffic on these roads, and it is only reasonable to imagine that some consideration should be given to improve the character of the road to suit

this change. While we, in the province of Manitoba, are not in a position to build roads to meet the requirements of this class of traffic in full, yet it is realized that the automobile has come in the natural development of things, that they are here to stay and that roads must be built to accommodate all kinds of traffic as far as possible. Safety of travel, facility of transportation and economy in securing these desired results should be the objects sought for by those in charge. No small amount of caution and circumspection should be exercised in laying out highways for the future. Every dollar spent should be done in such a way that it will meet the requirements of traffic upon it, and that when reconstruction becomes necessary, the change may be affected with as little undoing of previous work, and thereby rendered as inexpensive as possible. It is not alone to the present requirements that we should look, but also to those with which we may have to contend in the near future.

Culverts and Bridges

Much as improved roads are needed, permanent culverts are equally needful. The function that they perform in the road that of carrying the water across it, goes to show that they are almost always situated in the lowest and wettest points along the line of right-of-way, and at points which will require special care and attention. It is not necessary that all the roads should be improved to such a high standard, but it is necessary if the roads are to be made passable at all, that good strong culverts be built upon them. The culvert in any side road will go to pieces just as fast as the one on the heavily travelled street, for it is not the traffic that in most instances destroys these structures, but the elements. Therefore, a good permanent concrete culvert is as much in place in the earth road as it is in the best class of paved boulevard. Roadmakers for years have been endeavoring to put down something in the shape of a road that will require no repairing or renewing, with but a limited amount of success, but it is possible to build these small structures, so as to entirely eliminate maintenance cost and make them everlasting. Therefore, it is a short-sighted policy to use any other material than that recognized to be most permanent. If care be taken in building these of concrete either plain or reinforced, they should last for all time, and municipal authorities should not fear being criticized, nor should they hesitate to use municipal money for permanent culverts, and if they undertook to replace all the old ones as they were worn out, and to build new ones with concrete, it would be a very short time indeed until these structures would be all permanent and energy could be turned towards some other direction. The future generation might necessarily have to help to pay for some but they would not have to build any.

The construction of bridges in Manitoba is an affair of great moment. The numerous large rivers which find their courses through the province, demand strong, substantial bridges to ensure the safety of the travelling public, using them. The large traction engines with their trailers of threshing separators and tanks, exert the greatest stress on our rural highway bridges, and these structures are designed to carry safely the heaviest in use in the province. All the drawings for important bridges are prepared for the municipal councils by the Provincial Government's engineers, who design the plans for the sub-

structures and check all plans of superstructures submitted by bridge companies tendering on their erection.

Concrete Construction

The municipalities are now adopting concrete and masonry as the materials used for piers and abutments, and a great number of steel superstructures have been erected on these foundations in the past few years. The Provincial Government usually assists the municipalities to the extent of one-half the cost of this class of construction, when carried out according to the plans and specifications prescribed by them.

An effort is also being made by the Department of Public Works, to induce the municipal authorities to adopt reinforced concrete construction throughout for bridges up to forty or fifty feet in length, knowing that the maintenance cost and renewals on any other material of a temporary character, are not only burdensome but also vexatious. In the past season a start was made in that direction in one municipality and another is engaged at the present time in receiving tenders for four reinforced girders, to be constructed in the coming season. It is to be hoped that the completion of these will serve as an object lesson and a stimulus for other municipalities to adopt the same measure, as far as it may be possible in dealing with this class of highway bridges.

The Manitoba Good Roads Association—an organization of only about two years existence, fast gaining strength and coming into prominence, and it is to be congratulated on the public spirit and efforts displayed by its members in their endeavor to place the methods of road construction and maintenance on an up-to-date business basis, and if it succeeds in affecting the one reform of getting the management and directions of this work in each municipality under the control of a capable, responsible man, it will have accomplished something that will redound to its credit and be sufficient reason for it ever having existed. For there is no doubt but that the greatest obstacle in the way of securing—at least better roads in any country where this evil exists, is the method of assigning the actual execution of the work to elective councillors.

The Progress of Constructive Work in Ottawa

Ottawa, June 27th.

A great deal of the work on the Plaza Laurier which was to take in the Sappers Bridge and Dufferin bridge has been stopped on account of difficulties experienced in getting suitable foundations for the piers. One of the piers of the Dufferin bridge was to be utilized for the support of the plaza and another pier was to be situated just north of it. However, on digging down it was found that the foot of the Dufferin bridge pier had only one corner on rock, the remainder being on clay. While it had been sufficient for the comparatively light bridge it was not deemed safe for the heavy concrete plaza, and it is believed that this pier will have to be taken away altogether and a new one built, going down to rock a distance of some 20 feet farther than the foot of the present pier. The foundations for the other piers were also disappointing, and clay to about 20 feet in depth was found where rock had been expected. Whether the work of building these piers can be carried on in the summer with the water in Rideau

canal along side is causing uneasiness, and for this reason all this part of the work is held up until some decision is reached as to what action will be taken. It is probable that nothing will be done until the Minister of Public Works returns. As much of the operations as will not be effected by the piers is being done in the meantime. McGillivray and O'Toole are the contractors.

Construction of the Canadian Northern westward is being hurried. An overhead bridge is to be built across Bank street and will be finished as soon as possible. The company wants to haul its supplies for the big bridge across the Rideau river west of Hogsback over this line which is responsible for the activities here. The contractors had considerable difficulty getting sufficient teams for the construction.

The C. P. R. is doing considerable repairing on its Prescott line, but the erection of the new round house is held up until there is some decision regarding the tunnel.

Contractors are figuring on the new Congregational church and it is expected that the work will be begun very soon on this structure.

J. A. Ewart is preparing plans for a large factory for the Rolla Crain Limited in which will be located the company's printing plant. It will be a one-storey building covering nearly two lots. It will have a saw-tooth roof in order to give sufficient light.

Blyth and Holloway will start a factory to manufacture plumbing necessities. It will be located on Queen street in a building which will be altered for the purpose. Two or three smaller concerns are negotiating for factory sites who are at the present time in buildings that are not suitable.

V. V. Rogers has given a contract for the removal of about 40,000 cu. yds. of earth and rock in Ottawa South. It is being done by O'Leary Bros. The earth is removed about 1,000 feet for filling.

There is a great deal of residential building coming out just now mostly for people who will occupy them themselves. The high price of building lots has prevented several of the builders who construct for sale from erecting as many houses as usual this year.

The Model Homes Association will make an effort to prove that a \$1,000 house can be built that will be a comfortable and attractive home for a working man. If some capitalist cannot be persuaded to take up such an undertaking the association will erect such houses itself in order to show the regular builders what can be done.

The University Gains

Mr. C. R. Young has withdrawn from the firm of Barber & Young, Bridge and Structural Engineers, in order to devote his entire time to academic work as Lecturer in Structural Engineering in the University of Toronto. The practice will be continued by Mr. Frank Barber, 57 Adelaide street East, Toronto.

The supplementary estimates recently brought down in the Dominion Parliament contain a grant of \$35,000 for a survey of the proposed tunnel under the Strait of Northumberland to connect Prince Edward Island with New Brunswick. The distance between Cape Traverse on this island and Cape Tormentine in New Brunswick, the nearest approach on the mainland, is about 7 miles.

Caissons for Main Piers, Quebec Bridge

Caisson No. 1 in Place, Nos. 2 and 3 Launched—Difficulties are Many

Special to the Contract Record

Caisson No. 1 was built originally for the north main pier, but owing to difficulties met with in sinking it was decided by the Board of Engineers to use it on the south side of the river where the soil is not as hard as on the north side. (For description of the construction of this caisson see Contract Record September 7th, 1910.)

Caisson No. 1 passed the winter of 1910 in the dry dock at St. Joseph de Levis, and in April, 1911, re-

vicinity, (a maximum of 20 feet), and to the strong current and eddies at the bridge site, the plans for placing of the caisson had to be worked out in advance so that the caisson should reach the bridge site (10 miles from the dry dock) and be secured in place before the current should change.

The submerged debris of the old bridge also added a feature to the risk, together with the rocky nature of the shore, making it imperative that the caisson



Caisson No. 1 being towed to bridge.



South Caisson No. 1 before placing

pairs were begun to strengthen it for its trip up the river and for the sinking. The cutting edge timber which had been strained was repaired by the use of oak fish plates at the splices. The walls were filled in solid between the vertical posts with 12 in. x 12 in. timbers of Georgia pine for a height of 11 ft. above the deck. The roof of the air chamber was sheathed with yellow pine 12 in. x 6 in. and thoroughly caulked.

A false bottom was put in consisting of 32 longitudinal pine stringers, 12 in. x 6 in., 180 ft. long, made up of 20-foot lengths, spliced beneath each bulkhead with pine fish plates eight feet long. Each stringer was supported at three intermediate points by 6 in. x 6 in. spruce braced against the underside of the caisson roof.

The planking consisted of 3 in. spruce planed with edges slightly tapered, and was spiked directly to the stringers and thoroughly caulked.

Three boilers were installed on a platform on top of the crib work of the caisson—2 of 75 h.p., and 1 of 25 h.p. The water was supplied by two syphons extending over the side of the caisson into the river.

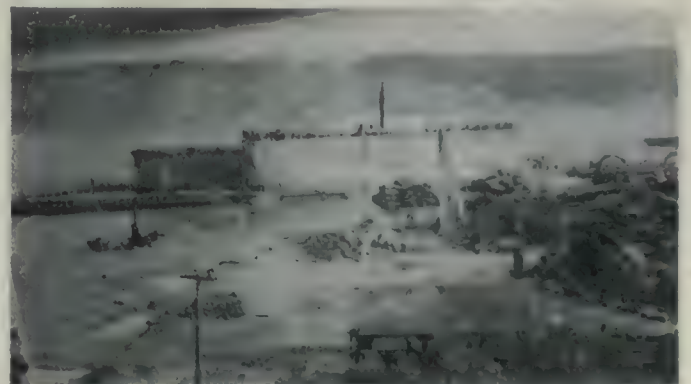
Five pumps were installed on the crib work, one centrifugal and four reciprocating. Four of these pumps had their suction pipes down the air shafts to draw water off the false bottom, and one was extended to pump water from the deck of the caisson in event of leakage.

About 50 tons of broken stone were placed on the deck of the caisson along the centre to trim the caisson when afloat.

Owing to the great rise and fall of the tide in this

vicinity, (a maximum of 20 feet), and to the strong current and eddies at the bridge site, the plans for placing of the caisson had to be worked out in advance so that the caisson should reach the bridge site (10 miles from the dry dock) and be secured in place before the current should change.

The submerged debris of the old bridge also added a feature to the risk, together with the rocky nature of the shore, making it imperative that the caisson



Placing South Caisson No. 1.

to break the force of the current (see Plate No. 1). The path to be taken by the caisson was also marked out by buoys and the danger points by flags.

During the night of May 27th, 1911, water was let into the dry dock and the caisson floated, drawing about 10 feet of water. It was towed through the gates at 3.15 a.m. and up the river with the incoming tide. Five tugs were used, one large ocean-going wrecking tug pulling in front, and four smaller tugs

used more for steering than pulling, as the large tug handled the caisson without difficulty.

The caisson was towed up the river east end first and reached Sillery at 4.30 a.m. In crossing from the north side to the south it was swung completely around into its correct position, the tide meanwhile carrying it toward the bridge site. When within about 150 yards of its correct position it was held against a very strong current by the large tug, while lines were taken ashore to the three hoisting engines anchored there, and a line from the hoisting engine on the caisson made fast on shore. Then by the aid



Caisson No. 2 at bridge, preparing for concrete.

of these four hoisting engines and three small tugs the caisson was worked, first toward the shore until it rested against the cribs and then westward until it reached its final position against the bumpers at 6.30 a.m.

At low tide it rested on the level bottom in its correct position and was scuttled by large holes cut in the false bottom to prevent it floating again. The entire false bottom has recently been removed.

This caisson is 181 ft.-0 in. long x 55 ft. 6 in. wide x 44 ft. high and weighed with boilers and pumps, 2600 tons.

The caulking had been so well done that not one of the five pumps had to be used at all, in the trip up the river.

The contract for the repairing and towing of the caisson to the site was sublet to Mr. Geo. T. Davie of Levis, and the placing in charge of Mr. M. P. Davis, both of whom were present in person.

It is intended to sink this caisson during the summer far enough into the bed of the river to resist the action of the ice during the coming winter and to finally sink it farther and build the south main pier on it in the summer of 1912.

LAUNCHING OF CAISSON NO. 2 FOR WEST HALF OF NORTH MAIN PIER

The north main pier is to be built upon two caissons each 85 ft.-0 in. long, 60 ft. 0 in. wide and 55 ft. 0 in. high, placed end to end and 10 ft. apart (see Contract Record June 7th, 1911). These two caissons were begun in March 1911, and the one for the west end of the pier known as caisson No. 2, was launched on May 29th. Caisson No. 3 was launched on June 26th. As these caissons are identical in construction and launching, a description of one applies to both.

At the time of launching, caisson No. 2 was built 21 courses of wall timber above the cutting edge a total height of 23 ft. 6 in.

The verticals in place reached to about 42 feet above the wearing timber and 14 courses of crib-work had been built above the deck and bolted to it by 1½-in. round rods 16 feet long.

One ten foot length of air shafting 3 ft. diameter was in place at each of the six air shafts and pipes for water, air, electric lights and whistle signals were all in place, as well as the entire electric lighting system for the air chamber. All pipes were sealed and the shafts closed with oak doors made with pure rubber gaskets bearing against the deck.

The caisson was built level, resting on timber supports carried to concrete foundations on solid rock.

Before launching, the caisson was lowered 3 feet at the outer edge by four 350 ton jacks and blocked onto the oak cradles which slid on the launchways. The launchways, three in number, consisted of concrete pedestals on solid rock carrying each 3 sticks of 12 in. x 12 in. Georgia pine securely bolted to the pedestals. The grade of the launchways was 10.39 p. c. and both ways and oak cradles were greased with tallow and linseed oil to reduce the friction.

The device for holding and for starting the caisson was very ingenious. The cradles were blocked in front by diagonal struts of oak braced against the ways and bolted to them. In the rear the cradles were held by steel chips hooked over 2 in. steel bars bearing against the back of the launchways.

For starting the caisson four 350 ton hydraulic jacks were placed beneath the cutting edge at the rear of the north side to raise it slightly and permit the foundation blocking to be removed. Behind each cradle was placed a 70 ton screw jack braced against the crib work on shore. The front braces were removed first and then at a given signal the 2 in. steel bars were knocked out simultaneously and the jacks were started. The caisson began to move almost



Caisson No. 2 being towed from Sillery to the bridge.

immediately and slid slowly down the ways taking about 30 seconds to reach the water.

As it was built without a false bottom it lost the greater part of the air from the working chamber upon reaching the water. It drew 8 ft. 6 in. immediately after launching and lost all the air, settling down to a draught of 11 feet. It was taken in tow by two tugs and towed out between two cribs where it was anchored and further work was done on it.

The caisson lay at its anchorage from May 29th till June 10th when it was towed to the bridge. Sixteen additional wall timbers were added while it lay there making a total height of 39 ft. 2 in. and the

cribwork was carried up to the level of the top of the wall.

The timber was floated out in rafts and handled by a derrick on a scow. The compressed air for the carpenters' augers etc. was carried out from the main plant by a two-inch pipe suspended from a steel cable.

On June 10th the Caisson was towed to the bridge by four tugs and placed in its proper position without difficulty. It drew 13 ft. and weighed about 940 tons. It is anchored by steel cables attached to "dead men" about 1,000 feet up and down stream respectively. These cables pass over six timber floats and are slackened and tightened by a hoisting engine on the wharf as the tide rises and falls.

The final building of the caisson is being done at the bridge and the placing of the concrete began on June 21st.

The concreting of the caisson and the plant at the bridge will be described in an early issue of the Contract Record. The work is in charge of Mr. J. D. Wilkens, resident engineer for the Board of Engineers. Mr. Walter M. Retner is chief engineer for contractors Messrs. M. P. & J. T. Davis.

Mistakes in Sidewalk Construction

By Jerome B. Landfield

A good proportion of all of the sidewalk work that is being done nowadays is constructed under the direction of engineers, or in accordance with specifications laid down by them. It is therefore strange that there should be such a diversity in the methods employed and in results obtained. This is a curious state of affairs, considering the extent of the work and the opportunities afforded for determining to a nicety the best possible practice.

Where there is such diversity of practice it naturally follows that in some cases it is correct and in others all wrong. There seems to be a mistaken notion that sidewalk work is not deserving of serious attention and may be properly left to the untrained man. What is true of sidewalk work is equally true of concrete curb and combined curb and gutter work. Surely this is a great mistake and municipal engineers in particular should realize that they owe it to the profession to devote sufficient attention to the subject to secure first-class results.

In this paper I desire to point out a few fallacies that have crept into sidewalk and curb and gutter work from different sources, especially those which have been sanctioned in many instances by engineers of standing.

Cinder a Poor Sub-base

Probably the most generally accepted fallacy is that of the cinder sub-base, and it is a fallacy that has cost our cities hundreds of thousands of dollars. It is probable that the fact that many are to-day specifying that a sub-base of cinders or sand should be put under a walk can be explained in this way. In the laying of flags of natural stone the under side of the flag was nearly always irregular and to dig out and shape the natural soil to fit it was a task quite out of the question. It was far easier and more practical to fill the excavation with cinders and sand, which would naturally mold itself to fit the configuration of the under side of the stone. What was more natural than to continue the same practice when concrete walks came to be laid, and to set up the argument that this sub-base ensured good drainage and was a safeguard against heaving due to frost?

This sounded perfectly plausible. In fact, I presume that a large portion of those who read this article will regard the views expressed in it as heretical. But the following fact appears pertinent. If one lifts a good-sized flat stone from its resting place in a field in the winter time he will notice that there is rarely to be found beneath it any frozen ground, while all around are evidences of frost. The reason is that, first of all, the natural soil that forms its bed is tightly packed so as to make a snug resting place that did not admit water readily, and, next, that the stone itself under these conditions affords good protection.

Now consider for a moment the concrete sidewalk. In constructing this, first the natural soil is removed whether it be clay, gravel or hardpan, making a trench that becomes the finest kind of reservoir to collect moisture. This trench is then filled with porous material that never becomes as compact as the original soil, but which absorbs and holds moisture like a sponge. Even if tile is placed in the bottom of this trench, this does not make the sub-base any the less a sponge. Four or five inches of concrete would have protected the compacted natural soil that would hug it so closely as scarcely to admit any water, but severe cold is very liable to freeze the cinder foundation in spite of the concrete. These are some of the considerations that lead me to believe that the cinder sub-base is useless and detrimental, even when carefully drained with tiles, and extended practice bears this out.

Water Should be Carefully Gauged

Another fallacy that is very prevalent, but which is happily growing less, is the idea that a sloppy top-coat is good practice. Somehow or other many concrete men have got the notion that in sidewalk work the wetter the mix the better. They argue from experience in other kinds of work where they find that poured concrete makes a dense mass and reduces the voids, and do not take into account the points wherein the conditions differ. Let us consider just what the conditions of sidewalk work are and how they affect the question of how much water to use.

In sidewalk work water-tight molds are not used in which to form the blocks. The mass dealt with is thin and has two large surfaces, one of which is exposed to the absorbant action of the ground beneath, and the other to the drying action of the air. If, therefore, too much water is put into the concrete there is a tendency for it to drain away and carry with it particles of cement washed from the aggregate. If less water were used and the mass well mixed, the whole amount of water would be closely engaged with the cement. In warm climates it is frequently argued that more water should be used in order that the surface may not dry out too rapidly. But here we have also a fallacy. If there is more water at the surface than is needed for the setting of the cement, there is almost certain to have been flushed to the surface considerable neat cement and as the surplus water evaporates the foundation is laid for hair-cracks. The correct way is to use the proper amount of water and then protect the surface against the heat.

The lower course should have just enough water so that it will not quake when tamped. The top-coat should be mixed stiff enough so that you can mold it in the hand and it should be put on while the lower course is fresh and green. Then tamp it lightly, remove the surplus material by striking it off, and fin-

ish immediately with a wooden float. The tamping of the top-coat is of great importance for fine work and it really does not add to the expense, as it simplifies finishing. The first effect is to make the top-course dense and to bond it mechanically to the base. The moisture is distributed evenly throughout the mass and enough is gently flushed to the surface for immediate finishing. Where the top-coat is put on as wet as mortar, or sloppy, the amount of moisture in upper and lower courses differs, and consequently the change in volume while setting is in different ratios. This is a fruitful source of checking.

There is one more cogent reason why the top-coat should never be put on sloppy. Sidewalks differ from some other kinds of concrete work in that the surface has to be finished by manipulation. If the finished surface is to be durable it should be finished as soon as possible. Now if the concrete is too wet the finisher stands around half an hour or so waiting for the surface to dry out enough for him to do his work. If he starts to use his trowel while it is too wet he flushes neat cement to the surface and this, being the softest part of the mass, makes a scale that wears away easily if it does not flake off. If, on the other hand, he waits until the surface is just plastic enough he is bound to disturb particles that have begun to set and which for the sake of strength and durability should have been left untouched in their original positions. Is it not strange that in view of these simple facts, easily demonstrated in practice, the big city of Chicago should specify a sloppy top-coat for her sidewalk work?

Removal of Forms

A number of other minor fallacies in sidewalk work might be pointed out, but they are mainly local and not widespread. One of these, however, which I desire to refer to is the notion that it is necessary to leave the forms in place in sidewalk work until the concrete has set. There is no special objection to this, except that persistence in the idea may prevent a contractor from adopting some of the modern styles of forms, which are usually of steel and more expensive than the old wooden forms, and the outlay for which is reduced if each section of form be used more frequently. Experience during the past few years with this style of form has shown this to be practicable without any detriment to the pavement.

Subsurface Structures?*

In considering the subject of street widths and their subdivisions, the necessity for providing ample space to accommodate the substructures needed to meet the requirements of modern city life cannot be overlooked. Underground circulation is as necessary to modern municipal life as surface circulation, and the problems involved in its installation and maintenance have become exceedingly complex and difficult as the demand for such service is increased. Surface traffic may be shifted entirely off of a street temporarily, in cases of emergency, without inflicting any great hardship, but the underground service, once installed, becomes permanent, and any derangement or interference with it often seriously affects large areas.

The great tendency in all our large cities, especially in America, to concentrate business activities at

some central location (to create civic centres) has demonstrated the total inadequacy of the street surface to supply space to meet the problems of passenger transportation. It is therefore essential to plan in all our large cities to carry the thousands of people who daily congregate for business or pleasure over railway lines constructed either above or below the street surface. The space required for the foundations to support elevated roads, or the area of the street cross section necessary for subways, in addition to the sewers, water and gas pipes, telegraph and telephone conduits, pneumatic tubes, pipes for the conveyance of steam, hot water or refrigerating compounds, vaults and tunnels, cannot be found except in streets of considerable width.

The substructure congestion occurs not only in the business districts but also along the lines of all main arteries of travel leading from the heart of the city to local centres of manufacturing or business interests. In the central and older portions of the city of Philadelphia many of the streets in the regular system are but 50 feet wide, with a few diagonal avenues 60 feet wide. The widths of these streets are inefficient not only for surface travel but also for the substructures which must be placed in them. This congestion is intensified at the street intersections.

In the replanning of these portions of the city it is found necessary not only to provide for widening existing highways but also to lay out and open additional avenues and to enlarge intersections to meet the demands for subsurface structures as well as for surface uses. This increase in street width has been gradually accomplished on Chestnut and Walnut streets, in the business section, by placing the streets upon the official plan of 10 feet greater width and requiring all new buildings to recede to the new line, paying to the owner at the time of construction any damages that may be sustained. By this method the cost is not burdensome to the city. The widths of a number of important diagonal avenues leading through local business centres are being increased in like manner.

In the growth of a modern city the number and character of underground structures is constantly increasing and changing, and it is probable that the future will see the present ones supplemented by others for purposes now scarcely thought of. This ever increasing demand for space under the street surface makes it therefore necessary that the available cross section be utilized to the best possible advantage. This in a measure can be accomplished, as it is in the city of Philadelphia, by grouping the structures as closely together as possible, but a much better method would be by the construction of one or more lines of subsurface galleries, of sufficient size to accommodate all future structures, preferably one on each side of the street, close to the curb line, thus doing away with the usual form of conduit construction and avoiding the necessity of continually opening the street surface and interfering with the proper maintenance of paved areas. Such galleries might, when old streets are widened or new avenues opened in the built up portion of the city, be advantageously constructed and maintained by the municipality and at least a portion of the cost covered by rental charges to public service companies which should be required by law to place their structures in them and to pay a proper rental therefor.

The prevailing custom in many cities of allowing vaults to be constructed under the sidewalks of the

*Paper presented by G. S. Webster at the third National conference on city planning, Philadelphia.

street and extending to the surface, results in the occupation of a large percentage of the available cross section of the street and interferes seriously with the laying of other underground structures. The disadvantage of allowing construction of this kind is now being realized in many of our cities, and such constructions wholly prohibited on main thoroughfares. Since 1902 it has been unlawful in Philadelphia to construct or reconstruct any vault under the sidewalks of the streets unless the outside top of the vault shall be at least 4 feet below the established grade of the sidewalk over the same, the purpose being to reserve this 4 feet of space for conduit and tube construction. All persons receiving permits to construct vaults are required to enter into agreement that the city shall in no case be liable for any claim for damages for the reoccupation and use of the whole street or any part thereof to the house line, for public purposes.

In the case of Philadelphia the location of underground structures of every character is determined by a board of highway supervisors composed of the chief officers of the various bureaus of the city government having charge of the municipal and underground structures. This board is vested with the full power, not only to grant original locations to companies authorized by law to lay pipes and conduits, but also to direct their removal and relocation whenever the public good demands it.

For the purpose of enabling the board to act intelligently upon all applications, a recording and drafting department is maintained where all underground structures are plotted and their sizes, depths and distances from the curb or building lines, shown upon plans of uniform size drawn to a scale of 20 feet to the inch. Each structure is colored with a conventional tint so that it may be readily followed on the plan. All applicants for permits to locate pipes, conduits or other subsurface structures are required to obtain plans from the department records showing, as far as practicable, all existing structures in the street, also the location which they desire to occupy. A charge per linear foot is made by the city for such plans and information, and the cash receipts are considerably more than the amount necessary to maintain the force in the drafting room and the field inspectors who are sent to see that the locations granted are followed, and to systematically make measurements of and report all structures of every character met with in the excavation. By this means the plans are constantly being checked and where necessary corrected. In all cases where electrical conduits are laid by public service corporations, the law requires that one conduit shall be provided and laid at the expense of the company for the use of the city.

No Canadians Need Apply

At a meeting of the Victoria, B. C., city council on Wednesday, June 7th, a discussion on the appointment of a consulting engineer for the Sooke Lake Waterworks project, for that city, took place.

The appointment was given to a San Francisco engineer, and amongst other remarks the mayor stated that Canadian engineers fail to get out and rustle for positions by canvassing, as the American engineers, do, but seem to think they should sit in their offices and be run after to accept appointments.

A few moments later an alderman asked the mayor to state whether he had, in his capacity as mayor, received

a letter from the secretary of the Vancouver branch of the Canadian Society of Civil Engineers, in March last, asking that Canadian engineers be given consideration in appointments for engineering work at the disposal of the city council. His Worship acknowledged having received the communication, but indignantly claimed that he was not bound to submit it to the council and had not done so, as the communication was addressed to the mayor. He further went out of his way to say he wanted understood that neither he nor the council meant to be dictated to by any engineering institution, as to whom the council should employ, Canadian or American, which uncalled for remark led an alderman to point out that the letter, a copy of which was then reproduced and read to the council, was simply a respectful request for fair consideration of engineers in Canada and was not dictatorial nor otherwise of offensive nature.

The judgment of a majority of the council was that the interest of the city would be served by engagement of the San Francisco applicant in preference to employing a Canadian firm whose application was the only other one brought before the meeting.

Having but a few days previously learned of the council's desire to engage a consulting hydraulic engineer, the writer proceeded to Victoria and called upon the mayor some hours before the council meeting above referred to, and stated that if the council were not committed to engagement of the American applicant, as it seemed might be the case, he would be glad to receive consideration in the matter and would feel perfectly satisfied to be judged solely upon his merits from the standpoint of professional ability, experience, and fitness, aside from the fact of his being a Canadian practising in the Province.

His Worship distinctly informed the writer, in reply, that his application, if submitted to council, would be considered only on condition that the application of the San Francisco engineer were rejected by council, at the meeting to be held that evening.

From the time of suppressing the letter of the Canadian Society of Civil Engineers, in March, until the appointment of the United States engineer on the 7th of June, Mayor Morley's disposition and inconsistencies indicate an aversion on his part, to even hearing of a Canadian whose merits would entitle him to the position, as against his American friend.

In times past, when Canadian engineers of recognized ability, were for the most part, located far east from the Pacific coast, and when United States engineers were available from the adjacent States, and perhaps in certain cases, more experienced with Pacific Coast conditions, there may have been some reason for looking to the Pacific States for professional services in preference to seeking Canadians more remote; but in these days the action of the mayor of Victoria looks positively disloyal and probably as much so to the good people of Victoria and British Columbia themselves, were the conditions fully understood, as to Canadians in general.

Waterproofing a concrete roof has been done successfully by Mr. J. R. Bayliss with a half-inch coat of 1:2 mortar, applied before the concrete had set and troweled smooth. A solution of 1 lb. of concentrated lye and 5 lb. of alum was made up with 2 gallons of water, and used by diluting one part of it with 30 parts of water. A mixture of 2 lb. of cement in a pint of this diluted solution was applied in two coats to the fresh mortar. A large reinforced concrete pipe was also waterproofed in much the same manner and has likewise remained tight for several years.

Bascule Bridge Over Canal at Lindsay

This bridge was recently erected over the Trent Valley Canal on Wellington street in the Town of Lindsay, Ont. The structure is known as a Strauss Trunnion Bascule bridge embracing a 73-ft. deck plate girder moveable or lift span, the main girders of which are supported through the trunnions on two pairs of trunnion posts. It further includes a reinforced concrete counterweight supported by steel columns or legs which are pin connected to the tail ends of the main girder and also the counterweight link, the counterweight tower and the 25 ft. 6 in. tower span supporting the tower.

The machinery embraces a train of gears actuating two operating pinions, one for each main girder

block is a few hundred pounds less than the weight of the structure itself and when power is applied, it merely overcomes this difference in weight.

The quality of material and the class of workmanship are of the very highest quality and all the conditions of the Dominion Government specifications were rigidly carried out, the work being inspected at all stages of shop and erection work.

The floor of the bridge consists of timber and the guard rails on each side are formed of steel lattice fences of the usual type.

Fig 1 shows the lifting leaf of the bridge open and the concrete counterweight at its lowest point.

Fig. 2 shows the lifting gear of the bridge closed to accommodate vehicle traffic over the canal and it



Lindsay Bridge; lifting leaf open.

and each engaging a segmental rack bolted to the tail ends of the girders and which are hereafter described.

It will be seen that this bridge is radically different from the ordinary structure carrying highway traffic over canals or rivers, and it is (so far as known), the first bascule bridge erected in Canada, although at the present time there are several in course of construction. The bridge consists as already stated of a 73-ft. lifting arm and which is raised and lowered with gears operated either by hand power or electric power, the electric power being used at all times and the hand power arranged for emergency cases. The structure itself is the ordinary type of plate girder with special ends on which are placed racks operating with gears and other machinery placed under the end of the bridge. The amount of power required for operating this structure is comparatively small as the large heavy reinforced concrete counterweight block is intended to practically counterbalance the weight of the lifting span, and the weight of this

will be noted the concrete counterweight is at its highest point.

Fig. 3 is an end view of the bridge showing it closed and the concrete counterweight at its highest point.

On this bridge being tested by the representatives of the government and the manufacturers, it was found to work very satisfactorily indeed, very slight adjustment being required to put it in perfect working order.

This bridge was built for the Department of Railways and Canals, A. J. Grant, C. E., of Peterboro, being the superintending engineer. The designers of the bridge were the Strauss Bascule & Concrete Bridge Company of Chicago, Ill., and the contractors and builders of the steel superstructure including all structural steel, machinery, concrete counterweight, operator's cabin, etc., were the Hamilton Bridge Works Company, Limited, of Hamilton, Canada.



Lindsay Bridge; lifting leaf closed, counterweight at top.

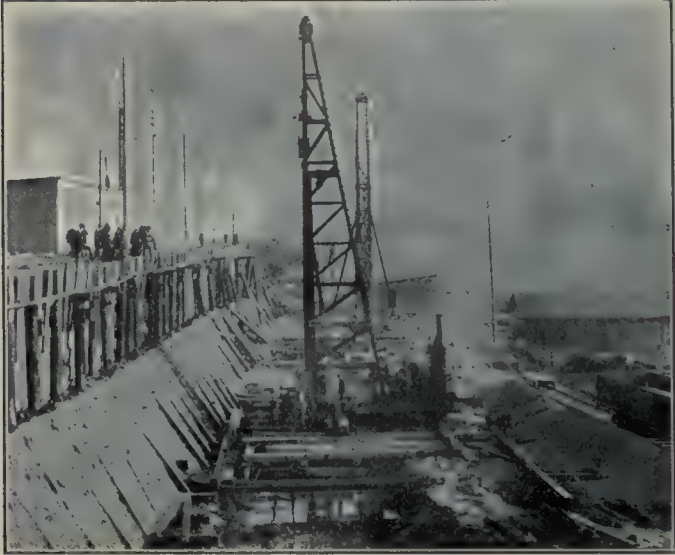


Lindsay Bridge; end view, lifting leaf closed.

Foundations for Retaining Wall at Seattle

In connection with the terminal improvements at Seattle, for the Oregon & Washington R. R., among which are a passenger station 145 x 185 ft. and 5 storeys in height, a passenger yard embracing 12 tracks of a capacity of 122 cars, some interesting features are to be noted in connection with the retaining wall running along 5th Avenue for 1,681 feet.

The level of the passenger yard and the track floor of the building is $24\frac{1}{2}$ ft. below the grade of the adjoining street. The two streets which cross the passenger terminal are to be carried on overhead bridges or viaducts;



General work of construction, showing pile drivers

one of them being in front of the station, the other near the end of the yard. Additional track room will be supplied by carrying part of the yard under the sidewalk at the 5th Avenue side, the walk being carried by a cantilever construction.

At this side of the yard (the 5th Avenue side), the bank will be retained by a wall of a maximum height of 50 feet and 1,681 ft. long, which will also serve to carry one edge



The erection of reinforcement for retaining walls

of the viaduct roadway platform 16 ft. wide, mentioned above, the outer edge of the platform being supported by columns. Between the row of columns and the base of the retaining wall, one of the tracks is to be located.

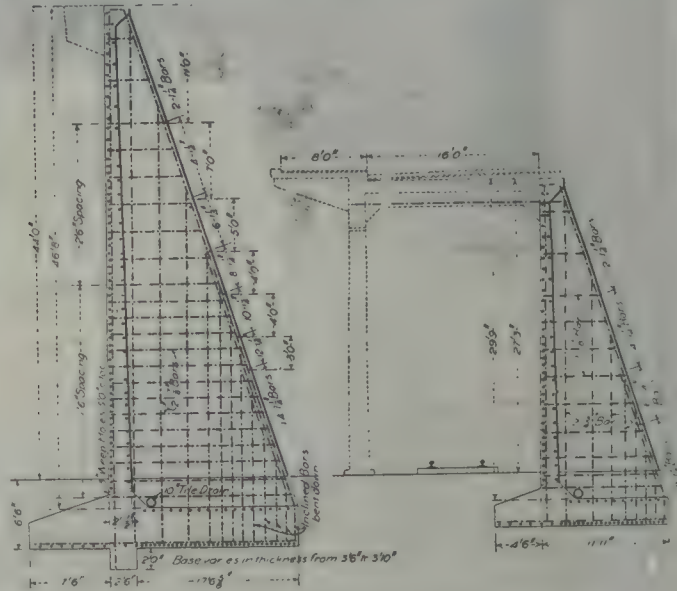
The reinforced concrete retaining wall is triangular shaped in sections as shown in Figures 1 and 3. Figure 1

shows part of the reinforcing set in place, previous to the erection of the wooden forms. The reinforcing consists of vertical and horizontal continuous webs, connected by transverse webs or counterforts 10 ft. apart.

The horizontal web or footing is supported on two and three rows of pedestal concrete piles, about three feet apart in both directions under the vertical web, with additional transverse rows of concrete piles under the counterforts.

The soil here consists of a soft mud fill about 35 ft. in depth overlying an old gravel beach with water line about 10 ft. below the original surface of the ground.

The pedestal concrete piles were formed by driving first a core fitting into a casing (the lower and pointed end of the core projecting several feet below the lower end of the casing) by two No. 2 Vulcan steam hammers in leads 65 ft. long. The core and casing were driven to an average depth of about 35 ft. The core was withdrawn and a small batch of 1-2-4 concrete, made with superior Portland cement and gravel, was dropped to the bottom of the casing. This was then bulged out by lowering the core down again into the casing and tapping it lightly. The

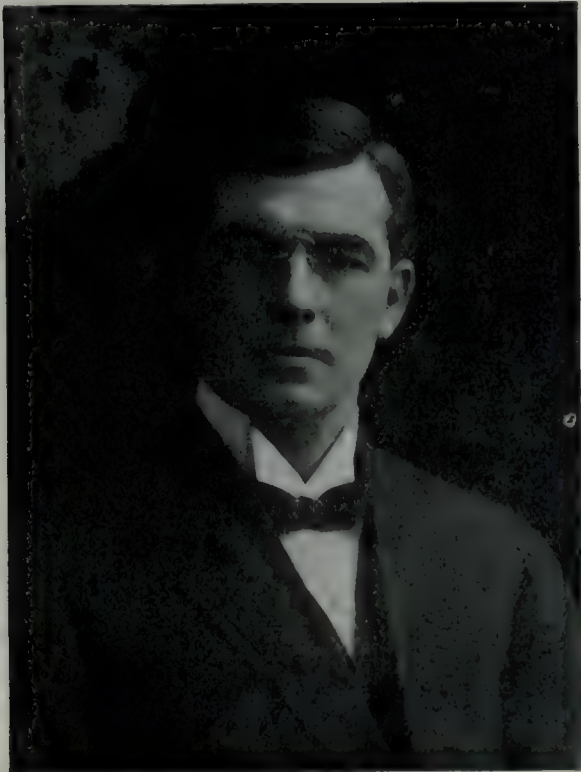


Canadian City Engineers

Frank Chappell, Oshawa, Ont.

Frank Chappell, town engineer of Oshawa, Ont., is a native of Cardiff, Wales. After completing a five years' apprenticeship course in the workshop and offices of the Mercantile Pontoon Company, ship builders and repairers, of Cardiff, and winning a scholarship, he began a course of study in 1904 in civil and municipal engineering at the University of South Wales, from which he graduated in 1907. Coming to Canada at this period, he entered the employ of the Grand Trunk Railway Company at Montreal. In 1908 he attended McGill University, Department of Surveying, and later he took up post graduate work in municipal engineering at McGill. After completing this course he engaged in work in a private capacity until appointed in June, 1909, town engineer and superintendent of waterworks at Oshawa, Ont.

In this capacity he superintended the construction by day labor of some 5,800 feet of main sanitary sewers and 4,500 feet of water main extension. In addition, some



Frank Chappell, of Oshawa, Ont.

12,000 feet of concrete sidewalk has been laid by contract. Approximately 3,500 feet of asphalt block pavement is to be laid by contract this year. The work of designing and laying out a system of sewage disposal is proceeding as rapidly as possible. It is Mr. Chappell's opinion, gained through experience, that day labor may readily compete with contract labor in the majority of cases where there is an efficient permanent staff. Where this staff is confined to the resident engineer, however, and to one or two foremen who may not be permanently employed, and where the labor at hand is of the crude description common to most small towns, Mr. Chappell considers it next to hopeless to think of competing with the skilled organization it

is possible for a capable contractor to bring to bear upon the work.

The waterworks system of Oshawa is in a most flourishing condition. Last year it was able to hand over to the town \$3,500 after paying out of its revenue all operating, constructional, and current expenses.

Trade Notes and Items of Interest

About 20 miles of pavements are being laid in Regina this season. One-half the work has already been completed.

The Engineer's Club of Toronto has secured an option on the Saturday Night Building and intends to purchase it for club purposes.

Paquette & Sons, of Sherbrooke, Que., were recently awarded the contract for the painting of the iron bridges in that city.

Mr. Gustav Lindenthal, of New York, has received the degree of Doctor of Engineering from the Royal Technical Institute of Dresden.

The fourth annual general assembly of the Royal Architectural Institute of Canada will be held at Montreal on the 3rd and 4th of October.

Walter J. Francis, C.E., consulting engineer, of Montreal, has submitted his report to the Moose Jaw city council in the question of its water supply.

Mr. Geo. Bury, general manager of western lines for the C. P. R., has announced the intention of the company to enlarge the railway station at Vancouver.

Work will be commenced immediately at Wilmer, B.C., for supplying the town with water. All the contracts for piping, connections, etc., have been awarded.

C. F. Gibson, until recently town engineer of Sturgeon Falls, Ontario, has secured the contract for laying the cement walks for the town of Campbellford.

E. B. Jones has resigned his position as city engineer of Chatham, Ont. The city council propose appointing a foreman of public works to run the department until next spring.

The Calgary Street Railway extensions are nearing completion and more than ten miles of new track will be in service by July 1, barely three months after work was begun on these extensions.

The Commission of Conservation has received formal protest from the Selkirk Board of Trade against the proposal of the city of Winnipeg to construct a sewer through Kildonian to the Red River.

Calgary building figures for May exceed those of any other Canadian city, having a monthly total of \$3,700,000. The Hudson's Bay store and the new St. George Hotel are big items in the city's May record.

Mr. C. A. Jennings, superintendent of the Bubbly Creek filter plant at the Chicago Stockyards, has been selected to instal several hypochlorite-of-lime plants for water supplies on the Pacific coast.

Saskatoon, Sask., building permits for the first two weeks of the month of June totalled nearly \$275,000. This is about \$100,000 in excess of the amount for the entire month of June last year.

Work will shortly be started on a new steel arch bridge over Niagara Falls, to replace the present cantilever bridge, it being regarded as too small to accommodate the increased heavy traffic.

Mr. Phillips B. Motley has been appointed engineer of bridges of the Canadian Pacific Railway. He became connected with that road in 1902, when he first entered rail-

way service, and has been engaged in various department of its bridge and structural work.

William Dicken, Fernie, B.C., has been engaged by the city of Medicine Hat to supervise the manufacture of concrete pipe for this season's work. Mr. Dicken has recently completed a contract for the supply of a large quantity of concrete pipe for the city of Fernie, B.C.

Superintendent Lesage of the water department of Montreal, has reported upon the enlargement of the aqueduct which runs from Point St. Charles to Lachine Rapids. The improvement means that the city will have at its disposal about 100,000,000 gallons of water per day.

Mr. A. H. Blanchard, Mem. Am. Soc. C.E., Associate Professor of Civil Engineering at Brown University, has resigned to accept the appointment of Professor of Highway Engineering at Columbia University. Mr. Blanchard will have charge of the graduate courses in highway engineering which are to be established there in the fall.

To more fully overtake the unprecedented demand for their locomotives, The Canadian Locomotive Company of Kingston, have decided to double the capacity of their plant, thus enabling it to turn out at least 150 locomotives per year. They also own sufficient land to enable them to still further increase their capacity, should business warrant it.

Montreal will soon have a valuable addition to its list of commercial structures in the form of an office building on Phillips Square, for Messrs. Henry Birks & Sons, Limited, the plans for which have been prepared by Messrs. Nobbs & Hyde, architects. Located on the south-westerly corner of the square the site is one of the finest in the city.

Plans have been submitted to the public works department at Ottawa for the establishment of a new waterway between Montreal, Lake Champlain and Quebec. A 12-foot waterway is proposed and the work will involve the complete construction of 21 miles of new canal. It is estimated that the cost of the work will amount to millions of dollars.

Plans for the improvement to the harbor at Port Stanley, Ont., have been forwarded to Ottawa. The sum of \$60,000 has been set aside for this work. The breakwater will be of the most modern construction. It is expected that the work will be completed this summer and when finished a new pier for unloading vessels will be built.

James D. McGregor, financier, representing British capitalists, states that engineers of the principals he represents will be in Brandon this week to report on the street railway proposition. On receipt of their report the syndicate will lay a proposition before the city for securing a franchise for the system. This system, as adopted by city, calls for about seven miles of track with car barns and overhead work.

Messrs. E. & W. S. Maxwell, architects of Montreal, have prepared plans for the St. Paul's hospital to be erected in Saskatoon for the order of nuns. Tenders will be called for shortly for the excavation and foundation work which is to be completed this fall. Work on the superstructure will be taken up in the spring and if possible completed during the following season. The building will be of concrete and brick practically fire proof and is expected to cost about \$150,000. The main part of the building will contain the administrative and operating departments with private and semi-private wards. Two wings will afterwards be added when the requirements call for them. The sisters already have a building close to the site of the new hospital. The different buildings will be connected by covered passageways. Mr. Fortin of Regina represents Messrs. Maxwell and will superintend the erection of the new building.

Railway Construction in Saskatchewan

Saskatchewan is witnessing to-day the greatest railway development any section of the world has ever known. Over one thousand miles of new railway track will be constructed in Saskatchewan this year. Last year Saskatchewan led all the provinces in the Dominion, with a total of 475 miles. The Canadian Northern Railway is constructing 330 miles; the Grand Trunk Pacific is constructing 340 miles; the Canadian Pacific Railway is constructing 348 miles. The longest single stretch of railway being constructed is 100 miles. About 1,300 miles of new grading will be done this year. Total construction for this year is almost one-half as great as in the preceding five years. At the end of the year there will be 4,752 miles of track in Saskatchewan.

According to the newest information obtainable, the following list of lines will be constructed by the various railways this year, unless something compels the railways to change their plans:

By the Canadian Northern—Aylesbury westward to Davidson, 15 miles; Battleford-Jackfish line, 40 miles, to be laid; Thunderhill extension, 70 miles west of Manitoba; Delisle branch from Goose Lake line, 35 miles; Moose Jaw southeast, 100 miles; Roseburn extension, 20 miles; Shelbrook line, 50 miles. This makes a total of Canadian Northern Railway construction of 330 miles this year.

By the Grand Trunk Pacific—Melville to Regina, 70 miles; Battleford to Biggar, 50 miles; Regina to boundary line, 90 miles; Regina to Moose Jaw, 40 miles; Young-Prince Albert, 90 miles; Moose Jaw northwest line, will be gone on with. This makes a total of Grand Trunk Pacific construction of 345 miles.

By the Canadian Pacific Railway—Northwest, 60 miles; Graven-Colonsay, 65 miles; Weyburn-Lethbridge, 20 miles; Estevan-Forward, 35 miles; Regina-Bulyea, 10 miles; Lauderdale extension, 20 miles; second track from Moose Jaw to Pasqua, 7 miles; second track from Moose Jaw to Caron, 16 miles; Moose Jaw, southwest, 35 miles; Swift Current, southeast, 45 miles; Swift Current, northwest, for 30 miles. This makes a total for the Canadian Pacific Railway construction of 348 miles.

Work in Montreal has commenced on the demolition of the residences that have for many years occupied the site of the new "Balmoral" office building which is about to be erected on St. Catherine street just east of Bleury. The building will have frontages on Mance and Balmoral streets as well as St. Catherine street. The building will be a ten-storey fireproof structure with 15,000 square feet of floor space on each flat. It is being built by Henry Morgan & Company Limited, of Beaver Hall Hill. The building is to be ready for occupation by next May.

Catalogue "F" of the Buffalo Pitts Company is a loose leaf pamphlet describing contractors' double cylinder hauling engines and also reversible road cars for heavy freight. The catalogue illustrates in a neat and concise manner special features of mechanism and operation relating to both.

The Western Wheel Scraper Company, of Aurora, Ill., have recently issued a prospectus relating to their various appliances for the handling of earth and stone. In it their products are classified as follows: Section 1, scrapers and road plows; Section 2, dump cars of various capacities, standard and narrow gauge; Section 3, dump wagons and elevating graders; Section 4, graders and crushers. Numerous diagrams illustrating types of difficult work that these machines have been successfully selected to do are also given. The whole is a 128-page pamphlet which contractors will find instructive as well as interesting.

Contracts Department

News of Special Interest to Contractors, Engineers, Manufacturers and Dealers in Building Supplies.

Information for insertion in these columns is invited from Architects, Contractors, Engineers, etc.

Waterworks, Sewerage and Roadways

Burnaby, B.C.

Waterworks. Cleveland & Cameron, Winch Bldg., are calling for tenders for special casting for water main.

Bridgeburg, Ont.

By-laws to be submitted for engineering. A by-law will be submitted on July 6th to raise \$8,000 for sewer extensions.

Coquitlam, B.C.

The city engineer has recommended \$140,000 for road improvements.

Calgary, Alta.

By-law to be submitted for waterworks. Owner, Corporation of Calgary, City Clerk, W. D. Spence; city engineer, J. T. Child, Calgary. To construct and install catch basins on the streets and avenues. The vote will be taken July 14th.

Dresden, Ont.

By-law carried for waterworks and fire protection, \$16,000. Owner, Corporation of Dresden; chairman fire, water & light committee, Ald. Carscalen. Some 10,370 ft. of pipe will be laid and 35 hydrants put in. Engineer's report estimated cost \$15,583; for \$7,000 more a domestic supply can be installed. This may be done later on.

Edmonton, Alta.

A by-law will be submitted on July 18 to provide \$100,000 for paving works. A. J. Latornell, city engineer.

Plans being prepared for pumping station. (West end). Owner, City of Edmonton, Alta; city engineer, A. J. Latornell, Edmonton, Alta. Tenders will be asked for shortly. Supplementary report later.

Eburne, B.C.

Sewer system. Cleveland & Cameron, engineers, Winch Bldg., Vancouver, are preparing plans for a complete sewer system.

Grandview, Man.

Tenders called for granolithic sidewalk. Owners, Corporation of Grandview, Man.; W. Dickie, clerk; engineer in charge, H. G. Beresford, Dauphin, Man. 18,000 square feet of granolithic sidewalk to be constructed, 8 feet wide on Main street. Further information obtained from W. Dickie. Tenders received until noon, July 10th.

London, Ont.

Asphalt pavement. A petition is being circulated to have streets between Ridout and Wellington paved. City Engineer Wright.

Medicine Hat, Alta.

Equipment required for extension to waterworks, Riverdale. City engineer, A. K. Grimmer. Owner, City of Medi-

cine Hat, Alta. Cost not estimated yet, probably \$25,000. Pumps, boilers, pipe, etc., will be needed.

Midland, Ont.

Tenders called for sewerage work. Owner, corporation of Midland; Frank R. Weston, town clerk. Labor and materials, required for construction of sanitary sewers, comprising about 4,700 lin. ft. of pipe sewers; plans, etc., at office of Chipman & Power, engineers, Mail Building, Toronto, or at office of town clerk. Advt. in "Tenders and For Sale Department" of this issue.

Montreal, Que.

Tenders called for sewers. Owners, Corporation of Montreal. Construction of sewers in Garnier, Fabre, Marquette streets and Laurier and Grand avenues. Plans, etc., at office of Superintendent of Sewers. Tenders addressed to board of commissioners received until noon, July 6th.

Municipality of Assiniboia, Man.

By-law to be submitted for paving, \$600,000. Secretary-Treasurer, Frank Ness, St. Charles, Man.; highway commissioner, A. McGillivray, Parliament Bldg., Winnipeg, Man. The municipal council have decided to submit a by-law to pave Portage avenue road, five miles west; the paving of the south side of the Assiniboine river will extend two miles along the river. The above is part of a scheme covering one or two years, this year's work to be completed by November 1st. Tenders will be called as soon as authority is given to borrow the required amount.

Moorefield, Ont.

Tenders called for municipal drain No. 1. Owner, Township of Maryborough, County Clerk, W. W. Scott, Moorefield. Construction of a drain, containing about 33,000 cubic yards of excavation. Plans, etc., at office of county clerk. Tenders received until July 14, by county clerk. Advertisement in "Tenders and For Sale Department" of this issue.

Quebec, Que.

Tenders called for permanent sidewalks, stone curb. Owner, Corporation of Quebec, Que.; city engineer, W. D. Baillairge, Quebec. Supplying and laying of stone curb and permanent sidewalks in certain streets. Tenders received until 4 p.m., July 5, by city engineer.

CONTRACTS AWARDED

Niagara Falls, Ont.

Cement walk. Owner, Corporation of Niagara Falls, Ont.; contractor, D. W. Mitchell Construction Co., Niagara Falls, Ont., at 123¢ for walks and 10¢ for curbs. Prices ranged from 123¢ to 141¢ on walks, and on curbs, from 10¢ to 13¢. Amount required, 50,000 feet cement walk; 2,500 feet curb.

Ottawa, Ont.

Equipment required for excavation and grading, Ottawa South. Owner, V. V. Rogers, Spark street; Ottawa contractor, O'Leary Bros., Ottawa; 40,000 cubic yards to be moved about 1,000 ft. Required steam shovels, cars, etc.

Quebec, Que.

Tenders called for steam roller. Owner, Corporation of Quebec; city engineer, W. D. Baillairge, Quebec. Tenders are called until 4 p.m., July 15, for supply of steam roller, by city engineer.

Paving. Owner, corporation of Quebec; city engineer, W. D. Baillairge, Quebec; contractors, Messrs. Falardeau & Co. The tender of Falardeau & Co. was again considered and the award made with some changes, at a special meeting of the council.

Sussex, N.B.

Owners, Corporation of Sussex, N.B. By-law carried to raise \$15,000 for improvements and extensions to water works and sewerage systems.

Steeltown, Ont.

Tenders called for cement walks. Owner, Corporation of Steeltown, Ont.; Jase Lyons, mayor; engineer, Chipman & Power, Mail Bldg., Toronto. Construction of about 72,000 square feet of cement sidewalks and 7,200 lin. ft. of cement curb. Plans, etc., at offices of Chipman & Power, Steeltown, Ont. Tenders received until July 4, by J. Robinson, town clerk.

Tenders called for sewers and roadways. Owners, Corporation of Steeltown, Ont.; town clerk, J. Robinson; engineer, Chipman & Power, Mail Bldg., Toronto. Construction of about 1,050 feet of 12-in. vitrified pipe storm sewer, including catch basin and manholes; about 2,750 feet of concrete curb and about 6,400 square yards of macadamized roadway. Plans, etc., at office of Chipman & Power, Steeltown, Ont. Tenders received by town clerk until July 4.

Vancouver, B.C.

Clearing and grading. Owner, City of Vancouver. Successful tenderer, McKay & Healey, 690 7th Avenue west, \$1,575. Others tendered as follows: G. Paonesso Co., Cedar Cottage, city, \$1,730; Billy A. Kupoff, 413 Pacific Bldg., \$1,775; Brown & Latimer, North Vancouver, \$2,000; Warren & Boyd, 812 Pender street east, \$2,225; W. S. Prescott, 1462 11th Avenue, \$2,848; Wm. Sjoquist, New Westminster, B.C., \$3,000.

Plans approved for sewerage, \$750,000; city engineer, F. Fellowes. Large mains in Wards V. and VI. to cost \$200,000. Maple street, trunk sewer from Creelman avenue to First avenue to be extended up Cedar street and laterals put in, cost \$25,000. Plans approved by board of works, Wm. McQueen, city clerk.

Weyburn, Sask.

By-law to be submitted for water-works extensions. Owner, Corporation of Weyburn; secretary-treasurer, Geo. Ross. By-law to authorize the borrowing of \$40,000 for completion of water-works system and to cover extension thereto. Vote will be taken on July 14th.

Railroads, Bridges and Wharves**Brandon, Man.**

Work in progress for transfer track. Owner, Great Northern Railway, Brandon; engineer, W. H. Stevenson, G.N.R. Brandon. No tenders were called either for construction or grading. Company will lay steel, employing its own track gang. Grading began June 26, 1911. J. Bradley, local contractor, working under G. N. R. engineer.

Negotiations in progress for street railway. City Engineer, R. E. Speakman, Brandon, Man. James D. McGregor, financier, representing British capitalists, says engineers of the principals he represents will be in Brandon this week to report on the street railway proposition. On receipt of their report the syndicate will lay a proposition before the city for securing a franchise for the system. System as adopted by city calls for about seven miles of track with car barns and overhead work. Supplementary report later.

Brampton, Ont.

Tenders called for steel bridge over Credit river. Owners, Tps. of Chinguacousy and Esquesing; county clerk, D. Kirkwood, Brampton, Ont.; county engineer, C. R. Wheelock, Orangeville, Ont. Construction of a 75-ft. steel span between Tps. of Chinguacousy and Esquesing, about one mile from Terra Cotta. Specifications obtained from county engineer. Tenders received until July 11, by county clerk. Advertisement in "Tenders and For Sale Department" of this issue.

Chilliwack, B.C.

The city and municipal council have decided to build a new bridge across the Hope river on Wells street.

Calgary, Alta.

The Calgary & Edmonton Railway Company will apply to Parliament to authorize the construction of a branch line from a point near Sedgewick to a point on the Lacombe branch extension Range 11 West 4th, and two other branches in Range 17, 18 or 19 West 4th. Andrew I. Thompson, Ottawa, agent. H. C. Oswald, secretary.

Montreal, Que.

Tenders called for concrete sheds, Tarte Pier. Owner, Harbor Commissioners of Montreal; David Seath, secretary, Montreal; chief engineer, F. W. Cowie, Montreal. Construction of two concrete wharf sheds. Plans, etc., upon application to chief engineer. Tenders received by the secretary until July 5th.

Millbank, Ont.

Tenders called for bridge. Engineers, Bowman & Connor, Berlin, Ont. Construction of concrete abutment at Armstrong's bridge on the Perth-Waterloo County line, three miles south of Millbank. Further information obtained from Bowman & Connor. Tenders received until 2 p.m., July 11th. Advertisement in "Tenders and For Sale Department" of this issue.

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Niagara Falls, Ont.

Work will be started shortly on a new steel arch bridge to replace the present cantilever across the Niagara river. Michigan Central Railway, controllers of the bridge.

Oakville, Ont.

Representatives of Halton County Council are asking assistance from the government for the construction of a high level bridge over the Sixteen Mile creek. Estimated cost, \$22,000.

Ottawa, Ont.

Canadian Northern Railway. General contractor, J. P. Mullarkey. 1st Sec., Sydenham, Ottawa. Bonneville, P. and Son, Lancaster, Ont.; Brennan Peter J., Ottawa, Ont. 587 Gladstone avenue; Dixon J. R., Ott. Ont. (Fence) 650 Gilmour street; Henniger, M. G., Grand Falls, N. B.; Leamy, F. A. & C. M.; James Macdonald Construction Co., Sydenham, Ont.; Ross McCombe, Dwyer Hill P. O. Ont.; Simmons, C. J. B. Fredericton, N. B. II Sec, Hawkesbury-Montreal. Bonneville, P. & Son, Lancaster, Ont.; Kert, Isaac, 546 Papineau avenue, Montreal; Quebec Contracting Co. Ltd., St. Nicholas bldg., Mont Dixon J. R. (Fence and Telegraph) Ottawa, Ont.

Port Arthur, Ont.

By-laws to be submitted for engineering, \$157,755. \$10,000 towards construction of bridge over Current river; \$9,000 extensions of telephone system; \$17,250, extensions of street railway; \$16,505, sidewalks and streets; \$75,000, extensions of waterworks; \$30,000, completion of storage dam at Current river. The by-law will be voted on July 6th. J. M. Teigue, city clerk.

Plattsville, Ont.

Tenders called for bridges. Owner, County of Oxford. County engineer, F. J. Ure, Woodstock, Ont. One 25-ft. beam span with concrete floor and abutments. One 45-ft. span steel truss with concrete floor and abutments; and the building of concrete abutments under two other bridges. Further particulars, apply to J. O. Given, reeve of tp. of Blenheim. Tenders received by engineer until 2 p.m. July 13th. Advertisement in "Tenders and For Sale Department" of this issue.

Rivers, Man.

Tenders closed for bridge, \$6,000. Owner, municipality of Daly, Man. Probable contractor, Henry Koester, Brandon. Steel on concrete abutments, one span, 80 feet long, 26 feet width, concrete abutments. Tenders for superstructure closed; contract will be awarded June 30, Henry Koester, Brandon, will probably be successful tenderer, his bid being lowest.

Sault Ste. Marie, Ont.

Tenders called for railway. Owners, Algoma Central Railway; chief engineer, R. S. McCormick, Algoma Central Railway Sault Ste. Marie. From Hobson on C. P. R. to the National Transcontinental Railway, 142 miles west of Cochrane, a distance of 101 miles. Work includes construction work to subgrade, and in addition, track laying and ballasting. Specifications at office of Chief Engineer, Sault Ste. Marie. Tenders received until noon, July 15, by chief engineer.

ders received until noon, July 15, by chief engineer.

Three Rivers, Que.

Negotiations delayed for street railway. Owner, Three Rivers street railway, Three Rivers, Que. Action of city council to organize approved by citizens. The proposition has been shelved for the present.

Company being organized; street railway. Owners, Three Rivers Street Railway, Three Rivers, Que. Action of city council to organize approved by citizens. \$375,000 stock to be taken up by city and \$25,000 offered to public company to be formed at once.

Toronto, Ont.

Time for tenders extended for seawall, Lake Ontario, vicinity of Exhibition grounds. Chairman, Board of Control, F. S. Spence, City Hall; city engineer, C. H. Rust, Toronto. Construction of seawall. Specifications on application to the Department of Railways and bridges, City Engineer's office. Tenders received by the Chairman, Board of Control, until noon, July 17th. Advertisement in "Tenders and For Sale Department" of this issue.

Thorold, Ont.

Contemplated, turning basin, \$30,000. Owner, Department of Railways & Canals, Ottawa; secretary, L. Jones; canal superintendent, L. Weller, St. Catharines, Ont. The site is selected and money provided.

Teeswater, Ont.

The county council will introduce a by-law to borrow \$20,000 on debentures for rebuilding Brant and other bridges. P. A. Malcolmson, county clerk.

Vancouver, B.C.

Plans submitted to council for bridges, \$434,300, Hastings, Pender, Harris & Keefer streets. City Clerk, W. McQueen; consulting engineer, Waddell & Harrington; city engineer, F. Fellowes. Structures on Hastings and Harris streets to be double tracked. Material, reinforced concrete and steel.

Woodbridge, Ont.

By-law to be submitted for bridge, \$4,000. A by-law to raise \$4,000 for construction of bridge on Clarence street will be submitted on June 30. E. Brown, clerk.

Waldemar, Ont.

Tenders called for Steel bridge over Grand River. County engineer, C. R. Wheelock, Orangeville, Ont. Construction of a 115 ft. span over Grand River about one mile from Waldemar. Specifications obtained from county engineer. Tenders received until 1 p.m., July 4th, by County Engineer. Advertisement in "Tenders and For Sale Department" of this issue.

CONTRACTS AWARDED**Vancouver, B. C.**

The contract for building the C.N.R. between Hope and Kamloops, a distance of 163 miles, \$15,000,000, has been awarded to Northern Construction Co., A. R. Mann, president.

Weston, Ont.

A. C. Lewis has been awarded contract for concrete work of the Weston Road bridge, \$2,600, and Canada Foundry Co., steel span, \$8,740.

Public Buildings, Churches, Schools, etc.

Big Point, Ont.

Tenders called for school, \$3,000. Owner, Separate School Board, Dover, Ont. One storey, 37 x 47, concrete block foundation, stone, brick and frame, hot air heating, shingle roof, interior, Georgia pine, cut stone, metal ceiling, shingle stain. Tenders received after July 1st until July 15.

Burnaby, B.C.

Two frame schools, \$6,000 each. Architect, J.-H. Bowman. Tenders closed on the frame schools on June 28th.

Cannington, Ont.

Revised plans prepared for school, \$8,000. Owner, Board of School Trustees; architect, G. M. Miller & Co., 59 Yonge street, Toronto. Two storeys, brick, cement foundation, steam heating, shingle roof. Plans submitted to Board of Trustees for approval. Tenders will be called shortly.

Chatham, Ont.

Plans being prepared for school. Owner, Board of Education, Chatham; architect, Jas. L. Wilson, Chatham. Two storeys and basement, 70 x 90, brick and frame, stone foundation, direct-indirect heating, electric lighting, gravel composition, hard wall plaster, interior finish, cut stone, terra cotta, tile, armored concrete, reinforced concrete, artificial stone, metallic lath, structural iron, ornamental iron, fire escapes, cornice pipe covering, electrical work, electrical bells. Tenders received after July 4. Exact date not decided yet.

Cloverdale, B.C.

Tenders called for school. Owner, Department of Public Works, Victoria, B.C. Public Works Engineer, J. E. Griffith. Four rooms, timber framed school, concrete basement. Plans at the office of Rev. T. H. Wright, secretary to the school board, Cloverdale; the government agent, New Westminster, and at the Department of Public Works, Victoria. Tenders received until July 10th.

Edmonton, Alta.

A by-law will be submitted on July 18 to raise \$55,000 for erection of a nurses' home. Mr. Brown, city solicitor.

Edmonds, Burnaby, B.C.

School sites. Three more sites have been obtained by school trustees, one of which will be built on early next year; the others later.

Echo Place, Ont.

Tenders called for school, \$18,000. Owner, S. S. No. 14, Tp. of Brantford; secretary, J. L. Barnes, Echo Place; architect, G. W. Hall, Brantford. Two storeys, four rooms, 45 x 80, brick and stone, concrete foundation, steam heating, electricity and gas lighting, modern, slate roof, cement work, marble, tile, artificial stone, ornamental iron, electrical work, telephone system, plate glass, art glass. Tenders received by secretary, until July 10.

Fort William, Ont.

Tenders called for Y. M. C. A. building, \$75,000. Owner, Y. M. C. A., Fort William. Four-storey solid brick, 100 x 100, cement foundation, cut stone,

structural iron, fire escapes, fireproof doors, electrical work, steel beams, iron columns. Tenders received by architect until 5 o'clock, July 8. Marked cheque for \$5,000 to accompany all bulk tenders or marked cheque for ten per cent. on all separate tenders.

Galt, Ont.

Tenders called for addition to hospital. Owner, Board of Governors; secretary, W. H. Lutz, Galt; architect, W. Grayson Brown, Chancery Chambers, Hamilton. Alterations to hospital. Plans, etc., at office of the secretary. Tenders received by secretary until noon, July 4th.

Hamilton, Ont.

Tenders to be called for public library. Owner, Hamilton Public Library; secretary, A. Hunter. Marble work, iron stairs and staircases, office fittings, vault doors, electric fittings, switchboard. Specifications obtained from A. Hunter. Tenders will be called about end of September.

Hillsboro, N.B.

Tenders called for public building. Owner, Dominion Government, Ottawa. Secretary Department of Public Works, Ottawa, R. C. Desrochers. Plans, etc., at office of Mr. D. H. Waterbury, superintendent of public buildings, St. John, N.B., at Post Office, Hillsboro, N.B., and at Department, Ottawa. Tenders received by secretary until July 10.

Hope, B.C.

Tenders called for court house. Owner, Department of Public Works, Victoria, B.C.; public works engineer, J. E. Griffith, Department of Public Works. Erection of timber framed lock-up and court house. Plans, etc., at the office of the government agent, Ashcroft, B.C. A. H. Governor, Esq., provincial constable, Hope; provincial timber inspector, Vancouver, and the Department of Public Works, Victoria. Tenders received by public works engineer until July 6.

Lethbridge, Alta.

R. V. Gibbons has sold lots on Fifth avenue for \$13,000 as a site for a new convent.

London, Ont.

Tenders called for Masonic Temple. Owner, Masonic Order; architect, Wm. G. Murray, 11 Masonic Temple, London. Steel, reinforced and brick construction. Tenders received by architect till 5 p.m., July 10th.

Montreal, Que.

The directors of the Canadian Theatres, Limited, have purchased a site from Strickland & Strickland and plan the erection of an up-to-date Vaudeville House on St. Catherine street. Ross & McFarlane, architect.

Plans being prepared for theatre, \$150,000, St. Catherine street near St. Charles Borrome. Owner, Canadian Theatres, Limited; architect, Ross & McFarlane, Beaver Hall and Belmont st., Montreal. Three-storeys, cement and brick. Tenders not called yet. Supplementary report later.

Church of St. Jean Baptiste on Rachel street, destroyed by fire; loss \$200,000. Fully insured.

The plans for the new school building

have been accepted. Work will be started this summer. Preparations have been made so that the work when started can be carried on.

Plans are being prepared for church, Dorchester street and Green avenue. Owner, Calvary and Bethlehem congregations (uniting); architect, Robert Findlay, 10 Phillips Place, Montreal. Brick, stone and concrete. Date for receiving tenders not set yet.

Oak Bay, B.C.

The council will take immediate steps for the construction of an incinerator plant.

Ottawa, Ont.

Tenders called for Synagogue, \$15,000, King Edward avenue. Owner, Hebrew congregation, Ottawa architect, J. W. H. Watt, Central Chambers, Ottawa. 60 x 56, solid brick, hot water heating, electric lighting, tar and gravel roofing, cut stone, fire escapes, electrical work, iron dome, interior finish ash. Tenders received immediately by A. Sugarman, 35 York street, Ottawa. Close June 29.

Tenders called for public library. Owner, Public Library Board, chairman, Herbert S. Campbell; Librarian, L. J. Burpee, Ottawa. Certain changes in the heating system. Specifications at offices of the librarian. Tenders received by chairman until 4 p.m., July 13.

Port Hope, Ont.

Tenders called for hockey rink. Owners, Trinity College Boys' School, Port Hope; architect, Ellis & Connery, Manning Chambers, Toronto. One storey, 96 x 200; frame and concrete, concrete foundation, felt and gravel roofing. Tenders received until July 1st.

Port Arthur, Ont.

By-law to be submitted for buildings, \$6,000 improvements to municipal buildings. A by-law will also be submitted to guarantee the bond of a company to be incorporated by J. L. McRae to the amount of \$30,000, etc. The vote will be taken on July 6. J. McTeigue, city clerk.

Saskatoon, Sask.

By-law to be submitted for buildings, \$95,000. \$45,000 to be used in converting King Edward school into municipal offices; \$50,000 to pay for two new fire halls and equipment. The vote will be taken on July 6th. A Leslie, city clerk.

Architect chosen for Y. M. C. A. building. Owner, Y. M. C. A., Saskatoon, Sask. Chief architect, D. W. F. Nicholls, 499 Main street, Winnipeg.

South Vancouver, B.C.

Tenders called for school, \$40,000. Owner, School Board, South Vancouver; architect, J. H. Bowman, Crown Bldg., Vancouver. Two-storey, brick mill construction, concrete foundation, slate roof, cornice, eight rooms, electric lighting, hot air heating.

Shoal Lake, Man.

Fire reported. The post office, government telephone exchange and the Millar block were destroyed by fire on the 25th inst. Estimated loss on Millar block, \$13,000. Total loss, \$18,000.

Toronto, Ont.

Tenders called for public school. Owner, Toronto Playgrounds Association; architects, J. P. Hynes, Bank of Com-

merce Bldg., 199 Yonge street, Toronto. Erection of the McCormick Social Centre. Building in the Brock avenue Playgrounds, Toronto. Tenders received until July 6th by the architect.

Proposed alterations for club house. Owners, Engineers' Club, Toronto; architect, A. Rollo, 12 Queen street east. Engineers' Club have purchased building occupied by Toronto Saturday Night and propose remodelling it for club purposes. No plans have as yet been drawn.

Vancouver, B.C.

Plans being prepared for rink, Georgia street. Owner, Patrick Bros.; architect, Thos. Hooper, Winch Bldg., Vancouver. 320 x 200. Tenders will be called in about ten days. Plans are being prepared for a Baptist church on 10th Avenue to cost about \$25,000 by the same architect. Tenders were called last week by T. Hooper for a 6-storey steel and brick building for Otis Fensom Elevator Company.

Victoria, B.C.

The Victoria Amusement Co., Ltd., incorporated for the purpose of establishing an artificial rink in this city. Capital \$100,000.

CONTRACTS AWARDED

Cranbrook, B. C.

Indian school and chapel, \$100,000. Owner, Dominion Government, Ottawa. General contractor, John I. Wood, Fernie, B. C. 2-storey and basement; main building 50 x 160; chapel, 27 x 47, brick. Work awarded June 3, contract not yet signed. Sub-contracts not let yet.

Hamilton, Ont.

Church, \$4,700. Garth and Main. Owners, Centenary Church Trustees, Hamilton, Ont. Architect, W. A. Edwards; general contractor, C. S. Scott, Hamilton. One storey and basement, 63 x 36 feet. Mason, C. S. Scott; cement contractor, C. S. Scott; carpenter, J. Evans; heating contractor, Charles Drew; plumbing, contractor, Fitzsimmons Bros.; sheet metal contractor, C. Drew; contractor for iron work, Hamilton Bridge Co.; electrical work, Culley & Breaym.

Revelstoke, B.C.

Court House, \$120,000. General contractors, Messrs. Foot & Praldeonie, Revelstoke. Brick and steel.

Strathcona, Alta.

Armory. Three storeys, brick and stone, 51 x 90. General contract awarded to The Cowan Construction Co., Winnipeg.

St. Thomas, Ont.

School. Two storey brick building, to be completed September 1st. Contracts awarded as follows: Masonry, E. Ponsford, \$4,079; carpentry, Green & Sons, \$4,084; plastering, J. Stewart, \$840; plumbing, J. Williams, \$1,127; all of St. Thomas. Heating, Ewart Mfg. Co., \$850, Brockville.

Sherbrooke, Que.

Barracks, \$8,000, (Wellington street). Owner, Salvation Army, Sherbrooke, Que. General contractor, Sherbrooke Construction Co. 2-storey, 30x60, brick and wood. Contract let June 16. Building to be completed Aug. 1st.

Saskatoon, Sask.

Church, \$126,000. The contract for erection of church was let to Smith

Bros. & Wilson, Architects, J. N. Semmens, McArthur building, Winnipeg.

Residences.

Aylmer, Ont.

D. Braneon's barns, three miles north, destroyed. Loss \$7,000; partly insured.

Brantford, Ont.

Tenders called for apartments, \$5,000. Owner, W. K. Halloran, Brantford, Ont.; architects, Taylor & Taylor, Brantford; 2 storeys and basement, 28 x 40, brick and stone, concrete foundation, steam heating, electric lighting, slate roofing, mantels, artificial stone, electrical work, telephone system, interior finish, hardwood and pine. Tenders received after July 1st until July 10.

Hamilton, Ont.

Tenders called for residence, \$4,500. Owner, W. J. Pulling, Sandwich, Ont. Architects, Crane & Pennington, Windsor, Ont. Two storeys, 31 x 32, solid brick, brick foundation, cut stone, hot water heating, electricity and gas, modern plumbing; shingle roof, interior finish, oak, mantels, electric bells. Tenders received until July 7th.

Medicine Hat, Alta.

Plans being prepared for residence, \$8,000. Owner, J. McLean, Medicine Hat, Alta; architect, W. T. Williams, Medicine Hat, brick and frame, concrete.

Plans being prepared for three residences. Architect, W. T. Williams, Medicine Hat, Alta. Owners, J. K. Drinan, Medicine Hat (\$5,000); frame and concrete (bungalow style); R. N. Napier, manager, Bank of Montreal, \$4,000; frame, Mr. McDonnaha, \$4,200, bungalow, frame and concrete. All of Medicine Hat. W. T. Williams, architect for all.

Montreal, Que.

Residence, \$10,000. D. Blay, 111 Delinelle street, Montreal, is having a residence built on St. Phillippe street, three storeys, 70 x 46, gravel roof.

Residence, \$15,000, F. Clavette, 282 Outremont avenue, will build a residence on St. Joseph Boulevard. Five storeys, 54 x 130, brick, hot water heating, electric lighting.

North Bay, Ont.

Heating and plumbing required for residence, \$6,000. Owner, J. W. McDonald, North Bay; architect, J. K. Burt, North Bay. 2½ storeys, brick. General contract let June 26, building to be completed November 1st.

Ottawa, Ont.

Tenders to be called for residence, \$6,000, Carling avenue. Owner, E. Barrett; architect, C. P. Meredith, Sparks street, Ottawa; 2½ storeys, solid brick, hot water heating, lighting electric, cut stone, mantels, weather strips, shingle stain, electrical work. Tenders received after June 29th, closed July 15th.

Tenders to be called for residence, \$15,000, Marlborough avenue. Owner, D'Arcy McGee, Ottawa; architect, C. P. Meredith, Sparks street, Ottawa. 2½

storeys, solid brick, stone foundation, hot water heating, electric lighting, shingle roof, hardwood interior finish, cut stone, marble, mantels, weather strips, fireproof doors, or windows, electric bells, shingle stain. Tenders received after July 1st, closed July 15th.

Prince Rupert, B.C.

Plans prepared for residence, \$8,000, First avenue. Owner, F. H. Mabley, First avenue, Prince Rupert; architect, A. L. Barker, Third avenue, Prince Rupert. Two storeys, 35 x 45, frame, steam heating, cement foundation, shingle roof, mantels, electric bells, art glass, refrigerator, dumb waiter, shingle stain. No contracts let yet.

Saskatoon, Sask.

Apartment house. Storey & Van Egmond, architects, of Regina and Saskatoon, have plans for a 30-suite apartment house, 50 x 130 feet, \$30,000. Mr. Turner, local representative.

Toronto, Ont.

Tenders to be called for garage, \$3,000, Dundas street. Owner, G. Curavo, 1701 Dundas street, Toronto (private plans); 1 storey, 60 x 46, brick foundation; combination lighting, felt and gravel roof, structural iron, cement work. Tenders received after July 1st.

Tenders called for residence, \$3,500. Owner, Mr. Woodcock, Toronto; architect, Ellis & Company, Manning Chambers, Toronto. 2½ storeys, 25 ft. 9 in. by 30 ft. 3½ in., brick, stone, hot water heating, shingle roofing. Tenders received until June 30th.

Tenders called for residence, \$3,400, College street. Owner, S. Shaver, 402 Dovercourt road, Toronto (private plans). 2½ storeys, 34 x 24, brick foundation, brick, slate roofing, hot air heating. Tenders will be open for about ten days for heating and plastering.

Heating, lighting, plumbing required for residence, \$2,500, Edgewood Crescent. Owner, A. A. Kennedy, 431 Palmerston avenue, Toronto; architect, J. H. Galloway, 23 Toronto street, Toronto; two storeys, brick and stone, hot air heating, electric lighting. Tenders on heating, lighting and plumbing will be opened for the next two weeks.

Plans prepared for residence, \$3,800, Howard Park avenue. Owner, J. C. West, 1125 College street, Toronto; private plans. 2½ storeys, 32 x 24, brick foundation, brick, hot water heating, combination lighting, modern plumbing, slate roof, interior finish, hardwood, cornice. Tenders will be called in about two weeks.

Heating, Lighting, and plumbing required for residence, \$4,000. Owner, C. Coulter, 377 Palmerston avenue, Toronto, private plans, 25 x 37.9, 2½ storeys, brick, stone foundation, hot water heating, electric lighting, slate roof, hardwood finish. Tenders received during next week for lighting, heating, plumbing.

Tenders open for apartment house, \$30,000, Glen road and Howard street. Owner, A. A. Garrett, Maple avenue, Toronto; architect, J. A. Harvey, 302 Manning Chambers, Toronto. Three storeys, 60 x 36, brick and stone, brick foundation, steam heating, electric lighting, felt and gravel roofing, tile and fire escapes, skylights, electric bells,

telephone system, heating, lighting, plumbing, lathing and plastering tenders will be open for about a week yet.

Plans prepared for thirteen detached dwellings, \$26,000, Gilmour avenue. Owners, Max Slatkin, 235 Gilmour ave., Toronto; private plans. Two storeys, 38 x 17, stone foundation, brick, hot air heating, combination lighting, felt and gravel roofing. Work will be done by day labor, commencing in about four days.

Tenders called for residence, \$2,000, Kenneth avenue. Owner, C. B. Hodson, 1613 Dundas street, Toronto (private plans). 2½ storeys, 32 x 22, stone and brick, stone foundation, hot water or combination heating, slate roof, cement roof, cement work, electric lighting. Tenders open for a week for heating, lighting, lathing plastering, and roofing.

Heating, lighting and plumbing required for residence, \$3,000. Owner, A. A. Kennedy, 431 Palmerston avenue, Toronto; architect, J. H. Galloway, 23 Toronto street, Toronto; 2½ storeys, 25 x 36, brick and stone, hot water heating, electric lighting, open plumbing. Tenders called for heating, lighting and plumbing during the next two weeks.

Tenders called for residence, \$7,500, Lonsdale and Lawton. Owner, R. D. McLeod, Walmer Road Hill, Toronto; architect, J. H. Stanford, 34 Yonge St. Arcade, Toronto; 2½ storeys, 34 x 30, brick, stone foundation, cut stone, cement work, pipe covering, combination lighting, hot water heating, slate roof, weather strips, electric bells, shingle stain, sheet metal work, tile and mantels, art and plate glass. Tenders received by owner, July 3rd.

Tenders to be called for alterations to residences, \$4,000, 80 and 82 Pembroke street. Owner, R. S. VanVlack, Gore Vale avenue, Toronto; architect, J. Hunt Stanford, 34 Yonge Street Arcade, Toronto. Three storeys, brick, stone foundation, hot water heating, combination lighting, felt and gravel roof, hardwood finish, cement work, cut stone, tile mantels, reinforced concrete, metallic lath, sheet metal work, cornice skylights, weather strip, fireproof doors, deafening paper, steel beams, plastic relief work, plate and art glass. Owner is altering two houses into apartments. Tenders called for everything but masonry after July 3.

CONTRACTS AWARDED

Chapleau, Ont.

Residence, \$5,900. Owner, O. Boucher, Chapleau; architect, H. W. Angus, North Bay, Ont.; general contractor, J. P. Quinlan, North Bay. General contract let first part of month; heating and plumbing not yet let. Building to be completed October 1st.

Hamilton, Ont.

Residence; two storeys, brick, 27 x 32. Contracts awarded as follows: Masonry, Rudolf Bros., Hamilton; plastering, H. Hull; heating, J. M. Luxon; plumbing, J. M. Luxon; sheet metal, W. D. Jackson; stone work, W. H. Northcott; electric light and gas to be used, hot water heating.

Business Buildings and Industrial Plants

Aurora, Ont.

Plans in progress for factory, \$10,-

00. Owners, Positive Clutch & Pulley Works; architect, A. R. Denison & Stephenson, 16 King street west, Toronto. Two buildings to be erected, two storeys, wood shop and 1 storey machine shop. Concrete block. Supplementary report later.

Brighton, Ont.

By-law to be submitted for factory. Parties interested, Corporation of Brighton and Niagara Brand Spray Co. Company to build factory in return for civic privileges.

Brantford, Ont.

Tenders called for factory warehouse, \$18,000. Owner, Massey Harris Company, Brantford; F. Grobb, local manager. Three storeys, 162 x 56, brick work. Tenders called until July 1st, possibility that time may be extended until July 8. Contract for lindow frames awarded to Mickle, Dymont & Son, Brantford.

Tenders called for stores and offices, \$10,000, Queen street. Owner, W. F. Cockshutt, Brantford; architect, G. W. Hall, Brantford. Two storeys, 56 x 70, brick and stone, concrete foundation, hot air heating, electric and gas lighting, modern plumbing, Brantford roofing, two vaults, sheet metal work, steel beams, passenger elevator, plate glass, art glass, telephone system, armored concrete, cut stone, fireproofing, interior finish hardwood and pine. Tenders received until July 8th.

Tenders called for business block, Queen street. Owner, W. F. Cockshutt, Brantford. Architect, Geo. W. Hall, F.R.A.I.C., Brantford. Tenders on several trades required. Plans, etc., at 321 Colborne street. Tenders received by architects until noon, July 8th.

Tenders called for factory extension, \$40,000. Owner, Cockshutt Plow Co., Geo. Wedlake, Superintendent, Brantford (private plans). Carpenter shop, 110 x 60, 3-storey; structural shop, 100 x 60, 1-storey; blacksmith, 110 x 70, 1-storey; storage, 100 x 70, 1-storey; paint shop, 105 x 60, 3-storey. Walls all of brick, except blacksmith shop, which may be of steel; foundations concrete. Tenders received after July 10th; close about July 20th. Work to be rushed to completion this fall.

Calgary, Alta.

Tenders called for department store. Owner, Hudson's Bay Company; architects, Burke, Horwood & White, 28 Toronto street, Toronto. All trades, except foundations and structural steel required in erection of departmental store. Plans, etc., at office of architect. Tenders called until July 6.

Campbellton, N.B.

Tenders called for hotel, \$20,000, Water street. Owners, J. Damboise, Campbellton, N.B. Architect, R. A. Frechette, Moncton, B. C. Three storeys, 45 x 95 ft., brick and stone, concrete foundation, hot water heating, electric light, enamel iron plumbing, tar & gravel roofing, cement work, cut stone, brick, terra cotta, reinforced concrete, metallic lath, structural iron, ornamental iron, fire escapes, sidewalk lift, pipe covering, electric bells, roofing paper, sprinkler system, steel beams, ornamental columns, plate glass, refrigerator, interior finish spruce. Tenders received after June 26 until July 10.

Chatham, Ont.

Machinery required for factory. Owner, Christianson Motor Co., of Milwaukee, and Swift Motor Co., Chatham (combined). Final arrangements not yet made. Present plant will not be enlarged as stated in bulletin. Required, about \$10,000 worth of iron working machinery, to equip the combined forces with stationary engines as well as marines. The Christianson Motor Co. providing the former and the Swift Motor Co. the latter.

Fort William, Ont.

Tenders called for bank, \$25,000 (Victoria avenue). Owner, Geo. A. Graham, Fort William. Architect, C. Wirth, Fort William; 3-storey, terra cotta and brick, concrete foundation, 25x100. Tenders received until July 8th.

Hamilton, Ont.

Equipment required for boiler room, \$10,000. Owner, Canadian Westinghouse Co., Hamilton, Ont. Engineer and architect, Westinghouse, Church, Kerr & Co., 8 Bridge street New York. Two storeys, 79.7 x 49.7, brick and steel, electrical work, steel beams. Required, one boiler, low pressure, for heating building, at once. Company does its own construction.

Plans being prepared for factory, \$400,000. Owner, Standard Underground Cable Co., Hamilton and Pittsburgh, Pa.; architect, Prack & Perrine, Hamilton. Three storeys, brick and structural iron bldg., 64 x 335 feet; 1 storey, sawtooth building, 60 x 224; 1 storey, sawtooth building, 60 x 250; 1 storey building, 64 x 90; 1 storey building, 30 x 70; also office building with other small buildings, reservoir, etc., steel and brick, tar and gravel roofing.

Equipment required for addition to factory, \$12,000. Owner, Zimmerman Knitting Co., Hamilton; architect, P. M. Smith, Hamilton. Two storeys and basement, 126 x 130, brick and steel, stone foundation, steam heating. Fire-wall and steel stair tower required. Tenders are being called privately.

London, Ont.

Mayor Beattie and Ald. Saunders contemplate the erection of a paving plant here and are investigating the plants at Toronto and Hamilton.

Tenders called for vault fitting. Owner, County of Middlesex, Ont., County Clerk, T. E. Robson; County Engineer, Chas. Talbot, London, Ont. Steel fittings for the south vault of Registry Office for North and East Middlesex on Court House Square, London; vault room, 14 x 24 feet. Plans, etc., to be submitted with tender. Tenders were received until noon, July 4th by County Clerk. Advt. in "Tenders and For Sale Department" of this issue.

Montreal, Que.

H. Forget, 1956 Dufferin street, has plans prepared for erection of a 12-flat building, 100x40 ft., on Christopher Columbus street, \$12,000.

The Montreal Locomotive Works, Ltd., Ottawa Bank Building, have had plans prepared by American Locomotive Co. for factory at Longne Point, \$34,000. Percy Webb, manager.

Niagara Falls, Ont.

Plans prepared for store and apartment building. Owner, W. P. Dixon, Niagara Falls Centre (private plans).

(Continued on page 61)

Tenders and For Sale Department

To Architects

P. Bon. French Architect, 1811 Rue St. Urbain, Montreal; formerly architectural expert for the Courts of France, "Master-of-Work" of the Union—the syndicate of French architects, designer of numerous important architectural constructions erected in France, desires either association with architect having work in hand, or the direction of an architectural drafting office in a large firm. 27-28

Notice to Ditch Contractors

Tenders Wanted

Tenders will be received by the undersigned up to 2 o'clock p.m., on Friday, July 14, 1911, for the construction of Municipal Drain No. 1 in the Township of Maryborough, containing about 33,000 cubic yards of excavation.

Plans, profiles and specifications of this drain may be seen at the Township Clerk's office in the Village of Moorefield.

The lowest or any tender not necessarily accepted. Satisfactory bondsmen or a marked cheque of 5 per cent. of the tender will be required.

W. W. SCOTT,

Clerk of Tp. of Maryborough.

Moorefield P. O. 27-28

Notice of Extension of Time for Acceptance of Tenders

CITY OF TORONTO

Tenders

For the

Construction of a Seawall

In Lake Ontario, in the Vicinity of the Exhibition Grounds.

Tenders will be received by registered post only, addressed to the Chairman of the Board of Control, City Hall, Toronto, up to noon on Monday, July 17, 1911, in place of Monday, July 3, 1911, as previously advertised, for the construction of a Sea Wall in the vicinity of the Exhibition Grounds.

Envelopes containing tenders must be plainly marked on the outside as to contents.

Specifications and forms of tender may be obtained on application to the Department of Railways and Bridges, City Engineer's Office, Toronto.

The tenderers shall submit with their tenders the names of two sureties (approved of by the City Treasurer not members of the City Council, or Officers of the Corporation of the City of Toronto), or in lieu of said sureties the bond of a guarantee company, approved of as aforesaid.

The lowest or any tender not necessarily accepted.

F. S. SPENCE,

Chairman of the Board of Control.

City Hall, Toronto, June 26, 1911.

27-27

Bucket Crane

FOR SALE—One full circle, self-propelling, modern 10 to 15-ton capacity Browning size No. 1 Locomotive Crane, standard gauge, 4-wheel truck, 38 ft. steel boom, 8 x 10 engines, equipped to handle Clam or Orange Peel. Will furnish with or without bucket. Attractive price, fine condition, quick delivery. Inspection here.

WILLIS SHAW MACHINERY CO.

39 So. LaSalle Street, Chicago.

CITY OF MOOSE JAW Saskatchewan

TENDERS

Sealed tenders addressed to the undersigned City Clerk will be received in the Council Chamber, Moose Jaw, up to 8.30 p.m. on Monday, July 24th, 1911, for the supply of the following electrical apparatus:—

Contract A.

Fifty 0.6 Ampere, Direct Current, series, Metallic flame arc lamps, complete with globes, etc.
Fifty Absolute cut-out hangers.
One Current Regulator, 50 lamp circuit.
One Mercury Rectifier, 50 lamp circuit.
One Control panel with switches, 50 lamp circuit.

Contract B.

Fifty ornamental arc lamp standards.
Full particulars and specifications may be obtained from J. D. Peters, Electrical Superintendent, Moose Jaw, Sask.
The lowest or any tender not necessarily accepted.

W. F. HEAL,
City Clerk.

25-28



TO CONTRACTORS

Sealed tenders endorsed "Tender for new Government House," addressed to the undersigned, will be received at this Department until noon of Wednesday, July 12th, for Concrete Foundations of the new Government House in Chorley Park, Rosedale, Toronto. Plans and specifications may be seen at this department.

An accepted bank cheque payable to the order of the Hon. J. O. Reaume, Minister of Public Works, for five per cent. of the amount of the tender and the bona fide signature and addresses of two sureties, must accompany each tender. Cheque will be forfeited to the Crown in the event of the successful tenderer refusing to carry out the work within ten days after acceptance. The Department will not be bound to accept the lowest or any tender.

By order

H. F. McNAUGHTON, Secretary,
Public Works Department.

Department of Public Works, Ontario.
Toronto, July 3, 1911.

Newspapers publishing this advertisement without authority will not be paid for it. 27-27

Contractors' Material

90 Austin 6-yd. two-way Dump Cars, 4 ft. 8½-in. gauge.

Davenport 10 x 16 Dinkey, Standard gauge.

Baldwin 16 x 24 American type locomotive, 4 ft. 8½ in.

Bucyrus 55-ton Steam Shovel, built 1903.

Marion A. A. Steam Shovel, built 1903.
Six Wheel Scrapers.

Two Lidgerwood Cableways, complete.

All of this material in Canada. No duty. Have you anything to sell? Write us.

THE MALES COMPANY,

No. 82 Perin Building,
Cincinnati, Ohio.

Tenders for a Steel Bridge

Sealed tenders marked "Tender for Steel Bridge" addressed to D. Kirkwood, Esq., County Clerk, Brampton, Ont., will be received up to noon on Tuesday, July 11, 1911, for the construction of a 75-ft. steel span over the Credit River, on the boundary line between the township of Clungacousy and Easing, about one mile from Terra Cota.

Specifications may be obtained from the undersigned.

The lowest or any tender not necessarily accepted.

C. R. WHELOCK,
County Engineer.
27-27

Orangeville, Ont.

Corporation of the City of Nanaimo B.C.

Street Paving

Tenders are invited for approximately 14,450 superficial yards of Asphaltic Macadam or other approved paving.

A plan of streets and further particulars may be obtained of the undersigned.

Sealed tenders endorsed "Tender for Paving" to be sent to the undersigned not later than July 21, 1911.

The lowest or any tender not necessarily accepted.

ALLAN WATERS,
City Engineer.

June 26, 1911.

27-29

Tenders for Bridges

Sealed tenders will be received by the undersigned up to two p.m. of Thursday, the 13th day of July, for the following bridge work: One 25-ft. beam span with concrete floor and abutments; one 45-ft. span steel truss with concrete floor and abutments; and the building of concrete abutments under two other bridges, all in the neighborhood of the village of Plattsville in the County of Oxford. Tenders will be opened at Plattsville at the time above mentioned.

The lowest or any tender not necessarily accepted.

For further particulars apply to J. O. Given, Reeve of the Township of Blenheim, or to

F. J. URE,
County Engineer.
27-27

Woodstock, Ont.

Bridge Tenders Tenders Wanted

Sealed tenders will be received by Geo. M. Fox, Esq., Warden, Wellington County, Drayton, Ont., up till 2 p.m. on Friday, July 21st, for building the following:

1. Douglas 40-foot concrete arch bridge and breakwater near Glen Allen.
2. Concrete breakwater, 10' feet high and 200 feet long, near Glen Allen.

For further information apply to

BOWMAN & CONNOR, Engineers,
36 Toronto Street, Toronto.

J. A. WILKINSON,
Morrison, Ont.

27-28

For Sale

Steam and Electric Machinery displaced by Niagara Power. One 125 horse power, one 225 Compound Condensing Wheelock Engines in good condition. Boilers, 14 ft. x 60 in. and 12 ft. x 48 in. complete with iron work and steam connection. Condensers, heaters, belt tighteners, pulleys and shafting. Direct Current Electric Dynamos and Motors from one to eighty horse power. Bargain prices. Write for particulars.

W. R. REYNOLDS,
Supt., Power & Light Commission,
Ingersoll, Ont.

25-27

The Algoma Central and Hudson Bay
Railway Company

Tender for Railway Construction

Sealed tenders for the construction of the Algoma Central Railway Extension from Hobon on the C. P. R., northerly to the National Transcontinental Railway at a point approximately 142 miles west of Cochrane, a distance of 101 miles, will be received up to noon July 15, 1911.

The work includes all construction work to sub grade, and in addition, track laying and ballasting in accordance with plans, profiles, forms of tender and specifications at the office of the Chief Engineer, Sault Ste. Marie, Ontario.

All tenders to be marked "Tender for Construction," and to be addressed to R. S. McCormick, Chief Engineer, Algoma Central Railway, Sault Ste. Marie, Ontario.

The lowest of any tender not necessarily accepted.

26-28

BOARD OF EDUCATION

Tenders Wanted

Sealed tenders addressed to the Secretary-Treasurer of the Board will be received until Thursday noon, July 6, 1911,

for Plasterers' Work

work required in the completion of the addition to Howard school, now in course of erection.

Specifications may be seen and all information obtained at the office of the Superintendent of Buildings, City Hall.

Each tender must be accompanied with an accepted bank cheque for 5 per cent. of the amount of tender, or its equivalent, in cash.

Tenders must be in the hands of the Secretary-Treasurer at his office in the City Hall not later than 12 o'clock noon on the said day, after which no tender will be received.

The lowest or any tender will not necessarily be accepted.

W. W. HODGSON,
Chairman of Committee.
W. C. WILKINSON,
Sec.-Treas.

27-27

Sealed tenders addressed to the Secretary-Treasurer of the Town of Yorkton will be received up till six o'clock p.m. Monday evening,

July 24, 1911, for the construction of approximately thirty-five hundred (3,500) feet of Water Main and thirty-five hundred (3,500) feet Sewer Main in the Town of Yorkton. Plans and specifications may be obtained on applying to the Secretary-Treasurer of the Town of Yorkton, or the consulting engineers. A marked cheque equal to five per cent. of tender must accompany each tender. The lowest or any tender not necessarily accepted.

McARTHUR & MURPHY,
Engineers.
T. F. ACHESON,
Secy.-Treas.

27-28

VILLAGE of TAVISTOCK

Tender for Pumping Equipment

Tenders will be received up to Thursday, July 20th next, for two half million gallon Steam Pumps, one Boiler etc.; also 1000 feet of Fire Hose. Plans and specifications may be seen at the office of either of the undersigned.

The lowest or any tender not necessarily accepted.

F. W. FARNCOMBE,
Consulting Engineer, London.
J. G. FIELD,
Clerk of Tavistock,
Tavistock.

27-28

(Continued from page 61)

Three storeys, 36 x 65, two stores on ground floor, apartments on second floor, public hall third floor. Excavation has commenced.

Equipment required for factory. Owners, McGlashan Clarke Co., Niagara Falls, Ont. Required, punch presses, rolls, etc., etc., suitable machinery for spoons and cutlery.

Fort William, Ont.

Contemplated assembling warehouse, \$100,000. Owner, Canadian Harvester Company; 300x90, solid brick. It is learned on good authority that the above company are arranging to erect a warehouse here. Enquiry being made for materials.

Ladner, B.C.

Subsidiary plant to be established; manufactory. Owner, Fraser Valley Tile and Cement Co., New Westminster. The intention of this company to establish a branch at Ladner for the manufacture of cement tile is announced. This tile is much in demand for draining the delta land of the Fraser Valley.

North Bay, Ont.

Tenders called for business block, \$6,000. Owner, L. Bunyan, North Bay. Architect, H. W. Angus, North Bay. 2-storey 34x48, brick, stone foundation, hot water heating, electric lighting, cut stone, structural iron, sheet metal work, metal ceiling, cornice, iron columns, roofing, pipe covering, plate glass, vaults, skylights, interior finish pine. Tenders were called for all but heating and plumbing until July 3rd.

New Westminster, B. C.

Machinery required for factory (Sapperton, B. C.) Owner, Fraser Valley

Tile and Cement Co., Ltd. Acting manager, S. C. Cook; Supt., J. Wicheil; sec.-treas., C. A. Sutherland. Recently organized through the People's Trust Co., New Westminster. Company in the market for machinery for manufacture of cement blocks and tile; plant to be run by electricity; 26 lots have been purchased in Sapperton with valuable deposits of fine sand and gravel. The company will have also cement, etc.

Ottawa, Ont.

New industry. Thos. Wm. Lehoe, of Fort Wayne, Ind., formerly of Ottawa, is promoting a scheme for the establishment of a large automobile concern here.

Parry Sound, Ont.

Equipment required for pumping plant, \$2,000. Owners, Canada Chemical Co., 510 Manning Chambers, Toronto. Required, two or three stage turbine electrically driven pumps, 8 in. rotary chamber and motor, for fire protection. This company is entitled to fire protection from town. The proposal is to install a pumping plant instead of extending a water main. Negotiations in progress between the town and the company. Information obtained from the company.

Regina, Sask.

The John Deere Plow Company are seriously considering the location of their plant here. W. H. Hutchinson, managing director, Winnipeg branch, 110 Princess street.

Swift Current, Sask.

International Lumber Yard, Swift Current, partially destroyed. A brick office will be built.

Destroyed by fire, two buildings. Great Northern Supply Co., Swift Current, Sask. On the 17th the G. N. Supply Company's building (hardware, machinery, harness, etc.), was destroyed by fire, loss \$75,000, \$30,000 covered; reconstruction not decided.

Saskatoon, Sask.

Warehouse and office building. The Western Canada Saw Mills, Ltd. The having plans prepared by Neil McKinnon, for the erection of a 2-storey warehouse and office building, 52 x 70 feet. Also for new residence for W. F. Watson, general manager of the company.

Plans prepared for business building, \$60,000, 22nd street and Second avenue. Owner, Herbert Weston; architects, Thompson, Daniel & Colthurst. Brick fireproof construction. The architects are also calling for tenders for the new manse for Knox Presbyterian Church, \$10,000; also preparing plans for a residence for Mayor Clinkskill.

Toronto, Ont.

Tenders called for fence and entrance gate. Owner, City of Toronto; F. S. Spence, chairman, board of control. Iron fence and entrance gate for high level pumping station. Plans, etc., obtained from the waterworks department, office of City Engineer, Toronto.

Toronto, Ont.

Heating, lighting and plumbing, etc., required for store, \$30,000 (Yonge street between Shuter and Wilton). Owner, Art Metropole Ltd., Yonge street, Toronto. Architects, Mitchell & White, 35 Isabella street, Toronto. 4-storey, 123x22, brick, steam heating, combina-

tion lighting, open plumbing, freight elevator, ornamental iron and copper, cornice, electrical bells, plate glass, prismatic glass. Tenders for heating, lighting and plumbing open about two weeks; those for elevator will be called in a month's time.

Tenders called for store, \$3,500, 494 Bloor street. Owner, H. G. MacKenzie, Toronto; architect, A. G. Strathy, Ltd., 123 Simcoe street, Toronto. Three storeys, 50 x 18, brick, brick foundation, hot air heating, combination lighting, felt and gravel roofing. Tenders received until July 6.

Tenders to be called for alteration to building (new front), \$5,000, King street west. Owner, Trust & Guarantee Co., King street west, Toronto; architect, Darling & Pearson, Leader Lane, Toronto. Two storeys, front brick, hardwood finish, brick terra cotta, reinforced concrete, structural iron, plate glass, rolled steel frame and sash. Tenders will be called in a week.

Tenders called for three stores, \$9,000. Owner, R. C. Bustard, 21 Heath street, Toronto; architect, J. Hunt, Stanford, Yonge Street Arcade, Toronto. Two storeys, 45 x 58, brick, hot water heating, combination lighting, felt and gravel roof, tile, mantels, metallic lath, skylights, electrical work, steel beams, plate glass, cornice. Tenders received until July 8th.

Vancouver, B.C.

The garage of W. Bauer, Georgia st., was destroyed by fire on the 18th inst. About 23 automobiles were destroyed. Headquarters for Everett and Tudhope cars.

Woodstock, Ont.

The necessary capital for the commencement of an automobile factory is stated to have been subscribed. Mr. Thorpe, representing Clark Automobile Co., of Detroit, is interested.

Woodstock, N.B.

The machine shops of Small & Fisher destroyed; heavy loss; small insurance.

Windsor, Ont.

Factory building, \$15,000. Owner, National Spring & Wire Co., Windsor. Contract for new Windsor factory building, 90x140 ft., reinforced concrete, awarded to Delisle, Culbertson, Winchester Co., 430 Penobscot building, Detroit, Mich. Work will be started within a few days.

CONTRACTS AWARDED

Brantford, Ont.

Stores and apartments, \$9,000. Owner, Dr. J. W. Robinson, Brantford. Architects, Taylor & Taylor, Brantford. Contractor, N. Kew, Brantford; 3-storey 40x56, brick, stone and concrete, hot air heating. Heating and plumbing contracts not let yet. Contract awarded June 28. Building to be completed Nov. 1st, 1911.

Bank and office building, \$30,000. Owner, Royal Loan & Savings Co., Brantford. Architects, L. D. Barber & Chapman, McGiffen Association, Brantford. General contractor, P. H. Secord & Sons, Brantford. Heating and plumbing not let yet.

Medicine Hat, Alta.

Office, \$10,000. Owner, M. Cousin, Medicine Hat. Architect, Mr. Trimble, Medicine Hat. General contractor,

Morton Fulton, Medicine Hat; masonry, Geo. Worthy, Medicine Hat. 2-storey, brick. Building to be completed Oct. 1st.

Montreal, Que.

H. Kellert & Sons, Royal Bldg., have awarded contract to C. E. Deakin, for a 4-storey, light mfg., building, concrete and terra cotta, 75x120 on St. Catherine street, \$50,000.

Office building, \$18,000, Lagauchetiere street. Owner, Wilson Carbon Paper Co., Craig street general contractor, Church, Ross & Co., 22 St. John street, Montreal. Excavation and brick work, J. Morrison, 207 Guy street, Montreal. Three storeys and basement, reinforced concrete, 32 x 70.

Orillia, Ont.

Addition to factory, \$15,000. Owner, National Hardware Co., Orillia. Architect, J. H. Robertson, Orillia. General contractor, E. Webb, Orillia. 2-storey, 45x100x34, steam heating. Contract let June 27th. Contract for heating and plumbing not let yet.

Victoria, B. C.

Site purchased for department store, (Fisguard and Herald). Owners, Hudson's Bay Co., London, England; sec., W. Ware. Sale effected by Messrs. Grant & Lineham. Land purchased front 240 ft. on Douglas street and 120 on Fisguard and Herald streets

Vancouver, B. C.

The terra cotta contract for Dominic Burns Bldg., Granville street, is stated to have been let to the Ladding & McBean, Los Angeles, Cal., \$60,000; Parr & Fee, architects.

Power Plants, Electricity and Telephones

Blyth, Ont.

By-law carried for electric light. Owners, Village of Blyth; clerk, A. Elder, Blyth. Authority given to buy electric light plant and extend fire protection.

Brandon, Man.

Equipment required for street lighting, \$15,000. Owner, City of Brandon; city engineer, R. E. Speakman, Brandon. 150 electric light standards and connections. In response to petition of citizens, City will advertise standard system of lighting as local improvement. City Engineer will recommend purchase of 100 5-light standards at \$150 each. G. A. Patterson, engineer, dynamos and motors.

Edmonton, Alta.

By-law defeated for power development, \$100,000. Owner, City of Edmonton, Alta; city engineer, A. J. Latornell, Edmonton. The by-law to provide for initial work on the municipal power plant at Grand Rapids, north of city, was defeated.

Tenders to be called for electric lighting. Owner, Corporation of Edmonton, Alta. (Electric Light Department). Superintendent, light and power, A. W. Ormsby, Edmonton; superintendent power house, Mr. Huffman, Edmonton. The city is also considering installation of ornamental standards on three or four of principle streets. For further information apply to Mr. Huffman.

Contract for installation of 75 magnate arc lamps to be erected throughout business section of city will be awarded shortly.

Galt, Ont.

Tenders called for purchase of debentures. Owner, town of Galt, Ont. Chairman finance committee, A. M. Edwards, Galt. Cost of plant to distribute electric power, \$25,000, 20 years at 4½ per cent re-payable June 5th, 1931. Interest payable semi-annually on December 5 and June 5 at office of town treasurer or Merchants Bank of Canada, Galt.

Hamilton, Ont.

A by-law will be submitted on July 25th to raise \$505,160 for the purpose of hydro-electric power and light distribution.

Medicine Hat, Alta.

Contemplated, new natural gas well, \$10,000. Owner, City of Medicine Hat, Alta. equipment that will be required: Well drillers. Location not decided, being discussed. This work has not yet been authorized, but is probable.

Nelson, B.C.

Application for license for power purposes. District Water Commissioner, W. F. Teetzel; A. L. McCulloch, mining engineer, Nelson, has made application for license to use 6,300 feet of water for power purposes from the Kootenay River at Granite. The parties behind the project, although names have not been disclosed, are understood to be strong enough financially to carry the work through. Alternative proposition, Mr. McCulloch has also recorded a similar amount of water at Slocan Junction, five miles below Granite.

Orillia, Ont.

By-law to be submitted for power development, \$80,000. Chairman water, power and light committee, councillor Curran. \$15,000 for line between Big Chute and Ragged Rapids, etc. Additional equipment rendered necessary by increased load as follows: Transformer equipment, recording meter, etc., at Big Chute, \$5,000; transformers (step down) in Orillia sub-station, \$4,000; switching and controlling apparatus, switchboard, meters, etc., \$5,000; lightning protection apparatus, \$900; motor and equipment for operating sluice valves in dam, \$750; air compressor, for cleaning generators, \$500; additions to equipment at Ragged Rapids, \$350.

Prince Albert, Sask.

Time for tenders extended for power works. Owner, City of Prince Albert; sec.-treas., C. O. Davidson; A. Holmes, mayor; engineers, C. H. & P. H. Mitchell, Traders Bank Building, Toronto, Ont. Construction of power station superstructure and transmission line part of proposed hydroelectric power development, 25 miles east of city. Plans, etc., after June 9, at City Hall, Prince Albert, offices of Canadian Engineer, Winnipeg and Montreal; and at office of the engineers. Tenders on electrical equipment extended until July 15th; received by C. O. Davidson.

Miscellaneous

Edmonton, Alta.

Tenders called for fire hose. Owner, Corporation of Edmonton, Alberta.

(Continued on page 66)

BOILERS



Fitzgibbon Type of Boilers built for McLachlin Bros., Arnprior, Ont.

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Engineers and Boilermakers

Limited

14 Strachan Ave., TORONTO, Canada

(Continued from page 64)

City engineer, A. J. Latonnell, Edmonton. Tenders called for 3,000 feet of fire hose by city commissioners. Sample of hose 6 in. long to accompany each tender.

Goderich, Ont.

The contract for construction of new sewerage system was awarded to Peter Nicholson, Moncton, Ont., \$22,150.45.

Guelph, Ont.

The contract for paving Oxford street from Norfolk street to Glasgow street at \$1.52 per square yard, was awarded to the Tarlitic Paving & Construction Company.

Medicine Hat, Alta.

By-laws carried for industries and fire engine. City Engineer, A. K. Grimmer. The following by-laws were carried: Auto Fire Engine and apparatus, \$10,500; J. H. Preston Planing Mill, 4 acres of land on industrial site; electricity at manufacturers' rates, etc.; Medicine Hat Milling Co. 150,000 ft. of gas every 24 hours free of charge for 5 years, etc. May or Milne.

Ottawa, Ont.

The following permits have been granted recently: A. J. Cawdron, residence, Marlborough avenue, G. Bannister, builder, \$4,500; William Fields, dwelling, Stewart street, \$3,500; Fred Diamond, apartment, Frank street, \$10,000, and tenements \$14,000; James Walters, dwelling, Sophia street, \$8,000; J. M. Garland & Son, warehouse, A. L. Weeks, architect, and Alex. Garvok, builder, \$30,500; John Heney & Son, coal chute, Catharine street, \$18,000; A. B. Foster, dwelling, N. Hollister, builder, 2nd avenue, \$5,000; Caleb Chambers, dwelling, Drummond street, \$3,000; F. Lefaiber and V. Boisvert, dwelling, Oak avenue, \$2,500; J. S. J. Routhier, dwelling, Botellier street, \$2,800.

C. P. Meredith is preparing plans for a residence for E. Barrett on Carling avenue. It will be solid brick, to cost about \$6,000; C. P. Meredith, architect, is preparing plans for a residence for D'Arcy McGee on Marlborough avenue which will cost about \$15,000.

J. A. Ewart is preparing plans for the factory for Rolla Crain Ltd., to be built on Spruce street. It will be a one-storey brick building covering nearly two lots.

J. W. H. Watts, architect, has prepared plans for a synagogue to be erected on Rideau street. It will cost about \$15,000. A. Sugarman is calling for tenders.

The city treasurer has been authorized to call for tenders for city debentures aggregating \$515,500. Offers will be received up to September 24th.

St. Thomas, Ont.

Contract awarded for reinforced concrete coagulating basin. City engineer, M. H. Baker; contractor, G. A. Ponsford, St. Thomas, \$4,990; capacity 400,000 gallons waterworks, others tendered: Perth Contracting Co., Stratford, \$5,157; L. M. McCandless, Sparta, \$7,216; Roger. Bids opened June 27.

Tavistock, Ont.

Tenders called for pumping equipment and fire hose. Owner, Village of Tavistock, Ont.; clerk, J. G. Field; consulting engineer, F. W. Farncombe,

London. 2 half-million gal. steam pumps; 1 boiler, etc.; also 1,000 ft. of fire hose. Plans, etc., at office of clerk engineer. Tenders received until July 20th. Advertisement in "Tenders and For Sale Department" of this issue.

Toronto, Ont.

Tenders called for fire-fighting equipment. Owner, City of Toronto; F. S. Spence, president of the council. Equipment required, fire hose, motor driven combination chemical engine and hose wagon, fire alarm boxes, and wire and cables for fire alarm telegraph. Specifications, etc., upon application at office of fire department, Richmond street. Fire hall tenders received until July 4th by F. S. Spence.

Vancouver, B. C.

Fire hose (5,000 ft. 2½-in. with couplings). Owner, City of Vancouver, B. C.; W. McQueen, city clerk. Successful tenderers, Vancouver Rubber Co., 526 Beatty street, Vancouver, 2,500 ft. "Eureka" \$1.25; Canadian Consolidated Rubber Co., Homer street, Vancouver, 1,000 ft., "Squelcher" \$1.05; Dunlop Tire & Rubber Goods Co., 359 Water street, Vancouver, 1,000 ft. "Imperial" \$1.15; Goodyear Tire & Rubber Co., 1213 Granville street, Vancouver, 500 "Magnet" \$1.00; W. L. Brown, 570 Granville street, Nil.

Winnipeg, Man.

Recent permits include: H. A. Walley, dwelling, Grosvenor avenue, \$4,000; W. B. Chambers, stores and apartments, Sargent avenue, \$2,600; G. H. Vowles, dwelling, Wolfeley avenue, \$2,800; Children's Hospital extension, Main street, \$40,000; Andrews & Son, dwelling, Grosvenor avenue, \$8,000; W. G. & T. G. Blakeley, two brick dwellings, Polson avenue, \$10,000; C. W. Fanthorpe, dwelling, Burrows avenue, \$2,200; A. J. Anderson, dwelling, Evanson street, \$3,000; J. D. Watson, two dwellings, Rosedale avenue, \$6,000; P. Czarowski, dwelling, Slater street, \$1,700; F. Spaven, two dwellings, Magnus avenue, \$2,800; H. Picken, dwelling, McAdam avenue, \$4,500.

New Companies

The Willcox Lake Brick Co., Ltd., Toronto, inc. with capital of \$100,000, to carry on business of manufacturers and dealers in supplies etc. Prov. directors, John F. Lennox and Chas. W. Plaxton, solicitors, both of Toronto.

The North Bay Real Estate and Development Co., Ltd., North Bay, Ont., inc., with capital of \$150,000 to carry on business as a land, building and development company. Prov. directors include Geo. H. Ferguson, Barrister, of Kempville and Jas. K. Paisley, hotel keeper, of Ottawa, Ont.

Death and Watson, Ltd., Toronto, Ont., inc. with capital of \$40,000 to carry on business of electrical and contracting engineers, manufacturers of electrical machinery, etc. Prov. directors, Norman P. E. Death and Lionel Watson, electrical engineers, both of Toronto.

The Beeton Telephone Co., Ltd., Beeton, Ont., inc. with capital of \$75,000 to carry on business of a telephone Co.

in townships of Mulmur and Mono, in counties of Dufferin and townships Adjala, Tecumseh, Tossorontion, Essa, West Gwillimbury and Innisfil in county of Simcoe. Prov. directors, David S. Morrow, druggist, and Andrew G. Gaul, both of Beeton.

The Columbia River Lumber Company, head provincial office 18 Hastings street, Vancouver, incorporated, with a capital of \$500,000, to manufacture and deal in lumber and wood products. Robie Lewis Reid, K.C., attorney for the company.

The Yahk Lumber Co., Ltd., Yahk, East Kootenay, B.C., incorporated, with a capital of \$50,000, to carry on a real estate lumbering and general contracting business.

Geo. C. Salt Lumber Co., Ltd., Vancouver, B.C., incorporated, with a capital of \$50,000, to carry on a saw planing mill and general lumber business.

Princeton Lumber Co., Ltd., Princeton, B.C., incorporated, with a capital of \$50,000, to carry on business as lumber dealers, bridge and dock builders, etc.

Mount Lehman Lumber, Timber & Trading Co., Ltd., Mount Lehman, B.C., incorporated, with a capital of \$30,000.

National Real Estate and Investment Co., Montreal, Que., incorporated. \$2,000,000 to carry on business of building construction real estate, etc. Incorporators include Richard T. Heneker, K.C., Alex. H. Duff, and Walter Seely Johnson advocates, all of Montreal.

The MacLumber Co., Ltd., West Lorne, Ont., inc. capital, \$50,000 to carry on business of timber merchants, saw mills, etc., heat office, West Lorne. Incorporators, Arch. McKillop, Daniel McKillop and Hugh C. McKillop, all of West Lorne.

Business Notes

The Ontario Sewer Pipe Co., Ltd., of Mimico, have recently closed the contracts for all three sections of the North Toronto sewerage system. The whole order comprises about 350 carloads or about 45 miles of pipe running from 8 in. to 24 in. in diameter.

The Fort Fraser Land Co., 541 Hastings street, Vancouver, incorporated, with capital of \$500,000, to carry on business of lumber and timber merchants, sawmill owners, to build and operate pulp and paper mills, factories, etc. D. Whiteside, Registrar of Joint Stock Companies.

The Bishop Construction Co., Ltd., Traders Bank Building, Montreal, have been awarded the contract for new Herald Building, corner Craig and St. Alexander streets. Building to be seven storeys with 12,000 sq. ft. floor space. Material, reinforced concrete, brick and terra cotta. David R. Brown and Hugh A. Vallance, architects.

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Contract Record

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Reliance Upon Subordinates

Numerous contractors and indeed many of them with business of considerable magnitude, are very apt to attend to almost all the details of their various projects themselves, without taking anyone in their employment into their confidence to any notable extent. They know just how they have estimated on the work in progress or work for which tenders have been submitted and they know just how they intend to carry on the work to make a profit. But is there anyone else in their employ who can take their place should they be compelled to be absent for a week or a month? Has the foreman exact knowledge of where to buy the different materials and supplies, and on what terms? Does he know anything about the cost of doing the work and what amount should be charged for overhead expenses? Even though he might be able to finish up the work in hand would he be able to estimate on new work? In short would the business of the contractor come to a standstill because he were not able to give his undivided attention to the work?

The greatest mistake that any business man makes is not to have an understudy, a second boss who is able and ready to take up his work in case he should be called away. Some contractors seem so afraid that their foremen will know something about their business that they will scarcely let him know what they have figured on a piece of work, much less ask his assistance in estimating. They fear that if he learns too much he will start in business for himself and that next they would hear from him might be that his tender proved lower than theirs. A man is perfectly justified in wanting to better his conditions, and the foreman who has no ambition to some day take a contract for himself is not of much value as a foreman. Little hesitancy should be shown in taking advantage of any inclination on his part to assist in making estimates. In doing this the contractor is preparing his foreman to start for himself sometime, and is doing it in such a way that will make him an intelligent competitor, who is far less likely

to enter into cut-throat competition than a man who knows little or nothing of estimating or the cost of doing work. For instance, if he has learned to make sufficient allowance for general running expenses in making up an estimate, he will not be likely to approach this important matter vaguely when he starts in business for himself, and as an intelligent, conservative competitor he will do well-established concerns less harm than if he were ignorant of the real cost of construction work, and if his sole aim were to bid low enough to be awarded the contract, and then be tempted to skimp the work in order to save himself from serious loss.

Meanwhile, training foremen and office staff so that each may bear a more intelligent part of the business, and that each of them may have some real responsibility, will form a business into such a shape that should the absence of the heads of the firm be unavoidable, even though it be for months, the work will go on very much the same as though they were there for personal supervision, or at least it will be sufficiently well managed that a short absence would not prove disastrous.

Concerning Certified Cheques

The numerous comments that have been received upon the editorial, "Concerning Certified Cheques," published in June 21st issue of Contract Record, are unanimous in subject matter. Without dissenting voice, those whose interest prompted a reply condemned the practice, many of them suggesting it an absurdity that nevertheless had to be respected. Examples were cited that appear outrageous. Here is a sample. One engineer asked for a certified cheque for \$500 to accompany the tender of a highly reputable firm for a contract which at most would not amount to more than a thousand dollars. Another requirement was that the cheque would be retained for nine months in lieu of a bond. The information goes on: "Can you imagine any firm tying up 50 per cent. of the amount of the contract for nine months in lieu of a bond and being paid on its contract as follows: 80 per cent. of the value of the material delivered monthly and the remainder 20 per cent. 30 days after completion and final acceptance."

Another letter instances a case where the contractor is obliged to furnish a marked cheque for 10 per cent of the contract price, amounting to \$1200 and an additional bond of \$10,000 upon signing the \$12,000 contract. At present the marked cheque is not being returned, although the \$10,000 bond would appear to be sufficient security for the satisfactory carrying out of the work.

For the sake of comparison we need merely repeat the conditions prevalent in England, where the sum of 3 guineas is in most cases sufficient to insure the bona fide intentions of the bidder. This cheque is generally returned to the unsuccessful tenderer upon return to the office of specification data and is always returned to the successful bidder. In no case is it retained longer than absolutely necessary, nor is it put into current use by the recipients. Frequently the contractor is asked to furnish additional security which is to be furnished by two corporations and to amount in all to only 10 per cent. of the contract.

The Moncton Times of June 20th calls attention to what it terms "A tremendous outlay proposed on a most unbusinesslike plan," in the following manner:

"The department of public works has issued a call for tenders for extensive work in the

harbor of St. John, which will probably bulk up to \$8,000,000 or \$10,000,000. Contractors are asked to put in bids for a dry dock and ship repairing plant of the first class, for the dredging of Courtenay Bay, for the construction of three steamship berths and of a breakwater. All are to be bid for in the lump. Contractors here are aghast at the proposal.

They say that only a firm which has an outside pull will have any chance whatever of getting the contract. It is pointed out that it will take more than a year, perhaps two years to do the necessary dredging before a stone can be laid for the steamship berths or dry dock.

The specifications are so indefinite also that a concern not having the benefit of confidential relations with the department of public works will be unable to make an offer that cannot be set aside for the benefit of favorites.

A deposit of half a million dollars is supposed to accompany each tender."

Turning to the question of withholding these cheques. One writer to the Contract Record has this to say: "What strikes me at the moment as being rather strange in connection with this certified cheque practice is that the cities like Toronto and Winnipeg almost always cash these cheques. In fact our bank manager informs us that he knows from experience that it is done 99 times out of a hundred by municipalities generally throughout Canada. As you know, these cheques are often kept for a long time after the contract has been definitely settled and the sum of the amounts are rather large (for instance when based upon 10 per cent. of the contract). It means that we have to pay each what amounts to a very large sum in the course of a year to allow cheques like these to lie dormant while the people to whom we have sent them are making use of our money."

Finally, the opinions of contractors in general on this important question may be summed up as in the following letter:

June 28th, 1910.

Editor, Contract Record:

I was much pleased to read the article on Page 35 in the Contract Record of June 21st, and must say that I agree in every particular with the remarks made.

Our company has frequently allowed contracts to slip past us altogether on account of the terms for tendering, especially the matter of certified cheques. I think the demand for certified cheques accompanying tenders should be done away with, especially where companies are known to be reliable. I have seen tenders advertised where deposit cheques have been called for that would hinder any company with small capital from putting in a tender, and have felt that the motive has been to keep out competition. We have also experienced the need of capital caused through the demand for certified cheques.

FAIR PLAY.

Road Improvement

People all over Canada are more or less interested in the movement to ascertain what can be done to improve the condition of the highways, both in town and country, and may, therefore, desire, to learn something of the work that is being done in an older country in that direction. Under the heading 'Improved Country Roads,' the following remarks have been published in an English paper:

'Pedestrians, cyclists and motorists are appreciating the extension of tar-sprayed roads to the country districts, though as yet only a stretch here and there is met with. Experiments have been carried out on the main Gloucester road, about the best highway leading from the city, for years past, and it is agreeable to find that at last Somerset is following the lead. A mile of the road has been tarred in the Long Ashton village, and the improvement is such, that with motors dashing past, the dust raised is scarcely perceptible. A report was submitted to the surveyor at the district council meeting this week, and, there being three tons of tar left, it was amusing to find how eager members were that it should be utilized in their own particular parish. The outcome of the discussion which ensued was that any parish willing to bear the cost of the tar and the use of the machinery, could have free of cost the labor, the most expensive item. Seeing that the Surveyor holds that a coating would not only make the heavily worked roads more tolerable for the persons using them as well as for residents and property adjoining the roads but would also be economical, the wonder is that road authorities in the country districts do not more extensively adopt the system. As is the case in many commercial matters, the initial outlay prevents people adopting what in the long run is economical, to say nothing of improvements in other directions.'

The officials of the Canadian Pacific Railway report that since June 30th, 1910, nearly 500 miles of new lines have been built. The annual report of the company for the fiscal year of 1910 gives the total Canadian mileage of the railway at 10,270.6. The C. P. R. has now in commission in Canada 10,758.80 miles of track.

Equally satisfactory are the figures showing the new track mileage under construction by this company. It is reported that 1,023 miles of track are now being laid, of which 897 miles are single track. Of the balance in double track 11 miles are being laid in connection with Montreal terminals; 15 miles between Smith's Falls and Gletnay; 77 miles between Portage La Prairie and Brandon, and 23 miles between Pasqua and Caron. The last mentioned is probably the only extension that will not be completed and in commission this year. Of the double trackage at the Montreal terminals the greater part has been laid in the Place Viger yards. 95 per cent. of the grading on the Portage La Prairie line has been done.

The single line construction includes sections practically from ocean to ocean, 20 new lines in all being under construction. The longest of these is from Craven to Colonsay, a distance of 110 miles. Half of this has already been laid. The Outlook-Kerrobert extension which is 101 miles long will take some time to complete as it includes a big bridge at Outlook. A 46 mile extension between Forwards and Lethbridge is expected to be finished within a few months as 26 miles of track have already been laid.

Other branches which will be finished in a short time are Wardner northerly; Galloway to Waldo; Cameron Lake to Alberni; Tilston to Alida; Irrivana to Alberni and Coldwater to Bethany. The latter branch is 76 miles long and is being built as a new grain route from Victoria Harbor to Montreal. This is expected to be completed by the time this year's western crop is ready to be moved.

Wood Reinforcement for Concrete

Ligno-Concrete More Economical than Ferro-Concrete of Equal Strength—Opinions of English Engineer—Results of Important Tests.

Although the use of metal rods for the reinforcement of concrete has come largely into use during the past half century, it is known to have been applied as a reinforcing material by the Romans as early as 100 B.C. History gives us the information that a still earlier practice of the builders of antiquity was the use of concrete reinforced with wood. This dates from the construction of the great wall of China. Mr. G. O. Case, an eminent London engineer, has recently made a series of investigations upon its use and states his belief that ligno-concrete structures of certain types can be produced more economically than ferro-concrete structures of equal strength. A report of his work is given by Mr. F. J. Gray in *The Surveyor*.

Mr. Case about two years ago set himself the problem of finding for reinforcement a material at once equal to and cheaper than steel. His selection had to be made of one of the other materials or of the woods. None of the other metals of high tenacity possesses the advantage of cheapness over steel, but all the woods are cheaper than steel, and some of them are strong in tension. It is the practice to use wood members in tension in the lattice work of timber bridges, roofs, granaries, and similar purposes, and, as a general rule, when the members of such structures fail, it is not due to tensile stresses, but to shear. The tenacity of wood beams depends upon the fibres of the vascular tissue, and consequently it is greatest along the grain, those timbers being the strongest in which the fibres are straightest and most distinctly marked.

"Taking the tensile breaking stresses of mild steel to be 80 tons per square inch, the tensile strength per square inch, and the required sectional area of the hard woods may be stated in percentages of the value of steel:—

Material	Tensile strength	Sectional area
Mild steel.. . . .	100	100
Tallow wood.. . . .	21	476
Teak	19	526
Jarrah	19	526
English oak	13	769

The cost of these woods differ somewhat, but taking oak—the weakest in the list—to be one-thirteenth of that of mild steel per cubic foot, and allowing for 7.69 times the sectional area of steel, it is seen that oak is over 40 per cent. cheaper.

"In constructing a ligno-concrete beam, Mr. Case carefully embeds in Portland cement concrete, so as to leave no voids, four die-square wood tension pieces. These wood pieces have a sectional area calculated to render them somewhat stronger in tension than the usual steel rods of a ferro-concrete beam of the same dimensions. For example, he uses $\frac{3}{4}$ -inch wood of square section in place of $\frac{1}{4}$ -inch steel rods. These tension pieces he fixes in position either by means of iron straps or by wood ties, spaced at suitable intervals and fastened by screws. A framework is thus obtained, very convenient for use

in moulding the concrete, but it is understood that rigidity of the framework is not essential to a ligno-concrete beam.

"Comparative tests have been made of ligno-concrete, ferro-concrete and concrete beams at the Brighton Municipal Technical College. Each of the beams tested measured $4\frac{1}{2}$ inches broad, $4\frac{1}{2}$ inches deep and 55 inches long. They had been made in the open air, in wooden moulds, and had been cast four at a time from the same gauging of concrete. The granite concrete used was composed of one part granite chips, one part sand and one-half part Portland cement. The wood reinforcements were arranged in the moulds so as to leave $\frac{3}{4}$ inch of concrete outside them, and the softer woods were immersed in water for a time to counteract the effect of shrinkage when encased in concrete. Siemens-Martin steel was used for reinforcing the ferro-concrete beams. The object of the tests was to find the respective loads applied at the centre of a span of 42 inches at the time of initial cracking and of rupture, and the results obtained are tabulated below, in the order of the stresses. These tests amply demonstrate the efficiency of ligno-concrete; for they show that wood of suitable dimensions can impart to a concrete beam of a given size a tensile strength equal to that imparted by ordinary steel reinforcements.

Description of beam	Age of beam, days	Initial cracking load	
		lb.	lb.
Granite concrete, reinforced with four $\frac{3}{4}$ -in. jarrah rods, connected by six $\frac{1}{2}$ -in. by $\frac{1}{8}$ -in. iron straps	10	850	3,300
Remarks:—Crack gradually opened. Rods broke at maximum load.			
Granite concrete, reinforced with four $\frac{3}{4}$ -in. tallow-wood rods, connected by nine $\frac{5}{8}$ -in. tallow-wood cleats	10	1,050	3,150
Remarks:—Four cracks gradually opened. Rods broke at maximum load.			
Granite concrete, reinforced with four $\frac{3}{4}$ -in. teak rods connected by six $\frac{1}{2}$ -in. by $\frac{1}{8}$ -in. iron straps	12	1,400	2,500
Remarks:—Three cracks gradually opened. Rods broke at maximum load.			
Granite concrete, reinforced with $\frac{3}{4}$ -in. spruce rods connected by six $\frac{1}{2}$ -in. by $\frac{1}{8}$ -in. iron straps	6	Initially cracked in cartage	
			3,250
Granite concrete, reinforced with four $\frac{3}{4}$ -in. oak rods connected by six $\frac{1}{2}$ -in. by $\frac{1}{8}$ -in. iron straps	14	1,400	2,240
Remarks:—Cracks gradually opened. Rods broke at maximum load.			
Granite concrete, reinforced with			

four 3/4-in. ash rods connected by six 1/2-in. by 1/8-in. iron straps	12	1,000	1,800
Granite concrete, reinforced with four 3/4-in. mahogany rods connected by six 1/2-in. by 1/8-in. iron straps	12	1,200	1,595
Remarks:—Cracks gradually opened. Rods broke at maximum load.			
Granite concrete, reinforced with four 3/4-in. steel rods connected by 1/16-in. wire links	14	900	1,500
Gritty beach concrete, reinforced with four 3/4-in. steel rods connected by 1/16-in. wire links ..	15	500	1,000
Remarks:—Cracks gradually opened. At maximum load steel rods bent up and concrete cracked off.			
Granite concrete not reinforced ...	10		650
Granite concrete not reinforced ...	12		425

"Among other experiments which Mr. Case has made were some for adhesion. He found, on cutting away the concrete from ligno-concrete beams three months old, that the adhesion to the concrete of the woods—both hard wood and soft wood—was perfect. The coefficient of contraction of concrete setting in air is given by Considere as 0.0005 and this contraction probably counteracts the small shrinkage of hard wood or of creosoted soft wood. On this account the wood reinforcements have no tendency to fail by shear, and their full tensile strength—which is considerable—is exerted before rupture under the breaking stress.

"It is too early now to require practical proof of the durability of ligno-concrete structures; but evidence is available from which its durability may be inferred. The wood reinforcements can rot only by moisture passing through the concrete from outside. The steel rods in ferro-concrete, which in this sense are analogous, are known not to have rusted in cases where the ferro-concrete was several years old; and there is no reason to think that the wood rods would be affected to any greater degree. Certainly it might be prudent to creosote soft woods to prevent them from absorbing any moisture from the setting concrete; but the hard woods would take up practically no moisture from that source. It is certain, too, that dry rot cannot occur provided the wood is well seasoned, or its sap removed and replaced by a preservative; and it is obvious that wood imbedded in concrete cannot decay from the action of germs in the atmosphere.

"Mr. Case estimates the selling prices, at Brighton, of piles and beams made of ligno-concrete, ferro-concrete, pitch pine, and oak to be as follows, per cubic foot: ligno-concrete, 2s. 3d.; ferro-concrete, 2s. 7d.; pitch pine, 2s. 6d.; and oak, 3s. 6d. Hence, ligno-concrete is over 16 per cent. cheaper than ferro-concrete, and over 38 per cent. cheaper than English oak. It appears, therefore, that in ligno-concrete the requisite properties are combined, fitting it to become a substitute for timber in building construction. It possesses great strength, and is more economical and more durable than timber

Wherever costly hardwoods have been used in the past for piles, beams and the like, the application of ligno-concrete appears to be indicated in the future; wherever timber is required for harbor works, wharves and groynes, ligno-concrete may be adopt-

ed economically; wherever fencing and similar works involving a great consumption of materials, are continually being constructed, ligno-concrete may be employed to the benefit of afforestation; and, in short, ligno-concrete is calculated to supersede timber work to the same extent as ferro-concrete has superseded structural steel work."

City Planning

Montreal recently had a visit from Mr. Dunnington-Grubb, B. S. A., who has just resigned the superintendency of the improvement work now being carried out in connection with the Peace Palace at The Hague. He is touring Canada for the purpose of studying conditions in our large cities. He has the reputation of being one of the leading landscape architects in Great Britain and his wife stands almost as high in the profession as he does. It is said to be the intention of Mr. Dunnington-Grubb to take up the practice of his profession in Montreal at the conclusion of his trip to the Coast.

In an address delivered at Westmount during his stay in Montreal Mr. Dunnington-Grubb expressed himself very strongly against the square block design of cities. Such an arrangement, he said, did not lend itself to distribution from the centre of the city. The square block was usually adopted regardless of topography. He favored a system such as existed in Paris and Vienna where the streets radiate from a centre to circular boulevards. It was not, however, merely wide boulevards and beautiful public buildings that were needed to make a city lovely and healthy. These would be useless if the masses of the population were herded in insanitary tenements where they were deprived of abundance of fresh air and sunlight. Modern town planning should be made to control individual enterprise so as to secure the greatest amount of health, happiness and prosperity for every individual in the community. The lecturer also touched on transportation, production, economy, land ownership, and the distribution of the land in a city. The traffic and transportation problem was one that required careful study and a wise solution, and the sooner this question was faced squarely and manfully the better for the community. He referred to the fact that the city of Paris had granted 300,000,000 francs for new embellishment schemes; the new Australian capital also was paying due attention to this important subject. Experiments were being tried in Chicago with the object of doing away with mercantile transportation in the centre of the city. Overhead traction, the lecturer said would, he believed, find no favor. Quite apart from aesthetic considerations it was imperative that nothing should interfere with the free circulation of air and the free access of light to all living places. Multiple decked streets we would undoubtedly have, but traction should be carried on below the thoroughfare rather than above it. The highest level in the street should be the pavement. Immediately below this he would suspend the entire system of pipes required for civic purposes including electric cables, water service, compressed air and vacuum cleaning tubes. Lower yet would come the electric goods transportation service communicating with all houses underground, while at a still lower level rapid transit service would be installed. Above the street the air would be as pure as in the open country.

Progress of the Toronto Filtration Plant

Work will be Completed in October—The Quantity of Concrete Assuming Gigantic Figures—Fifth Article of the Series upon this Enterprise,

Special to the Contract Record.

It will be remembered that as far back as 1896 Mr. Mansergh, the eminent English engineer, recommended obtaining a supply of water from Lake Ontario, this supply to be filtered before delivering to the city. The advance in the science of water purification since that time has been marked and the plant now nearing completion at Toronto embodies the latest ideas on the subject. For the purpose of recapitulation it may be stated that the plans were prepared for the city by Mr. Allan Hazen, as consulting engineer to the City Engineer, Mr. C. H. Rust. The contract for the complete plant was awarded in May, 1909, to Messrs. Dill, Russel & Chambers, Toronto, who commenced operations almost immediately, and

each 117 by 213 feet in plan. These are grouped equally on either side of the regulating houses and sand bins. Each filter has an inverted groined arch floor and a similar ceiling, the latter supported by square concrete piers 13 feet to centres.

The water upon leaving the 36-inch branch at the entrance to the filter is spread over the surface of sand to a depth of 6 to 8 inches, and is then obliged to filter through three feet six inches of specially cleaned and graded sand. Under this there are three layers of broken stone and gravel to a depth of about 12 inches, the lowest layer consisting of about seven inches of 2-inch clean-washed broken stone as shown in Fig. 1. Fig. 2 shows the interior of the filter with



Fig. 1.—Filter beds showing first layer of broken stone



Fig. 2. Filter beds containing 3 layers of broken stone and gravel

have employed a large gang of men throughout the past two summers and well on into the winter months. Mr. A. Richley, who has had a wide experience in work of this nature, is in charge of the work for the contractors. Mr. F. F. Longley is engineer in charge for Mr. Hazen.

The water problem in Toronto has been the subject of innumerable suggestions for some time, and the clarion "boil the water" has in no wise become as great a nuisance as the means of obtaining pure water is a handicap. Since the publication of the last article of this series (see Contract Record, September 28, 1910), the construction of the filtration plant on Centre Island has taken on the appearance of being in a fair way toward completion, and the finishing touches will in all probability be applied in the course of a few months.

The plant has been described in detail in previous articles as to general plan and layout. It will be remembered that from the pumping station the water to be filtered will flow through a 72-inch reinforced concrete pipe, from which two 36-inch branches are taken off at right angles to the inlet pumps under each filter entrance. There are twelve of these filters,

these three layers in place and ready to receive the sand.

Upon reaching the broken stone the newly filtered water is collected in 10-inch split tile or channel pipes, which drain into a main pipe at intervals of 13 feet. This main drain is built of concrete and is about six feet in width. It carries the water through a 24-inch cast iron effluent pipe to one of the regulator houses. Each of these pipes is provided with a reinforced concrete Venturi meter. The regulator houses will fill a very important function in the operation of the filtration plant, containing as they do the outlet pipes and controlling gates of the several filters, the means for controlling and refilling the filters after cleaning, as well as the device for obtaining an accurate measure of the velocity of the water through the filters. From there the water will pass to the pure water reservoir, an illustration of which is shown in Fig. 3. This shows the piers in place and ready for the roof, which has since been completed and appears in Fig. 4. This pure water reservoir is 312 feet square, covering an area of $2\frac{1}{4}$ acres. The floor contains over 2,500 cubic yards of concrete, the roof concrete being the same. There are 529 piers (see Fig. 3), each 13

feet high, and spaced 13 feet centre to centre, each way. The walls are 14 feet high and average nearly three feet in thickness. The floor level is about seven feet below the ordinary level of the lake. The water when it reaches this reservoir is filtered and ready for use.

For the operation of the filters a constant supply of washed sand has been provided. Four circular

which has the effect of reducing the velocity of flow from the pipe. The coarser gravel settles through an opening and is carried to a screen by a drag operated by an endless chain. The remaining material passes into a large V-shaped box, the dirt and the finer sand flowing over the top with the surplus water. The heavier sand and fine gravel settles to the bottom of the box and is carried by spigot pipes to a washer box. Here water pressure is applied to the bottom of the box and the remaining fine material removed. The sand is then elevated by bucket conveyor to storage bins and from there by cars to the filters.

The laying of the 72-inch concrete pipe connec-

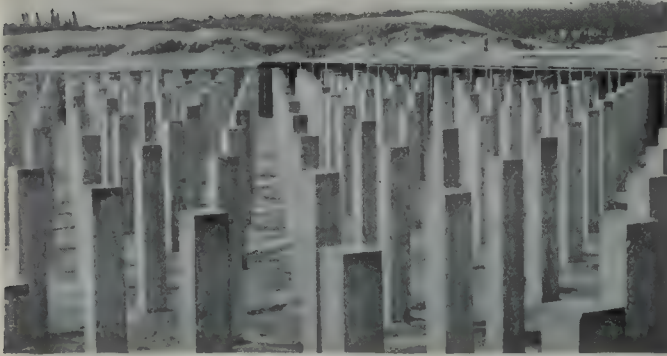


Fig. 3.—Pure water reservoir before roofing

storage bins were constructed, each of which has a capacity of 612 cubic yards, an inside diameter of 34 feet and a depth of 21 feet.

Returning to the operation of filling these filters, Fig. 5 illustrates the screening plant used to obtain the layer of 3-8 inch gravel which forms the top layer of the coarse material in the filters. The ma-



Fig. 4.—Pure water reservoir with roof in place.

terial from the pure water reservoir to the present city intake is illustrated in Fig. 8. This was a particularly difficult piece of work as the bottom of the trench was 13 feet below the lake level and the proximity of the lagoons made it difficult to handle the water, especially as the main trench crossed the drainage canal, which surrounds the whole plant (its total



Fig. 5.—Screening plant for coarse gravel.

terial used was the screenings from the screens providing concrete material, and was carried from a chute by an endless belt up an incline and dropped upon vibratory screens on which water was sprayed to remove all dirt and sand. Figs. 6 and 7 show the plant for rendering the filter sand ready for use. The crude material is delivered to this plant through pipes from a large dredge to a gradually widening table,



Fig. 6.—Washers for filtered sand.

length being 4,000 feet), and the water had to be kept low in this canal to permit of the whole operation of the work being carried on as usual.

Since our last article on this subject was published, about 300 men have been constantly engaged in the various portions of the work. Very rapid progress has been made in the concrete work, the total quantity placed being nearly 45,000 cubic yards.



Laying of 72-inch pipe connection to city intake

Considerable interest has been evinced in the construction of the sand washer plant, previously described, in the design and construction of which the contractors were assisted by Professor Haultain, Engineering Faculty, University of Toronto.

At the present time the pure water reservoir is completed. The pumping plant in the pumping sta-

Reinforced Concrete as a Sound Deadener

The charge has been made against reinforced concrete, that it transmits sound too readily, and is therefore not adaptable to dwellings, halls, etc. The sound waves penetrating into a solid body are propagated with less loss, the more homogeneous a body is. The various degrees of sonorousness are only functions of the surface hardness of the body which receives the sound waves. Thus wood transmits sound less than iron, because it reacts less to the activity of the shock as the sound waves strike it. The same applies to reinforced concrete. It is much less sonorous than iron, and reinforced concrete reacts infinitely less to the action of the sound waves than any other material. Concrete is of such a heterogeneous composition, that it does not take up the sound waves that strike it, and therefore, does not send them along as iron does. If there are any transmitted, they are transmitted in such a bad form that they have no influence at all upon the acoustic qualities of a room. Perfect deadness to sound can be obtained much more easily in a concrete building than in an iron one. It is only necessary to interpose a very thin body between the concrete and the sound to get this condition. A simple linoleum placed upon the floor of a concrete building, is sufficient to ensure perfect deadness to sound. This is impossible to obtain in a frame structure. However, care must be taken to avoid cement or brick floors placed directly over reinforced concrete floor-beams, for the change of medium in this case will transmit sound and counteract the good effects of the concrete. There is no reinforced concrete construction that cannot be made sound-proof with a little care and thought. On the other hand, it is impossible to reach complete deadness to sound in construction where the metal is the predominating element. Iron transmits sound so perfectly that it is next to impossible to reach the desired effect as can be done in reinforced concrete.—*Le Ciment Arme*.



Fig. 7.—Washers for filtered sand.

tion is practically all installed. Eight of the twelve filters have been completed so far as the concrete work is concerned, and the other four will be finished in a month's time. Two have been filled with sand, and it is expected that everything will be ready for operation early in October.

Owing to a shortage of cement and unfavorable weather conditions the building returns of Edmonton show a marked decrease from those of the month of May.

Relation of the Contractor to his Foreman

Good Foremen are Money-Savers—They Lower Cost by Increasing Efficiency—The Question of Bonuses as Incentives.

By Daniel J. Hauer.

In contract work, or in fact in any class of construction, the foreman factor is an all important one. Thousands of men are thus employed, and the employer is entirely dependent upon the foreman for the handling of all details of his work. Their success means success for him, their failures and shortcomings mean money losses for them. Frequently we hear foremen and contractors say that although a profit has not been made upon a certain piece of work yet a loss has not been sustained.

The writer has always asserted and maintained that if a profit has not been made by a contractor, that money loss has been sustained, as in the contracting business it is not possible to stand still. We must either go forward or else we take a step backwards. There may not be a direct loss on the job, but the indirect loss may soon show itself and be keenly felt. To illustrate: A railroad contractor with a twenty team scraper outfit undertakes a contract to build a section of a road, and at the end of a year's work he draws his final estimate and balances his books he finds his profit and loss account is balanced and he congratulates himself upon the fact that although he has not made a profit yet he has not lost money. But he has. His money is worth money and if interest has not been earned on the capital invested that much has been lost. His time, too, is worth money, and if a profit has not been made to recompense him for the time and thought put upon the job, he has lost money. During the year, the horses and mules and the scrapers and other tools have been exposed to all kinds of weather and worked to the utmost, so that they are not as fit to start a new job as they were before. In other words they have depreciated in value. This is a money loss that soon makes itself manifest. Thus the contractor's time has gone for naught, and his capital has depreciated so that he has sustained serious losses.

A contractor must always be attentive to his duties, but his close attention means but little unless his foremen are alert and try to work for his best interests. Many foremen state that if they cannot make money on a job for a contractor they want to resign. This is as it should be if it is the fault of the foreman, but if it is not, a foreman makes a grievous mistake by resigning when a job is not netting a profit. At times a contractor underestimates the work and takes a job at prices that are so low, that it is not possible to make a profit, and there are occasions when unforeseen conditions exist or accidents occur that turn a seemingly profitable contract into a losing one. There are circumstances over which a foreman has little control and if his labors do not show a profit he is not to blame, but on the other hand he should not desert the ship when disaster overtakes it, but rather put his shoulder to the wheel by concerted action with his fellow foremen and with his employer, the contractor, pull the job through with the least possible loss. A foreman's reputation is not injured by being employed on a losing job, unless money is lost through his fault, and if he leaves the job at such a time, he will suffer

in reputation and he will soon be known as a "quitter," a man who gives up as soon as he encounters difficulties. To continue work will help to make his reputation, but those interested will learn of the circumstances even if he says nothing about the facts.

With easy work, good men, efficient tools and machinery it should not be difficult for any foreman to make money for his employer, but with adverse conditions, when good men are discouraged and with worthless laborers and a run down plant, a foreman who can then bring a job through to completion at the lowest possible cost shows he is a man of marked ability. It is only by overcoming difficulties that we learn; and on a job where there is only trouble and loss, a man has a greater opportunity to learn and make a reputation for himself than where things run smoothly. Bitter and costly experience is the most valuable to us. George Washington showed his great ability at Valley Forge rather than at Yorktown. Valley Forge made Yorktown possible.

Good Foremen Are Money-Savers

Many examples in the contracting business can be cited to illustrate these things. Only recently a contractor was losing money on a heavy piece of construction work located in the east. He himself was ready to give up the work, when he succeeded in obtaining a superintendent or general foreman who was not afraid to be employed on a losing contract. This man reorganized the work, obtained for the contractor certain concessions from the owner, changed the methods of doing the work and ended by turning a losing contract into a winning one. His reputation was materially enhanced so that when he stepped out of his position he went to another job where heavy losses were being sustained, and once more so improved conditions that a profit was made on the job in the end. This man will never lack work, but what would have been the results if he had said, "I cannot afford to let my reputation suffer by working on a money losing job."

A foreman should always be alert to learn and should welcome advice. No matter how long we have been following a particular line of work, there is always something to learn. At all times we should be willing to learn new work and be ready to give it a fair trial. If they are not money-makers they will soon demonstrate the fact and they can then be discarded. Even an artist can learn from a cobbler. Many foremen will take orders from their superintendent and employers as to what work to do, but they will not allow themselves to be advised or instructed as to the methods of doing their work, acting as if those above them could not possibly know more than they do. Granting that this is the case, it is wrong in most cases not to follow the contractor's orders or advice as it is his money at stake and not the foreman's, and it should certainly be the privilege of the contractor to decide how his money is to be spent, when he wishes to assume that responsibility.

There are times though that a foreman might be

justified in ignoring orders or even in directly disobeying them. To illustrate: A foreman asked permission of a contractor to allow him to send a well-drilling machine to drill blast holes for blasting in front of a steam shovel and making holes for deep blasts. This was before the days of using these machines for that class of work. The contractor absolutely refused to allow such a machine to be brought onto his job. The foreman did not argue the question, but as soon as his employer left, he went off and hired the well driller and put it to work. A week or so later the contractor again visited the job and one of the first things he noticed was the well driller at work on a hill. He at once inquired who had hired the machine and when told it was the foreman, who had asked permission to do so, the contractor at once ordered him dismissed for disobedience. Upon being discharged, the foreman went to the contractor and told him that in many ways he had done the proper thing in discharging him, but at the same time he had proven he was right, for with the machine he had materially reduced the cost of drilling and had saved in a short time several thousand dollars. Upon investigation the contractor found this was true and he at once ordered the foreman to be taken back and placed in charge of all drilling. He also gave orders to purchase a number of these machines. A short time after this one of the leading engineering journals published a description of the work done by the well drillers on this job, with the result that such machines have been employed on contract work in this country ever since. Here was a justifiable case of disobedience. A case showing that the foreman was a man of his convictions and willing to sacrifice himself to prove that he was right, and by doing this, gave the construction world an efficient tool.

The cost of foremen to a contractor is a heavy item in his expense account. The smaller the job the larger is the proportionate cost for a foreman. In earth and rock excavation this expense may sometimes amount to several cents per cubic yard and may be no inconsiderable part of the total price the contractor may receive for his work. It lies entirely with the foreman to lessen this cost. Not by taking less wages, but by increasing the efficiency of his forces and the machines that he has in charge.

The wages paid to a foreman should hardly be taken into consideration, provided he obtains results. To hire a foreman because he can be employed for a low wage is false economy. His ability should be considered and if he is found to be efficient and experienced he should be engaged.

Hiring foremen and deciding upon their wages is a most important subject. It is difficult to judge a man's ability as a foreman from his appearance and a short talk with him. Most of them are very apt in telling of the work they have done and of how they can manage men and obtain remarkable outputs from machines. Good foremen are always scarce and when in need of one, if it is not possible to obtain a man that is recommended by some other contractor or engineer, or one who is known, it is necessary to employ a foreman who may apply for a job. He is an unknown quantity, and it is always a question as to what salary to pay him. A contractor is not looking or rather should not be looking for a low priced man, but at the same time he does not want to pay a man who may be inefficient and be discharged within a week or two a large salary. A good method in such cases is to employ a man, say at a daily wage of three

dollars, and tell him that if he proves satisfactory within a month he will be paid the standard wages of four to five dollars per day. A man without a job cannot object to being employed in this manner and the contractor protects himself somewhat by this method.

Some contractors pursue this course, and when they secure a good man soon place him on a monthly salary instead of a daily or weekly basis. This means the man has regular employment even during bad weather, and receives a stipulated salary. When work has to be shut down or the contractor finishes all his jobs without obtaining new ones, the best of the monthly men are selected and left on the pay roll and given such work as overhauling outfit and repairing and painting tools and machinery.

Value of Weekly or Monthly Bonuses as an Incentive

Some contractors find that they can not only get the foremen to take greater interest in their work, but the foreman obtains more work from his men and machines by paying the foreman a bonus when he gets better work done. These bonuses are paid for either weekly or monthly work.

In doing this the writer's practice has been to keep a very detailed account of the cost of each foreman's work. All labor, teams, supplies and other expenses are charged against the foreman and the section or part of work he has charge of, at the same time records are kept of the work he does. These daily records are checked against the engineer's estimates, so that the daily records cannot be padded without detection. In this way it is always possible to tell if a foreman is making money for his employer, and it is also the basis for starting a system of rewarding the foreman with a bonus for making extra money. Then, if the foreman does not come up to a certain standard or show a profit on his work, there is cause for discharge.

It is quite surprising to those who have never used this method to find out that many so-called "good foremen" do not show a profit on the work they do each month. On one job of railroad work done by the writer he employed nine foremen, and in order to obtain efficient men he used this method. Three good foremen resigned their positions to take better ones during the job and to obtain the twelve men who proved satisfactory, seventy-seven different men were tried out. A few who showed a profit on their work were discharged for drunkenness.

Such a method keeps a foreman anxious to obtain results and there generally springs up a friendly rivalry between the different foremen doing the same class of work. They also study their men to learn what kind of work the man is best suited to do.

Some years ago the writer had a number of foremen who each complained that one or two men in his gang were not doing good work and should be discharged. In every case the men had been employed for several years, many of them longer than the foremen. Laborers were scarce and it cost from \$15 to \$20 transportation to obtain new ones. The writer, consequently, decided to change his organization for a short time. He selected a foreman who quickly sized up men's ability and gave him the men whom the other foremen were dissatisfied with, to use in his gang, dividing his men among the other crews. This foreman worked these men for about three weeks and showed more profit from their work in that time than either he or any of the other foremen

had ever made in a month. He was anxious to keep these men under him, but the other foremen seeing how their old men were handled and the results obtained, clamored to have their men back and the old organized gangs were formed again, and every foreman got better results from that time on.

The test of a foreman showing a profit on his work each month is a hard one on most foremen. A contractor employed the writer to increase the efficiency of his forces, and he quickly found out that many of the foremen that the contractor believed to be his best ones, really showed a loss on their work each month or the profit was so small that they hardly covered the overhead charges. It was difficult to prove to the contractor that such was the case. One man who was considered an efficient blaster lost money each month on his blasting, due to ignorance of handling explosives.

General foremen or superintendents are employed in most cases on monthly salaries. However, many of them are paid a percentage of the profits made on the job in addition to their salary. This is a bonus to obtain better work from him, and it is generally successful. However, some contractors who do this will not consider paying a bonus to a foreman. If the method works well with the superintendent it will also improve the work of the foremen, and the writer has gone farther than this, by applying it to the laborers themselves.

One great advantage in the last named case is to materially decrease the foreman cost. Men working to make a bonus can be worked in larger gangs, so that the foremen's wages are distributed over a greater amount of work, or by the bonus or task system a few men can be worked at a task, and a foreman's time divided among a number of such gangs, while by the ordinary method foremen must give close surveillance to each man.

The day for a foreman to swear at and beat his men is past. With some he may have to be emphatic, and at times harsh, others may be stirred to quicker and more work by praise. A foreman should study the temperament of each man under him, and handle him accordingly. No two men can be controlled in exactly the same manner. Words of praise are essential to both foremen and men. They are valued as highly by employees as the contractor values commendation from the engineer under whom he is working. Remember that a laborer is a man, and as he is on the lower round of the ladder of life he feels his position keenly and is quick to resent any slight or seeming hardship.

Great care and consideration should be given to placing foremen in charge of certain work, as frequently foremen are given work to do for which they are entirely unsuited. One man may be competent as a sub-foreman and yet be a failure in charge of the whole force, and a man may be successful in running a scraper force, when the teams are owned by the contractor, yet may prove a dismal failure with hired teams. These things are not really the foreman's fault, but rather the contractor's, as the latter should be a quick judge of a man's qualifications and his disposition.

Training Essential to Success in This Position

Many contractors make the mistake of making foremen of good active laborers, the so-called leaders of their gangs. They generally ruin a good laborer and make a poor foreman. The proper way in such

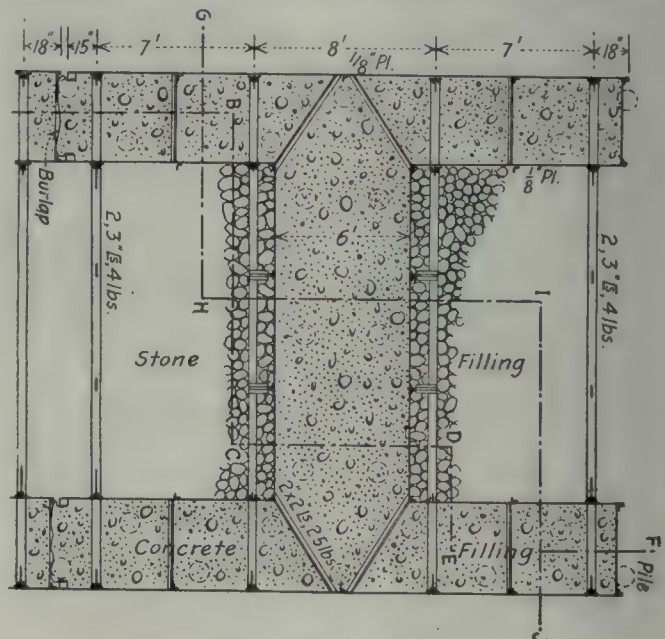
cases is to encourage such men by increased pay, then to make them sub-foremen, then assistants, and finally after this training, promote them to be foremen. The chances are that they will be good ones, as leaders who rise from the ranks by hard work are as a rule competent.

There is no doubt a great field open to young, industrious men of the country to fit themselves for foremen on construction work. Contractors in all sections of the country are continually on the lookout for foremen of ability. They prefer young men whom they can teach their methods. It is to be regretted that many people think the title of foreman a reproach. It is not, and it is as honorable a position as that of clerk or manager. Young men should not hesitate for any such false notions. Their chance of promotion is great, greater even than that in the engineering field.

With less education than that needed for engineering, a young man can start as a foreman and rise higher and quicker. From foreman he can go to superintendent, general manager and become a contractor if he wishes, better equipped for success than through any other channel. Should he possess an engineering education or training it will be an aid to him. The supply of able foremen falls short of the demand.

Steel Forms of Concrete Breakwaters or Piers

The accompanying drawings show the details of a system of steel forms for building concrete cribs for piers or breakwaters, designed by Mr. E. J. Duffies, M. Am. Soc. C. E., U. S. Assistant Engineer now stationed at Harbor Beach, Mich. It is intended that they be used to sink on prepared foundations, be filled with concrete and broken stone and then



Plan of Steel Form with Filling.

topped with a concrete or stone masonry upper works as desired, leaving the steel forms in place to rust away.

Each form is in H-section, the legs and cross bar of which are of structural angles and other shapes, covered with steel plates and braced inside and together with angle struts as shown. Each section

Bituminous Highway Construction

Investigations as to Suitability and Cost—Water-Bound Macadam Versus Asphalt Poured Macadam—Methods of Application.

The form of construction involving the use of bituminous compounds has hitherto been looked upon as entirely experimental. According to "The Contractor" the Illinois Highway Commission during the last few years have constructed numerous roads for determining the following questions.

1st. The general desirability of the poured asphalt or tar macadam road as regards dustlessness, resistance to wear and comfort of travel. 2nd. The relative cost of the water-bound macadam and the tar or asphalt poured macadam. 3rd. The relative cost of maintenance of water-bound macadam and the poured asphalt or tar macadam. 4th. The suitability of an asphalt oil in the construction of earth roads.

In the construction of bituminous macadam roads it was decided to confine the experiments entirely to the poured macadam. It is a matter of common observation that on roads which are traveled exclusively or almost exclusively by farm teams, the traffic confines itself to seven or eight feet of the width of the road, the wheel wear coming entirely upon two strips of the roadway which usually do not exceed two feet in combined width. Where this concentrated traffic is encountered, there is a marked tendency for bituminous macadam to squeeze out along the wheel track, forming a broad depression. The wear also must necessarily be great where the vehicles all follow the same track. This depression will eventually become deep enough to hold water which hastens the deterioration of the road. On village streets there is no such tendency because the traffic must necessarily spread out because of the constant passing. Where these conditions are encountered, it is essential to design a poured macadam pavement so that the lower course shall give stability and the upper course provide a durable wearing surface so placed that the opportunity for lateral displacement of the stone composing it is reduced to a minimum.

Four sizes of stone are used in the state experimental bituminous roads as follows: Stone passing over a 2-inch screen and through a 3-inch screen, designated as 3-inch stone; stone passing over a 3/4-inch screen and through a 2-inch screen, designated as 2-inch stone; stone passing over a 1/4-inch screen and through a 3/4-inch screen, designated as chips; screenings that pass through a 1/4-inch screen, sometimes containing a percentage of chips.

In general, bituminous macadam roads have been made about 9 inches thick at the crown line and about 6 inches thick at the edge after rolling. The stone is placed in two courses, the top course of 3-inch stone being 2 1/2 to 3 inches thick after rolling and the lower course of 2-inch stone being 6 1/2 inches thick at the crown line and 3 1/2 inches thick at the shoulder or curb line after rolling. The lower course is spread, harrowed, rolled and bonded with water and screenings in the manner of an ordinary water-bound macadam roadway. It was learned early in the experiment that an essential part of this form

of construction is to have the top course of uniform texture, and it was found that herein lay the greatest difficulty in the construction; unless every detail is carefully watched from the inception of the project, it is certain that there will be a lack of uniformity in this upper or wearing course. In order to insure absolute uniformity in thickness and texture of the upper course, evidently the lower course must be laid very carefully and finished absolutely true to cross section and grade in every particular. The top course of stone must then be spread with great care so as to insure uniform thickness, it must be harrowed to bring a uniform sized stone to the surface and then be rolled until it is well keyed together. Where the 3-inch stone is used, it has usually been found necessary to sprinkle over the surface after the first rolling a small quantity of 2-inch stone, and to roll this smaller size into the surface, which has the effect of pushing together the larger stones in the surface and keying them up tight so that after this rolling has been done, the surface presented is so compactly knit together that without the addition of any binder it is possible to haul a loaded wagon over the surface with but slight disturbance to the stone. When this condition is realized it seems that the ideal for a poured macadam has been reached. The upper course of stone now presents a surface which is sufficiently stable to carry the weight of the loads which will come upon it and it only remains to add to it something that will prevent the displacement of the stone.

It is estimated that this surface layer of stone will contain about 20 per cent of voids after the rolling. Theoretically all of these voids should be filled to prevent any displacement of the stone, which would require a little more than 2 1/2 gallons per square yard of surface for a layer of 2 1/2 inches thick. Practically, however, this may not be essential because the stones composing the surface have been so locked together that there is no opportunity for lateral movement of any stone unless some of them are first removed from the surface. It is the function of the bituminous compound to prevent that, and on the state experimental roads, 2 gallons per square yard has been the usual treatment. It will often be found that the surface of the road is so open that a smooth surface cannot be obtained without first filling the surface interstices and the chips are used for this purpose, being whipped into the interstices from the shovel. The surface is then broomed to sweep all chips into the voids leaving a clean surface. The voids are then poured practically full of the asphalt or tar binder.

Care in Selection and Application

In the use of bituminous compounds for this purpose, two facts must be taken into consideration. First, the material which is to be used for this purpose must be well chosen and must be appropriate to the conditions under which it will be applied. Second, the application must be made in such a way as to insure that the material will go on the surface in a uniform layer and that the surface will be in such a condition as to permit the material to flow into the inter-

¹Paper by T. R. Agg, Assistant Engineer, Illinois Highway Commission

stices and to fill practically all of the voids in this upper lower of stone which has been discussed.

If a tar is used as a binder, the following method of application has been found to be successful. The binder is received in tank car lots and is heated in the car by means of the steam coils provided in the cars for that purpose. In heating the tar, it is necessary that an ample supply of steam be provided and usually it has been secured from some power plant of large capacity. It is possible to heat the material in the tank car by this means to a temperature of 250 degrees Fahrenheit which is sufficient to make the tars used soft enough for their application. Undoubtedly the temperature at which the material is applied is of great importance, and the temperature which would be correct for one material will not be correct for another. The ideal condition to be reached is that the material shall be sufficiently fluid when it reaches the road to flow into the interstices before cooling. It must not remain as a mat on the top of the stone. In handling tars, the material is forced out of the tank car into a distributing wagon by means of steam pressure applied to the top of the car. Steam pressure has not been found to be altogether satisfactory on account of the water which condenses and remains in the car, but has been fairly so. However, if pressure may be furnished by means of compressed air from a portable compressor the method is entirely satisfactory. The material is then drawn to the road in the distributing wagon and attached to a steam roller and steam connection made from the roller to the top of the distributing wagon; the tar is then forced out of the distributing wagon through a hose and nozzle and is sprayed by means of the nozzle on the stone. This method of distributing is very satisfactory, it being possible to apply either large or small quantities of the material in a very uniform layer to the stone. The only objectionable feature so far observed is the slight amount of water which condenses in the tank wagon. This water turns into steam as soon as the new batch of hot binder is turned into the wagon and may cause the binder to foam badly.

Petroleum Unsatisfactory

The same general method of application has been attempted with petroleum residuum compounds, but has not been found satisfactory because it is impossible to heat the binder sufficiently by means of the steam coil to make it flow through the hose. It cannot even be heated sufficiently to spread by means of hand spreading cans filled from the tank wagon. At the temperature to which the material can be heated by steam the method is not satisfactory because the material is not sufficiently fluid to flow into the interstices; the result is that there are patches on the surface of the road which are unsightly and make the surface uneven to an extent which is perceptible to those who traverse it. In general it is thought that asphaltic compounds should be applied to the road surface at a temperature not less than 400 degrees Fahrenheit, and in some cases the temperature would need to be considerably above that in order to get satisfactory results. The principle mentioned before applies in this case, in that the binder must be sufficiently fluid to flow into the interstices of the stone before cooling. It must not, however, be heated to the flash point of the material if an open kettle is used. In using an asphaltic compound, the best results have been obtained when the material is heated in kettles, drawn off from these kettles into hand

sprinkling cans and poured onto the surface of stone.

The first spreading of these compounds will leave the surface of the road slightly rough where individual stones project partly from the surface, owing to the fact that they have been disturbed by the men walking over the surface in spreading the chips and compound. By rolling this surface with a wet roller before a second spreading of asphalt is applied, this fault can be corrected. After the first spreading of bituminous compound, then the surface of the road should be rolled and then covered with stone chips, and thoroughly broomed so that these chips work into all of the interstices and voids that show up in the surface of the road. This is the most important operation aside from the pouring of the compound, but if it is carefully done an extremely uniform surface can be secured. After this spreading of chips has been carefully broomed, a second spreading of compound in the nature of a paint coat is applied to the surface. In this application not to exceed one-half gallon per square yard of surface should be used. In the first application the amount of compound must be determined by the nature of the surface layer of stone. Usually $1\frac{1}{4}$ to $1\frac{3}{4}$ gallons per square yard has been used in state work.

Experience with the use of various bituminous compounds in construction work led to the conclusion that there are some important variations in the characteristics of the commercial preparations sold for use in road construction. In the absence of accepted standard specifications for these compounds, no attempt was made to secure compounds meeting any certain specification except in a few instances, but all materials used in 1909 and 1910 were analyzed according to approved methods and a record made of the results. It is thought that a study of those analyses and a comparison of them with the behaviors of the compounds on the roads will give information that may eventually be incorporated in a set of specifications.

Summary of Results

Inspections were made in 1910 of roads built in 1909, and the condition of the various tars is summarized as follows:

Sample 101 gave fair results as a binder, holding the surface of the road intact and forming a slight mat on the surface which plainly showed the print of the shoes of the horses. During the hot weather the material softened sufficiently to flow out of the macadam on the earth shoulder at the edge to some extent. The constant kneading of the mat surface seemed to deaden the material so that it began in places to separate from the stone and to become brittle. So far the wear is almost entirely on the mat of tar on the surface of the macadam.

Sample 103. The same general conditions were found as where the No. 101 was used except to a slightly less degree, with the probability that the life of this material will be somewhat longer than that of No. 101.

Sample 104. This material seemed to work out on the surface to an undesirable extent and became quite soft during hot weather, running out onto the earth shoulders in large quantities. The mat on the surface is dead and brittle and is peeling off from the stone. This seems to be the poorest tar used during the season. So far the mat of tar is taking all the wear.

Sample 105. This tar was used on a road so situat-

ed that large quantities of mud were carried onto it during the winter. The tar now appears to be dead and somewhat brittle and does not seem to have held the chips in the interstices of the upper layer of stone. The surface of the road is rough, the wear all coming on the stone.

Sample 106. No report received.

Sample 107. This material has held its life well on a very heavily traveled road. On about 60 per cent. of the surface, the tar has worn off entirely, the surface presenting a mosaic appearance, each stone being surrounded by the tar, the stone forming the wearing surface. On the remainder of the surface, the tar forms a thin mat over the stone and is taking the wear and protecting the stone. This tar is apparently the best one used during the season.

Sample 108. This tar was used in resurfacing work where a considerable quantity of stone dust and mud was found on the road. The tar became brittle and wore off the surface. There has been no loosening of the stone. It is thought that the poor results were due in part to the fact that the tar was applied in cold weather.

Sample 109. About the same results were obtained with this material as with No. 105, it being used under similar conditions.

Sample 110. This material was used under conditions similar to those where Nos. 105 and 109 were used. The results were better, however, the surface being fairly smooth. The chips hold in place in the interstices of the surface. The stone is taking the wear and the surface presents a mosaic appearance.

Samples 111 and 112. With these materials the stone is held in place but the wear is on the stone. The tars here become slightly brittle during cold weather, but in warm weather seem to regain their life. They did not soften enough to flow.

Sample 113. This tar became brittle and the surface of the road cracked up under traffic, due, it is believed, to the fact that the tar was applied during cold weather, and that the road was not in proper condition for receiving the tar treatment.

In general, it may be said that all the roads were dusty except those that had an excessive mat of tar on the surface, and these were comparatively free from dust. This mat, however, is probably short lived and the conclusion is that all tar treated roads will become dusty within two or three years after construction, and that if the mat surface is not obtained, the roads will be dusty from completion. It may also be said that the surface layer of stone, in all cases, is held firmly in place, but that the finer particles in the interstices are not held in place by brittle tars. It is probable that when the mat surface wears off one of these roads, it can be replaced by applying a proper grade of tar in the nature of a paint coat and that this will be the cheapest method of maintaining roads of this character.

Quality of Tars not the Best

It seems that some change must be made in the character of the tars available for construction purposes, to insure that they will not soften and flow in hot weather and not get brittle during cold weather. Just how this can be done is not at once apparent, but it is probable that volatile light oils should be eliminated and the free carbon held as low as possible. There should then be a sufficient quantity of dead oils present to give elasticity to the pitch.

The oiled earth construction was undertaken with the object of determining the durability of this form

of construction under the soil and climatic conditions encountered in Illinois. It was desired to accomplish something more than a surface treatment which would merely serve to alleviate the present dusty condition of roads during dry weather and possibly reduce the cost of maintenance on a country road. In order to accomplish these purposes, it was thought necessary to incorporate into the surface layer of earth on the road a sufficient quantity of an asphaltic oil to render this surface layer impervious to water. In accomplishing that purpose, it seems possible that such a large quantity of oil will need to be used that in the hot weather, the oil will soften up sufficiently to make the surface layer of the road plastic. If such is to be found the case to any extent, it is at once apparent that the slight depression which is formed by the wheels will hold water and will soften and eventually cut through; but it seems also probable that if the surface becomes sufficiently plastic to be put out of shape by means of the traffic, it will also be sufficiently plastic to be readily put back into condition, and it is probable that on such a road the surface can be reshaped about once a year and it is believed that if this is done, the road will not get muddy to any extent during the winter. It is possible then that the road may be well worth its cost, but until more experience has been had with this class of construction, no definite answer can be made on that point.

Ivesdale Road

Section I of this road in Bement township, Platt county, was constructed in 1908. This oiled earth road was constructed on a black gumbo soil by mixing with the upper layer of the road an asphaltic oil in such an amount as to give a layer about five inches thick which was treated with oil in as large a quantity as it would absorb. In general, the method of construction was as follows:

The centre of the road for a width of about 15 feet was plowed up, disked, and pulverized as fine as possible. The pulverized earth was then removed to the side of the road and the middle portion of road bed, on which the oil was to be used, was shaped and thoroughly compacted with a 10-ton steam roller. Alternate layers of oil and earth were then placed on this foundation, thoroughly mixed with a disc harrow, and rolled. The road was finished by putting on a light layer of earth and rolling the surface.

In the construction numerous difficulties were encountered, particularly in getting proper mixtures of the earth and oil. This mixture when once made was of such a gummy nature that it was almost impossible to get it evenly distributed over the surface of the road. Also the nature of the soil was such that it could not be entirely reduced to dust and there were numerous large clods in the mixture which were not broken up in any of the operations and remained in the surface of the road after its completion. It was found that the oil never impregnated these larger pieces of earth at all.

Subsequent work on this road showed that the earth and oil mix more uniformly if the earth is moistened with water during the mixing process. At first the road is very soft but as the water dries out the oil apparently takes its place and the surface becomes harder. During this time the road should be rolled and kept smooth.

Conclusions

Conclusions. The experiments have conclusively

shown that a poured macadam is a desirable roadway. It has an elastic surface pleasant to travel which is much less dusty than the untreated macadam. While the roads built have not been in service long enough to give accurate data on the life of the macadam, still it is apparent that for some years the wear will be entirely on the bituminous compound if a proper one is used. In general we may safely state that the life of the road is greatly lengthened especially if the road has a mixed traffic with a considerable amount of one horse and automatic traffic.

Oil earth construction must be considered as of doubtful value so far as the experiments already made may be interpreted and while there can be no question but that the roads were greatly benefited still it remains to be proven that the treatment is worth the 30 cents per square yard it costs.

As to the relative cost of the waterbound and bituminous macadam, the tar macadam will cost 15 cents per square yard more than the waterbound at the present cost of tar, and the asphaltic macadam will cost from 15 cents to 20 cents per square yard more than the waterbound, depending upon the price paid for asphalt.

In regard to the relative cost of maintenance, no data can be given because none of the bituminous roads have been in service long enough to determine this point. It seems probable, however, that a bituminous macadam will maintain its surface at least as long as a waterbound macadam and probably much longer. When necessary it can be repaired by a surface dressing or paint coat of the proper grade of binder at a cost of about 15 cents per square yard of surface. To properly resurface a waterbound macadam road would cost 30 cents per square yard, so that the maintenance of the bituminous road is probably longer for the macadam and the road itself more desirable.

Need of Standard Specifications

The committee composed of Prof. A. Marston, Seth Dean and W. B. Warrington, appointed by the Iowa State Drainage Association to look into the matter of Standard Specifications, opened the report with the following interesting statements:

"A very serious situation has developed in Iowa during the past season in connection with the construction of large tile drains. An especially disastrous failure of large drain tile occurred in Sac county, Iowa, under the load of earth filling in the ditch, the damage running up to several thousands of dollars. Following this failure, intelligent and reliable experts have made examinations of a number of large tile drains in the northern part of the state, and they report that many of the pipe in such drains are found cracked when the depth of earth filling exceeds five to eight feet. The above is true both of cement and clay drains. We also have reports from time to time of cracked pipe found in examinations of city sewers.

Great Need for Standard Specifications

"It appears, therefore, that at present many large tile drains have been built of material not sufficiently strong to stand the loads which come upon them in the ditches. When we understand that Iowa has already completed within the last few years, or put under way, \$17,000,000 worth of drainage work in thirty-one counties in the northern part of the state, and when we further realize that the construction of large tile drains in preference to open ditches is con-

stantly growing in favor, and that hundreds of thousands of dollars worth of such work will undoubtedly be under way the present season, then it may be readily understood that some immediate remedy for a possible disastrous state of affairs must be found.

"Up to the present, drainage engineers have had no standard method of making tests of the strength of drain tile, nor have they had at hand any data on the strength actually developed by tile which are considered to be of fair quality. Hence, it is impracticable for drainage engineers to prepare proper specifications which will insure satisfactorily strong tile, and equally impracticable for the manufacturers of tile to be certain that the product will stand the actual conditions of use. It is absolutely essential, therefore, that specifications for standard methods of making tests should be adopted at once, to govern in Iowa during the coming construction season, even if later it becomes necessary to revise the specifications. In fact such revision, should it prove necessary later, will be no more serious than the revision which has just been made of the standard specifications.

Glass in Canada

Mr. J. F. W. Thomson, St. Nicholas street, Montreal, who deals extensively in imported glass, marble and metals, interviewed by the representative of Contract Record on the glass situation in Canada stated that there has been no appreciable change in the quotations in recent years with regard to window glass and even less in connection with plate glass. The standard price list for window glass that exists to-day was established in 1874. The variations from this standard are indicated by discounts and the fluctuations in recent years are fairly represented by the following figures: The discount this year is 64 per cent. In 1909 it was 67 per cent. In 1906 it was 65 per cent. and in 1894 it was 81 per cent. This shows plainly that the present prices are not the lowest ever experienced in this country. Mr. Thomson is in close touch with the Belgium market as well as familiar with conditions in the Canadian field. The glass market for Belgium is at Charleroi where open market is held every week. Large glass dealers may have branches in various parts of Europe or elsewhere, but practically all important companies have their head offices there.

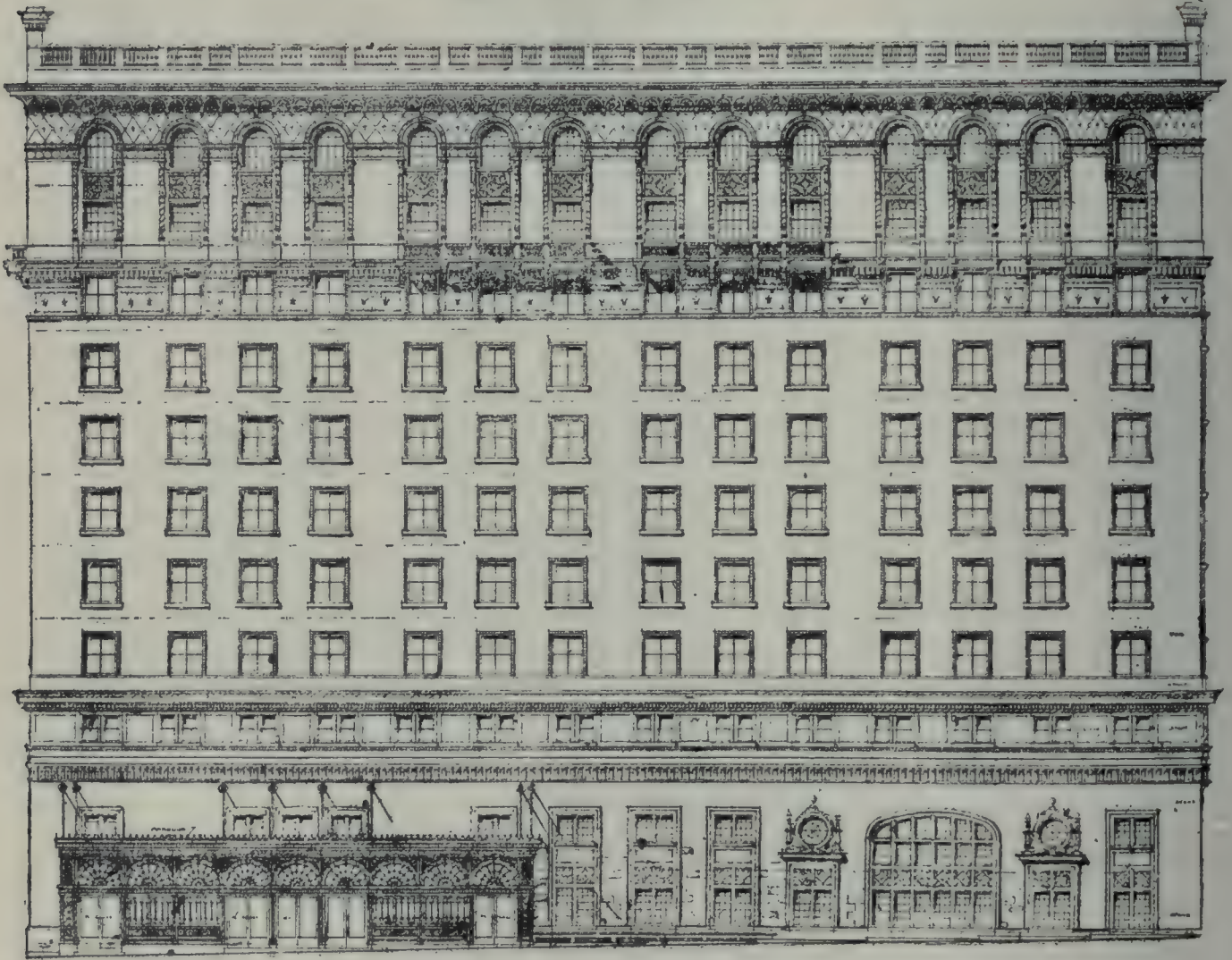
Belgium has the world for its market, and Mr. Thomson accounts for the steady prices that have been maintained by the fact that when there is a brisk demand in one country there is liable to be a dullness in other parts of the world. Canada last year bought freely and did not get rid of the heavy stock on hand. This year so far the market has been very dull and any possible change in quotations will depend largely on how stocks are cleared up within the next two or three months. Mr. Thomson believes that a firm giving a large order would obtain the same quotations this year as last.

As to the existence of a combine and any effect the combine might have on Canadian prices Mr. Thomson declares that there is none. There is a sort of understanding or agreement supposed to be in force, but it is so little observed as to be worthless. The agreement, like the commodity dealt with, is very easily broken and when it suits them dealers show no hesitancy in making holes in it.

Building Operations in Montreal

The New Ritz-Carlton Hotel—Harbour Commissioners' Elevator—Post Office Improvements

Special to the Contract Record.

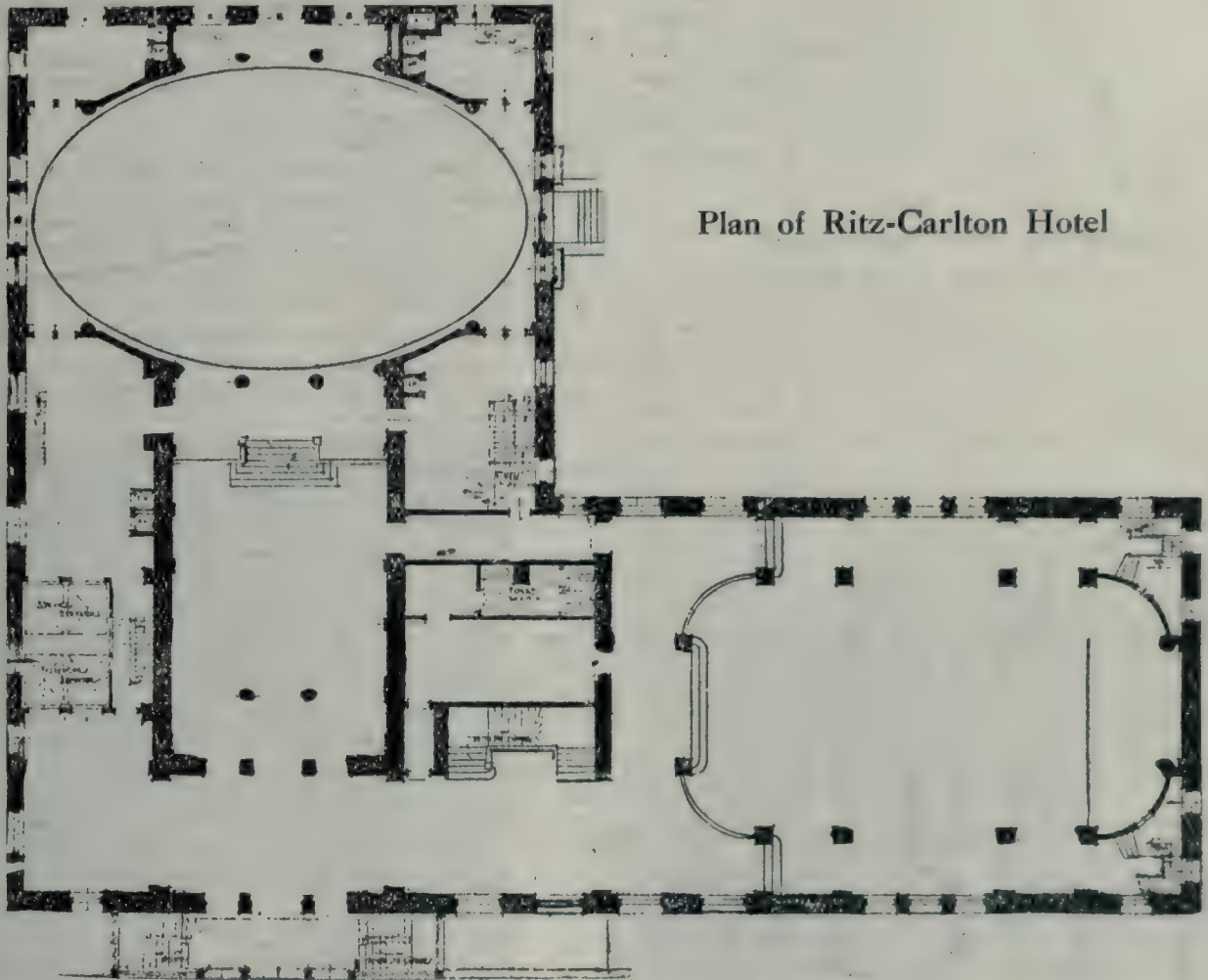


The plans for the Ritz-Carlton hotel to be erected on Sherbrooke street at the head of Drummond street are well advanced and a large part of the excavation work has been done by The George A. Fuller Company, Limited, who are the contractors for the foundation work. The contract for the steel work has been awarded to The Dominion Bridge Company and this portion of the structure is to be in place by the middle of November. Tenders have just been received for the general construction, but the contractors will not be announced for a couple of weeks. The architects are Messrs. Warren & Wetmore, East 33rd street, New York. The building is being erected for the Hon. Lionel G. Guest of Montreal.

The Ritz-Carlton Hotel will have a frontage of 187 feet on Sherbrooke street and 142 feet on Drummond street, and will be ten storeys high. The Sherbrooke street entrance will be covered by a large vestibule. On the left of the entrance lobby will be the office and elevator hall; on the right the reception lobby and staircase leading to the ball room. Fac-

ing the entrance lobby will be the palm garden 34 feet by 59 feet leading by a low flight of steps to a terrace at the entrance of the restaurant. The restaurant will be an oval shaped room devoid of all columns and will be fifty by eighty feet. It will be situated at the north end of the Drummond street front. The ceiling of this room will be oval and the treatment of the decorations will be of the Adams period.

The palm garden will be a very attractive feature of the hotel, with tiled floors and a scheme of decoration arranged in lattice work similar to a conservatory. Two flights of stairs in the vestibule will be 46½ feet by 56 feet and will accommodate about 150 guests. It will be panelled in oak, the general decoration being English in treatment. The kitchen will be on the basement level and situated immediately under the restaurant. The kitchen will be lighted by windows on Sherbrooke street and the lane in the rear of the building. Under the kitchen in the sub-basement will be the kitchen preparing rooms,



Plan of Ritz-Carlton Hotel

the boiler and pump rooms, baggage rooms and the elevator and refrigerator plants. On the first floor in addition to accommodation for a large part of the hotel staff, there will be a series of dressing rooms for the use of guests arriving by morning trains and leaving again in the evening and who do not wish to take bedrooms. The barber shop and ladies' hair dressing parlors will be on this floor. The second floor is provided with several suites of rooms and two large private dining rooms. The bedrooms are nearly all $14\frac{1}{2}$ feet by 18 feet. Each bedroom is provided with a private bath. Many of the bedrooms and all sitting rooms will be provided with fire places.

The ball room will be on the Sherbrooke street front at the westerly end of the building and will be 58 feet by 89 feet. A moveable stage will be provided at the westerly end of the ball room which will be available for concerts, theatricals, banquets, balls and other large entertainments. A gallery of boxes will overlook the ball room. The floor will be of polished hardwood. A pipe organ will also be installed in connection with this room. The floors throughout the building apart from the ball room, will be of cement, only a narrow strip of wood being let in the floors for the securing of the carpets. At the end of each corridor will be a staircase leading from the top to the bottom of the house, closed in with fireproof material. In the centre of the building will be another fireproof shaft. The whole building will be

of the best fireproof construction. The arrangement of the building will be such as to provide an unusual amount of natural light; the most modern system of ventilation will also be installed.

Montreal's New Elevator

Splendid progress has been made in the construction of the Montreal Harbor Commissioners' elevator No. 2, situated on the harbor front between the Jacques Cartier and Tarte piers. In this mammoth elevator there are 246 bins with an aggregate capacity of 1,772,000 bushels of grain. The height of these bins is 86 feet over foundation work, 27 feet deep, making a structure at the present time a huge mass of concrete 113 feet in height with a ground area of 313 feet by 100 feet. In its construction 10,000 cubic yards of concrete were put into the foundations; 5,400 cubic yards in the columns and bin girders and 12,600 cubic yards in the bin walls, making altogether 28,000 cubic yards of cement work. There remains to be erected a concrete cupola to a height of 102 feet above the present structure, making a total height for this elevator of 215 feet.

Considerable time was taken in getting in good solid foundations, but the storage bins have been constructed in remarkably quick time. They were put up in two sections, the whole taking only 38 days and the second half only 14 days. 700 men were employed on the task working day and night in shifts

of 11 hours each. In addition to the large amount of concrete used 100,000 bars of reinforcing steel were employed. The elevating and weighing machinery will be in the copula and it will take probably all of the summer season to complete the construction and installation. Several new features will be incorporated in the arrangement of the superstructure. This elevator is being built by The John S. Metcalfe Company, Limited.

General Post Office Improvements

The work of demolishing the old General Post Office building on St. James Street, Montreal, is progressing rapidly and very shortly there will arise on the site a new fireproof structure of pleasing design. The architect is Mr. Theo. Daoust. The foundation will be of concrete. The frame work will be of steel, the walls and floors of terra cotta and tile and the front of Montreal limestone orna-



mented with stone figures. The front steps will be of granite and the stairways of iron. This part of the building will be served by two elevators. The section of the post office fronting on Craig street, which was built last year, also has two elevators and is fireproof throughout. The new structure will have a frontage of 117 feet on St. James street by a depth of 90 feet on St. Francois Xavier Street. There will be but one basement and the front of the building will rise to a height of 100 feet above the sidewalk. The general contractor is Mr. Joseph Bourque; the steel work will be furnished and placed by the Dominion Bridge Company. The ventilating system will be the Buffalo Forge.

Mr. Carr Lane Glasgow, who has been appointed Montreal District Sales Manager of Allis-Chalmers Bullock, Limited, has had extensive experience in the construction of electric railways and the design of electric power plants. After leaving college he was in the employ of the well-known engineering and contracting firm, Westinghouse, Church, Kerr and Company for five years and was one of the engineers in connection with the construction of the Lackawanna and Wyoming Valley Electric Railway and the Grand Rapids, Grand Haven and Muskegon Electric Railway and the electrification of the Long Island Railway. Later he was engaged in the electrification of the West Jersey and Sea Shore Railway and also with the Northern Colorado Power Company. Mr. Glasgow is a graduate of the Cornell University in Mechanical Engineering.

Difficult Problem Solved

Ingenious Device for Regulating the Injection of Chloride of Lime into the Water Under Pressure.

This problem which has confronted the authorities of the city of Toronto for some little time, and which almost led them to adopt a scheme at a cost of \$1,000 by a Philadelphia expert, has been solved in the following manner:

The disinfecting solution is led by gravity to a small pump directly connected to the rocker arm of the pumping machine. The diameter of this pump and the length of its stroke bears such a relation to that of the large pump as to suit its capacity, so that a constant and accurate supply of the disinfectant is insured at all times.

The solution enters the discharge pipe clear of the pump, doing away with any liability of injurious effect upon cylinder or piston. It enters the discharge pipe as a spray through a series of fine nozzles which thoroughly mix it with water from the outlet valve of the large pump. This thorough mixing constitutes a very important feature, and, owing to the pressure of the contained water, had been for some time a subject of very careful consideration. An idea of the mixture used may be formed from the following: Some twelve pounds of chloride of lime are first dissolved in forty gallons of water. One gallon of this is applied to thirty gallons of water, forming a solution ready for the pump. The proper proportion of solution to water to be disinfected may then be computed by comparing the stroke displacement of the two pumps. This device is the invention of Mr. Fred Henning, chief engineer of the Toronto Filtration Plant. It has been installed upon all the city pumps at the Island, and was duplicated a few days ago at the pumping station in West Toronto. The appliance costs \$25 and may be applied in a couple of days. One of these has been in operation for some time and has not given the least trouble.

A. L. Young, vice-president of the Aikenhead Hardware Company, Limited, Toronto, with whom he has been associated since 1882, is severing his connection with that firm to become Canadian manager for Messrs. Henry Hope & Sons, Limited, of Birmingham, Eng., the well known makers of steel casements, steel factory sash, roof glazing, etc. Mr. Young has taken a prominent part in the builders' hardware business in this city and the fact that in his new field he will still have headquarters in the city is much appreciated. Mr. Young is at present looking over sites prior to erecting a factory for the manufacture of steel factory sash and roof glazing. The building will be 80 feet by 250 feet in plan.

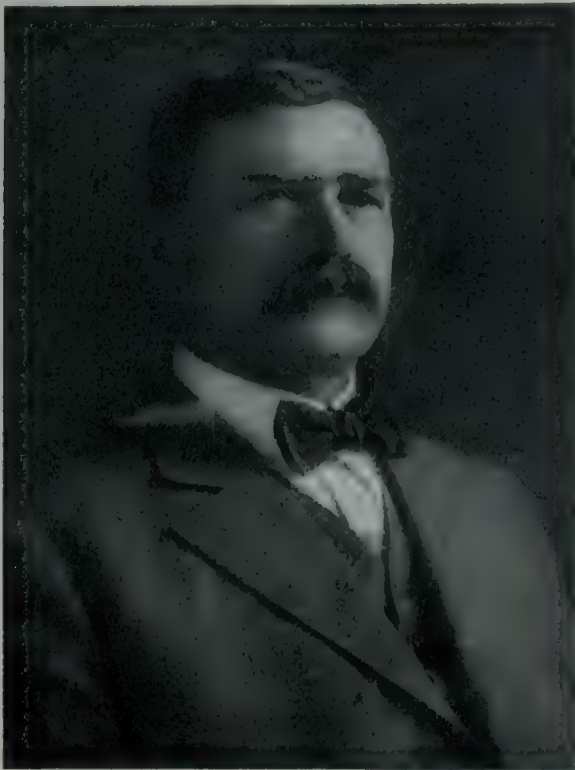
Building Up Cement Piles in Quicksand

A novel method of building up cement piles or supports in quicksand is the subject of a German patent. A pipe of suitable size has at its lower end an auger point and a helical screw blade, several holes being driven through the wall of the pipe just above the blade to permit the discharge of cement grout outward. By water pumped through the pipe, the apparatus is twisted into the sand, jets being used to aid the sinking if necessary. When the required depth has been reached, the grout is pumped into the pipe and the drill is turned backward to withdraw it. Flowing out along the face of the blade, the cement becomes mingled with the sand directly above, and the twin-jet screw passes the mixture to the space below. A cylindrical pile is thus built up in the semi-liquid sand. Others may be produced in the same way alongside the first and these may be readily consolidated into very strong and substantial piers.

Prominent Contractors

Mr. J. P. Mullarkey, Montreal

Mr. J. P. Mullarkey, railway contractor, of Montreal, is one of the best known and most successful contractors in the province of Quebec. His long and varied experience as organizer, operator, and construction administrator in both electrical and steam railway work has made for him a reputation in the Canadian railway world that anyone might be proud of with the result that, with the passing years larger and more important contracts have been committed to his executive charge. Quite recently he was awarded the general contract for two important sections of the Canadian Northern Ontario Railway, the one being the line from



Mr. J. P. Mullarkey, Montreal

Sydenham to Ottawa and the other from Hawkesbury, Ont., to Montreal, Que. In Quebec also Mr. Mullarkey was recently placed under contract to build the Quebec and Lake St. John extension.

Mr. Mullarkey was born in the province of Quebec, and after receiving a good general education and business training, he entered the employ of Mr. H. J. Beamer, who was at the time engaged in the construction of the line between Pontiac and Pacific, and, shortly after, the Ottawa and Gatineau line, now belonging to the C. P. R. Following this the Montreal and Western line, which is now part of the Ste. Agathe branch of the C. P. R., and the line between Quebec and Ste. Anne's, were built.

On leaving Mr. Beamer in 1896, Mr. Mullarkey undertook the promotion and construction of the Montreal Terminal Railway. The object of this system was to furnish the citizens of Montreal with a rival service to the Montreal Street Railway. Mr. Mullarkey and his associates succeeded in establishing a very useful service covering a considerable mileage through a district where such service was in demand, but the city council of the day proved to be largely

antagonistic to the enterprise and the promoters found their way hedged about in all directions. The Montreal Street Railway had priority rights over available streets shutting out the Terminal line from extending their service to parts of the city which would have made the proposition a paying venture. Finding in the end that competition was not going to be encouraged by the civic authorities and that their money could be invested in other enterprises of a more promising character, the directors of the Terminal decided to sell and a satisfactory offer from the Montreal Street Railway Company being made it was accepted, upon which the Terminal became an integral part of the Montreal Street Railway system, and it is operated as such at the present time.

Mr. Mullarkey next undertook the construction of the Chateaugay & Northern Railway between Montreal and Joliette, including the large bridge at Bout de l'Isle, which is now a part of the C. P. R. Mr. Mullarkey also built the line between Garneau Junction and Quebec City, also that between Pierreville and Lotbiniere, an extension of the Quebec and the Montreal & Southern Railway, owned by the Delaware and Hudson Railway Company.

C.P.R. Building, Glasgow Exhibition

The Canadian Pacific Railway building in the Glasgow Exhibition at the Crystal Palace is of quite a novel and attractive design. The front shows the forward parts of two mammoth C. P. R. locomotives embedded in the walls, one on either side of the portal. This work is done in plaster of Paris. The decorative features of the interior includes a series of paintings depicting important events in



Canadian history. There is a picture for each province and several others representative of the chief industries and interests of Canada as a whole. The exhibit illustrates numerous phases of life and work in the Dominion. Many of the photographs and other pictures depict natural scenery along the lines of the C. P. R. and elsewhere. The cost of the building was in the neighborhood of \$20,000.

The Goodyear Tire & Rubber Company of Canada, Limited, has recently received a large rubber conveyor belt contract from the Jencks Machine Company, of Sherbrooke, Quebec, also a contract for the entire season's requirements of belting, hose and packing for the Dominion Cannery, Limited. The company have found it necessary to increase the size of their plant, and the contracts are being let for the buildings, machinery, etc.

Trade News and Notes of Interest

Calgary is to have a new water supply with three times the volume of the present service. Surveys have been ordered and will be made at once.

Work on the C. P. R. high level bridge at Edmonton is progressing rapidly. The concrete work will be completed in a few weeks and will be ready for the steel.

John A. Stiles, B.A.Sc., Toronto, is resigning his position as demonstrator at the University of Toronto, to accept a professorship in the University of New Brunswick.

By-laws authorizing the expenditure of over \$54,000 for waterworks and sewer extensions, and local improvements, were passed by a big majority by recent vote of Red Deer.

The contract for a new factory building at Windsor has been awarded to Delisle, Culbertson Winchester Company. The building, 90 by 140 feet, will be of reinforced concrete.

The Massey-Harris Company have their new storehouse and offices at Edmonton, Alta., well under way. The building is to cost \$25,000 and is being constructed by day labor work.

The firm of Mitchell, Jones & Company, of Calgary, contractors, have been awarded the contract for 12,000 linear feet of trunk sewers in that city. The amount of their bid was \$172,654.

City Engineer Rust estimates that it will cost \$25,000 annually for five years to construct the necessary bridges, driveway and trespass-proof fence on the Humber park driveway, proposed for this city.

The Steel Company of Canada, at Mimico, were granted permission to construct a siding from the Belt Line across Windermere avenue to their property, between the Lake Shore road and Queen street.

Woods & Company, of St. John, N.B., have been awarded the contract for the construction of a new station for the Intercolonial Railway at Campbellton, N.B., replacing the one destroyed by fire last year.

Mr. Samuel J. Fox, M.P.P., of Lindsay, a Canadian authority on brick manufacturing, died on July 3rd after a long illness. Mr. Fox is a past president of the Canadian Clay Products Manufacturers' Association.

A new intercepting sewer for Saskatoon, which is to cost some \$300,000, is well under way. The Lock Joint Pipe Company, of New York, have the contract for the piping. The McGoogan Company, of Port Arthur, are doing the excavating.

Work has been begun on the rebuilding and enlarging of the bakery of Messrs. James Strachan, Limited, of Montreal. The new structure will be absolutely fireproof and the improvement will cost \$25,000. Peter Lyall & Sons have the contract.

The same company is carrying on dock improvements at Port Arthur for the Canadian Northern Railway. This work includes concrete coal shipping pockets, sheds and foundations. The coal handling machinery will be operated by electric power furnished by the Kaministiquia Power Company.

Construction work on the new Parliament Buildings at Edmonton, Alta., is being rushed with all possible speed. The total cost of the work will be in the neighborhood of \$2,500,000. The work will be continued throughout the winter. Since the opening of the building season 200 men have been continuously employed.

The Quebec & Saguenay Railway Company is constructing a single track steam line 56 miles in length from Cape

Tourmente to Murray Bay. The contract for the entire work has been let to Mr. M. J. O'Brien, railway contractor, of Renfrew. At the present time in the neighborhood of 2,400 men are employed on the work.

In connection with the extension of the C. P. R. Windsor Station, Montreal, an artesian well is being sunk. The depth reached at last report was 860 feet, when a flow of 1,200 gals. per hour was obtained. As it is desired that a flow of 4,000 gallons an hour should be furnished by this well the intention is to go down to a depth of 1,000 or 1,500 feet if necessary. The Wallace Bell Company, Limited, are the contractors.

What is stated to be the largest contract ever let in Canada constitutes an outlay of \$10,000,000, and involves the building of 160 miles of grade for the Canadian Northern through the heart of the Rockies. The steel will run through the valleys of the Fraser and the South Thompson rivers. The contracting firms are the Northern Construction Company, and P. Welsh, of Spokane.

Messrs. Barnett McQueen & Company, Limited, have erected a mill and elevator at Sudbury for the Ontario and Manitoba Flour Mills Company, of Ottawa. This building was commenced in August and was ready for the machinery in March. The mill machinery for this also is being supplied by the Allis-Chalmers Company. The power will be hydro-electric and will be brought a distance of fifteen miles. The motor was furnished by Mr. A. C. Bullock, of Montreal.

The plans for the enlargement of the C. P. R. station at Calgary provide for the extension of the present building, a distance of 300 feet to the west and 65 feet to the east. The west wing will be extended to within 40 feet of the new hotel which will front on Ninth avenue. This wing will accommodate the ticket office, the express office, including express parcel room, a dining room and restaurant. The whole of the present building will be turned into a commodious waiting room. The east wing will be extended to a point close to the new Irrigation Building. This building will be occupied by the telegraph offices. Tenders for the work will be called for in a few days.

The Barnett, McQueen Company, Limited, of Fort William, have just completed and delivered over to the St. Lawrence Flour Mills Company, Limited, the latter's new mill at 1110 Notre Dame street west. The work was in charge of Mr. E. D. Casseday, chief engineer, and D. J. McKinnon. This mill has a capacity of 3,000 barrels per day. The construction work was commenced on first of September, 1910, and was practically completed on May 1st. The electrical installation was then commenced and was completed in a little over a month. The Canadian Westinghouse Company supplied the motors and transformers. Electrical energy is being supplied by the Montreal Light, Heat & Power Company. The mill machinery was put in by Messrs. Allis-Chalmers, of Milwaukee.

A marked improvement in the general tone of industry and a corresponding increase in activity of general labor is reported in the June Labor Gazette. Weather conditions have brought along crops rapidly, and the agricultural outlook is excellent. On the commercial life of the community the effect has been felt at the close of the month in an increasing buoyancy of orders. The outlook in the manufacturing industry has also been affected in a similar degree. The feature of the month was the rapid absorption of the supply of general labor in view of extensive railway construction, building and civic improvement work that has been planned for the present summer season, the outlook being on June 1 that in each of these branches the year will see an exceptionally large amount of work completed.

Contracts Department

News of Special Interest to Contractors, Engineers, Manufacturers and Dealers in Building Supplies.

Information for insertion in these columns is invited from Architects, Contractors, Engineers, etc.

Waterworks, Sewerage and Roadways

Brandon, Man.

Petition granted for granolithic sidewalks and electric light standards. Owner, City of Brandon; city engineer, R. E. Speakman. Wider granolithic sidewalks and standard electric light; additional sidewalk amounts to about one-half mile by 3 feet. Purchase of electric lighting, 5-globe standards, \$15,000.

Engineer's report. Proposed addition to sewers, Rosser avenue. City Engineer, R. E. Speakman. Cost of laying 24-in. pipe on Rosser the distance required, \$7,500; enlarging sewers in 11th 10th, 9th and 8th streets, etc., about \$3,000. The plan decided upon by the council will be the enlargement of the laterals on the four streets mentioned. Copy of engineer's report to be had on application to the office of MacLean Daily Reports, Limited, Toronto.

Brantford, Ont.

Tenders called for bridge (2 miles from Burford on town line). Owner, County of Brant. Chairman Co. and Road and Bridge Commission, Wm. Milmine, Brantford. Reinforced concrete, 1 span 75 ft. Plans, etc. at office of Co. Clerk. Tenders received until noon July 15th.

Burnaby, B.C.

Tenders called for waterworks. Owner, Corporation of Burnaby. City clerk, W. Griffiths. Engineer, Cleveland & Cameron, Winch Bldg., Vancouver. Special castings for waterworks supply. Plans, etc. at office of engineers. Tenders received until 5 p.m. July 24th. Tenders also called by engineers until July 24th, for sluice and special valves.

Cornwall, Ont.

By-laws to be submitted for waterworks. Owner, Corporation of Cornwall. Town Clerk, George S. Tarvis, Cornwall. To raise \$30,000 for the laying of additional pipe line for waterworks. Vote will be taken on July 28th.

Chatham, Ont.

Tenders called for Tp. of Raleigh and Government Drain No. 2. Owner, County council. Engineer, W. G. McGeorge, Chatham. Spans 30 ft. each, concrete and steel foundation. Plans, etc. obtained from engineer. Tenders received by engineer until July 8th.

Tenders called for sidewalk. (S. S. No. 4, North on Lot, Con. 5, Raleigh). Sec., W. J. Shreve, Chatham. Supply of material and construction for concrete foundation and sidewalk from S. S. No. 4 N. con. 5, Raleigh. Specifications at residence of undersigned, Lot 7, Con. Raleigh. Tenders close July 8; work to be completed Sept. 1st.

Dundas, Ont.

Dredging (Desjardins Canal). Owner, Board of Works, Dundas; engineer, J. J. Armour, Dundas, Ont. Successful contractor, J. E. Russell, 307 Logan avenue, Toronto. Removal of 27,500 cu. yds. of materials, work to be done in accordance with the Jennings award. Equipment required, dredgers.

Drayton, Ont.

Tenders called for bridges. Owner, Wellington County, Ont. Warden, M. Fox, Drayton. Engineers, Bowman & Connor, 36 Toronto street, Toronto. Construction of one Douglas forty-foot concrete arch bridge and breakwater, 10 feet high, 200 feet long, near Glen Allan. Tenders received until 2 p.m. July 21st, by M. Fox. For further information apply to engineers or to J. A. Wilkinson, Morriston, Ont. Advertisement in "Tenders and For Sale Department" of this issue.

Lethbridge, Alta.

Railway. Sir Wm. Whyte, Vice-pres. of C. P. R., states that work on the new Lethbridge-Weyburn line may be commenced this season.

Moose Jaw, Sask.

Proceedings of council, survey for pipe line. City Engineer, J. M. Wilson. City Engineer authorized to survey for a pipe line to Sandy Creek and estimate cost. Contract recommended for acceptance, Patrick Kilenny, South Hill trunk sewer at \$37,653; Prairie Construction Co., South Hill sewer and water system at \$30,770; National Iron Works Co., iron pipe at a cost of \$39 per ton and special at \$65 a ton; Whitlock & Marlatt's sewer pipe at \$18,783.90.

North Bay, Ont.

Tenders to be called for supply of cast iron pipe. Owner, Town of North Bay, Ont.; engineer, J. Sinton, North Bay; commissioner of works, T. N. Colgan, North Bay. Special castings, headers, etc., 15,550 feet 14-in.; 2,550 ft. 10-in.; 27,745 ft. 6-in.; 1,100 ft. 4-in. c. i. pipe. Tenders called by July 20th received by commissioner.

Sanitary sewers. Engineer, J. Sinton, North Bay; contractor, Stewart & Co., Port Arthur, Ont. 6,470 ft. 10-in. pipe; 1,332 ft. 20-in. pipe; 2,873 ft. 24-in. pipe; 1,985 ft. 30-in. pipe; 1,700 ft. 36-in. pipe. Contract includes everything but supplying of pipe. Engineer's estimate, \$45,000. Work to be completed November 1st, 1911.

Niagara Falls, Ont.

Contemplated new bridge. Owner, International Railway Co. Steel arch. The rumor is persistent regarding the unsafeness of the bridge between Niagara Falls, Ont., and Niagara Falls, N. Y. Municipal authorities may ask In-

ternational Waterways Board to investigate.

By-law to be submitted for sewers, \$60,000. Owner, Corporation of Niagara Falls; clerk, W. J. Seymour. Niagara Falls; engineer, J. C. Gardner, Niagara Falls. On July 24, the ratepayer will vote on a by-law to raise \$60,000 to convert Muddy Run Creek into a sewer.

Nanaimo, B. C.

Tenders called for paving. Owners, Corporation of Nanaimo. City Engineer, Allan Waters. Laying 14,450 superficial yds. of asphalt, or other approved paving. Plans at office of city engineer. Tenders called until 21st July, by engineer. Advertisement in "Tenders and For Sale Department" of this issue.

New Westminster, B. C.

Tenders to be called for sewer pipe. Owner, City of New Westminster, B. C. Engineer, J. W. Blackman, City Hall New Westminster. Supply of 18-in. 122-in. 10-in. 8-in. and 6-in. vitrified pipe; length, 10¾ miles approximately. Supplementary report later.

Tenders called for sewer pipe (West end). Owner, City of New Westminster, B. C. City clerk, W. A. Duncan. Engineer, J. W. Blackman, City Hall, New Westminster. Supply of 4-in., 6-in., 8-in., 10-in., 12-in., 15-in. and 18-in. vitrified pipe with necessary bands, Y's etc. Tenders received until July 10th.

Ottawa, Ont.

Tenders to be called for paving. Owner, Corporation of Ottawa; city engineer, N. J. Ker, Ottawa. Tenders will be called about last of July for asphalt paving of a number of streets. Petitions coming in.

Scarboro Township, Ont.

Tenders called for bridge, \$10,000, over Rouge river. Owner, Co. of York. Co. engineer, F. Barber, 37 Adelaide street E., Toronto. Concrete abutments and a concrete truss bridge. Plans, etc. at office of engineer. Tenders received until noon July 11, by John Ramsden, county clerk.

Toronto, Ont.

Subway. Contract for 25,000 yds. of concrete work on the new John street subway will be awarded next week. Cost about \$85,000.

Contemplated street extension, \$17584. (Brunswick avenue). Owner, Corp of Toronto. City engineer, W. A. Littlejohn. Brunswick avenue to be extended - Petitions against must be made on or before Aug. 5, 1911. Supplementary report later.

Tavistock, Ont.

Tenders called for drainage. Owner, Tp. of South Easthope, Ont.; clerk, V.

Stock. Construction of three drains, two near Tavistock and one near Stratford. Contractor to furnish materials, tools, etc. Separate tenders for each of three drains accompanied by ten per cent. in cash. Plans, etc., at office of clerk. Tenders received by township council until 7 o'clock, July 17.

Vancouver, B. C.

Tenders called for steam road roller, (10 ton). Owner, City of Vancouver. City clerk, W. McQueen. City engineer, F. L. Fellowes. Recommended that city clerk be instructed to advertise for tenders for roller, to be received not later than 2 p.m. July 11th. Particulars obtained from city engineer.

Tenders received for sewers. Supervising engineer, F. L. Fellowes, City Hall, Vancouver. City clerk, Wm. McQueen, City Hall. The following tenders were received: Evans Coleman & Evans, Ltd. \$52,608.00; Dominion Glazed Cement Pipe Co., \$59,854.20; C. Gardiner Johnson Co., \$69,793.00. Sewer trenching machines as follows: A. G. Langley & Co., Ltd., for a "Buckeye" Trenching Machine, f.o.b. Vancouver, \$2,500.00; Mussels Limited, for Carson's Lingerwood cableway, f.o.b., \$5,571.00; Mussels Limited, for removing steam shovel, 25 ton f.o.b., \$7,453.00.

Woodbridge, Ont.

By-law carried for steel bridge, \$40,000. Owner, Corporation of Woodbridge. Clerk, E. W. Brown, Woodbridge. The ratepayers carried a by-law to raise \$40,000 by debentures for the construction of a bridge over the Humber river.

Whitewood, Sask.

Tenders called for cement sidewalks and crossings. Owner, Corporation of Whitewood, Sask. Sec.-treas., C. S. Barker, Whitewood. Construction of about 66,000 feet of cement sidewalks and crossings. Tenderer to provide all material and deposit 5 per cent. of tender, etc. Tenders received by sec.-treas. until July 15th.

Yorkton, Sask.

Tenders called for waterworks. Owners, Corporation of Yorkton, Sask. Engineers, McArthur & Murphy. About 3,500 ft. of watermain and 3500 ft. sewermain. Plans, etc. on application to sec.-treas. and consulting engineers. A marked cheque equal to 5 per cent. of tenders to accompany each tender. Tenders received until 6 p.m. July 24 by sec.-treas. Advertisement in "Tenders and For Sale Department" of this issue.

CONTRACTS AWARDED

Calgary, Alta.

Trunk sewers (12,000 lin. ft.). Owner, City of Calgary, J. T. Child, engineer. Successful contractor, Mitchell, Jones & Co., Calgary, \$172,654. Other tenderers, Orpen Co., \$239,040; T. R. Allison, & Co., \$205,800, both of Toronto; International Construction Co., \$193,500; I. Breckenridge, \$210,780; Crown Paving Co., \$238,400; F. Fehrenback, \$191,420; all of Calgary; Misho & Benjamin, \$215,400; Aug. Ilse & J. A. Clark, both of Seattle and L. A. Broley & Co., of Fernie. Details of bids furnished on request to office of MacLean's Daily Reports, Ltd., 220 King street W., Toronto.

Hamilton, Ont.

Pipe sewers. Owner, City of Hamilton; city engineer, A. F. Macallum,

Hamilton; contractors, Arthur st., J. J. Armstrong, 57c. per foot; St. Clair Boulevard, city engineer, \$2.19 per foot; Main street, city engineer, \$1.40 per ft.; Cumberland avenue, J. J. Armstrong, 87c. per foot; Sherman avenue, city engineer, \$2.22 per foot; Blake street, J. J. Armstrong, \$1.27 per foot. Contract let July 6th.

North Bay, Ont.

Supply of concrete pipe. Engineer, J. Sinton, North Bay; contractor, W. G. Carr, North Bay. 6,470 feet 10-in. tile pipe; 1,332 20-in.; 2,873 24-in.; 1,985 30-in., and 1,700 36-in. concrete pipe. Work to be completed October 1st, 1911.

Cement sidewalks, \$25,000. Owner, Town of North Bay. Engineer, J. Sinton, North Bay. Contract awarded to Tarlithic Paving Co., Chatham, Ont. Quantity, 10,000 feet.

Vancouver, B.C.

Grading. City Engineer Fellowes; successful contractor, Laplaca Bros. Construction Co., Vancouver (\$12,986). Other tenderers, S. Becker, \$14,000; T. R. Nickson & Co., \$14,200; W. Allan Kennedy, \$24,877. Grading 4th avenue, from Vine street to Alma road.

Walkerville, Ont.

Street paving, \$90,000. Owner, Town of Walkerville. Successful contractor, Thomas Chick, Bruce avenue, Windsor. 25,000 yards of asphalt block, 6,000 yards reinforced concrete and about 6,000 yds. cedar block pavement. Work to be started within a week or two and to be finished this year.

Railroads, Bridges and Wharves

Brandon, Man.

Purchase authorized of steel rails. City engineer, R. E. Speakman. The city council has authorized the purchase from the United States Steel Product Co., quantity of 80-lb. steel rails in 60-foot lengths for street railway track to be laid when the asphalt block paving already authorized is put down. The order also includes all necessary specials, bands, fish plates, etc., for the railway.

Galt, Ont.

Proceedings of council; engineering projects. Owner, Town of Galt; city engineer, E. O. Fuce. Recommendations, sewer on William street; plan to be prepared for trunk sewer on Main street. Calling of tenders for an arched concrete and reinforced cement covered bridge across Canada Woollen Mills race.

Heachcote, Ont.

Bridge, \$1,200. (Between Collingwood and Euphrasia township). Owner, Co. of Grey. Engineer, J. Wilson, Collingwood; 1 span, 35 ft. 14 ft. roadway, foundation concrete. Tenders called for superstructure and sub-structure until July 10th.

Moose Jaw, Sask.

Proceedings of council. Bridge (Across Thunder Creek). Owner, Corporation of Moose Jaw; city engineer, J. M. Wilson. The engineer was instructed to prepare plans and estimates of cost of a bridge at the corner of Fourth avenue and River street.

Quebec, Que.

Tenders called for railway station,

\$750,000. Owner, National Transcontinental Railway Co. Architect, March & Hastell, 164 St. James street; 3-storied 257 x 124. Deschambault stone, concrete foundation. Tenders called shortly. Supplementary report later.

St. Thomas, Ont.

Contemplated, concrete piers. Owner, Michigan Central Railway; division engineer, W. Marble. Preparations are being made to strengthen the approach to the company's cantilever bridge here by the erection of concrete piers.

Toronto, Ont.

Tenders will be called in a week for construction of five groins between Kew and Balmy Beach to cost \$11,000. Groins will be built on unit basis; five feet above water level.

Tenders will be called July 10th for construction of dock at foot of Princess street to cost \$10,000. To be built on unit basis.

Tenders will be called in about a week for painting and cleaning and supply of paint for Moore Park, Sherbourne street and Dundas street bridges.

Washdeneoak, Queen's Co., New Brunswick.

Tenders called for concrete pier. Owner, Province of New Brunswick, Fredericton, N. B. 20x4 ft.; 40-ft deep. Tenders will be called about July 10th by P. S. Archibald, Moncton, N. B.

CONTRACTS AWARDED

Harriston, Ont.

Steel bridges Tp. of Minto). 72-ft. steel bridge; 6 bids highest, \$2,380. Contractor, Corbett Machine Co., Owen Sound, \$1,475. Co. of Wellington, 47 ft. 6 in. span, 16 ft. roadway, steel; 4 bids, highest \$1,365. Contractors, Corbett Machine Co., Owen Sound, \$985. Bids opened June 23rd; Bowman & Connor, Toronto street, Toronto, engineers.

Princeton, B. C.

Railroad to Coalmont, spur to Portland Cement Works and United Empire Mine, 35 mile. Engineer, L. M. Hale, Princeton, B. C. Contractor, A. Guthrie. The B. C. Portland Cement Works are putting in a large plant and laying out a townsite.

Vancouver, B. C.

Railway. The contract for the construction of the proposed Cowichan Lake branch, has been awarded to Palmer Bros. & Hemmins of this city. Work will be commenced in a few weeks.

Public Buildings, Churches, Schools, etc.

Brockville, Ont.

Hospital. The Provincial Government have approved of the purchase of farm property comprising 253 acres for the Eastern Hospital.

Tenders called for Nurses' Home, \$10,000. (Addition). Owner, Brockville General Hospital, Brockville, Ont. Architect, B. Dillon, Brockville; 1-storey 40x50, brick, cement work, cut stone, marble, terra cotta, tile, mantels, fireproofing, fire escapes, passenger elevator, pipe covering, electrical work, telephone system, asbestos materials, steel beams, iron columns, ornamental columns, electrical lighting, steam heating, interior finish, pine, composition roofing. Tenders received until July 10th

Berlin, Ont.

Tenders called for hospitals. Owner, Town of Berlin; clerk, A. H. Millar. Construction of two Isolation Hospitals and a smallpox shack. Plans, etc., at office of town clerk. Tenders received until noon, July 15, by town clerk.

Chippewa, Ont.

By-law carried for school, \$15,000. Clerk, W. Myers, Chippewa. Architect, C. M. Barter, Niagara Falls. By-law carried to expend \$15,000 on new building.

Collingwood, Ont.

Heating and plumbing, metal tenders not let. Fire hall, \$12,000. Owner, Town of Collingwood. 2-storey, brick, 46 x 73. Building to be completed with gymnasium in attic Jan. 1, 1912. Advertisement in "Tenders and For Sale, Department" of this issue.

Calgary, Alta.

By-law carried for university, \$150,000. Owner, University of Calgary. The by-law to appropriate \$150,000 for erection and equipment of the university was carried by a large majority. Supplementary report later.

Forest, Ont.

Library. Plans are being prepared by Architect Mahoney, Guelph, for a new Carnegie library.

Hamilton, Ont.

Contemplated grandstand, \$50,000. Owner, Hamilton Jockey Club, Hamilton. Architect not selected. Steel and stone. Stand is to replace one destroyed July 1st. It will not be definitely planned till end of August. Supplementary report later.

Hull, Que.

Negotiations closed for hospital. Owner, Sisters of Providence, Montreal. City clerk, John F. Boulton. The deal is practically closed in regard to the hospital. Next spring additions to the amount of \$30,000 will be built. Present property to be converted into a hospital by October.

Kingston, Ont.

School. The Board of Education wants the city council to give \$5,000 additional for the erection of a new public school. Construction delayed by building strike.

Kamloops, B.C.

Specifications in progress for Old Folks Home (\$125,000). Owner, Dept. of Public Works. Architect, Mr. Owens, Victoria, B.C. Plans provide for an expenditure of \$30,000 this year on the east wing, two storeys. Supplementary report later.

Medicine Hat, Alta.

New tenders called for Nurses' Home, \$12,000. (Main street). Owner, General Hospital Board, Medicine Hat. 2½-storeys, 60x40, brick and stone, hot water and steam heating, gas and electric lighting, cement work, cut stone, terra cotta, plastering. Tenders received until July 10th. Tenders received before rejected.

Medicine Hat, Alta.

Tenders called for school, \$40,000. (Bridge street). Owner, School Board. Architect, W. T. Williams, Medicine Hat. 2-storey, 60x100, brick and stone, concrete foundation, cement work, cut stone, brick, electric and gas lighting,

shingle roof, electric work, shingle stain, deafening paper. Tenders received until July 10th.

McLeod, Alta.

Tenders called for municipal hospital. Owner, Corporation of McLeod; Mayor, T. Dickson. Architect, Messrs. Barnes & Gibbs, Imperial Bank Building, Edmonton. Bulk tenders invited. Tenders for plumbing and heating to be kept separate. Plans, etc., at municipal offices, McLeod, and office of architect. Tenders received until noon July 15th. 5 per cent. of amount to be enclosed.

Middleton, N. S.

Plans being prepared for post office and custom house. Owner, Department of Public Works, Ottawa. Sec., R. C. Desrochers. The work will probably be undertaken next year.

Niagara Falls, Ont.

By-law to be submitted for extension of City Hall. Owner, Corporation of Niagara Falls, Ont. Clerk, W. J. Seymour. Architect, C. M. Borter, Niagara Falls. The vote will be taken on July 24th to raise \$15,000 to extend city.

Outremon, Que.

Tenders to be called for convent, \$100,000. Owner, Fathers of Blessed Sacrament, Mt. Royal and St. Denis. Architect, G. A. Monette, 97 St. James street, Montreal. Stone and brick concrete foundation. Institution will include chapel and will be fireproof.

Tillsonburg, Ont.

Plans under construction for school. Owner, Public School Board, Tillsonburg. The plans for new school are under consideration. Building operations will not commence until next year.

Trail, B. C.

Tenders called for school. Owner, School Board; secretary, F. E. Dockerill, Trail. Architects, A. Currie, Nelson. Digerent trades in connection with 8-room school. Plans, etc., at office of the secretary, or at office of the architects. Tenders received by F. E. Dockerill, secretary, until 12 p.m. July 29th.

Toronto, Ont.

Plans prepared for club house, \$3,500. Owner, Don Rowing Club, Toronto. (Private plans). Contractor, Geo. Wibby, 58 Hogarth avenue, Toronto. Frame. Building destroyed on June 30th will be rebuilt immediately according to former plans.

New plans being prepared for church and Sunday School (corner of College and Montrose). Owner, West Presbyterian church, Toronto. Architects, Gordon & Helliwell, Confederation Life Building, Toronto. Various trades required. New tenders will be called. Supplementary report later.

Tenders called for church alterations, (Halton and Dundas streets). Owner, St. Barnabas Church, Toronto. Architect, A. R. Denisen & Stephenson, 18 King street W., Toronto. 1-storey and basement, 96x58, brick, hot air heating, shingle roof, cut stone, cement arches. Tenders close July 6th.

Plans in progress for private patients' building. Owner, Toronto General Hospital. Architect, Darling & Pearson, 2 Leader Lane, Toronto. 5-storey, brick, concrete foundation, forced hot water heating, electric lighting, open plumb-

ing, felt and gravel roofing, terra cotta, tile, fireproofing, armoured reinforced concrete, metallic, lath, structural and ornamental iron, sheet metal work, cornice, skylight, fireproof doors, electrical work, plate and prismatic glass, passenger elevator. Tenders called in about a month.

Tenders called for Government House (Chorley Park, Rosedale, Toronto). Owner, Department of Public Works, Toronto. Secretary, H. F. McNaughton, Toronto. Concrete foundation for new Government House. Plans, etc., at Department. Tenders received by Secretary until July 12th. Advertisement in "Tenders and For Sale Department" of this issue.

Tenders called for addition to Howard school. Owner, Board of Education, Toronto. Sec.-treas., W. C. Wilkinson, Toronto. Plastering work required in completion of addition. Specifications at office of the Supt. of Buildings, City Hall. Tenders received by Sec.-treasurer until noon July 6th. Advertisement in "Tenders and For Sale Department" of this issue.

Vancouver, B. C.

Plans being prepared for school, residence. Owner, residence, R. V. Winch, (\$13,000); Wesley Methodist Church. Architects, Thomas Hooper, Winch Building, Vancouver. Plans are being prepared by T. Hooper for above; also for a Methodist Parsonage at Merritt, B. C.

Tenders called for fire hall. (12th avenue and Quebec street). City Clerk, W. McQueen. Architects, S. N. Jarrett, Bldg. Inspector, City Hall, construction work. Tenders received by City Clerk until 4.30 p.m. July 13th.

Y. M. C. A. The plans for the new Y. M. C. A. building have been completed and will be here shortly. H. S. Griffiths, architect, Victoria and Vancouver.

Church. Smith & Goodfellow, architects, 303 Hastings W. have plans for a new Methodist church on Angus Rd., Kerrisdale. Building to be frame 30x60, seating capacity of 200; electric light; cost \$3,000. Tenders will be called shortly.

Victoria, B. C.

Tenders called for addition, parliament building. Owner, Department of Public Works, Victoria. J. E. Griffith, Public Works Engineer. Erection and completion of addition etc. Plans, etc., after July 15th at office of Prov. Timber Inspector, Van. Govt. agent, New Westminster and Dept. of Pub. Works, Victoria. Tenders received by Minister Public Works until August 15th.

Wolfville, N. S.

Plans being prepared for library and manual training school. Owner, Acadia University, Wolfville. President, Dr. G. B. Cutten, Wolfville. Library, \$25,000; manual training school, \$10,000, brick. Building to be erected this autumn or next summer.

Winnipeg, Man.

Fire hall. The city has purchased a site at the corner of Lipton and Westminster avenue for a fire hall for the district south of Portage avenue and west of Arlington.

Hospital. It has been decided to purchase a lot for a new building in North

Winnipeg and to commence work on same.

CONTRACTS AWARDED

Montreal, Que.

The contract has been awarded to G. W. Nicholson, Eastern Township's Bank Building, Montreal, for a three storey deaf and dumb institute building, 29 x 50, stone and brick, Ross & MacFarlane, 1 Belmont street, Montreal, architects.

Ottawa, Ont.

Church, \$2,800. Owner, First Congregational Church, Ottawa. Architect, A. LeB. Weeks, Canada Life Building, Ottawa. General contractors, Holmes & Slack; 66 x 99, brick. Heating and plumbing contract not let yet.

The following contracts have been awarded by the Public School Board:—H. N. Giorlofi for painting Kent street school, \$425; William Howe, painting Creighton street school, \$425; Ritchie & Nunn, for painting Rosemount avenue school, \$390. For supplying tables and cupboards, etc., for Domestic Science school, J. Oliver & Son, Ltd., \$400.

These were the lowest tenderers in each case.

For the heating system of Mutchmor street school the contract for the Webster system was awarded to Mr. J. R. McLennan, for \$3,929. The tenders were: J. R. McLennan, Webster system, \$3,929; gravity system, \$3,313; Johnston system, \$4,225. McKinley & Northwood, Webster system, \$4,027; gravity system, \$3,688; Johnston system, \$4,887. Central Hardware Co., Webster system, \$4,468; gravity system, \$4,383; Johnston system, \$5,241. M. M. O'Connell, Webster system, \$3,680.50; gravity system, \$3,195.50; Johnston system, \$3,950; Currie & Livock, Webster system, \$6,200; gravity system, \$5,339; Johnston system, \$6,259.

Toronto, Ont.

At a meeting of the Property Committee of the Board of Education the following tenders were accepted:

Iron stairs, Harbord Collegiate Institute, Canadian Ornamental Iron Company, \$3,070; Humburside Collegiate Institute, Shipway Iron Manufacturing Co. \$2,725; Oakwood High School, Shipway Iron Manufacturing Co., \$6,288.

Iron fence, Harbord Collegiate Institute, Canadian Ornamental Iron Company, \$2,200.

S. Percy Co., white lead, \$120 per ton; linseed oil, \$1 per gallon; turpentine, 72 cents per gallon.

Terreno flooring—Oakwood High School, Sanitary Flooring Co., \$1,240.

Cleaning and repairing stoves and pipes, E. W. Chard.

Iron stairs, Canadian Ornamental Iron Co., for Balmy Beach, \$600; Brown, \$2,950; Dugerin, \$1,895; Frankland, \$1,435; McMurrich, \$2,790; Shipway Iron Mfg. Co., Howard, \$2,168; Manning, \$4,952.

Iron fences, Canadian Ornamental Co., Brown, \$790; Shipway I. on Company, Kent, \$1,575; Lansdowne, \$588; Queen Victoria, \$805.

Carpenter work, Niagara, \$1,298, to M. Hutchinson; Brock and Dovercourt, \$187, to O. C. Pook; Clinton, Crawford and Givens, \$400, to M. Hutchinson; Dugerin, Duke, Park and Victoria, \$1,237, to F. Armstrong; St. Clair, Strath-

cona and Western, \$1,394, to M. Hutchinson.

St. Nicholas Mission, Simcoe Park, was rented for school purposes for \$30 per month, including heat and care-taking.

The tender of George White for plastering work at Howard School, \$1,515, was accepted, and the previous tender of H. Beaver & Co., disallowed, because of delay in doing the work.

Vancouver, B.C.

The contract has been awarded to La Placa Bros. Construction Co. for the erection of addition to the Lord Tennyson school, \$79,400. Messrs. Matheson tendered at \$80,560.

Residences

Edmonton, Alta.

Residences. Owner, W. J. Crafts, J. Kenwood, J. Ross, all of Edmonton. General contractors, Cuthbertson, \$9,000 brick and concrete block; Pheasy & Batson, 2½-storeys, brick and stone, \$11,000; Grant Bros., \$7,000, brick and stone, all of Edmonton. Contracts were let on June 26th and 24th.

Hamilton, Ont.

Addition to residence. General contract for addition to residence, \$5,000; 2-storey 14x36, brick, electric work, awarded to Wm. Findlay. Work to be completed Sept. 14. Architects, Mills & Hutton, Hamilton.

Medicine Hat, Alta.

Specifications in progress for 10 cottages, \$15,000 each. Owner, Crosley Bros., Medicine Hat, Alta. (Private plans). 1½ storeys, 25 x 25 each, frame, concrete foundation, hot air heating, gas lighting, brick, shingle stain. Crossley Bros. have completed 4 cottages and now propose erecting a row of 10 more.

Toronto, Ont.

8 dwellings. W. W. Hiltz, Broadview avenue, will erect 8 dwellings on Chester avenue, 2-storeys, 28x16 ft. 6 in. rough cast, brick foundation, hot air heating, combination lighting, open plumbing, shingle felt and gravel roofing. Work to be done by day labor. Sept. 14th.

Apartment house, \$5,200. (48 Grenville street). Owner, J. H. Young, 46 Grenville street, Toronto. Architect, W. H. Mallory, 31 Queen W., Toronto. Mason contractor, A. J. Peppiatt 204 Sunnyside avenue. Carpenter, Wm. Williamson, Woodbine and Queen; 2-storeys, brick, 32x40, brick foundation, hot water heating, combination lighting, felt and gravel roof, interior finish Georgia pine. Contract let June 28th. Other tenders still to be let.

Tenders to be called for dwelling, \$3,000, Plater Crescent. Owner, Ernest Preston, 739 Broadview avenue, Toronto. Private plans; 2½ storeys, brick and stone, 43 x 20, stone foundation, hot air heating, combination lighting, slate roof, tile and mantels. Tenders to be called shortly.

Tenders to be called for dwelling, \$8,000, 45 Benlomond avenue. Owner, Alex. McLeod, 57 Benlomond avenue, Toronto. Private plans for 2½ storey, concrete and brick, 56 x 38, hot water heating, electric lighting, shingle roof,

tile mantels, metallic lath, steel beams, cut stone. Tenders received after July 12, 1911.

Tenders called for twenty-five semi-detached dwellings, \$55,000, Campbell avenue. Owner, Deeth & Son, 44 Grove avenue, Toronto. Two storeys, 16 x 35, brick and stone, stone foundation, hot air heating, combination lighting, shingle and felt roofing, cut stone, tile mantels, metallic lath, electrical work, electric bells, plate glass. Tenders received after July 10th until July 17th.

R. Lankin, 81 Hogarth avenue, will erect four dwellings on Curzon street, two storeys, 39 x 32 ft. 6 in., brick front and roughcast, brick fouldation, shingle roofing. To be built by day labor.

B. J. Case, 189 Weston road, will erect a pair of houses on Humburside avenue, 2½ storeys, 33 x 33, brick and stone, stone foundation, hot air heating, combination lighting, open plumbing, felt-gravel and shingle roofing. Will be built by day labor.

Tenders called for residence, \$3,000. (Radford avenue). Owner, P. Coltman, 48 Major street, Toronto. 2½ storeys, 18x46, stone and brick, stone foundation, hot water or comb. heating, comb. lighting, slated roof, tile, mantels, electrical work, cornice. Tenders received for all but carpentry until July 20th.

Tenders called for 1 single and 1 pr. semi-det. residence, \$7,500. (Lansdowne avenue). Owner P. Coltman, 48 Major street. (Private plans). 2½-storeys, 18x46, brick, stone foundation, hot air heating, shingle roof, tile, mantels, cornice, electrical work. Tenders called until July 11th on all but carpentry.

Tenders called for 2 detached residences, \$5,000. (Silver Birch avenue). Owner, Wm. Williamson, Architect, W. H. Mallory, 31 Queen West, Toronto. 2-storey, 20x38, frame, brick foundation, hot air heating, combination lighting, shingle roofing. Tenders called after July 20, until July 28.

Garage. A 1-storey garage will be erected by Mr. Grant at 11 Constance street, 18x12, wood and galvanized iron, galvanized iron roofing. Wells & Gray, Ltd., 315 Confederation Life Building, Toronto; architects.

Garage. A 1½-storey garage will be erected at 172 Rusholme Road, 25x18, brick concrete foundation, tile roofing.

Vancouver, B. C.

Plans being prepared for apartment house, \$70,000. (Pendril and Cardero streets). Owner, M. J. Conlin, 1133 Cordeiro street, Vancouver. Architect, Patrick J. Donohue, 903 Dom. Trust Bldg., Vancouver. Reinforced concrete foundation, 25 3-room suites. Tenders will be called shortly. Supplementary report later.

Residence. Plans are being prepared by Smith & Goodfellow, architects, 308 Hastings K. for a 6-room frame residence city concrete foundation. Cost, \$3,200 at Strathcona, Point Grey.

Tenders to be called for apartment house and store (Bridge street and Eighth avenue). Architect, E. Gardiner, 247 Pender street W. 2-storey and basement 80x80, brick, electric lighting. Supplementary report later. Mr. Gar-

diner will also call for tenders for an apartment and store building, on esplanade for North Vancouver Improvement Co., 2-storey and basement, brick, 50x70, electric lighting.

Winnipeg, Man.

Tenders called for school (McPhillips street). Owner, Public School Board. Sec.-treas., R. H. Smith, Winnipeg. 4-room, frame. Plans, etc., with J. B. Mitchell Commrs. of School Buildings, School Board office. Tenders received by sec.-treas. until July 11th.

CONTRACTS AWARDED

Brockville, Ont.

Residence—King street E.) Owner, Dr. E. B. Moles, Pine street E. Architect, A. Stuart Allaster, 42 King street E., Brockville. General contractor, John Micks, Brockville; 2½-storeys, 39 x 30, brick and stucco construction, stone foundation, hot water heating, electric lighting, shingles, southern pine interior finish, cut stone, pipe covering, sheet metal work, metallic lath, shingle stain, plate glass, art glass, prismatic glass, iron columns, mantels, cornice roofing, sheathing paper. Heating and plumbing not yet let.

Hamilton, Ont.

Two residences, \$11,500. Herkimer street and Hamilton Mountain). Owners, H. E. McLaren and E. Morwick, both of Hamilton. Architects, Mills & Hutton, Hamilton. General contractor, Wm. Findlay, Hamilton; both contracts brick, 2 and 2½-storeys. Contracts let June 29th; residences to be completed

Halifax, N.S.

Residence, \$3,500. Owner, G. F. Lynch, Oxford street, Halifax; general contractor, G. W. Thompson, Halifax, 2½ storeys, concrete foundation, 26 x 48. Frame construction.

Montreal, Que.

The contract has been awarded to Jas. H. Maher, 57 Guardian Building, for alterations and additions to four-storey apartment house on Milton street.

The contract for a \$21,000 residence (Catholic School Commissioners, owners) has been awarded to J. R. Gratton, Ltd., 82 Mercier avenue, Montreal, three storeys, brick and stone, 32 x 80, hot water heating, W. E. Dore, architect.

Business Buildings and Industrial Plants

Brandon, Man.

Business opportunity. Purchase of property, \$22,500, opposite new C. N. R. hotel. Owner, Sylvester Mfg. Co., Brandon. Tenders received for property, 75 x 124, in heart of city until 12 o'clock, July 14. Terms \$1,000 cash, balance one-third cash and 60 days and 90 days. Splendid site for store or block.

Chatham, Ont.

Equipment required for alterations to store, \$2,500. (King street). Owner, W. Gordon, Chatham. Architect, J. L. Wilson & Son, Chatham. Copper and plate glass front. Bids will be received until July 10th.

Cochrane, Ont.

Plans prepared for offices, \$7,000. Owner, W. J. Bauldry, Cochrane, Ont. Architect, H. W. Angus, North Bay; 2-storey 40x44, brick veneer, concrete

foundation, hot air heating, electric lgt., felt and gravel roofing, cement work, sheet metal work, metal ceiling, cornice roofing, telephone system, plate glass. Foundation in. Date of calling for tenders for superstructure not yet set. Building to be occupied by New Telephone Co. and Cobalt Power Co.

Edmonton, Alta.

Hotel. A \$50,000 hotel is to be erected in Edmonton, 3-storeys and basement—brick and steel, steam heating, electric lighting, tar and gravel roofing, cement work, cut stone, brick, metallic lath, structural iron, fire escapes, electrical work, electric bells, steel beams, iron columns, combined rooming house, lunch room and cafe. Barnes & Gibbs, architects.

Work in progress for storehouse and offices, \$25,000. Owner, Massey-Harris, Edmonton. Architect, Hopkins & Wright, Edmonton. 50x70, frame cement work, electrical work, roofing. The company have engaged foremen to take charge, the construction being done by day labor.

Plans being prepared for foundry, \$20,000. Owner, Edmonton Iron Works, Edmonton. Architect, H. A. Magoon, Edmonton. 50x75, cement work, brick, structural iron, electrical work. Tenders will be called at an early date.

Fort William, Ont.

Tenders called for store, \$3,000, Simpson street. Owner, Mr. Kaslar, Simpson street, Fort William. Architects, Hood & Scott, Fort William. Two storeys, solid brick, concrete foundation, 25 x 65. May be increased to three storeys. Tenders received until 14th July.

Goderich, Ont.

Plans under consideration for factory. Architect, F. A. Fowler, Goderich. Machine shop for company being promoted by Doty Engine Works, Winnipeg and Goderich, 120x40, brick, saw tooth roof and wired glass, \$7,000. Supplementary report later. Company will manufacture grain car doors, woodworking, etc.

Grand Pre, N. S.

Contemplated 2 storage buildings. Owner, W. H. Chase, Wolfville, N. S. 1-storey and basement, steel and frame, stone foundation, \$4,000.

Hillsboro, N. B.

Tenders being called for plaster mills, \$100,000. Owners, Albert Mfg. Co., Hillsboro, N. B. 4-storey, wood and iron, stone foundation, steam heating, fireproofing, brick, structural iron, sheet metal work. Private tenders being received by C. J. Oswan, Hillsboro, N. B.

Ingersoll, Ont.

Plans being prepared for addition to factory, \$12,000. Owner, John Morrow Machine Screw Co. Architects Stewart McPhie, Hamilton. 1 and 2 storeys, 75 x 100, 40x60, brick, stone foundation; steam heating, cement walk, fireproof doors, tar and gravel roof; electric lgt. a little plumbing. Supplementary report later.

Kentville, N. S.

Owner, Hillcrest Orchards, Ltd., R. S. Eaton, mgr., Kentville, 1-storey and basement, frame. Buildings to be used for storing apples.

Lethbridge, Alta.

The A. MacDonald Co. will erect a three-storey and basement brick ware-

house on Smith street. Tenders are being called.

Moose Jaw, Sask.

Plans in progress for warehouse. Owner, Tees & Persse, 315 William street, Winnipeg. Architect, not yet chosen. Plans are being prepared for a six-storey warehouse.

Montreal, Que.

Office. Henry Morgan & Co. will call for tenders at once for a 10-storey office building, on St. Catherine street, between Manc and Balmoral.

Contemplated, office, Beaver Hall Hill and Craig street. Owner, Sheddon Forwarding Co., 38 Victoria Square Montreal. President, Hugh Paton. Ten storeys. After present building is torn down work will commence. Supplementary report later.

MacLeod, Alta.

The Canadian Northern Railway have decided to erect their western shops at MacLeod. Plans are prepared for passenger and freight stations.

Niagara Falls, Ont.

Machinery required for hat factory. Owner, Hawes Von Gal. Manager, E. J. Von Gal, Niagara Falls, Ont. The large addition to the Hawes-Von Gal hat factory is nearly ready to have machinery installed.

North Bay, Ont.

Plans being prepared for store and offices, \$17,000. Owner, H. S. Campbell, North Bay; architect, H. W. Angus, N. Bay. 3-storey and basement, 37x90, brick, steel and wood, stone foundation, steam heating, electric lighting, cut stone, brick, tile, sheet metal work, vaults, metal ceiling, cornice, skylights, pipe covering, steel beams, art and plate glass, interior pine finish. Date of receiving tenders not decided yet. Complete working plans before end of month.

Ottawa, Ont.

Tenders to be called for warehouse, Queen street. Owner, J. M. Garland & Sons, Ottawa; architect, A. L. Weeks, Canada Life Building, Ottawa. Tenders to be called shortly for plumbing and heating, steam heating.

Tenders to be called for stores, Wellington street. Owner, D. H. MacLean, Ottawa; architect, W. E. Noffke, Ottawa. Two storeys, brick, 90 x 50, concrete foundation, tar and gravel roof, electric lighting, structural iron, sheet metal. Tenders called next week.

Regina, Sask.

Warehouse. The Finance committee have recommended the council to sell lots 9, 10 and 11 to Armstrong, Smith & Dowswell as a site for a proposed warehouse.

Negotiations in progress for department store. Owner, Hudson's Bay Co., London, Eng. Stores commrs., H. E. Burnbridge, Winnipeg. Co. looking after site, frontage of 150 ft. on Rose st. and 125 on Eleventh avenue. No decision made. D. M. Hackney, real estate agent, is interested. Supplementary report later.

Stratford, Ont.

Tenders called for business block. Owner, Senate Cigar Store, Stratford; architect, Taylor and Taylor, Brantford. Enlargement and improvement of block.

(Continued on page 61)

Tenders and For Sale Department

To Architects

P. Bon. French Architect, 1811 Rue St. Urbain, Montreal; formerly architectural expert for the Courts of France, "Master-of-Work" of the Union—the syndicate of French architects, designer of numerous important architectural constructions erected in France, desires either association with architect having work in hand, or the direction of an architectural drafting office in a large firm. 27-28

Notice to Ditch Contractors

Tenders Wanted

Tenders will be received by the undersigned up to 2 o'clock p.m., on Friday, July 14, 1911, for the construction of Municipal Drain No. 1 in the Township of Maryborough, containing about 33,000 cubic yards of excavation.

Plans, profiles and specifications of this drain may be seen at the Township Clerk's office in the Village of Moorefield.

The lowest or any tender not necessarily accepted. Satisfactory bondsmen or a marked cheque of 5 per cent. of the tender will be required.

W. W. SCOTT,

Clerk of Tp. of Maryborough.
Moorefield P. O. 27-28

CITY OF REGINA

Sidewalk Construction

Sealed tenders addressed to the City Commissioners, Regina, and endorsed on envelope "Tender for Sidewalk Construction," will be received up to 12 o'clock noon, Friday, July 28th, 1911, for the construction of approximately 175,000 square feet of concrete sidewalks.

Particulars may be had upon application to the City Engineer.

A marked cheque for \$1,400 must accompany each tender.

The cheque of the unsuccessful tenderers will be returned.

The lowest or any tender not necessarily accepted.

(Signed) L. A. THORNTON,
28-29 City Engineer.

CITY OF REGINA

Pavement Construction

Sealed tenders addressed to the City Commissioners, Regina, and endorsed on envelope "Tender for Pavement Construction," will be received up to 12 o'clock noon, Friday, July 28th, 1911, for the construction of approximately 37,500 square yards of pavement and 24,000 lineal feet of curb and gutter.

Particulars may be had upon application to the City Engineer.

A marked cheque for \$5,000 must accompany each tender.

The cheque of the unsuccessful tenderers will be returned.

The lowest or any tender not necessarily accepted.

(Signed) L. A. THORNTON,
28-29 City Engineer.

Bucket Crane

FOR SALE—One full circle, self-propelling, modern 10 to 15-ton capacity Browning size No. 1 Locomotive Crane, standard gauge, 4-wheel truck, 38 ft. steel boom, 8 x 10 engines, equipped to handle Clam or Orange Peel. Will furnish with or without bucket. Attractive price, fine condition, quick delivery. Inspection here.

WILLIS SHAW MACHINERY CO.

39 So. LaSalle Street, Chicago.

Tenders

Sealed tenders addressed to the undersigned will be received until noon on Monday, July 17, for the construction of a reinforced concrete beam bridge over the Otter Creek on the town line between the Townships of Sombra and Chatham. Plans and specifications may be seen at the residence of Neil McGugan, Wilkesport, and at William Abraham's, Chatham Township, or at the office of the undersigned.

BELL & McCUBBIN,

Civil Engineers.
St. Thomas, July 8, 1911. 28-28

TO CONTRACTORS

Tenders will be received by the undersigned up to 2 o'clock p.m., on Monday, July 17th, for the construction of a Municipal Drain in the Township of Arthur, Wellington County. Plans, profile and specifications may be seen at the Clerk's office, Kenilworth. A marked cheque for ten per cent. of contract must accompany each tender.

The lowest or any tender not necessarily accepted.

ALBERT HELLYER, Clerk,
28-28 Kenilworth P.O.

CITY OF MOOSE JAW Saskatchewan

TENDERS

Sealed tenders addressed to the undersigned City Clerk will be received in the Council Chamber, Moose Jaw, up to 8.30 p.m. on Monday, July 24th, 1911, for the supply of the following electrical apparatus:—

Contract A.

Fifty 6.6 Ampere, Direct Current, series, Metallic flame arc lamps, complete with globes, etc.
Fifty Absolute cut-out hangers.
One Current Regulator, 50 lamp circuit.
One Mercury Rectifier, 50 lamp circuit.
One Control panel with switches, 50 lamp circuit.

Contract B.

Fifty ornamental arc lamp standards.
Full particulars and specifications may be obtained from J. D. Peters, Electrical Superintendent, Moose Jaw, Sask.

The lowest or any tender not necessarily accepted.

W. F. HEAL,
25-28 City Clerk.

Contractors' Material

Brown Locomotive Crane, 10 ton capacity, at 14 feet. Overhauled.

Canadian Rand New Giant Rock Drill, No. 431, tripods and weights.

Ingersoll "Little Giant" Rock Drill, No. 3 3/4, tripod and weights.

Cooper No. a Small Rock Drill, with tripod.

6 x 4 American Steam Pump, Valve, piping and elbow.

New Size B Pulsometer Pump

30 h.p. Upright Boiler, 46 in x 10 in., complete.

Screen for stone crusher, 24 in. x 6 ft.

Have you anything to sell? Write us.

THE MALES COMPANY,

No. 82 Lerin Building,
Cincinnati, O.

Corporation of the City of Nanaimo B.C.

Street Paving

Tenders are invited for approximately 14,450 superficial yards of Asphaltic Macadam or other approved paving.

A plan of streets and further particulars may be obtained of the undersigned.

Sealed tenders endorsed "Tender for Paving" to be sent to the undersigned not later than July 21, 1911.

The lowest or any tender not necessarily accepted.

ALLAN WATERS,
City Engineer. 27-29
June 26, 1911.

CITY OF TORONTO

Tenders

For the

Construction of Cribs

At the City Yard, Princess Street
Toronto

Tenders will be received by registered post only, addressed to the Chairman of the Board of Control, City Hall, Toronto, up to noon on Monday, July 24th, 1911, for the construction of cribs at the City Yard, Princess street.

Envelopes containing tenders must be plainly marked on the outside as to contents.

Specifications and forms of tender may be obtained on application to the Department of Railways and Bridges, City Engineer's office, Toronto.

The tenderers shall submit with their tenders the names of two sureties (approved of by the City Treasurer, not members of the City Council or officers of the Corporation of the City of Toronto) or in lieu of said sureties the bond of a guarantee company approved of as aforesaid.

The lowest or any tender not necessarily accepted.

F. S. SPENCE,

President of the Board of Control.

City Hall, Toronto,
July 7th, 1911.

28-29

Bridge Tenders

Sealed tenders will be received by Geo. M. Fox, Esq., Warden, Wellington County, Drayton, Ont., up till 2 p.m. on Friday, July 21st, for building the following:

1. Douglas 40-foot concrete arch bridge and breakwater near Glen Allen.
2. Concrete breakwater, 10 feet high and 200 feet long, near Glen Allen.
3. A 40-foot girder bridge, 18-foot roadway, also near Glen Allen.

For further information apply to

BOWMAN & CONNOR, Engineers,
36 Toronto Street, Toronto.

or
J. A. WILKINSON,

Morrison, Ont.

27-28

Tenders for Reinforced Concrete Bridge

Tenders will be received by the undersigned at the Court House in the City of Brantford, up till noon, Saturday, the 15th inst., for the construction of a reinforced concrete bridge having a span of 75 feet on the Town Line between Brantford and Burford, one mile north of Bishop's Gate and two miles from the Village of Burford.

Plans and specifications may be seen at the County Clerk's Office at the Court House, Brantford.

Dated this 5th day of July, 1911.

(Signed) WILLIAM MILMINE,
Chairman, Road and Bridge Com.
County of Brant.

28-28

The Algoma Central and Hudson Bay
Railway Company

Tenders for Railway Construction

Sealed tenders for the construction of the Algoma Central Railway Extension from Hobon on the C. P. R., northerly to the National Transcontinental Railway at a point approximately 142 miles west of Cochrane, a distance of 101 miles, will be received up to noon July 18, 1911.

The work includes all construction work to sub grade, and in addition, track laying and ballasting in accordance with plans, profiles, forms of tender and specifications at the office of the Chief Engineer, Sault Ste. Marie, Ontario.

All tenders to be marked "Tender for Construction," and to be addressed to R. S. McCormick, Chief Engineer, Algoma Central Railway, Sault Ste. Marie, Ontario.

The lowest of any tender not necessarily accepted.

26-28

VILLAGE of TAVISTOCK

Tenders for Pumping Equipment

Tenders will be received up to Thursday, July 20th next, for two half million gallon Steam Pumps, one Boiler etc.; also 1000 feet of Fire Hose. Plans and specifications may be seen at the office of either of the undersigned.

The lowest or any tender not necessarily accepted.

F. W. FARNCOMBE,
Consulting Engineer, London.

J. G. FIELD,
Clerk of Tavistock,
Tavistock.

27-28

TENDERS

Tenders will be received up to the 21st July, from steam fitters, bricklayers, carpenters and painters, for altering, reheating and ventilating the public school at Napanee, Ont.

Plans and specifications can be seen with the clerk of the School Board at Napanee and also at the office of the architects, G. M. Miller & Co., 59 Yonge street, Toronto. Tenders can be sent to either of the above parties.

Tenders Wanted

Sealed tenders addressed to the Secretary-Treasurer of the Town of Yorkton will be received up till six o'clock p.m. Monday evening, July 24, 1911, for the construction of approximately thirty-five hundred (3,500) feet of Water Main and thirty-five hundred (3,500) feet Sewer Main in the Town of Yorkton. Plans and specifications may be obtained on applying to the Secretary-Treasurer of the Town of Yorkton, or the consulting engineers. A marked cheque equal to five per cent. of tender must accompany each tender. The lowest or any tender not necessarily accepted.

McARTHUR & MURPHY,
Engineers.

T. F. ACHESON,
Secy.-Treas.

27-28

WOODBIDGE

Tenders

for

Concrete Abutments

Sealed tenders, plainly marked as to contents, will be received by Ed. H. Brown, Village Clerk, Woodbridge, Ont., up to eight o'clock p.m., on Monday, July 24th, 1911, for the construction of Concrete Abutments for a Steel Bridge in the Village of Woodbridge, in the County of York.

Plans and specifications may be seen and all necessary information may be obtained at the office of the undersigned, 57 Adelaide street east, Toronto.

The lowest or any tender not necessarily accepted.

FRANK BARBER,

Engineer.

Toronto, July 7th, 1911.

28-28

Corporation of the City of Westmount

City Surveyor's Department

Tenders are invited for the erection of the Upper Level Fire Station (No. 2).

Drawings, specifications and form of contract can be seen at the City Surveyor's office on and after the 17th of July, 1911.

Copies of drawings and specifications can be obtained on payment of Fifteen Dollars, which will be refunded on receipt of a bona fide tender and return of plans and specifications.

Sealed tenders, marked "Fire Station" contract are to be deposited with the City Clerk, Westmount City Hall, not later than twelve noon on 27th July, 1911.

Tenders will be opened by the Mayor sitting in public at 5 p.m., 27th July, 1911.

The council does not bind itself to accept the lowest or any tender.

ARCH. CURRIE,

City Surveyor.

City Hall, Westmount, Que.

28-28

Tenders for Waterworks

Town of Dresden

Tenders addressed to J. T. Bridgewater, town clerk, Dresden, will be received up to noon on Wednesday, the 26th day of July next, for 4, 6 and 8 inch cast iron water pipe, about 13,000 feet in all, also about 35 hydrants, also two half million gallon steam driven pumps.

Plans and specifications may be seen at the offices of either of the undersigned. The lowest or any tender not necessarily accepted.

F. W. FARNCOMB, C.E.,
Consulting Engineer,
64 Bank of Toronto Chambers,
London, Ont.

J. T. BRIDGEWATER,
Town Clerk,
Dresden, Ont.

28-29

Water Works Intake

Tenders will be received until July 27th next for an Intake Pipe and Filter Basin for the Town of Southampton. Plans, etc., may be seen at the town clerk's office and at our offices in Toronto and Berlin.

BOWMAN & CONNOR, Engineers,
36 Toronto Street, Toronto.

FOR SALE

Complete Electric Generating Set, consisting of Leonard Peerless steam engine direct connected to 150 k.w. Canadian General Electric generator, 2,300 volts, 60 cycles; also condenser, switch-board, steam and exhaust piping, spare parts for engine and generator, and everything constituting the complete set as at present installed in the Thomas street lighting station of the Town of Brockville. This machine is in first-class order, having only been used on peak loads. It is now being replaced by a larger Belliss & Morcom engine with Swedish G. E. generator. Full particulars and price can be obtained from Laurie & Lamb, Consulting Engineers, Board of Trade Building, Montreal.

28-28

CITY OF TORONTO

Tenders for the Supply of Paint and for the

Cleaning and Painting of Bridges

Tenders will be received by registered post only, addressed to the Chairman of the Board of Control, City Hall, Toronto, up to noon on Monday, July 31st, 1911, for the supply of Paint, and for the Cleaning and Painting of Three Bridges in the City of Toronto.

Envelopes containing tenders must be plainly marked on the outside as to contents.

Specifications and forms of tender may be obtained on application to the Department of Railways & Bridges, City Engineer's office, Toronto.

The tenderers shall submit with their tenders, the names of two sureties approved of by the City Treasurer, not members of the City Council or officers of the Corporation of the City of Toronto, or in lieu of said sureties the bond of a guarantee company approved of as aforesaid.

The lowest or any tender not necessarily accepted.

F. S. SPENCE,
President of the Board of Control,
Toronto, July 10, 1911.

28-29

City of Toronto

TENDERS

for the Construction and Placing of

GROYNES

in Lake Ontario at Kew Beach, Toronto

Tenders will be received by registered post only, addressed to the Chairman of the Board of Control, City Hall, Toronto, up to noon on Monday, July 24th, 1911, for the construction and placing of Groynes in Lake Ontario at the foot of the following streets:—

Woodbine avenue,
Waverley avenue,
Leuty avenue,
McLean avenue (Howard)
Beech avenue.

Envelopes containing tender must be plainly marked on the outside as to contents.

Specifications and form of tender may be obtained on application to the Department of Railways & Bridges, City Engineer's office, Toronto.

The tenderers shall submit with their tenders, the names of two sureties (approved of by the City Treasurer, not members of the City Council or officers of the Corporation of the City of Toronto, or in lieu of said sureties the bond of a guarantee company approved of as aforesaid).

The lowest or any tender not necessarily

F. S. SPENCE,
President of the Board of Control.
City Hall, Toronto, July 8, 1911. 28-29

Business Buildings and Industrial Plants

(Continued from page 61)

Plans, etc., at offices of the architects, or on application to owner. Tenders received by F. J. Patrick, Stratford, Ont., until noon, July 12.

Sydney, N. S.

Tenders called for shops and offices, \$23,000. (Esplanade). Owner, A. N. Crotton, Sydney. Architect, R. S. Dahl, Sydney. 4 storeys in rear, 44x80, concrete and iron, hot water heating, electric lighting, tar and gravel roofing, cement work, fireproofing, armored concrete, ornamental iron, fire escapes, skylights, electrical work, telephone system, steel beams, iron columns, plate glass, metallic lath, fire escapes, steel beams, iron columns, roofing. Tenders received until July 10th.

Toronto, Ont.

Plans prepared for store and school, \$12,000. (Gerrard street E.) Owner, F. M. Johnston, 4 Victor avenue, Toronto. (Private plans). 2-storeys, 32x86, brick, brick foundation, hot water heating, felt and gravel roof, plate glass. Tenders have been called.

Winnipeg, Man.

Factory. H. F. Ledoux, Ltd., plan to establish a factory here for the manufacture of cigarettes.

Tenders called for steam boiler. Secretary board of control, M. Peterson, Winnipeg. Supply and erection of boiler required for incinerator plant in Ward 7. Plans, etc., at office of city engineer, 223 James avenue, Winnipeg. Tenders received by chairman, board of control, until 11 a.m., July 13.

Vancouver, B. C.

Maclure & Fox, architects, Pacific Block, are calling for tenders on one-storey brick building, 75 x 120, on Duns-

muir street, between Seymour and Granville. Owner, W. F. Hunting, 1185 Burnaby street.

Gould & Champany, architects, Bower Building, are calling for tenders on granite and stone work for the Rogers' Building, corner Granville and Pender. Plans and specifications may be seen at the office of the above architects.

Permit has been issued to the National Finance Co. for the erection of a seven-storey brick and reinforced office building at 325 Howe street. Thos. Hooper, Winch Building, architect. Adkinson & Dill, 347 Pender west, contractors. Cost, \$100,000.

Permit has been issued to the Chinese firm of Leon Way & Co., for a four-storey brick rooming house and store building, at 295 Harris street. Cost, \$30,000. Birds & Blackburne, Loo Building, architect. Adkinson & Dill, 347 Pender west, contractors.

Permit has been issued to G. E. Trorey for repairs to Tourist Hotel, 1200 Granville street, to cost \$2,600. W. H. Pawson, 410 Crown Building, architect. Western Sheet Metal Co., 1253 Howe street, contractors.

Permit has been issued for a frame addition to store and residence, 1936 Broadway west, to S. Patrick, 1924 Broadway west, to cost \$1,600. C. Lillington, 1800 8th Avenue west, architect and contractor.

CONTRACTS AWARDED

Chapleau, Ont.

Stores, \$4,300. Owner, Desjardins & Langis, Chapleau. Architect, H. W. Angus, North Bay. General contractor, J. A. Bernier, Chapleau, Ont. 1-storey, 48x55, frame, metal ceiling, plate glass fronts, felt and gravel roof. Heating and plumbing contract not let yet.

Edson, Alta.

Coal bunkers, \$15,000. Owner, Grand Trunk Pacific. General contractor, A. Beatson, Edmonton. The work will consist of piling for foundation; a concrete cap over this to form a foundation for the frame work of the sheds, the roof will be tar and gravel. Contract let June 26th.

Hamilton, Ont.

Store, \$4,000. (Elgin street). Owner, Mrs. Tegart. Architect, E. B. Patterson, 167½ King street E., Hamilton. General contractors, Frid Bros., Hamilton. Carpenters, Brenner & Penny, Hamilton. 3-storeys and basement, brick, 22x45. Contract let July 4th; Heating, plumbing, sheet metal, iron, electric and gas contracts to be let later.

North Bay, Ont.

Warehouse, \$25,000. Owner, Yonge Co., Ltd., North Bay. Architect, J. F. Brown, Toronto. Mill construction, 3-storey and basement, 60x120. General contractor, Hughes & Co., North Bay. Heating and plumbing contracts not let yet. Ground floor to be used as general and private offices of Company.

New Westminster, B. C.

Offices, \$150,000. Owner, The People's Trust Co., Ltd., New Westminster, B. C. Architect, W. A. Doctor, Vancouver. Contractor for concrete work, Fraser Valley Tile & Cement Co., Ltd., New Westminster; 8-storeys, 66 x 132, brick, terra cotta, tile, mantels, fireproofing, artificial stone, fire escapes, freight and passenger elevator, sheet metal

work, vaults, cornice, metal ceiling, sprinkler system, plate and art glass, electrical work.

Toronto, Ont.

Office, \$5,000 (Dundas street). Architect, J. N. Cowan, 65 Adelaide street E., Mason contractor, Venn & Evanson, 776 Crawford street. Carpenter contractor, E. H. Stanford, 535 St. Clarence. Wiring contractor, W. E. Sheppard, Bank street; brick and artificial stone, stone foundation, hot water heating, gas and electricity, modern plumbing, slate roof, interior maple flooring, 3-storey, 21x60. Heating and plumbing contract not let yet.

Moose Jaw, Sask.

Meat packing plant, \$150,000. Owner, Gordon, Ironsides & Fares, Winnipeg, Man. Official in charge, G. W. Rudesill, Moose Jaw, Sask. Contractor, D. D. Davies & Co., Chicago, Ill. Excavation has commenced.

Montreal, Que.

The contract for a \$27,000 office and factory building on King street for the McClary Manufacturing Company, Ltd., has been awarded to C. E. Deakin, stores, stone and concrete, 106 x 114, felt and gravel roof, galvanized cornice.

The contract has been awarded to the Atlas Construction Co. for a five-storey building on 65 Alexandra street by the Gillette Safety Razor Co., Ltd. Concrete, 105 x 76. Contract price, \$112,000. Lockwood & Grace, Boston, architects.

Power Plants, Electricity and Telephones

Edmonton, Alta.

Negotiations about completed for gas franchise. Parties interested, Utilities Commrs. and the International Lighting & Heating Co. Represented by Mr. Eaton. The agreement will require work to commence this year, and a fixed sum to be expended each year on additions and extensions. Supplementary report when agreement is presented to public for tenders, etc.

Niagara Falls, Ont.

Work in progress for power plant, \$66,000. Owner, American Cyanide Co., Niagara Falls, Ont. Electric furnaces, retorts, cranes, conveyors. Extension of factory. The company have started work on extension. Work being done by day labor.

Machinery required for power house extension, \$500,000. Owner, Toronto Niagara Power Co., Niagara Falls. Equipment, \$300,000 for generators, governors, turbines, pen-stocks, eac. Construction (\$200,000) will begin at once by day labor.

Sault Ste. Marie, Ont.

Tenders called for wireless telegraph station. Owner, Department of Naval Service, Ottawa, Ont. Deputy Minister, G. J. Desbarats, Ottawa. Erection of station. Plans, specifications and form of contract to be entered into can be seen and after July 1st at the office of the Supt. of Wireless Telegraphs, Dept. of Naval Service, Ottawa; the office of the Agent of the Dept. of Marine and Fisheries, Parry Sound, Ontario, or the office of the Supt. Engineer of Sault Ste. Marie Canal, Sault Ste. Marie, Ont. Tenders received by Deputy Minister until July 15th.

BOILERS



Fitzgibbon Type of Boilers built for McLachlin Bros., Arnprior, Ont.

BOILERS, of All Kinds for Any Service

"Inglis" Boilers are Designed and Built by Skilled and Experienced Workmen.

"Inglis" Boilers are Built of the Best Material that can be procured.

"Inglis" Boilers are Made in Shops Equipped with the Latest and Most Modern Machinery.

Workmanship, Quality, Quick Delivery and Fair Prices, together with Fifty-Two 52 Years' Practical Experience, have made "INGLIS" Boilers the "Standard." Write us for prices.

The **John Inglis Company**
Engineers and Boilermakers Limited

14 Strachan Ave., TORONTO, Canada

Miscellaneous

Brandon, Man.

School. Owner, Public School Board, Brandon. Architect, T. Sinclair, Brandon. Heating and plumbing contract awarded to Brandon Heating and Plumbing Co., Brandon. The above firm also received contract for heating and plumbing in school in Souris, Man.

Guelph, Ont.

Ald. C. W. Kelly has been granted six weeks leave of absence, during which time he purposes visiting several American cities to get information regarding auto fire apparatus and fire halls.

Halifax, N. S.

Laboratory, \$25,000. Owner, Commissioner of Public Works and Mines, Halifax, N. S. General contractor, F. A. Ronnan, 16 Prince street, Halifax. Brick and stone building.

Saskatoon, Sask.

Recent permits include the following: W. Storey, frame residence, 7th avenue, \$4,000; F. Cahill, brick office block, Avenue A., \$50,000; H. D. McKay, frame residence, Avenue G, \$4,000; W. G. Hunt, two-storey brick addition, 23rd street, \$20,000; E. A. McNash, frame residence, 8th street, \$2,500.

Winnipeg, Man.

Recent Permits include the following: A. E. Fulljames, two dwellings, Corydon avenue, \$9,000; D. Menzie, dwelling, Merrion avenue, \$2,000; Boyle-Higgins Co., dwelling, Morrison avenue, \$3,500; B. Lindal, dwelling, McGee street, \$2,000; P. Fife, dwelling, McMillan avenue, \$3,200; Arni Eggertson, dwelling, Arlington street, \$4,500; W. E. Graham, dwelling, Pine street, \$2,500; J. H. Blair, dwelling, Chalmers avenue, \$2,200; G. F. R. Harris, dwelling, Harvard avenue, \$7,500; B. Goldstein, two dwellings, Flora avenue, \$5,000; C. M. E. Williams, dwelling, Aubrey street, \$3,000; J. Thistlewaite, dwelling, Beresford avenue, \$1,800; J. Hodder, two dwellings, Selkirk avenue, \$3,000; F. S. Parlee, dwelling, Canora street, \$5,500; A. Simpson, dwelling, Evanson street, \$3,500; W. McKelvey, dwelling, Alexander avenue, \$2,500; J. C. Waugh, duplex dwelling, River avenue, \$15,000; F. Nation, business block, Portage avenue, \$21,000; J. H. Morgan, dwelling, Morley avenue, \$2,200.

Unclassified Items

Brantford, Ont.

Work in operation for new industry, Sydenham street. Owner, Brake Beam Co., Buffalo, N.Y.; Canadian branch of this company is being established in Brantford. The machinery has arrived and is being erected. The work on the first order for 4,000 brake beams will commence at once.

Campbellton, N.B.

Tenders called for heating and ventilating school. Owner, Board of Trustees; architect, Leslie R. Fairn, Aylesford, N.S. New school under construction. Tenders for heating, etc., close July 15, 1911.

Hamilton, Ont.

Heating system required for school, Caroline street. Owner, Board of Education; secretary, R. F. Foster, City Hall; architect, Munro & Mead, Main &

Hughson streets, Hamilton. Steam or hot water, \$3,000. Architects will soon call for tenders.

Tenders to be called for factory, Sanford & Wilson. Owner, Tallman Brass Company; architect, Stewart & Witton, Hughson street south; addition to finishing department, 64 x 93, \$12,000; addition to foundry, 43 x 20, \$1,000, one storey and basement (both), brick and steel, stone foundation, steam heating, electric lighting, Careys roof, cement work, structural iron, sheet metal work, skylights, steel beams, iron columns, roofing, wired glass, area gratings, one 75 h.p. boiler. Tenders received by company after about three weeks.

Plans being prepared for extension to factory. Owner, The Canadian Tungsten Lamp Co., Hamilton; president and general manager, W. H. Ginder. The president was authorized at the annual meeting to get plans and specifications for a five-storey extension, work to commence as soon as possible.

Kindersley, Sask.

Tenders called for school. Owner, Board of Trustees, Kindersley; acting secretary, J. D. MacLeod, Kindersley. Four rooms and auditorium, brick. Plans and specifications may be seen at the office of the acting secretary or at the office of the managers of the following firms: J. H. Ashdown Hardware Co., Main street store, Winnipeg, Man.; Peart Bros., Regina, Sas.; Isbister & Prette, Saskatoon, Sask. Tenders to be accompanied by a deposit of five per cent. of amount of tender. Tenders received by the acting secretary until 5 p.m., July 25.

Lethbridge, Alta.

Tenders to be called for school, \$4,000. Owner, Hyssop S. D. No. 2,447, Lethbridge; architect, Whiddington Bros., Lethbridge. One storey, 34 x 34, brick, concrete foundation, hot air heating, shingle roof. Tenders received after July 15 until July 25. Supplementary report later.

Niagara Falls, Ont.

Machinery required for grading. Owner, Thomas Battle, Niagara Falls. Required, Feldspar grading machinery.

Neepawa, Man.

Tenders closed for round house. Owner, Canadian Pacific Railway, brick, 5-stall. Plans and specifications with C. P. R. engineer, Winnipeg, or C. P. R. superintendent, Brandon. Tenders closed July 7.

Toronto, Ont.

Plans in progress for rectory, \$8,000, Dufferin street. Owner, St. Annes Church, Toronto; architect, Gordon & Helliwell, Confederation Life Building, Toronto. 2½ storeys, brick and stone, hot water heating, combination lighting, slate roof, hardwood interior finish, electric work, plate glass, tile, mantels, metallic lath, cornice, plate glass, structural iron. Tenders will be called in about three weeks.

Plans in progress for branch bank, Bloor and Sherbourne streets. Owner, Dominion Bank, Toronto; architect, J. M. Rule. Two storeys, brick and stone, cut stone, hot water heating, felt and gravel roofing.

School, \$36,825, Essex street. Owner, Board of Education; secretary, W. C.

Wilkinson, City Hall; contractor, masonry, G. T. Gayton, 2 Wayland avenue; carpentry, Crocker & LeDrew, 185 Ossington avenue; painting, P. Phinmore, 536 Brunswick avenue; plastering, M. J. Haildock & Son, 792 Crawford street; roofing tinsmith, J. T. Flowers, 5 Denison avenue; iron work, W. H. Slater, Toronto; terra cotta, Robert Bennet, 347½ Euclid avenue. All contractors of Toronto.

Contract awarded for parish house, \$15,000. Owner, St. John's Church; architect, Symons & Rae, 15 Toronto st., Toronto; masonry, W. G. Veal & Son, Toronto; carpentry, Betson & Terry, 3 Fenwick avenue; plastering, J. S. Trail, 62 Argyle street; plumbing, F. Armstrong & Co., 277 Queen west; galvanized iron, A. Mathews, Ltd., 256 Adelaide street west; steel, Reid & Brown, 63 Esplanade east; wiring, D. A. Hills, 1039 College street. All contractors of Toronto.

Thorold, Ont.

Tenders called for paving. Owner, Corporation of Thorold; clerk, D. J. C. Munro, Thorold; engineer, J. C. Gardner, Niagara Falls, Ont. 5,800 lin. ft. of 16 ft. macadam road. Tenders received by clerk until July 15.

Vancouver, Kamloops, B.C.

Railroad. Owner, Canadian Northern Railway; general contractor, Northern Construction Co., of Winnipeg; P. Welch, Spokane. Sub-contractor, Aylmer Bros. & Henning, of Vancouver, Hope to Yale, 14 miles; Burns & Jordan, Spokane, Wash., Yale east 14 miles; Geo. Chew, Spokane, 5½ miles; Cunningham & Co., of Greenwood, B.C., 5 miles, Boston Bar; W. P. Tierney & Co., Vancouver, 11 miles; A. E. Griffin and Jas. Welch, 19 miles to Lytton; Grant, Smith & Co., Seattle, Lytton to Spence's bridge, 23 miles; Twohy Bros., Portland, Ore., Spencer Bridge east 41 miles; Grant, Smith & Co., 30 miles to Kamloops.

Woodbridge, Ont.

Tenders called for concrete abutments. Owner, Village of Woodbridge; clerk, Ed. H. Brown, Woodbridge; engineer, Frank Barber, 57 Adelaide street east, Toronto. Concrete abutment for steel bridge. Plans and specifications at office of engineer. Tenders will be received by clerk, until 8 p.m., July 21.

Whitewan's Creek, Ont. (2½ miles N.E. of Burford Village).

Tenders called for bridge, \$5,000. Owner, County of Brantford. A. E. Watts, clerk, Court House, Brantford; engineer, W. H. Fairchild, Brantford. One 75-ft. span, width 16 feet, arch 18 inches at crown, rise 10 feet, abutments run back 20 feet, 9 feet high at front, 2 feet at back, wing walls extend back 25 feet from face of abutment, cement furnished by county. Plans, etc., at Clerk's office, Brantford. Tenders received until July 15th, by Wm. Milmine, Chairman Bridge Committee, until noon July 15th. Alternate tender calls for abutments, centre pier and two reinforced concrete girders, each having a clear span of 40 feet. Pier 25 feet long, 6 feet at base, 17½ feet high, two abutments 7 feet at base, 22 feet high, wing walls 24 feet at one end of bridge and 13 feet and 20 feet at other. Expanded metal for boor, reinforcement and Kahn bars for girders. Cement supplied by county.

Contract Record

A Weekly Journal of
Building, Contracting, Engineering, Public Works
Municipal Progress, Advance Information

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No. 29

The Strained Relation

The feeling of hostility that frequently exists between the engineer and contractor whereby each is ever trying to get the better of the other, and a conflict of wits is always taking place, has, as we all know, a host of disadvantages. Both contractor and engineer are generally worthy firms anxious to do their best for their employers and turn out creditable and satisfactory work. Differences of opinion are inevitable but among the best and the most experienced engineers and contractors, it is safe to say that there exists a friendly feeling and also a feeling of confidence. It certainly is no pleasure to the right-minded engineer to see the contractor suffer any unnecessary loss. As Mr. Jeckell states in his article, entitled, "Duties of a Consulting Engineer," contractors have to live, and by taking up an attitude antagonistic to them he, the engineer, is really working against and not for his client. It has often appeared that a considerable amount of money is wasted and annoyance caused owing to an unnecessary want of confidence, and owing also to a certain reserve on either side whereby each party has misjudged the other's intentions and apprehends that all business relations must be framed in suspicion and distrust.

The old-fashioned horse trade is an illustration of the relationship and has been described as follows:

"The picture is a familiar one to some of you, no doubt, of the two traders with their questionable steeds, watching each other out of the corners of their eyes, while each makes an examination of the other's horse. All of the tests known are tried to see if the horse's eyes are good; his teeth are examined to make sure of his age, and the examination is a very careful one at that, to make sure that the horse's teeth have not been filed up for the occasion. The horse is paced around to see if it is string halt or lame, likewise trotted a distance to see if it is wind-broken, run down hill to see if it is stove up, and examined for ring-bone, spavin, and all the ills that horseflesh is heir to. Then dickering begins as to the amount of boot

to be paid by one or the other, each word and action indicating the distrust that the one horse trader has for the other."

The origin of such a feeling between engineer and contractor has not been without reason. Very often the young engineer lacks the business training of which he finds himself in great need, and resorts to theory to too pronounced an extent. Contractors are often tardy in appreciating this fact. The contractor on the other hand has been confronted with a more positive training from which beneficial results in a business way have been more immediate.

It is the duty of the engineer to be, in so far as possible, a mediator between his principals and the contractor, knowing that the one gets the result paid for, or results equally as good, and that the other gets the best possible opportunity to make money in carrying out the work to reach the desired end. Specifications should as far as possible, as Mr. Jeckell suggests, leave the method of doing the work to the contractor, as one contractor may have plans and methods different from those known to the engineer, which will enable him to bid much lower than his competitors. In all cases specifications should be devoid of clauses which favor one manufacturer or one bidder against others.

It is often in the mere reading over of the specifications that the contractor forms a drastic opinion of the engineer. The clauses therein may becloud the mind of the former and appear unnecessary. They may be contradictory and thus obscure the intent. Frequently in compiling specifications the engineer copies portions of an old form for use on the new work, and after turning it over to a clerk or stenographer, clauses are found to have crept in which do not belong there, and the result is a field for trouble and litigation.

However, the many points that arise between the engineer and the contractor are too numerous, though important they may be, to be considered in these columns. The article referred to, states concisely and exclusively ways and means of preventing some differences, improving the result sought after in the contract, and above all, creating a healthy tone between two of the parties involved.

Not Only at Home

The "friend of the family" advice and authority that city councils continue to exercise over our wayward city engineers throughout the country ceases to be a subject of local comment. According to a leading American journal the topic is worthy of a paragraph.

It is no uncommon thing for the members of the city councils of American cities to take a more than fatherly interest in the working of their city engineers' departments. In fact this interference, this telling the engineer how to do his work, has often resulted in the city losing a capable official. In Canada, if we are to judge from a recent issue of one of our Canadian contemporaries, city councils are also quite active in the running of the city engineer's department. In the "personal mention" columns of the above issue are three items relating to the resignations of city engineers. In one city the city engineer resigned because of the refusal of the city council to give him sole control of his department and because of the independent appointment of an assistant engineer by the city council. In the second city the engineer resigned in consequence of interference with

the department from the city council. It was one of the conditions of the appointment of this engineer that he should be given full control of the department. Instead, it is stated, he was treated in an arbitrary manner and has had to submit to aldermen "who knew little about civic improvement and less about engineering." In the largest of the three cities the engineer resigned following an order of the city council that all civic employees must register their arrival and departure by a time clock.

Whether the publication of this in an American technical journal will tend to decrease the verdure of the Canadian field for American engineers to such an extent as to worry the minds of several of our city councils, who tend to lean kindly toward them, is a question. To them an American engineer famine would be serious, there being nothing Canadian to fill the bill.

What is seriously in the interests of us all to advocate is the appointment of engineers to direct, as responsible heads, the public works departments of our cities. In every large city at least there should be a review board composed largely of engineers to review, to criticize, and to suggest improvements in the work of these department heads. The direction of a city's street department, or sewer department, or water supply department, or bridge department, is a work of management engineering. The engineer fitted to be at the head of great works is to-day a management engineer, something more than a technician but none the less a man of technical attainments. There are such engineers, scores of them, and it is they who should handle our city public works.

Citizens to whom it has become evident that aldermanic appointments are not solutions to engineering problems should assert their influence in an endeavor to place the tasks upon proper and capable shoulders.

Surety Bonds

Editor, Contract Record:

The problem of contractors' cheques has received considerable space in your journal of late, and I think the movement is a worthy one.

It is becoming a very common occurrence for individuals, business houses and municipalities to exact of contractors the filing of a surety bond to indemnify them against any loss they may sustain, up to the penalty of the bond, through the failure of contractors or in the event of the contractor not living up to the contract, plans or specifications.

It is a matter of business and dollars and cents with the owner, and, therefore, no contractor should take offense or think that it is in any way a reflection on his financial standing or ability to complete the contract in a faithful and satisfactory manner. Put yourself in the place of the party about to build, and for argument sake, we will say you expend one hundred thousand dollars, would it not be just and right for you to require some form of security over and above the retained percentage specified in the contract? You know how hazardous a line the contracting business is, and also how easily unforeseen contingencies can arise to wipe out your profit on your contracts, and also taking into consideration the fact that the keen competition that exists in the business to-day will not always allow a contractor to figure against contingencies which may arise and also in the event of the failure of the contractor, experience has shown that the reletting of a contract incurs an

extra expense on the owner, and the retained percentage very seldom proves adequate. So I feel sure that you will agree with me, when I say that a party about to build, as a matter of business, has a right in exacting a bond of a guarantee company and also recognizing the nature of the trade.

An antiquated method of municipalities mostly, requiring a deposit of ten per cent. in the form of an accepted cheque, of the contract price, as security for the faithful performance of the work, is being very rapidly replaced by the surety bond owing principally to the fact that contractors who make a specialty of public work find it quite a hardship on their finances to have, say ten per cent. contract price in addition to a retained percentage tied up. So in the event of a contractor filing a bond, he has this ten per cent. working in his business, and in many cases keeps him from running in on his bank to make whatever arrangements might be necessary. So you will readily see it works out both ways. The requiring of bonds is as big a benefit to the contractor as it is to the owner. Any reliable contractor with a good name in the trade and one who has had a knowledge of the business, providing he has not considerably more work on hand than his financial responsibility warrants, can secure the bonds of a Guarantee Company.

There is nothing more satisfactory than when you are in session with an owner or architect who does not know you, it is very nice to be able to say, "I am a reliable contractor, I have done certain contracts in a satisfactory manner and I have a reliable guarantee company who will guarantee my ability to complete the contract in question." So you will see that guarantee company, as well as being a convenience to contractors can also be a friend in need.

When the contractor is associating himself with some bank he chooses the one that is most liberal and courteous; the same idea applies to contractors about to associate themselves with a guarantee company. There are two points which should arise in his mind. (1) What facilities have they for handling my business and (2) will they be as liberal as the next company. A contractor should see that his guarantee company has confidence in him, as it is as essential as having the confidence of your bank, as guarantee companies loan their name which represents money.

F. D. SELWONK.

According to Mr. Takahashi, C. E., who is at present in Canada looking over the many water plants completed and under way, the Japanese are at present very active in developing the water powers of that country. Mr. Takahashi states that he is engaged on a formidable power proposition about 150 miles from their capital city of Tokio, and he has been spending the last two months in the United States, Ontario and Quebec. While he was convinced that the Dominion offers about all he wants to see as an engineer, he will proceed to Norway and Sweden and other European countries where water powers abound. The city of Tokio, he says, is now supplied by two water plants of 67,000 horse power and four steam plants aggregating about 40,000 additional horse power.

The Grand Trunk Pacific Railway propose enlarging its roundhouse at Edson, Alta., to double its capacity.

The Detection of Civic Waste of Water

The Value of the Meter—Its Effect upon Public and Free Water Consumption — Other Methods of Detection — Frequency of Investigation Advisable

The serious problem that confronted the city of Toronto and other cities in the Dominion, during the recent heat wave, when an abundant supply of water was most needful, has occasioned in this city an investigation of the channels of waste. At several times of late the water situation became alarming, and the Waterworks Department do not propose risking a repetition under any circumstances.

The opinions of aldermanic and other officials as to the advisability of installing individual house meters throughout the city now forms daily food for the press. The enormous outlay for such installation is evident. The point that such a procedure might curtail the consumption to an extent sufficient to seriously decrease the revenue of this department was likewise brought up. Imagination rose to the pitch of suggesting that citizens would economize so diligently that the department would be obliged to continually use good water for keeping the sewers flushed.

Citizens do not intentionally cause such a shortage of water as has been recently experienced. The population of the city of Toronto, at least a large proportion of them, are aware that the expense of furnishing water is quite a heavy item, and all of them understand the necessity of payment, sooner or later. There is, however, a very deep prejudice against metering the services of private dwellings, despite the fact that the introduction of meters would undoubtedly prove a help to consumer as well as waterworks department. Before the American Society of Waterworks Associations at a recent convention it was stated and agreed upon that a service charge plus a uniform rate for water, when worked out on an equitable basis in a large city, is almost always productive of a reduced water bill in houses where ordinary care is taken to prevent waste.

A few questions relating to meters and other methods of waste detection has been considered by Mr. Edward W. Bemis in the Engineering Record. In his paper certain broad and important questions of policy are dealt with.

The Metering of Public and Free Water

Almost every water department furnishes water free for fire protection, public buildings and schools, parks, fountains, street and sewer flushing, and often for puddling during pipe and sewer laying and street paving. Water may also be free to parochial schools, hospitals, charities and churches. It is not practicable to meter water for fires or for street or sewer flushing and occasional connections in the parks for lawn sprinkling. In the few cases of this kind where it is physically possible to attach a meter the water used hardly seems to justify the expense, but it is possible to determine approximately the amount of water used by occasional meter tests and by daily reports of the time in which fire hydrants are used for fires, the amount of street and trench puddling and the number and size of flushing carts in use, etc. It is easy to meter all water used by fire engine houses and fountains. Those fountains which run intermittently when a

button is pressed can be estimated. It is also easy of course, to meter public buildings, including schools, charities and hospitals.

The only question at issue, both as regards metering where it is practicable and as regards estimates where meters cannot be used, is whether the object to be attained warrants the trouble and expense. There can be no doubt on this subject if the water department is paid, as it should be, for all such uses of water. This is true even if the water department be in the hands of the city and the money thus appears to be taken from one pocket and put into another. Nothing will so stimulate any city department to keep a watchful eye upon its plumbing as the necessity of paying another department or private company for the quantity of water used or wasted. The time will come when every city water department, like that of Holyoke, Mass., will receive pay for all water furnished for every purpose, such as schools, parks, municipal buildings, street flushing, charities, and so forth, and in return will pay for services of other city departments. Even rent will be paid for city buildings and such taxes as a private company would pay. Only in this way can municipal accounting be clear, and the cost and profits or losses of each department be known.

But even if law or custom does not allow the payment to the water works of all the water furnished for public uses, charities, hospitals, etc., there is still abundant reason for metering all that can be metered and estimating the remainder. When the results are brought to the attention of the various city departments and others affected, accompanied by the records of investigations showing what is the probable cause of any large consumption, and by comparisons with similar places in the city or elsewhere, the excess use is very likely to be stopped.

If it is not stopped there remains the publication of the results in official reports and in the daily press, which will lead to the formation of a public opinion that will force proper economy upon the other departments, and will also enable the true profits of the water department to be understood.

In the case of water used for fires, it is hardly necessary to state that the amount of water used is no fair test of the cost of the service, but the amount of water so used should be known.

When the public schools of Cleveland were metered the writer discovered a consumption varying from 5 gal. per child per day throughout the year to over 200 gal. This was based on the average number of children in school attendance. The average of all the schools was over 30 gal. Meters, together with investigation and the partial co-operation of the Board of Education, resulted in the reduction of this average to under 15 gal. Leaks and the running of fountains outside of school hours were largely stopped. Save in the high schools and in buildings where long rows of closets were automatically flushed at frequent intervals, whether occupied or not, the average was brought below 10 gal. Children are easily taught to

use in school such individual tanks as they will use in after life. If the school authorities had to pay for the present reckless use of water they would adopt such plumbing in all schools. Indeed, the more economical method is already in use in many of the finest primary and grammar school buildings in the country.

Few cities have made any careful study of the amount of free water, whether used by public authorities or given away to charitable institutions. From the data that some cities have given the writer has computed the following:

Free Water per Day, per Capita

Place	Year	Quantity Gallons
Yonkers	1909	3.3
Jersey City	1910	4.3
Chicago	1909	8.3
Cleveland	1909	8.9
Minneapolis	1909	10.0
Fall River	1910	10.7
Worcester	1910	11.0
Detroit	1909	12.0

It is safe to say that free water takes from 3 to 12 gal. per day per capita. In most cities it will probably run from 8 to 11 gal. Let us assume 10 gal. as a fair amount.

Metering of Private Fire Lines

In addition to the use of water covered above under the name of "free water," there is the use of water by private fire lines which are connected with sprinkling systems or with stand-pipes, yard hydrants and roof tanks. As fraud and leaks are discovered in many fire lines, the movement for metering such lines is growing. It is evident that either there must be a suitable meter on each fire line, or a vault with a by-pass where similar test meters can be attached at any time by inspectors of the water department. In either case, some charge should be made for the expense and trouble put upon the water department and the cost of all meters and vaults of this kind should be borne by the consumer.

What Should be Metered First?

Public sentiment is ready for metering all business consumption and free use of water. There are only two questions of really serious import in this connection. The first is, whether business use shall be metered when the business is conducted in only part of the building and when expensive changes of plumbing are necessary to separate the business supply from the rest of the building. The second is as to the order in which the domestic consumption should be metered.

With regard to business conducted in a portion of any building, it would seem that in most cities the people are ready for metering the entire service on part of which there is business consumption, even though it may not be ready for metering all domestic uses. Where saloons or stores occupy the lower part of a building it costs much more to separate the plumbing and install meters separately for the business portion than to meter the whole building, and there is much danger of fraudulent connections afterward between the two parts of the plumbing.

Where, however, the community is not ready for metering such a building, it is hardly worth while to press the matter upon the business portion of the building, if the business is of such a nature as to use little water, as in some small shops and stores. Such

has been the policy of the New York water department during the past two years.

Assuming, however, that the community is ready for beginning of domestic metering, where should the work start?

The tendency of many water departments at this point is to meter first the consumers who are thought to be wasting most water. In many places this is a great mistake. It prejudices all classes of consumers against meters. It makes them think that the meter is their enemy—a badge of disgrace. It becomes associated with high bills. Some departments may have sufficient legal or popular strength to carry out such a policy, but in many places it destroys the possibility of general metering. A wiser plan is the one the writer introduced into the Cleveland Water Department, of first metering a considerable portion of those sections likely to have good plumbing and whose occupants are ordinarily prudent in the use of water. Then, if the meter rates are properly adjusted, it will be found that the meter is a financial benefit to this class, which is in the majority in the city. With the sentiment thus established, it is easy to go and meter sections which inspection or pitometer investigations may show to be wasteful.

Having decided what streets to meter, every service on the street should be metered continuously from end to end, thus saving expense in moving about from one location to another.

It is hardly necessary to add that the best stopcocks and stopcock boxes on the market should be provided at the curb on every service that does not already have good ones in working order.

Should All Domestic Services be Metered?

Some ably contend that the metering of one-half of the domestic service, together with all the business and free services, will accomplish almost as much in the line of prevention of waste as will the metering of every service, and, of course, at less cost. This may be admitted if the 50 per cent. of domestic services metered are the more wasteful ones. In that case, it may also be asserted that the flat rate will yield more revenue from the 50 per cent. of prudent consumers than would any reasonable meter rate.

The above admissions do not imply that the metering of exactly one-half of the services would accomplish these results. It is more likely that in most cities 60 to 70 per cent. would have to be metered in order to accomplish as much reduction of waste as is practicable with the smallest expenditure of capital and least loss of revenue. But the above is only one side of the matter.

The fundamental and, in most cities, the fatal defect in all this reasoning against universal metering lies in the assumption that it is practicable to meter only the more wasteful services. Some water companies may be so strongly entrenched in their franchise rights and superiority to public opinion as to be able to do this. The majority of private companies and almost all municipal plants would in time shipwreck their policy and bring discredit on the meter system by placing meters on the services of only the more wasteful half or two-thirds of their consumers. The difficulties would be the same as pointed out above with respect to placing the meters first upon the more wasteful services.

Even if it were practicable to endure the unpop-

ularity incident to metering only those whose bills would often be raised thereby it would be difficult to justify the refusal of meters on the same terms to others. Moreover, one of the great arguments for meters, the justice of charging according to the quantity of water used rather than according to ridiculous rules, such as the number of rooms or fixtures or frontage, would lose much of its force if the water department refused to apply the principle to its more prudent consumers.

Frequent Reading and Free Investigating

Too much emphasis cannot be placed upon matters dwelt upon in previous articles, the importance of frequent reading with notices to proprietors and consumers of any large and unusual meter registration, and the offer of the services of the department free in locating causes of the same.

In Cleveland the domestic consumption of water was nearly 5 gal. per capita per day greater, or 25 per cent. greater in 1910 than in 1909, a large portion of this increase being due to the discontinuance by a new administration of this policy. To be sure, the city obtained larger revenues at less cost, but with injury to the water consumers and the popularity of the meter system and a detriment to the whole water administration.

Other Methods of Waste Detection

There are two methods of attack upon waste; one by meters, the other by house to house inspection with the imposition of penalties where necessary and the investigation and stoppage of slips at the pumps and leaks in street mains and service. Both are absolutely necessary to any satisfactory settlement of any question that might arise. Where meters are universally used, house to house inspection may be omitted, except to assist property owners to locate leaks where the meter shows a large consumption, but even universal metering will not dispense with the need of discovering and stopping the slip of pumps and the waste in the street mains and services. By the use of pitometers or Venturi meters, slips of modern and almost new pumps of over 30 per cent. have been discovered in some cities. The mere substitution of new pumps, with proper maintenance of the same, has been responsible for a considerable apparent reduction in per capita consumption in Philadelphia and Cincinnati. Misguided but honest people often argue against the meter system, because in universal metering in Milwaukee, Yonkers and some other cities, over one-third of the pumpage and below 15 gal. per day per capita has been proved in Cleveland and other universally metered cities. The slip of modern pumps should be kept below 4 per cent., and the slip of the meters below 3 per cent., and 8 per cent. should cover all other unaccounted for uses of water in a fully metered city.

Not only must the slip of the pumps be stopped in order to reach such a record, but careful surveys must be frequently made of the street mains and the services from the main to the meter. This can be done by pitometers supplemented by the use of hose and meter for block to block investigation. By the latter method, the water flowing into a block in the middle of the night is taken through a metered fire hose from a hydrant outside of the block to a hydrant inside of the block. It was the combination of the pitometer, the Deacon meter, in general use in

England, and the hose and meter, joined to the fact that the city had directly laid every foot of street mains from the start by its own labor and not by the contract, that is responsible for the excellent record of unaccounted for water in Cleveland. Large results are being accomplished by the pitometer at the present time in Washington, Chicago, New York, Yonkers, and elsewhere.

When the writer took charge of the department of waste detected and metering in New York City, in January, 1910, no methods of waste detection were in use, but the pitometer and house to house investigation from the start have already borne considerable fruit, although the hose and meter work was stopped after the writer left and none of the work was pushed to one-tenth of the extent which the writer had planned. Yet many millions of gallons a day of underground leaks have already been found and stopped in New York. In Washington, 20,000,000 gal. per day of underground leaks have been found and stopped since 1906, and over 6,000,000 gal. per day of underground leakage was found and stopped in Chicago in 1910. By far the larger proportion has been found to be in services and at the base of fire hydrants. Where the meter, as in Cleveland, is placed in the majority of cases in a vault at the curb, it will detect leaks in one-half the length of the service, but even then the use of hose and meter, aquaphone, detectorphone and pitometer or Deacon meter is needed for the street part of the service and for the street main.

In a period of threatened water famine, like that in New York City to-day, brought on by most disgraceful neglect by several administrations, house to house inspection will do much temporary good if pursued with thoroughness, tact and perseverance. It has hitherto been found absolutely impossible, however, in America, to rely for any length of time on house to house inspection as a substitute for meters. Chicago, during the last three years, has been doing a commendable piece of work in pitometer and house to house investigation, yet the per capita consumption has increased from 190 gal. per day in 1900 to 237 gal. in 1910, with only 6 per cent. of the services metered. Mr. T. C. Phillips, who has charge of the work, earnestly advocated meters in an article in the Engineering Record of March 4, 1911. In the last report of the Washington, D. C., water department for the year ending June 30, 1910, it is stated that the pitometer investigation showed the night flow per square in typical metered territory to be 873 gal. per day against 10,500 gal. in unmetered territory.

The general conclusion of this necessarily brief description of other forms of waste detection is that each method, whether by pitometer, house to house inspection, etc., or by meters, needs the other method. My own experience, however, has convinced me that where, as in Cleveland, universal metering is possible, it is by far the more important and effective of the two methods, although both should be used. In the majority of the cities, however, where the public is not yet ready for universal metering, a large development of various forms of waste detection and prevention aside from meters will not only effect great good in itself, but will prepare the public mind to undertake the large work which only universal metering in American cities can accomplish.

Strengthening the Great Assouan Dam

Remarkable Engineering Feat in Progress—Irrigation Project of Vast Importance—Answer to Criticism

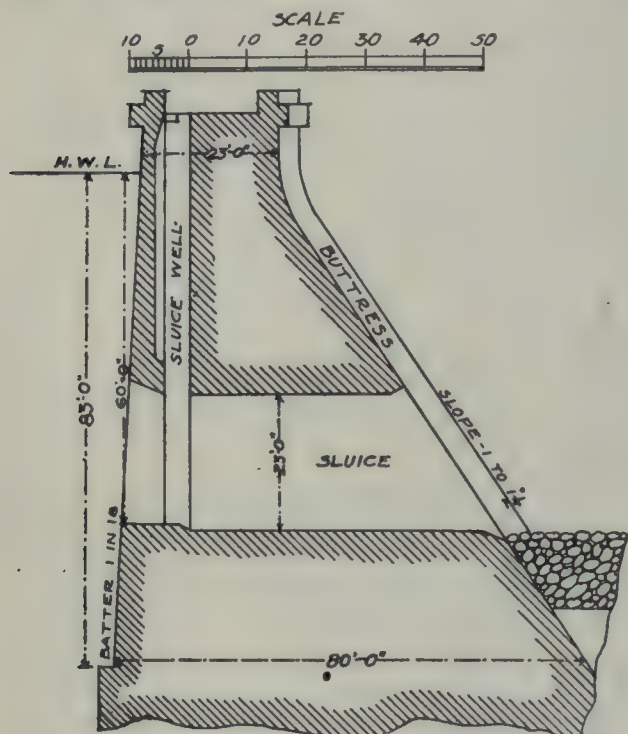
When the Assouan Dam is mentioned in engineering circles, its importance, dimensions, and the technical difficulties surmounted are invariably described as "very great," yet no one who has not actually seen the structure can realize its remarkable

erosion at the foot of the dam. Some three years' work on this strengthening of the dam has already been done, and another two years' on the raising of the structure will probably mean completion sufficiently early in 1913 to obtain the additional water storage for that year.

The primary difficulty has been the joining-up of the new work with the old; and in this Portland cement has played an all-important part, the joint between the old work and the new being about 6 inches wide, close upon 100 feet high, and fully 2,000 yards long, this length, however, being divided into sections. A liquid grout is used. It is mixed in three large mixers and carefully run in through metal flexible hose, loose stone (under 2-in.) having been left in the joints to serve as aggregate, and the grouting taking place when the temperature of the new work and the old is approximately equal.

Of the supplementary works in connection with the raising of the dam, we would mention the extension of the series of locks to take the Nile steamer traffic—this extension involving a strengthening of the locks generally, an additional gate some 80 feet in height, and a clever rearrangement of the existing lock gates.

For those concerned with concrete, the work at the dam has a peculiar interest of being a gigantic



Sectional Elevation of the Assouan Dam.

value, its magnitude, or its position as one of the great engineering wonders of the world.

If the Assouan Dam, as originally built to control the waters of the Nile, is a magnificent achievement, we venture to think that the present work of raising its height some further twenty odd feet must likewise rank as an undertaking of the highest order, and in certain respects we consider the engineering difficulties that have to be overcome not a whit less important than those surrounding the completion of the original structure.

Expressed briefly, the original dam accumulates 234,000,000,000 gallons of Nile water for irrigation purposes, by which means about half a million acres of land have been rendered cultivable. The dam runs 2,150 yards across the Nile, rises 130 feet above its foundation, has a width of 23 feet at the top, and 180 sluices. The additional height will mean water storage $2\frac{1}{2}$ times that of the present enormous amount, and close upon another million of acres rendered arable.

In order to attain this additional storage capacity, the dam is not only being raised about 23 feet, but it is also being thickened, this comprising an additional 16 feet taken down the face to the foundation and firmly bedded into the great aprons that prevent



Thickening of Dam on Down Stream Face.

example of the application of Portland cement concrete and Portland cement generally. British Portland cement has been used throughout, and in the present work—which involves an expenditure of a million and a half sterling—a large part is from the works of the Associated Portland Cement Manufacturers, Limited. The responsibility of providing a perfect cement at such a distance from the Thames

for use in a climate of exceptional dryness and high temperature, should not be underrated, the more so as the slightest hitch in the quality of the material may at any moment involve a very heavy expenditure of time and money in the pulling down and re-erection of the work, seeing that not the slightest of risks can be taken in the execution of this great undertaking.

The illustrations are of sufficient clearness to show some of the features of the work. The position of the great joints, the pipes for pouring down the grout into the joints, the horizontal inspection and test pipes, the bars used between the new and the old work, all show distinctly in the photographs reproduced. In one respect, however, the photographs quite fail to give the correct impression, and that is, as indicated above, in the matter of size and scale. Photography cannot fully assist the reader in this direction.

provide water to supplement the natural supply during any period of insufficient discharge.

The contractors for the work are Messrs. John Aird & Co., the ironwork being supplied by Messrs. Ransome and Rapier.

The operations furnish an example, not only of a great engineering project, but of technical management of unusual excellence. Moreover, the dam, by its look of utility and power, has all the features of a great work of art. The bold, straight line of plan, the curved front, the sluices with their well-regulated streams of foaming water, all speak forcibly of a well-conceived purpose well executed with the least possible waste of material and the least possible superfluity of strength.

Finally, one word to critics as to the submersion of the Temple of Philae caused by the raising of the Assouan Dam. This temple is one of many ruins



The Raising of the Nile Dam.

In the illustrations shown Fig. 1 represents a sectional elevation of the Assouan dam across the Nile river as originally constructed. From Fig. 2 may be seen the method of thickening the dam on the down stream face, the operation being shown near completion. Connecting rods bind the old work to the new through a 6-inch poured joint. Cement grout is applied to this joint through perforated pipes on the slope between sluices. Fig. 3 shows this operation completed and the dam being raised. The dam is about $1\frac{1}{4}$ miles long. It originally contained over 1,000,000 tons of masonry, forming a reservoir extending 140 miles up the valley with greater capacity than any other artificial basin in the world. It is the first unsubmergible dam built without overflowing waste weirs. Flood waters pass freely through the sluices placed at different levels, which are gradually closed after subsidence of the flood, to

situated between Cairo and Wadihalfa; and although the temples as a whole are of the greatest possible interest, the single specimen is a mere entity. What each entity is able to teach the present age, has been investigated and recorded, and these records are duly housed within easy reach of students. Whether one or a dozen of the ruins disappear to-day is merely a matter of sentimental regret. The practical loss would be nil, for there is no utility in the ruins, and all they have to teach us has been duly taught. To demand that the possible submersion or occasional submersion of one or more ruins should stand in the way of the development of Egypt, is as unreasonable as it is inhuman. Humanity requires that our knowledge, skill, and means be applied to the improvement of mankind. The lot of the Egyptian is vastly improved by the regulation of the Nile.—Concrete and Constructional Engineering.

The Fields of Operation for Contractors

**Scope Limited by Specialties — General and Diversified Work Commended —
Experience the Foundation of Reputation — Speed and Capital Great Assets.**

Some contractors show marked ability in obtaining work and much of their success at contracting depends upon this. Naturally a contractor cannot make money unless he obtains contracts, and on the proper basis. This is really the selling end of contracting. It should be as well organized and thought out as the operating part of the business.

On public work the personality of the contractor can be made a factor in obtaining work, but in most cases work must be awarded to the lowest bidder, although in some sections awarding boards now have authority to give contracts to those they believe will best serve the interest of the public, irrespective whether they are the lowest bidder or not. Acquaintance with engineers and officials can become an asset, and in private work this is especially so.

In private work some contractors can obtain jobs at much better prices than others, yet they may not have the ability to carry on the construction work as well. Politicians are sometimes made members of contracting firms with a view of obtaining new work through them. This practice is in most cases to be condemned.

Whether the work is to be public or private, the contractor or those who bid for them, should be accustomed to make deals and to handle business men in a diplomatic manner. They should be quick at sizing up men and be good talkers, yet have the ability to make other people talk, and be good listeners. They should have a retentive memory so that they can make notes of conversations after they have occurred, as it is not always good policy to make memoranda while the conversation is going on. They should be able to size up conditions quickly, observe facts, make deductions, and carry general plans in their minds with all facts, figures and other things that may affect the price of the work and the method of carrying it on. When two men are discussing any matter on which a deal is to be made, the one likely to obtain the better side will be the better posted one.

His Favorite Form of Contract

In obtaining work, one governing factor will be the scope of operation a contractor will cover. First comes the form of contract under which he is willing to work. This limits the scope of a contractor's work. If he takes work upon a percentage basis or on the cost plus a fixed sum plan or some similar method, then he is prevented from obtaining public contracts, as they are never let in this manner. A contractor doing work under such forms of contract, if he is honest and wishes to be sincere to his customers, cannot accept lump sum or unit price contracts. One prominent contractor who has made a specialty of doing business under the "cost plus a fixed sum method" said: "At first I took contracts under the cost plus a fixed sum form and at the same time lump sum and unit prices, and although I tried to do justice to the first contracts, I found myself sending my best men and tools and machinery to the job where my profit could be increased and the cost

plus a fixed sum contracts suffered, so I decided that if I was to continue under the last named form of contract, I must give up all others," which he did.

This illustrates how a man's scope can be limited by the form of contract he is willing to work under. When any form of a percentage contract is used, then public contracts cannot be obtained and not only is the contractor limited to private contracts but also to those where the owner is first convinced that such a form of contract is to his advantage. Most owners, however, seem to think the lump sum or unit price contracts are more desirable.

Classified Construction

The next factor in the scope of operation is to the class of construction that the contractor places limitations upon. The first great division or distinction is buildings from other classes of construction. Erecting buildings might be termed "architectural contracting" in distinction from "engineering contracting." Some contractors limit their field of work to buildings, and in many towns and cities this kind of contracting has been emphasized as the "building trade." It has almost grown to be a distinct branch of contracting, and frequently contractors, who confine their operations to this field are called "builders." Some of the largest contractors in the country who do this class of work also do general contracting, that is any class of engineering construction, and this fact coupled with engineering contractors, who during the last decade have turned their attentions to concrete building constructions, is breaking up any division between architectural and engineering contracting.

Many contractors limit their operations to sub-contracting work on buildings, as carpenter work, brick laying, plumbing, plastering, metal work, electrical fixtures, and many other classes of construction. In some sections of the country these various sub-contractors are considered trades people, instead of contractors, but in as much as they all name prices for their work and enter into contracts for it, they must be considered contractors.

Some building contractors specialize, that is, some confine their work to factories and warehouses, others to office buildings, some to residences, some to churches and others to public buildings. Many will take any kind of building to construct, for which they can obtain a contract.

In some cases contractors limit their work to certain materials, as steel, concrete, earth and rock, masonry, timber or wood work, the installation of machinery and other lines.

Some contractors narrow the scope of their operations to difficult and hazardous undertakings. In other words they become specialists in these lines and are thus enabled to keep a corps of men who are trained for such work. Some classes of work of this kind are foundations, subaqueous work, such as tunnels and pipes under water, bridge piers, and similar structures. Docks, piers, and dredging seem to be work that go together and many contractors do this

exclusively. Some even confine their work to dredging.

On land we find contractors who build bridges, others railroads, others wagon roads, some sewers, some street paving and sidewalk work, some power dams, others do waterwork construction, such as reservoirs, aqueducts, pipe laying, stand pipes and similar structures. Occasionally we find contractors who confine their work to shaft sinking and tunnel construction. Then some contractors specialize on electrical work, as telephone and telegraph lines, transmission lines, trolley roads and such classes of work.

There are a large number of contractors who do any kind of construction work and under any form of contract and undertake both private and public contracts. Some firms will undertake contracts to build an entire manufacturing town, build the railroad to it, construct a dam for power purposes, build the factories and warehouses, the dwellings of the officials, laborers' houses, store buildings and public halls, electric lighting system, water supply system, sewerage system, and all the details that go to make up a new town or city.

There are many opinions as to the scope of work a contractor should undertake. This alone is shown by the various lines followed as just outlined. Some engineers and contractors claim it is well to specialize, and become experts in certain lines, others believe in covering several lines of similar work or else work that goes hand in hand, and many believe in doing a very general line of work.

Personally the writer is of the opinion that the general and diversified work is the best to follow. More work can be obtained, a wider experience is gained, and in hard or stringent times, when specialists are idle, the general contractor is able to keep his outfits and forces at work, without having to enter new and untried fields. The opportunity of making money is as great, if not greater, than the following only of one line or kind of work.

Choice of Territory

Next to the scope of work, that a contractor will do, comes the territory over which he will operate. Contractors differ very much in their opinions as to this matter. Some confine their operations to one large city, others to the largest cities of the country, some to several states near their home offices, some will work in a section of the country as eastern Canada or the New England states, some limit their territory to the north, some to the south, others to the middle west and some to the far west. Occasionally contractors are found who will not go more than fifty to one hundred miles from their homes, even limiting their territory in which they do work to one or two counties of their state.

On the other hand, there are some contractors who will go anywhere in their own countries, as an American will do work in any or all parts of the United States, Canadians who operate all over Canada, then we find Americans who make a specialty of doing work in Mexico, others confine their operations to Central and South America. There are some few American contractors who will not do work in the States but will undertake contracts in any foreign land. Then we find some American and European firms who do work in any part of the world.

Various arguments are given for limiting the territory of operation, and at the same time excellent

reasons are set forth for making the world a contractor's field, but at the best, many contractors are always moving from one section to another, from one country to another, and some within ten years have circled the globe.

Thus work is done under varying conditions, and in order to make a success, contractors must be close students of people and countries, quick to size up local conditions and make correct deductions. They should likewise know the practical side of geology. Thus work in a country in which there has been glacial action is decidedly different from those sections that have never been visited by glaciers. Geological faults change the character of the timber in a country and likewise the soil and they materially change excavation work. The aggregate used for concrete changes in different sections of the United States and also in the world, due to geology to a great extent. Weather conditions likewise vary with the geology of a country. This affects streams that may have much to do with a contractor's work. The bottom of streams is especially affected by such things. Practical geology affects nearly all kinds of construction work. Even street paving and surface road work is affected in this way. The oil tamped roads of California have not been duplicated in the east, owing to the soil and climatic conditions.

Many contractors, in moving from one section of the country to another to do work, have lost money owing to the fact that they have not studied these things and taken them into consideration.

Another factor that governs obtaining work is the reputation of a contractor. This applies to individuals, firms, and corporations. Experience is part of a contractor's reputation, for he gains his reputation as he gains his experience. Every beginner is bound to lack experience, but as many contractors first work as engineers, foremen, superintendents, timekeepers, and in similar positions on construction work, they have some years of experience before actually beginning as contractors.

The Contractor's Reputation

A broad experience in construction is a large asset, and is absolutely needed, but some owners and engineers insist on contractors having had special experience on the special line of work upon which they are making proposals.

Reliability and responsibility are always specified in public contracts. The laws governing the letting of contracts often read that contracts must be "let to the lowest responsible bidder." This is generally taken to mean that the bidder must put up a certified cheque, not necessarily his own, and must make the necessary bond. At times, however, his financial responsibility is looked into and the manner of carrying on his former contract. The writer knows of one case where a contract for a reservoir was not awarded to a contractor because on a previous job for the same class of work he had put a large number of empty cement barrels in an earthen dyke. The awarding board's decision was carried into the courts by the contractor, and the courts decided that a contractor who resorted to such practices was not reliable.

Ability is a varying quantity with an individual firm or corporation. Ability is the keynote to success. Many contractors could make public all their cost records, methods of doing their work, their system of accounting and carrying on their jobs, yet

their competitors following in their footsteps with the knowledge thus gleaned from them would never achieve the same success due to the greater ability possessed by these contractors. A man, firm, or corporation of marked ability will always be well advertised and will always achieve success. Carnegie had many able assistants but it was his marked ability that made his company the most influential one in the steel business. Rockefeller, by his superior ability, made possible the Standard Oil Company, the greatest of modern commercial corporations. Numerous examples could be named in the contracting field.

A man of ability will realize that reputation for good work is a valuable asset. To use a common term, "skinning work" will injure a contractor. Everyone wants value for the money expended. It is possible to skimp some work without affecting its quality, but a contractor who follows specifications and plans will win more in the end than the one who believes he can fool the engineers. The reputation that contractors as a class are dishonest has been caused by some contractors believing they were able to make more money by ignoring specifications and skinning and skimping their work. It is the old proverb brought home again, "Honesty is the best policy." With honest work done by all, inspectors would soon lose their jobs, but from present indications inspectors need not worry about this matter.

The speed of carrying out contracts is an important consideration to all who have construction work to do. A contractor who gains a reputation for furnishing contracts on time has a valuable asset in obtaining work, both public and private contracts, and especially the latter. To further increase the speed of the work so as to finish ahead of the contract time, and even cut off a number of months, means to give a contractor an additional lever to land work. Upon one occasion the writer in bidding upon a job, on which a fourteen months' finish was asked by the engineer, suggested to the president of the company that the company, with which the writer was associated, could do the work within nine months and he offered to make it a bonus and forfeit job on such a basis. This practically landed the work and the job was finished so as to earn six days' bonus.

Men who are contentious frequently have a hard time in carrying out contracts, and lawsuits are generally brought by such men. A reputation of this kind is an injury. One of the largest contractors in the world is proud of his record that he has never brought a lawsuit against an owner.

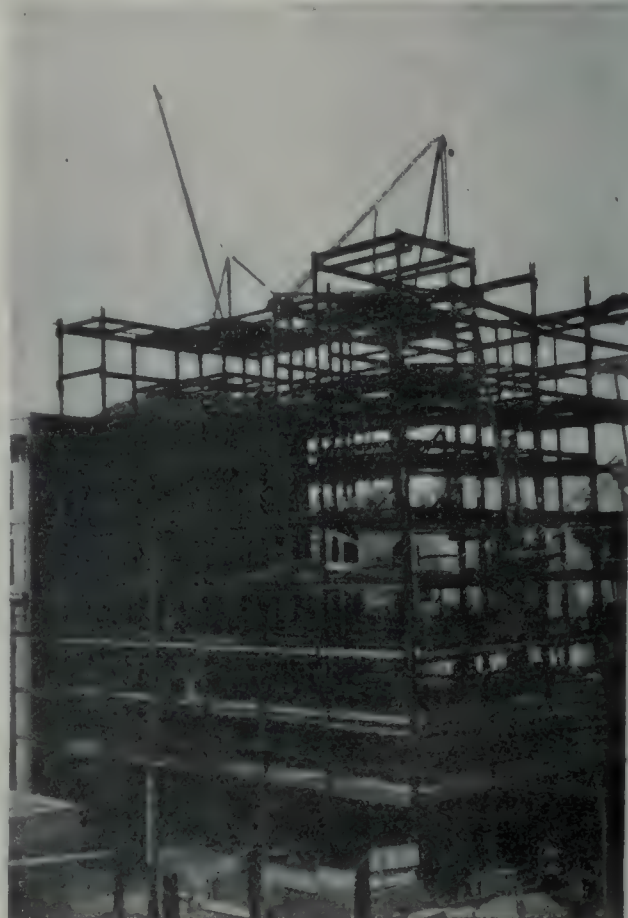
The amount of capital that a contractor has plays an important part in obtaining and handling work. Just how much capital is needed for any certain job few contractors can agree upon, but with small capital only small jobs can be handled, and only a few jobs at a time, but with a large amount of capital many big undertakings can be carried on at the same time. These are self-evident facts. (*The Contractor.*)

Montreal Dominion Express Building

The new office building of the Dominion Express Company at the corner of St. James and St. Francois Xavier streets, is well on its way towards completion. The stone work, of light colored granite, of the first and second storeys is now in place and most of the floors, all of concrete, have also been laid. The building has a frontage of 120 feet on St. James street and 95 feet on St. Francois Xavier street. It will rise 130 feet above the pavement, providing 10 storeys

above the street level and two basements below St. James street. The first two storeys and especially the main entrance on St. James street are very elaborately constructed and will, when finished, present a grand appearance. There will be two other entrances on St. James street. The upper 8 storeys will be finished in white glazed terra cotta with ornamentations of conventional design.

The Dominion Express Company and the Canadian Pacific Railway Company will have their offices on the ground floor. The rest of the floors will be rented as private offices, and the two top flats will contain the spacious and magnificently furnished rooms of the Montreal Club. The top storey will be a pergola which will be enclosed and heated in winter, and



Dominion Express Building, Montreal, Showing Steel Work

used as a roof garden in summer. The entire building will be heated with steam by a vacuum process and will be mechanically ventilated. The heating, ventilating, power and refrigerating plant will be in the sub-basement.

The main hall and the upper hall will be finished in marble, while the stairs and elevator shafts will be enclosed in grilles and wired glass. An enclosed fire escape, itself fireproof, will lead down to St. Francois Xavier street. The building will be connected with the annex now used as the St. Lawrence Hall by a bridge. Three hydraulic plunger passenger elevators will provide rapid communication to and from the upper storeys. The front of the basement will be equipped as a first class restaurant with entrance from St. Francois Xavier street. The rear of this floor will be used as an express storage room with entrance on Fortification Lane. There will also be a third class ticket office for the C. P. R. on this floor.

Duties of a Consulting Engineer

By Joseph A. Jeckell, M.I.E.E., Past
President Electrical Club, Birmingham

It seems that it would be advantageous to consider what these really are. Surely the main duty of a consultant to his client is to obtain suitable work carried out at a fair cost, and not as some would seem to think, to prevent a contractor from making a fair and just profit.

To obtain the above, the consultant should:

1. Design the job to suit the work to be accomplished.
2. Design the job to cost as little as possible.
3. Draw up the specifications so as to allow of a satisfactory job being carried out without necessarily keeping absolutely to the letter of the specification.
4. Allow as far as possible each contractor to work in his own patterns. If standard patterns are used the cost will frequently be much lower than if specials are called for.
5. In any dispute between the contractor and the client, to hold the balance of justice impartially as he frequently has to be virtually, if not actually, arbitrator.

Surely it is not the duty of a consultant:

(a) To impose conditions of contract harder than is absolutely necessary to insure the faithful performance of the contract. It should always be borne in mind that all unnecessarily stringent conditions must increase the cost of the work, as contractors are not out for the good of their health only. Thus, extra capital is expended, a course to be vigorously avoided, as the more capital is expended the more interest and depreciation will have to be found, and many undertakings have failed from over capitalization. This should be carefully avoided in a new country where failure of an undertaking to earn a fair return on the capital invested will have a deterrent effect on proposed undertakings.

(b) Nor to insist on patented or special articles being exclusively used without any option, as this enhances the cost, and there may be just as good apparatus made by other firms. This has a great tendency to curtail the number of firms likely to tender and should be avoided as much as possible, as firms not making these articles may be inclined to think things which of course are very far from the mind of the engineer.

(c) Nor to wring the last penny from a contractor or make him replace free of charge, goods which are found to be unsuitable, and this through no fault of the contractor.

Against Client's Interest

If a consultant gives this matter a few moments' consideration he will see that it is directly contrary to his client's interests to ignore the fact that contractors have to live and that by taking up an attitude antagonistic to them he is really working against and not for his client. This is easily demonstrated, because a consultant who issues specifications with unnecessarily stringent conditions as regards deposits, payments, guarantees, maintenance, retention money, etc., naturally receives many less tenders than one who takes a more broad-minded view of the matter. There is therefore less competition for the work. The price is higher than it otherwise would be, and not unfrequently the client is landed in a law suit at the end.

The work not only costs the client more in money but also in worry.

Against Consultant's Interest

It has frequently been proved in actual practice that a fair-minded consultant will obtain plenty of tenders and at low figures, as men know they will be fairly treated and hence have not to put on an extra price in order to meet what may be demanded. The narrow-minded consultant who wants the contractor to place himself bound hand and foot in his hands, obtains very few tenders. These frequently are high priced to cover chances, and not from the firms of the highest repute, as they will not condescend to be treated in the way that the engineer has power to do under his conditions. A case is well known to the writer where in a large town for many years no builder in the city (and there were many good ones) would tender to specifications issued by the City Engineer, on account of the very absurd conditions contained in them. Thus the men who were helping to pay the City Engineer's salary were precluded from tendering for the work, if they had any self-respect. They willingly tendered for similar work carried out by other engineers in the same city.

If, on the other hand, the consultant, while fairly conserving his client's interests, is willing to meet the contractor in a fair manner, the contractor, who frequently knows as much about the work as the consultant, and sometimes more, will be willing to assist when difficulties arise, which they often do in every contract of magnitude. But the consultant cannot expect this assistance if he never considers the contractor at all, and grinds him down to the last penny.

In conclusion, if the consultant would bear in mind the proverb "Do unto others as ye would be done by," it would be better for him, his clients and other contractors, but possibly worse for the lawyers, as there would not be so many cases to come into court.

During the past few weeks an agitation has been going on among the carpenters of Montreal for an increase in the wage scale to a minimum of 40 cents an hour. The men had been getting from 27½ cents to 37½ cents an hour during the season, to July 1st. At the beginning of the year the employers promised an increase of 10 per cent. all round effective on July 1st. At a meeting held a week or two ago journeymen carpenters and joiners representing six local unions met and discussed the proposal to demand a minimum wage of 40 cents an hour. Some of the speakers represented that certain contractors had agreed to give a minimum of 35 cents. After the vote had been taken and counted it was given out by the labor leaders that two-thirds of the ballots favored a compromise and that the 35 cent rate would be unanimously accepted.

On the other hand the employers say that no increase has been granted except the 10 per cent. agreed to some months ago. The best men would be getting a little over 40 cents from the first of July to the end of the season, but the 27½ cents men would only get 30 cents. "However," said an employer, "if the men want it understood that they have gained something by their agitation we are not going round to explain or deny their statement. We are not going to split hairs over the matter." Work is going on as usual, the matter having been arranged without any delay.

Notes on Construction of Masonry Dams

Settlement of Foundations a Grave Subject—Compressibility of Masonry—Expansion and Contraction Due to Temperature Changes

In the presidential address of Edward Sandeman, president of the Association of Water Engineers (England), he took as his theme the construction of impounding reservoirs and especially the construction of masonry dams. His principal thought was the importance of studying and making allowance for the effect of both compressibility of foundations and masonry and temperature changes upon the masonry, and also the unit compressive strength adopted as a maximum.

He said in part: I hope that in the future those who are engaged in masonry dam construction will devote especial attention to the recording of the amount of settlement in the foundations, and that, if possible, some information may also be gathered relating to the compression of masonry itself due to its own weight. It has generally been considered (and one authority at least lays it down as an axiom) that for a masonry dam it is absolutely necessary to have an unyielding foundation to build upon. But while such a foundation is no doubt an ideal one, it is to be remembered that all materials are more or less compressible and that settlement must always take place to some extent in the case of the hardest rocks, the amount being, of course, exceedingly small and without doubt difficult to accurate measurement. Masonry dams built upon shale and materials of a similar character must of necessity produce a compression greater than that produced upon harder rocks, and in these cases measurements of the amount of compression brought about by a given weight could be ascertained without much difficulty and the results recorded. It seems certain that, as the knowledge obtained from such observations accumulates, it will no longer be held that a masonry dam foundation must be an unyielding one.

It will not infrequently occur that the various parts of the foundation of the masonry dam, even when this is bedrock, will differ slightly in compressibility, and there must consequently be some adaptation of the masonry to the unequal yielding. Moreover, the compressibility of the masonry itself will probably not be the same as that of the rock, and consequently the settlement in sections of the dam which have different heights, owing to the variation in the depths of foundations, will differ. That masonry will adapt itself to pressure is known, but the extent of its adaptability had not, as far as Mr. Sandeman knew, been ascertained or calculated. Experiments made to determine the movement of high dams when subjected to water pressure have shown slight movements, in all probably bending movements and not due to a real motion of the dam as a whole. It seemed to him probable that when concrete was subjected to a continuous strain for a long period, its continuing to set more firmly through a period of years would enable it to gradually eliminate the strain and the concrete would take a permanent set in its final position and thus retain its full strength.

Movement Resulting from Changes in Temperature

Probably of greater magnitude than these movements and stresses due to compressibility is the move-

ment due to variations in temperature. "It was formerly considered that temperature practically remained constant a few feet with a mass of masonry, but even in this country (England) with its moderate temperature, it has been found that 30 feet from the face of a dam there is a change between winter and summer of about 5 deg. Fahr. Close to the surface—say within one inch—the temperatures vary as much as 70 deg. Fahr. Contraction in masonry produced by low temperature is a much more troublesome thing than expansion and one which in large masses of masonry almost invariably produces cracks of smaller or greater dimensions." Mr. Sandeman referred to observations made on the Boonton, N. J., dam, 2,150 feet long, in which the sum of all the cracks measured was $3\frac{1}{2}$ inches. He stated that if concrete were placed at a temperature of 60 deg., which was raised to 70 deg. by the chemical action and that this fell during the winter to 40 deg. in the masonry within 10 feet in from the face, this fall of 30 deg. would cause a theoretical contraction of about 2 inches in 1000 feet, which would cause a tension in the masonry of 21 tons per square foot, sufficient to cause cracks in almost any masonry. cracks thus caused commence at the top of the dam where it is thinnest and extend downward as the cold increases with a kind of tearing action.

The same stress exerted in compression by the expansion of the masonry could be resisted without injury and it has therefore been suggested that the masonry be laid in cold weather. But to do this would involve building in winter time only, which is an inconvenient and expensive method and liable to introduce more objectionable features due to the freezing of the mortar. Mr. C. S. Gowen, resident engineer on the Croton dam, suggested covering masonry built in the summer time with a thick coating of masonry placed in the early winter so as to prevent the development of cracks in the upper part of the masonry, and this Mr. Sandeman considered a valuable suggestion and quite practicable. That this consideration of the effects of temperature is not a heedless one is shown by the fact that nearly all masonry dams which have been constructed show sooner or later the effect of change of temperature.

In speaking of the limiting stresses in dam masonry he referred especially to the Croton dam, in which a stress of 14 tons at the base of the downstream face and 15 tons at the base of the upstream face were used in calculating the design. "Credit is due to the American engineers for their boldness in deliberately designing a dam which, while exceeding in height any existing dam by nearly 100 feet, at the same time was calculated to resist stresses so far in advance of anything previously contemplated. French engineers had already constructed dams in which the pressures on the base reached $6\frac{1}{2}$ to 7 tons, and Rankine, in a report dated February 9, 1871, suggesting masonry dams in connection with the water supply of Bombay, had even fixed a limit as high as 20,000 pounds for the upstream base, although he limited the pressure on the downstream base to 15,625 pounds

for reasons which he set out, but this great increase in the limiting pressure on the masonry is a striking feature in the design of the Croton dam and one which engineers cannot do otherwise than admire. It is possible the designers were influenced in their decision by the known fact that greater pressures than those fixed by Rankine had already been borne safely by existing masonry. The granite ashlar in the Bear Valley arched dam in California is compressed to the extent of 40 to 50 tons per square foot, and even brickwork has been known to bear as much as 26 tons. Another good reason for increasing the compression limit is to be found in the greater strength now obtained from our cementing materials. So long as the mortar binding the stones of a dam together is weak, the compressive limit must be correspondingly low, for it may be taken that the stone used is stronger than any ordinary mortar; but in these days when cement is obtainable of a uniform character and high strength, there is no longer any reason to continue the compressive stresses to figures below those employed by our friends, the American engineers."

June Building in Montreal

During the month of June just past the Montreal City building inspector issued 323 permits for new buildings and 100 permits for repairs and alterations. The amount of money set down in the estimates for the cost of the new buildings was \$1,550,365 and the amount of money estimated for repairs was \$230,495, making a total of \$1,780,860.

For the same period in 1910, 263 permits were granted for new work and 87 for alterations. The new work was valued at \$1,430,028, and for alterations \$155,226, making a total of \$1,585,254, being an increase for this year of 73 permits and \$195,696. The building operations for June included 621 dwellings and 9 factories.

If the actual values of the buildings for which permits were issued had been given doubtless the total amount for June would have reached at least two million and a half dollars. It has been the custom in Montreal amongst proprietors and in some cases, contractors and architects to underestimate the values of the buildings they are about to erect. This places Montreal in a bad light in comparison with other cities where the full values are given. Permits have been taken out in Montreal for buildings that have been estimated at only from half to two thirds of the real value. It is advocated by many persons in the building trade that when a building on being completed, exceeds the valuation set down at the time of a permit was secured the additional fees should be collected by the building inspector and the additional value kept track of until the end of the year, when the real value of the building operations carried on in the city could be arrived at much more accurately than is done at present. It is further suggested that fine should be imposed on persons making false entries. It is quite probable that this matter will be taken up by the commission which has in hand the revision of the civic building by-laws.

New Montreal Edifice

The new Birks building to be erected at the corner of Union avenue and Cathcart street will be an ornament to a section of Montreal which possesses a number of fine large office buildings and commercial houses. The illustration shows it as it will ap-

pear viewed from Phillips Square. It will be a ten-storey building of first class workmanship and most modern design and finish. The Union avenue and Cathcart street facades will be simple but dignified in style, the only enrichment being in the first two storeys and in the large order which runs through the ninth and tenth storeys. The base is Stanstead granite, very massive, and rusticated. The upper storeys will be of grey Canyon sandstone. The entrance is flanked by monoliths of "Tenos" marble.

Particular attention has been paid to the main entrance hall. Its treatment is such as one meets with in the old Flemish palaces with high vaulted ceilings and simple groinings. In the wide, plaster wall-surfaces will be set subject medallions which are being modelled by Mr. Herbert, the sculptor. The floor, the high wainscot and the trim are all in marble. The hall runs through two storeys but the second floor



The Birks Building, Montreal

corridors are connected by a gallery in one end. The corridors in the upper storeys will have tiled floors and marble door trim. There will be one freight and two passenger elevators. A clock, electrically controlled from a master clock will be provided in each office and the electrical equipment, besides providing light, will also furnish power when required by professional men. The building will be thoroughly fire-proof throughout. The contract calls for the completion of the building by the first of April next. Messrs. Nobbs and Hyde are the architects and following are the contractors: Excavating, masonry and plastering, John Stewart; reinforced concrete, F. J. Jago & Company; roofing, G. W. Reed & Company Limited; painting, F. Fefebvre & Company, all of Montreal.

The North American Smelting Company propose to begin next month the erection of a lead smelter at Kingston, to cost \$30,000. The company has been awaiting the building of the Canadian Northern line which will run directly through its property.

Further Comment upon the Building By-law

Opinions Differ as to Several Items—Mr. Wm. Fry Scott Expresses his Views—Comparison of the Toronto By-law with Requirements of the Joint Committee

Mr. Wm. Fry Scott, consulting engineer and architect, takes exception to a letter published recently in one of the Toronto dailies regarding building conditions in Toronto. The letter referred to was written by Mr. Wm. Dobie, president of the E. W. Gillett Company, and was a severe criticism upon the present by-law. Mr. Dobie is of the opinion that local architects and builders have just cause for complaint, and he further states, subject to proof, that a structure costing about \$200,000 in New York would likely cost close to \$300,000 in Toronto. A new building was contemplated by this firm, but operations were delayed for several months in the expectation that the city authorities would do something in the way of modifying the various stringent regulations as applied to reinforced concrete. Mr. Dobie drew attention to the scarcity of concrete buildings in Toronto, and compared this condition with similar sized cities in the United States possessing as they do hundreds of such buildings. The letter went on to state:

"We fully realize the importance of having plans passed by the authorities, but if no system of this kind were in force it is hardly likely that any reputable concern would put a large sum of money into a building or number of buildings and construct them so poorly that they would collapse. In the interests of this city and its architects and builders, we claim that structures that are sufficiently strong to carry heavy loads in New York, Brooklyn, or other cities, should be sufficiently strong to carry the same loads in Toronto.

What Investigation Shows

"In our investigation we have discovered:

"(1) Curtain walls are specified fourteen inches in thickness in Toronto, in place of the eight-inch curtain walls used in Brooklyn.

"(2) Twisted steel must be figured in Toronto at 16,000 pounds per square inch, where it is figured at 20,000 in Brooklyn.

"(3) Girders must be figured rectangular in section where they are figured in 'T' sections in Brooklyn. This makes the girder very much larger than is used there, in some cases as much as twice or three times as large.

"(4) Columns are specified for an allowable stress of 350 pounds per square inch on the concrete, and 12,000 pounds on the steel, which would add from 50 to 100 per cent. over the cost of material in a hooped column.

Cost of Material

"In the cost of material we find:

"(1) That cement which costs approximately \$1.65 per barrel in Brooklyn, will cost \$1.95 in Toronto.

"(2) Sand which costs from 60 cents to 70 cents in Brooklyn, costs 90 cents in Toronto.

"(3) Gravel which costs around \$1.40 in Brooklyn, costs \$2.20 in Toronto.

"(4) Steel costs are also 20 to 30 per cent. higher in Toronto than in Brooklyn.

"These figures show that the costs of material on such a job as we propose to build would run very much higher in Toronto. Labor in some instances is a little cheaper, but as a rule the grade of labor is inferior."

In reply Mr. Scott, speaking from considerable

practical experience obtained in New York and Toronto, acknowledges that there is need of a revision of the by-law for reinforced concrete, but goes on to say that conditions are not so bad as those who read Mr. Dobie's letter or the Citizens' Memorial are led to believe. Mr. Scott's letter reads as follows: Editor, Contract Record:—

Thickness of Curtain Walls

I am inclined to think there is something in the contention as to the thickness of the curtain wall, and as a matter of fact the question was brought to the notice of the Mayor and Board of Control in the year 1907 by the Board of Trade and others when the provision of the old city by-law was maintained. In some types of buildings the difference is more serious than in others, but in the most extreme cases that can be cited it will not involve an excess of more than 5 per cent. on the entire cost of the structure.

Allowable Stress in Steel

"Second, with regard to the question of the allowable stress in the steel as referred to in Mr. Dobie's item 2, let it be granted for the purpose of examining this question that allowance should be made, under some conditions of 20,000 lbs. per square inch on the steel, instead of 16,000 lbs. as required in the by-law. Now what effect does this have on the cost of the finished structure? The cost of the reinforcement alone does not exceed, say eight per cent. of the total cost of the structure, but suppose we say ten per cent., so as to give Mr. Dobie the benefit of all doubt, then we find that this item affects the cost of the structure by only two per cent. This item is very slight in its influence, and it can be said that many other influences that depend upon the personal equation of the contractor in charge of the building operations, more than offset it and make it sink into comparative insignificance.

I would like to point out that there are a few cases in actual work where a conservative designer who considers actual costs of the totals of his materials rather than the costs of occasional items, such for instance as steel, as being one item of several that go to make up reinforced concrete, would use so little steel as to stress it much above 16,000 pounds per square inch, which is allowed by the present Toronto by-law.

With regard to Mr. Dobie's items concerning T. beams, I hold that the regulations laid down by the Joint Committee on Concrete and Reinforced Concrete are considered as representing the best and safest regulations of the day, and it is my opinion that they should be adopted until such time as they may be improved upon, although they are not stringent enough on the question of bonds, and in private practice I use what was found to be safer values; but, in the main, I believe these regulations to be the best yet produced. Now, comparing the Toronto by-law with the Joint Committee's regulations on T Beams, it will be found that for actual practice the Toronto by-law will permit an even greater overhanging width of T beam than the Joint Committee's regulations will require. The Joint Committee's regulations on T beams are these:

"In beam and slab construction an effective bond should be provided at the junction of the beam and slab. Where the principal slab reinforcement is parallel to the beam,

transverse reinforcement should be used extending over the beam and well into the slab.

"Where adequate bond between the slab and web of beam is provided the slab may be considered as an integral part of the beam, but its effective width shall be determined by the following rules:

(a) It shall not exceed one-fourth of the span length of the beam.

(b) Its overhanging width on either side of the web shall not exceed four times the thickness of the slab.

"In the design of T beams acting as continuous beams, due consideration should be given to the compressive stresses at the support."

The Toronto by-law requirement on T beams is as follows:

"The floor plate to the extent of not more than five times the width of any beam or girder may be taken as part of that beam or girder in computing its moment of resistance."

Now assume the most common span in use in buildings to illustrate the application of the two regulations and see what effect they have. Considering a floor panel of 20-foot span it is evident that the Toronto by-law will permit the effective width of the T beam to be 6 feet when the beam width is 1 foot. Now what does the Joint Committee allow for such a case? They allow one-fourth of 20, or 5 feet, as a maximum, and there is a further restraint that the overhanging width must not exceed four times the thickness of the slab. This shows that the Toronto law really allows a greater use of T beams than conservative practice warrants. Thus, Toronto reinforced concrete should cost less rather than more in the requirement for T beams.

The By-law and Practice

The writer believes that the difference between correct practice and the more or less empirical demands of the by-law in these matters, is much less than two or three per cent. in their effect on the cost of a reinforced concrete structure. In fact, the difference is just as apt to be on one side as on the other, because builders have been knowingly or unknowingly misleading themselves as well as others on these questions. Thus it can be proven that greatest possible excess of cost due to stringency in the requirements of the Toronto building by-law, does not exceed six or seven per cent. of the total cost of any building. And the writer believes that the average does not exceed two per cent. on all types of buildings affected by this by-law.

The Cost of Cement

"With regard to the question of cost of cement in Toronto, it is true that few barrels of cement may possibly cost \$1.95 per barrel, but Mr. Dobie will find that he can obtain large quantities of cement in carload lots for \$1.55 per barrel. This, then, is less than the cost in New York, according to his price. However, it must not be forgotten that there is usually more cement in United States barrels than in the Canadian barrels, although this difference does not materially influence comparative values as they really stand.

Cost of Sand and Gravel

"Mr. Dobie states, among other reasons, for excessive cost in Toronto, the increased cost of sand and gravel but admits labor to be less here than in New York. This is true, but his point will be quite lost if it is realized that the cost of labor on concrete and form work amounts to over one-fourth of the cost of the entire building, whereas, the excess cost of sand and gravel is of no practical consideration. Therefore, the saving in cost of labor should and does help to meet the excess charges he speaks of.

"His letter also suggests that if no system were in force of having plans passed by the authorities, it is hardly likely that any reputable concern would put a large sum into

a building or number of buildings and construct them so poorly that they would collapse, and further says that structures that are sufficiently strong to carry loads in New York and Brooklyn or other cities, should be sufficiently strong to carry the same loads in Toronto. Quite so, but this does not prove that the requirements in New York or Brooklyn should necessarily be blindly followed here.

Brooklyn and Manhattan

The building requirements in the borough of Brooklyn have in the past, to the writer's definite knowledge, been notoriously lax on the question of reinforced concrete, and these requirements are entirely different from the requirements in the borough of Manhattan, the borough in which the head municipal offices of Greater New York are located. It should, however, be remembered that separate building regulations have in the past existed for these two separate boroughs of the greater city of New York, and the Brooklyn regulations have been as notoriously weak as the Manhattan regulations have been notoriously conservative. The Toronto regulations as they now exist conform more or less to the old original Manhattan regulations, which were the first to be adopted on this continent. The latter are no more conservative than they should have been in the light of knowledge of the subject when they were prepared. The latest and most modern and accepted regulations on reinforced concrete may be considered as a mean between the two extremes represented in the Brooklyn and New York requirements, and the rank and file of the engineering profession have put their stamp of approval on them. Therefore they should be adopted in Toronto until such time as something better is proposed and accepted by the technical world.

Revision Must Be Careful

"Thus, while it is true that we do need a revision of the building by-law on reinforced concrete, on curtain walls and on other questions more or less important, it is also true that we do not want these questions revised to suit unscrupulous exploiters of special materials who make their profit out of the deception they are able to perpetrate on the may for whom they build. The buildings built by these men do not always fall down—they usually hang on the verge of collapse, however, and at best the owner seldom gets a building that is adapted at all times to the use he had intended for it. Most of them are deceived in one way or another, and have been led to the same conclusions as Mr. Dobie. Therefore we need a conscientious City Architect to protect these men against themselves, and in the interest of public safety a City Architect is absolutely necessary, and a conservative one is preferable to none at all, as suggested by Mr. Dobie. This would still be true if some few buildings did actually cost even ten per cent. more than buildings built by careful and experienced architects and engineers without city supervision. Mr. Dobie's whole statement fails in its convictive force because of his suggestion to do away with city supervision.

Improvements Only Recent

"In plain justice to City Architect McCallum, it should be stated that it is only recently that more approved regulations than those in the present Toronto by-laws on reinforced concrete have been generally accepted by the engineering profession, and even those regulations have not been unanimously approved—a minority report was attached to them.

"The City Architect should be given credit for the work he has done in building up his department. He may be slow to adopt new developments in construction, but we should not forget that he is made responsible for our public safety, and who can say that he has not been a zealous worker and faithful to that trust?"

A Few Points for the Concrete Contractor

Wet Concrete and Dry—Joining New Work to Old— Coating Forms—A Collection of Valuable Pointers

The placing of concrete is a matter requiring considerable care. Forms should be perfectly clean and be free from sawdust, which is very hard material to get rid of. Care should be taken that no dirt falls into the concrete, a point that is often overlooked by workmen. At the north end of panels, beams and girders placed north and south, and at the west end of panels, beams and girders placed east and west, there should be holes cut in the bottom forms, through which to brush the dirt and dust before placing concrete. At the bottom of the column forms holes should be made through which to clean out sawdust and dirt of all kinds, and the holes should be on the north side.

Holes in Column "Forms"

The reason for mentioning north and east is that this is the practice of the writer. Any other location is as good, but there should be a system established and strictly adhered to. It is essential that the holes be filled before the concrete is poured, and men sent to fill the holes should find them with the fewest lost motions. When a certain location is established, then the holes will be quickly found. This is one of the little points making the difference between profit and loss in contracting work. For stopping holes in the bottom of forms pieces of tin are good. They can be made from old tin cans or obtained from a nearby tin shop, and short nails can be used to fasten them over the holes. For holes cut in upright forms a secure plug is made of a piece of wood, a little smaller than the hole, with a piece of tin fastened to it and projecting over the edges. It is inserted in the hole with the tin on the inside and a small wedge placed between the side of the plug, and the edge of the hole, will hold it in place until the concrete rises to that level, after which the pressure of the concrete will hold it.

Forms must be strong enough to retain wet concrete, which exerts a pressure equivalent to a fluid weighing 80 lb. per cu. ft., or it must be strong enough to withstand the pressure due to tamping in case a "dry" concrete is used. Years ago "dry" concrete was almost universally used. The cement, sand and aggregate were dampened to such an extent that a handful, when squeezed, would retain its shape, but the hand would not be wet or stained and the lump would fall to pieces when shaken. It was like moist brown sugar. When concrete block machines were first introduced this quality of concrete was advocated because the forms could be removed within a short time. The claim was made that it was stronger than "wet" concrete. Some men still make that claim. When "dry" concrete was deposited in forms it was required that it be tamped until the moisture rose to the surface and the concrete quaked. It was really remarkable to see how little water was required to make a mushy-looking concrete after considerable tamping.

Amount of Water in Wet Concrete

Wet concrete contains water in varying degrees. It ranges all the way from a concrete having slightly more water than what is termed "dry" concrete to a concrete so wet that it runs like cream. In the days when "dry" concrete was common it was believed that an excess of water caused the materials to separate and the cement to settle to the bottom. The truth about the right amount of water

is that the best and strongest concrete is that in which the consistency is that of a thick soup. Soup is of two kinds, bouillon, which is thin and watery, and broth, which is thick. When soupy concrete is mentioned it is of the broth and not of the bouillon variety of soup that one speaks.

Wet vs. Dry Concrete

Wet concrete is more economically placed than dry concrete, for it is mixed in a shorter time and requires no tamping. It settles readily into all corners and crevices and thus presents a finer appearance on the surface. Better appearing work can be done with a flowing concrete. When concrete had to be thoroughly tamped in was hard to figure on the strength of forms, and bulging forms were common. With wet concrete the pressure is always uniform and can be calculated and the forms designed accordingly. When the concrete is reinforced dry concrete cannot be used, for it is absolutely essential that there be no displacement of the steel or disturbance of the bond between the steel and concrete. If dry concrete, with the necessary tamping, is used, the steel will generally be moved a little and the bond between the steel and the slowly-setting concrete will be disturbed. Wet concrete, which flows readily around the steel, is the only concrete to use with reinforcement. Thousands of tests have demonstrated that there is no tendency on the part of the cement to settle to the bottom and separate from the aggregate and sand if the concrete is of the proper consistency.

The writer commenced concrete work about 25 years ago when dry concrete was the only kind permitted. He was discharged from one job 23 years ago because he permitted the foreman to use a wet, mushy concrete in filling certain pier forms. He received a few weeks ago an apology from the man who discharged him, but that does not recompense him for the loss he suffered at the time for what was termed his "ignorance and carelessness," and which he thought was progressiveness. It was not uncommon in old-fashioned dry work to find in the interior of walls, when torn down, lumps of unset materials which had been rolled up into balls coated on the outside with cement, these balls having been formed during the mixing process. When a large amount of water is used such balls cannot form.

Strength of Dry Concrete

Dry concrete is not stronger than wet concrete. Hundreds, perhaps thousands, of experiments have conclusively proven this idea to be wrong. The results of these experiments have been published over the names of responsible and well-known authorities, so there is no reason to keep the old idea running. Dry concrete obtains a certain degree of strength in a shorter time than it takes wet concrete to obtain the same strength. This enables forms to be removed sooner with dry than with wet concrete. Wet concrete and dry concrete placed in the same day are of practically equal strength at the end of 30 days, but at the end of the first four or five days the dry concrete is the stronger. After 30 days the wet mixed concrete gains rapidly in strength, as compared with the dry mixed concrete, the latter picking up in strength if wet with a hose or otherwise drenched with water. Concrete requires water in order to set and harden properly, so the necessary water must be supplied during the mixing period. Three months after mix-

ing the wet concrete is much stronger than the dry concrete, and it always retains this advantage, but as the years go by and the dry concrete has an opportunity to absorb moisture, and the wet concrete gradually loses excess moisture, the difference becomes small. For quick strength use as little water as will make good concrete. For permanent strength and low cost in mixing and depositing, use wet concrete. Wet concrete is much more uniform in strength than dry concrete, and plenty of water is required to harden concrete. In summer a certain excess of water must be used to supply the loss caused by evaporation and the absorption of water by the sand and stone. In winter a much smaller amount of water should be used in order to obtain quick setting and thus avoid danger of freezing.

The foregoing matters have been touched upon several times, but they are very important. The forms should be tight in which concrete is deposited. The surface of the wood next the concrete should be smooth and the edges of the boards closely fitted. The forms should be thoroughly wet before the concrete is deposited in order to make the forms swell and thus close the joints and prevent leaking. Another important reason for wetting the forms is to prevent them absorbing water from the concrete which it requires for setting and hardening. Use no oil on forms. Oil is nasty and the atmosphere seems somehow to become filled with oily vapor after a few days of its use. It sometimes discolors the face of the concrete and it is always difficult to properly treat surfaces which have come in contact with oiled forms. It is impossible to get rid of the thin oily coating and it is impossible to make plaster stick to an oiled surface. The writer uses plain water or soap. Common soap can be melted in hot water or soap oil can be purchased from the nearest soap factory. It is applied with a brush and does not injure the surface of concrete. It helps make it waterproof and can be washed off with water when fresh so that plaster can be applied.

Whitewash for Coating "Forms"

Common whitewash is a fine material with which to coat forms. It would be difficult to find anything cheaper and it is really very efficient in preventing concrete from adhering. If wet concrete is poured against dry forms large areas of surface will be pulled off with the forms, so that some coating is necessary. In the order of cheapness and merit the coatings stand about as follows: Water, whitewash, soap, oil. In the order of practicability they stand as follows: Whitewash, soap, oil, water, for water is apt to dry out during the filling of a high form and more water cannot be added without thinning the concrete, already poured and possibly injuring it. The writer prefers soap to all the coatings he has used.

The stopping of joints which open in forms is accomplished partly by the use of water to cause the wood to swell and partly by filling the joints with some material. The writer has found nothing equal to mud paste. A clay of some sort can generally be found in the vicinity of every concrete job, and it is an easy matter to mix it with the paste and fill all cracks. Sometimes a long time intervenes between the placing of the clay and the pouring of the concrete so the clay dries up and falls out. Some contractors use thin oil with which to mix the paste instead of water; and this is generally satisfactory. The writer has used oil and has also used thin soap or very heavy soapy water. This is cheaper than oil and much more readily mixed with the clay. Some fibre or hair mixed with mud paste makes it possible to use it in filling quite large cracks, although the use of fibre is not common. The writer has used it on several jobs with great satisfaction.

Concrete should be deposited in thin layers and be well

tamped if dry; and well puddled with sticks or rods if wet, in order to fill all crevices and insure that all aggregates are coated with cement mortar. When concrete is poured in at the end of the form and permitted to run down a slope there is bound to be a separation of materials, the large pieces freeing themselves from the mortar and running ahead of it, the slow-moving mortar generally setting before it gets an opportunity to cover the faster-moving aggregates, thus making porous places in the mass. When work is stopped all joints should be vertical.

Joining New Work to Old

When work is resumed the face of all joints should be washed thoroughly and then be coated with a neat cement wash. When the fresh concrete is poured it should be well spaded against the old face. Beveled strips placed in the edge of all work help to make keyed joints when work is resumed. To obtain a smooth face do not depend too much upon coats of plastering, but try and get it in the forms by using a perforated concrete spade or a potato fork to work in next the form and press back the large stones so the mortar can work to the front. This is very good when making curbs and walls. For the top surface of curbs and walls, as well as for many floors and sidewalks, use a tamping device made on the principle of a wire potato masher to push down into the mass all large stones and thus force the thin mortar to the surface. Smooth it off with a long board on edge and then brush it over with a stiff broom instead of floating it. A lean mixture is generally used in the body of sidewalks and floors for the sake of economy. Sometimes it is cheaper to use a richer mixture all the way through and treat it as above described, thus saving the high-finishing expense.

The reason difficulty is experienced in making new work join to old is that not sufficient care is used in getting the old faces clean. Washing with water is not sufficient and brushing is not sufficient. A wire brush is not always satisfactory, for it produces much dust, and this is not always washed off. The writer uses steam under high pressure on large jobs, for it will certainly clean off the concrete as nothing else will. If the job is not large enough, then use wire brushes and plenty of elbow grease, following with water applied through a hose. On jobs where steam cannot be had then a solution of acid should be used to get the concrete perfectly clean. If reinforcing is used do not use acid, but do the best work possible to make a good joint without it. When the top of a wall is setting cement paste is forced up to the surface and this sets and becomes dead, the product being known as "laitence." It is this laitence that makes the trouble. Sometimes men make a mixture of sand and cement 1 to 3 perfectly dry and pour it over the top of a wall a few minutes before work stops and puddle it well, so that as the cement paste rises it mixes with this dry material and a semi-porous coating is formed on top which contains little or no dirt. When starting work the next morning a thin paste of cement and water is placed over the top, and then on this a cement mortar 1 or 2 in. thick. The concrete follows quickly and the result is generally a first-class joint.

Applying Plaster to Face of Concrete Work

In applying plaster to the face of concrete work an attempt must be made to get a surface with a good suction, as painters term the property that makes a surface eat up paint. The surface should be first gone over with a wire brush, and this should be followed with a wash of weak acid, such as strong vinegar, sour beer, a weak solution of hydrochloric acid, etc. Then go over it several times with a wide brush dipped in water until the surface is

damp, but not wet. Do not use a rich mixture for the plaster. Use 1 part of cement to 3 parts of clean, coarse sand. Put the first coat on thin and scratch it. Apply with a hard pressure and let it set until strong enough to carry the next coat. Before applying the next coat wet the first one and then apply the second in the same way. Three coats will generally be sufficient. Avoid as much as possible the working of material more than merely enough to make it adhere. A lean mixture gives far better results than a rich mixture and is not so liable to show hair cracks. Quick setting causes hair cracks and a rich mixture sets quickly.

Concrete Arch over Tiber

The 328-foot reinforced concrete arch bridge across the Tiber at Rome, Italy, was opened for traffic on May 12 of this year. As has been stated before, this is the longest span masonry arch bridge yet built, surpassing by 8 feet the Grafton concrete arch at Auckland, N.Z., and by 33 feet the Plauen arch in Germany the largest stone voussoir arch in existence. A recent article in "L'Ingegneria Ferroviaria," of Rome, describes the construction of the bridge briefly, but does not take up the design in any detail. The bridge is intended primarily to provide a passageway over the Tiber to an exposition that is to be opened this summer and was not projected until about May, 1909. The time for its necessary completion was then very short so it was at first thought best to build a wooden structure. This was opposed by the municipal authorities who desired a permanent bridge at just this location, so it was decided to build the bridge of reinforced concrete, as being both rapid in construction and permanent in character. Many studies were made for the design of so extraordinary a span, and the design submitted by "La Societa Porcheddu Ing," was accepted after a conference of a special commission appointed for the purpose. The contract under this design was awarded to a firm composed of Messrs. Porcheddu and Bentivegna for the sum of 1,250,000 lire (\$238,000), and work was started on November 11, 1909.

The bridge consists of a single arch span across the river, 100 m. (328.1 ft.) in span and 10 m. (32.8 ft.) in rise, and has a roadway 43 feet wide flanked on either side with a 10-foot sidewalk. It comprises seven separate no-hinged arch ribs, each 20 cm. (8 ins.) deep at the crown and 50 cm. (20 ins.) deep at the spring and 20 cm. (8 ins.) thick throughout the arch span, widening to a thickness of 30 cm. (12 ins.) in the continuation into the cellular abutment. All of the arches are tied together with transverse and horizontal diaphragms and are topped with a reinforced concrete slab forming the roadway. The abutment is of the cellular type resting on a concrete slab bottom which in turn is founded on piles formed by the "Compressol" system. The ribs and diaphragms are reinforced throughout, though the amount of the reinforcement is not available to us at present. The bridge was designed for a load over the entire surface of 500 kg. per square m. (100 lbs. per sq. ft.) and a rolling load of three 16-ton road rollers.

The city of Montreal has awarded to F. H. Hopkins & Company a contract for a supply of their special Ransome street concrete mixers equipped with electric motors, two one-half cubic yard and two three-quarter cubic yard capacity mixers. These will be the first concrete mixers of this type used in Canada and will have towers and a special scoop and will discharge over the ends. This type of machine is used by Messrs. Laurin & Leitch, contractors, the Sicily Asphalt Paving Company, and the city of Hamilton, but the motive power in the last three named cases is either gasoline or steam, instead of electricity.

Montreal Notes

The Town of Outremont and the City of Westmount are considering the subject of placing electric wires under ground.

The Montreal City Controllers have called for estimates of the cost of macadamizing Sherbrooke street from Westmount to Montreal West, a distance of about three miles.

The Montreal Locomotive Company has received an order from the G. T. P. Railway Company for the construction of forty-five locomotives, being 15 Pacific, 20 consolidated, and 10 switching engines.

The officials of the Town of Montreal South recently decided to increase the wages paid to laborers on corporation work from 16 cents to 17½ cents an hour, owing to the difficulty in obtaining enough men at the previous rate.

The City of Westmount has just passed the second reading of a very stringent by-law dealing with the handling of explosives. This by-law forbids persons under sixteen years of age or intoxicated persons to carry this commodity, and prohibits street cars or other public conveyances being used to convey it thorough the city.

The Town of Montreal South has received an offer from Messrs. Gillespie & Ross to put in a water system, including drainage, to build cement sidewalks and to accept in payment the town's debentures for 44 years at five per cent.; the plant to become the town's property whenever the work, or any part of it, is completed. A similar offer was made to the Town of St. Lambert.

On the report of the town engineer of Outremont the council decided to order 6,500 gallons of asphaltoline, a dust-laying preparation which the official highly recommended, and which costs 7½ cents a gallon. The streets of the town will be treated with this preparation so far as it will go, by way of experiment. The proposal to purchase a new street water sprinkler was laid aside until it would be seen whether the new treatment was satisfactory.

The council of the Town of Outremont has adopted a by-law authorizing the purchase of lands for parks and playground space to the value of \$175,000. The citizens seem to favor the establishment of several small parks for the use of the juvenile section of the community rather than one large park, which seems to be a wise decision, seeing that Mount Royal park can be reached within a few minutes from the farthest boundary of the municipality.

The Town of Longueuil has been successful in a suit taken against the Town of St. Lambert for the purpose of preventing the latter municipality from emptying its sewage into the River St. Lawrence in such a manner that it would flow past Longueuil, endangering by pollution that town's water supply and constitute a menace to the health of the citizens. As a consequence the Town of St. Lambert is under the necessity of establishing a sewage purification plant. This subject is now being studied by the Town Engineer, Mr. Dickson.

The Canadian Hassam Paving Company, Montreal, has taken out an injunction to prevent the city controllers from giving a contract for paving to the Hofeller Paving Company, whose tender was higher than that of the Hassam Company. Growing out of the dispute is a libel action taken by Controller Wanklyn against Mr. Oliver Asselin, secretary of the Canadian Hassam Company, it being alleged that Mr. Asselin had made statements in newspaper articles and interviews calculated to damage Mr. Wanklyn in his reputation and standing as a controller, Mr. Wanklyn having been charged with showing favoritism in connection with the award of the contract.

Canadian City Engineers

Lucius E. Allen, Belleville, Ont.

Mr. Allen was born in 1877 in Chautauqua, New York, and was educated in Jamestown, New York, High School. He received thorough military training and served in 1898 with the 65th Regiment of Buffalo, N. Y. He entered the University of Michigan in 1898 and followed a full course in the University, receiving degree of Bachelor of Arts in Science in 1902. Later he was appointed an Assistant on the Faculty of the University during the last year of residence at the University, and carried on special research work under Dr. George A. Hulett, now of Princeton University, and Prof. Edward D. Campbell of the University of Michigan.

Mr. Allen accepted a position as Chemical Engineer of the Crescent Portland Cement Company, Wampum, Pa., on leaving University. In 1904 he resigned to assist in formation of the New Castle Portland Cement Company, New



Lucius E. Allen, Belleville, Ont.

Castle, Pa.; and was actively connected with the work of laying out and constructing a 1,500 barrel Portland cement plant, a 1,000 ton per day capacity rock crushing plant, and a modern hydrated lime plant for the above company, from its inception till purchased by the Lehigh Portland Cement Company, Allentown, Pa.

In 1905 Mr. Allen removed to Belleville, Ont., assuming full charge of the production end of the Belleville Portland Cement Company, Limited, and rearranged the process of manufacture and improving the quality of the product to equal any on the market. In 1907 he was appointed General Superintendent of the above company and Superintendent of the Belleville & Point Ann Railway. During this time the entire plant practically doubled in size, and it has since been purchased by the Canada Cement Company, Limited.

In 1908 he resigned the above position to organize the Ontario Limestone and Clay Company, Limited, and is at present Managing Director.

For the past few years Mr. Allen has undertaken a limited amount of general engineering work outside of business connections. As County Engineer for the County of Hastings he has charge of all new bridge work in the

county. Approximately \$120,000 of new bridge construction consisting of steel and reinforced concrete bridges are now in course of construction. He is also consulting engineer for the Corporation of Deseronto, Ont., and the Raglan Corundum Co. and last season carried on extensive engineering work involving the valuation and testing of two operating coal mines in Nova Scotia and a large cement property in Quebec.

Mr. Allen is a charter member of the American Institute of Chemical Engineers, National Cement Users Association, Canadian Cement and Concrete Association, Ontario Good Roads Association, the Chemists Club, New York City, the Ontario Club, Toronto, and other societies.

He has presented and published articles and papers in engineering and technical journals on The Solubility of Gypsum; The Waterproofing of Concrete; The Manufacture and Uses of Hydrated Lime; The Design and Construction of Reinforced Concrete Bridges; The Reconstruction of the City of Kingston Gas Holder, etc., etc.

Personal

Mr. Alcide, chief building inspector of Montreal, has received notification of his appointment as a member of the committee on fireproof construction, including concrete work, of The National Fire Protection Association. This association embraces most, if not all of the fire underwriters' organizations of the United States and Canada. Prof. I. H. Wooson of New York is the chairman of the committee.

Mr. A. C. D. Blanchard has been appointed to the position of City Engineer for Lethbridge, Alta. Mr. Blanchard is an engineer of experience in municipal engineering. For the past four years he has been connected with the engineering department of the City of Toronto in the capacity of engineer of the new construction in the department of special works. He engineered the work on the shore protection, and later had charge of Toronto's main drainage system and storm sewer system, at a cost of \$3,500,000. Prior to going to Toronto Mr. Blanchard was consulting engineer of the Niagara Electric Company, and of the Kootenay Power Company at Bonnington Falls.

Trade Notes

Corbett Machine Company, of Owen Sound, have been awarded the contract for erecting a 72-foot steel bridge at Harrison, Ont.

A by-law to appropriate \$150,000 for the University of Calgary for the purposes of erection and equipment was carried by a large majority.

The Canadian Harvester Company are contemplating the erection of a 90 by 300 foot solid brick assembling warehouse at Fort William, Ont.

The ratepayers of Woodbridge, Ont., have carried a by-law to raise \$40,000 by debentures for the construction of the bridge over the Humber river.

The city of Brandon propose electrifying their present steam plant and installing two 2,000,000 gallon variable speed pumps, adaptable also for electrical operation.

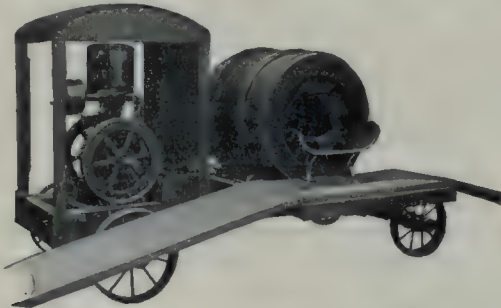
The American Cyanide Company, of Niagara Falls, Ont., have started work on the extension of their factory. Work is being done by day labor and includes the installation of electric furnaces, retorts, cranes and conveyors.

A Canadian branch of the Brake Beam Company is being established in Brantford, Ont. A number of laborers are at present at work erecting the machinery and it is expected the first order for some 4,000 brake beams will commence at once.

Business Notes

Eclipse Concrete Mixer

The Eclipse low charging concrete mixer is a machine especially adapted for various classes of work and is at present attracting large attention from the concrete contractors throughout the entire country. Its special feature is the low charging open drum, which makes it necessary for the charging platform to be only 24 inches high when mounted on truck, and the outfit is always complete and ready for operation as soon as it arrives on the job. It is only required to wheel the material on this platform and a barrow can be run up a 12-foot plank almost as easily as on the ground. The material from the barrow

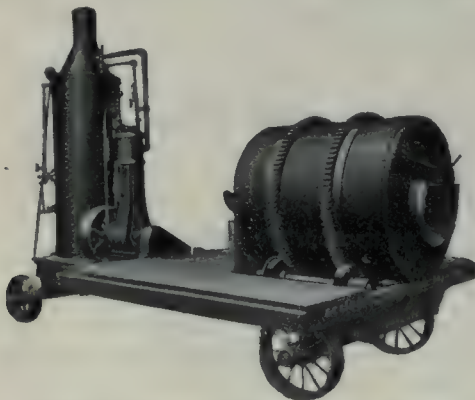


Gasoline Driven Eclipse Mixer on Truck

is thrown into the drum very quickly, on account of the large opening in it.

An advantage of the large opening in the charging end of drum is that the entire batch can be seen while mixing and it can be determined before discharging that the concrete is in the exact condition desired. The fact that the entire batch can be seen while mixing enables the contractor to produce uniform high grade concrete, insuring good reputation for first-class concrete work, which is very important. The interior of the drum is also easy of access for any purpose.

One other feature about the Eclipse mixer is, that it will operate on either wet or dry mix and with any kind of



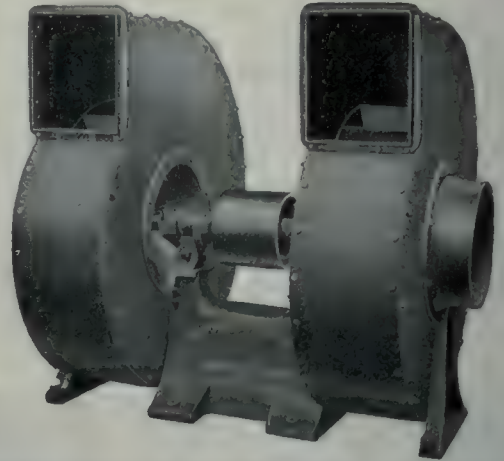
Eclipse Concrete Mixer, Steam Driven.

material. It can also be used for mixing cement mortar or top dressing for sidewalks, the smaller sizes being especially adapted for sidewalk work, where the light portable machine is preferable. A superior quality of cement mortar can be made at a much lower cost than when mixing by hand. High-grade mortar is always secured. The Eclipse is also used for mixing tar products, such as westrumite, etc., which are more difficult to mix than ordinary concrete.

The Standard Scale & Supply Company, 1345-1347 Wabash avenue, Chicago, Ill., manufacturers of the Eclipse concrete mixers, are prepared to supply all orders from stock; also desire to secure agencies and representation in different sections of Canada.

Interesting Running Record of Exhaust Fan

The Canadian Buffalo Forge Company, Limited, Montreal, has perfected a slow speed multi-blade exhaust fan which has proven exceptionally economical in power consumption. Three double fans of this type, for some time in use by the Cutler Desk Company, furnish a striking example of their efficiency which is above anything heretofore heard of in the line. The Cutler people discarded three



Multiblade Slow Speed Exhaust Fan of Double Type.

double fans, of a well-known make, practically new, and in design and construction regarded as inferior to none on the market. Their power consumption was 40 h.p. The new "Buffalo" fans, performing the same amount of work, are using 21 h.p., practically only one-half. Figuring power at \$35 per h.p. per year, this gives a saving of \$665 per year with the three fans, which, applied to the purchase price, exceeds a return of 100 per cent. per annum on the investment.



Multiblade "Buffalo" Exhaust Fan of Single Type

This high efficiency is attributed to the design of the fan wheel, which is of the multiple type, and to its proportions, which give maximum efficiency at speeds averaging fully 30 per cent. below the normal for exhaust fans. The slow speed is a very important feature. It reduces power consumption, minimizes wear and cost of upkeep, and lengthens the life of the fan.

Contracts Department

News of Special Interest to Contractors, Engineers, Manufacturers and Dealers in Building Supplies.

Information for insertion in these columns is invited from Architects, Contractors, Engineers, etc.

Waterworks, Sewerage and Roadways

Alliston, Ont.

Materials required for waterworks. Owner, Waterworks Department. This department is still in the market to purchase 3 to 400 feet 5 to 6-in. iron pipe, also a reductor.

Ayr, Ont.

Tenders called for roadway. Owner, Village of Ayr; reeve, H. Gemlin, Ayr. Construction of about 2,282 lin. ft. of macadam road. Crushed stone, gravel and tile furnished by the corporation. Tenders received until noon, July 17th.

Burnaby, B.C.

Petition to be presented for highway road. Owner, Municipality of Burnaby. City clerk, W. Griffiths. The council adopted councillor Rumble's motion to petition government for a 66 foot road along B. C. E. Railway's right of way from Paterson road to Vancouver road.

Cardston, Alta.

Tenders called for waterworks, \$40,000. Engineer, R. E. MacArthur, Lethbridge, Alta. New system gravity, 35,000 ft. 10-in., 8-in., 6-in. wood pipe hydrants, valves and excavating. Tenders were called on July 8th.

Dresden, Ont.

Tenders called for waterworks. Owner, Corporation of Dresden; Town Clerk, J. T. Bridgewater; consulting engineer, F. W. Farncombe, C.E., 64 Bank of Toronto Chambers, London. 4-in., 8-in., and 6-in. c.i. water pipe, about 13,000 ft. in all, also about 35 hydrants; also two half million gallons steam driven pumps. Plans, etc., at office of town clerk and consulting engineer. Tenders received by town clerk until noon July 26th. Advertisement in "Tenders and For Sale Department" of this issue.

Hull, Que.

By-law carried for sewage, \$30,000. Owner, Corporation of Hull; engineer, R. W. Farley, Sparks street, Ottawa. Pipe. By-law passed for city to pay its share of \$8,000. Tenders called shortly.

Tenders to be called for water mains, \$100,000. Owner, City of Hull; engineer, R. W. Farley, Sparks street, Ottawa. Enlargement of water mains, largest size of c.i. pipe, 20-in.; also new mains and general extensions. By-law just passed authorizing. Tenders will be called in about a month.

Milton, Ont.

Tenders to be called for waterworks. Owner, Town of Milton; engineer, J. Hutcheon, Guelph. Three miles of cast iron pipe. Tenders called shortly; received by Geo. A. Hemstreet.

North Bay, Ont.

Tenders called for waterworks extension. Commissioner of Works, T. N.

Colgan, North Bay. Contract A.—Laying of about 46,945 feet of water mains, placing valves, valve boxes, hydrants, etc. B.—Laying of about 500 feet 16-in. steel intake pipe, construction of concrete pump well and necessary connections to two pumps. C.—Supplying of about 15,500 ft. 14-in. pipe; 500 ft. 16-in. steel; 2,500 ft. 10-in.; 27,745 ft. 6-in.; 1,100 ft. 4-in.; and necessary tees, crosses, etc. D.—Supplying of about 32 hydrants, 11 14-in. gate valves and valve boxes, 5 10-in. ditto; 40 6-in. ditto; 3 4-in. ditto. Plans, etc., at office of Commissioner. Tenders close August 5.

New Westminster, B.C.

Machinery required for roadway. City engineer, J. W. B. Blackman, City Hall. The council are in the market for the purchase of steam roller, scarifier.

Proceedings of council, cement walks, paving, etc. City Engineer, J. W. B. Blackman. A resolution was passed to construct cement sidewalks on 3rd, 4th, 5th and 6th avenues, etc., also to pave McKenzie, Lorne and Begbie streets.

Tenders to be called for sewer pipe (west end). Owner, City of New Westminster, B.C.; city clerk, W. A. Duncan; engineer, J. W. Blackman, City Hall, New Westminster. Tenders are about to be called for laying twelve miles of sewers in west end, manholes, etc.

Nanaimo, B.C.

By-law carried for sewer extension and power company. Owner, Corporation of Nanaimo; city engineer, A. G. Waters, Nanaimo. Sewerage extensions by-law for \$50,000 and B. C. Hydraulic Power Company were both carried.

Ottawa, Ont.

Tenders called for lock gates and valve gates, Trent Canal (Holland River division). Owner, Department of Railways and Canals, Ottawa. Secretary, L. K. Jones, Ottawa. Plans, etc., at office of Chief engineer, Department of Railways & Canals, Ottawa; office of the superintending engineer of Trent Canal, Peterborough. Tenders received until 16 o'clock, August 4th.

Prince Rupert, B.C.

Plans being prepared for sewerage. City Engineer, W. M. Davis, C.E. Two sewerage schemes to drain a portion of the business section. City Engineer will report at an early meeting of the council. The work will be done by day labor, but will involve heavy purchases of 6 and 8-inch sewer pipe. A preliminary estimate calls for an expenditure of \$250,000 on the work. Details later.

Regina, Sask.

Tenders called for sidewalk construction. Owner, City of Regina; city engineer, L. A. Thornton. Construction of about 175,000 square feet of concrete sidewalk. Particulars upon application

to city engineer. A marked cheque for \$400 to accompany each tender. Tenders received by city commissioners, Regina, until noon, July 28th. Advertisement in "Tenders and For Sale Department" of this issue.

Tenders called for pavement construction. Owner, City of Regina; city engineer, L. A. Thornton. Construction of about 37,500 square yards of pavement and 24,000 lin. ft. of curb and gutter. Particulars upon application to city engineer. A marked cheque for \$5,000 to accompany each tender. Tenders addressed to city commissioners, received until noon, July 28th.

Toronto, Ont.

Roadway. Tenders will be received by the Board of Highway Commissioners for twenty miles of macadam highway. Full particulars may be obtained from E. A. James, engineer for the board, 57 Adelaide street east, Toronto. Tenders close July 29, 1911.

West Lorne, Ont.

Works. A by-law will be submitted Aug. 4 to provide an expenditure of \$11,000 for installation of waterworks system.

CONTRACTS AWARDED

Goderich, Ont.

Sewer extension. Engineer, M. Roberts. Successful contractor, Conn. Chatham, \$26,210; others tendered: Nicholson, Moncton, \$28,000; Reid, Brantford, \$27,100.

Jonquieres, Que.

Water mains, etc. Owner, Price Bros. General manager, O. Porritt, Quebec; engineer in charge of construction, G. F. Hardy, New York. Successful contractor, Contractors Limited, Room 21, 204 St. James street, Montreal. Water mains, sewers, filter, septic tank and pumps; water pipe and intake pipe will be of iron and steel.

Montreal, Que.

Filtration plant, Point St. Charles. Owner, Corporation of Montreal; engineer, Geo. Janin; successful contractor, F. M. McGuigan Construction Company, Continental Life Bldg., Toronto, \$673,000. Other tenderers, Quinlan & Robertson, \$744,000; Brown & Aylmer, \$902,000; P. McGovern, \$829,000. Materials required, pumps, pipe, hydrants, valves, meters, concrete.

Sydney, N. S.

Paving, 18,600 ft. (Charlotte street.) Owner, City of Sydney, N. S. City Clerk, Jas. J. Curry, Sydney. Contractor, Central Paving Co. Manager, R. S. Low.

Vancouver, B. C.

Sewer pipe, \$52,608. City Engineer, F. L. Fellowes, City Hall, Vancouver; City Clerk, Wm. McQueen, City Hall. Con-

tractors, Evans Coleman & Evans, Ltd. for pipe ranging from 4 ft. 24 in. including a quantity of T's and Y's.

Windsor, Ont.

Street Paving, \$71,000. Concrete Paving on Gladstone avenue, Curry avenue, Pelissier street and Ashby Place. Contract to C. W. Cadwell & Co., Windsor. Work to be started within a week or two.

Railroads, Bridges and Wharves

Brooklyn, N.S.

Tenders called for breakwater. Owner, Department of Public Works, Ottawa; secretary, R. C. Desrochers, Ottawa. Construction of breakwater. Plans, etc., at this department, and at the offices of C. E. W. Dodwell, Esq., district engineer, Halifax, N.S.; Thomas J. Locke, district engineer, Shelburne, N.S., and on application to the postmaster at Brooklyn and Liverpool, N.S. Tenders received until 4 p.m., July 26th, by the secretary.

Brampton, Ont.

Steel bridge and concrete abutments, over Credit River. Owners, Townships of Chinguacousy and Esquesing; county engineer, C. R. Wheelock, Orangeville, Ont. Construction of 75-ft. steel span between Townships of Chinguacousy and Esquesing, about 1 mile from Terra Cotta. Contractor for steel structure, Ontario Bridge Co., Manning Chambers, Toronto, \$2,230. Contractor for concrete abutments, Wm. Smeaton, Inglewood, Ont., \$8 per yard below water line, \$6.25 above.

Edson, Alta.

Proposed enlargement of round house. Owner, Grand Trunk Pacific Railway. Steel structural and reinforcing, brick and cement, tar and gravel roofing, crane, turn-table, etc. The present plant will be enlarged to double its capacity. Chas. May Co., contractors for it, may be awarded the new work.

Montreal, Que.

Tenders called for addition to railway station, \$200,000 (Windsor to Mountain streets). Owner, Canadian Pacific Railway; architect, W. S. Painter, Windsor Station, Montreal. One storey, concrete, including four new track and sheds to cover them. Tenders received until Aug. 11, 1911.

Midland, Ont.

Tenders called for wireless telegraph station. Owner, Department of Naval Service, Ottawa; deputy minister, G. T. Desbarats, Ottawa. Erection of station. Plans, etc., at office of superintendent of wireless telegraphs, department of naval service, Ottawa; agent department of marine and fisheries, Parry Sound, or to the office of the local postmaster. Tenders received until noon, July 24, by deputy minister. Advertisement in "Tenders and For Sale Department" of this issue.

Oakville, Ont.

Tenders are being received for bridge, \$2,200 (over 16-mile creek). Owner, County of Halton; Wm. Pantou, city clerk, Milton; engineer, J. Hutcheon, Guelph. Concrete, one span, width 18 ft.

Ottawa, Ont.

Tenders called for station and other buildings. Owner, Commissioners

Transcontinental Railway, Ottawa; secretary, P. E. Ryan, Ottawa. Erection of stations, etc., along Transcontinental Railway on sections 10, Cochrane to Currie, Ont.; 11, from Fraser to Grant; 12, Superior to Dugald; 1,000 ton coaling station at Grant. Plans, etc., at office of Gordon Grant, chief engineer, Ottawa, and at the district engineer's offices at Cochrane and St. Boniface, Man. Tenders received by secretary until noon, August 3rd.

Princeton, B.C.

Tenders called for bridge (across Similkameen river). Owner, Great Northern R. R., Princeton. Engineer, L. M. Hall, Princeton. Foundation piles, length of span about 85 feet. Tenders called July 12, received by W. T. Budd, Princeton; tenders are also called for spur to cement work about two miles.

Prince Rupert, B.C.

Dry dock. Official in charge, J. H. Pillsbury, Prince Rupert. Surveyors are taking soundings to complete plans for floating dry dock at Hays Creek, Prince Rupert. A Dominion subsidy of 3½ per cent. on \$2,000,000 for twenty years has already been voted by the Dominion government to the Grand Trunk Pacific for the work. No contracts have yet been called for, but will be ready in very short time. Work is to start within three months, according to contract with city. More details later.

Contemplated, smelter, Goose Bay, 50 miles north. Owner, Granby Smelting Co.; superintendent, H. Macdonald; engineers, Williams & B. Lawrence, New York. The smelter will treat copper ores, capacity 1,000 tons per day. It is understood that an appropriation of \$2,000,000 has been voted for this and development work.

Raleigh Tp., Ont.

Tenders called for bridge, Chatham. Location, River Road, West town line. Concrete and steel, concrete and steel foundation. Specifications received until July 22 by Thos. R. Clarke, N. Buxton.

Township of Amaranth, Ont.

New tenders called for bridge. Owner, County of Dufferin; engineer, F. Barber, 57 Adelaide street east, Toronto. Construction of concrete abutments for steel bridges; Miller's Creek Bridges, Lot 26, Con. 10; McConachie's Bridge, Lot 6, Con. 9. Plans, etc., at office of the engineer. Tenders received until noon, July 17, by F. Barber.

Toronto, Ont.

Tenders called for groynes (Kew Beach). Owner, City of Toronto, Ont. president, board of control, F. S. Spence. Construction and placing of groynes in Lake Ontario at the foot of the following: Woodbine, Waverley, Leuty, McLean and Beech avenues. Specifications obtained on application to Department of Railways and Bridges, City Hall. Tenders received by chairman board of control, until noon, July 24th. Advertisement in "Tenders and For Sale Department" of this issue.

Tenders called for cleaning and painting bridges. Owner, City of Toronto; president board of control, F. S. Spence. Supply of paint, cleaning and painting of three bridges. Specifications on application to Department of Railways & Bridges, City Engineer's office. Tenders received by chairman, board of control,

until noon, July 31st. Advertisement in "Tenders and For Sale Department" of this issue.

Toronto, Ont.

Tenders called for construction of cribwork (Princess street). Owner, City of Toronto; president board of control, F. S. Spence. Construction of cribs at city yard. Specifications on application to Department of Railways and Bridges, City Engineer's office, Toronto. Tenders to submit the names of two sureties (approved of by the city treasurer) not members of city council or officers of corporation. Tenders received by chairman board of control until noon, July 24.

Township of Chatham, Ont.

Tenders called for bridge (over Otter Creek on town line). Owner, Township of Chatham and Sombra; engineers, Bell & McCubbin, St. Thomas, Ont. Construction of reinforced concrete, beam bridge. Plans, etc., at residence of Neil McGugan, Wilkesport, at William Abraham's, Chatham Township, or at office of engineers. Tenders received until noon, July 17th, by engineers. Advertisement in "Tenders and For Sale Department" of this issue.

CONTRACTS AWARDED

Rivers, Man.

Bridge, \$6,000. Owner, Municipality of Daly, Man. Successful contractor, Algoma Steel Co., Sault Ste. Marie, Ont. Steel on concrete abutments, one span, 80 ft. long, 26 ft. wide, concrete abutments.

Toronto, Ont.

Street railway, \$55,976. Owner, City of Toronto. Contractors, F. H. Hopkins Co., Montreal, Que., 44-yd. dump cars, \$8,600; 4 flat cars at \$875; 200-ton steel rails, 30 lbs. per yd., \$6,500; 75 kegs spikes, 20 kegs bolts, \$1800; pair fish plates, \$806; 1 marion shove \$8,665; Whyte Railway Signal Co., Manning Arcade, Toronto, 24 switch leads \$740. Thew Automatic Shovel Co., Loiraine, Ohio, 1 Thew shovel \$6,780. H. K. Porter Co., Pittsburg, Pa., 6 saddle tank locomotives, \$20,385.

Winnipeg, Man.

Subways, Sherbrooke street and Elgin avenue. Owner, Great Northern Railway; W. Eddy, engineer of construction. Contractors, John Gunn Co., subways on Sherbrooke and Ross ave., Elgin ave., Wallace and Akin, corner Harvard and Wilton, Winnipeg. W. J. H. Holmes will have charge of the bridging to be done between Brant & Sherbrooke streets. Work will commence immediately.

Public Buildings, Churches, Schools, etc.

Amherst, N.S.

Heating and ventilation required for school, West Highland. Owner, Corporation of Amherst; clerk, W. F. Donkin; architect, Leslie R. Fairn, Aylesford, N.S. Installation of heating and ventilating system. Plans, etc., at town office and at office of architect. Tenders received until 5 p.m., July 21st, by town clerk.

Barnett, B. C.

Police Sub-Station. Plans are being prepared by Architect Hugh A. Hodg-

son, Carter-Cotton Building, for a 2-storey police sub-station, 60x80, concrete construction.

Chilliwack, B.C.

Tenders called for public building. Owner, Department of Public Works, Ottawa. Secretary, R. C. Desrochers, Ottawa. Erection of public building. Plans, etc., at office of W. Henderson, resident architect, Victoria, B.C., at the local post office and at the department. Tenders received by secretary until 4 p.m., July 24.

Fort William, Ont.

Addition to School. Tenders have been called by R. E. Mason until 5 o'clock July 7 for electric wiring, plumbing, pointing and glazing for addition to Central School. Combined tenders will represent \$6,000 to \$8,000.

Halifax, N.S.

Tenders called for school, Tower road. Owner, Board of School Commissioners; secretary, R. J. Wilson; architect, W. T. Busch, 60 Bedford Row, Halifax, N.S. Erection, including heating, ventilating and wiring. Plans, etc., at office of architect. Tenders received by secretary until 1 p.m., July 21st.

Humboldt, Sask.

Tenders called for public building. Owner, Department of Public Works, Ottawa; secretary, R. C. Desrochers, Ottawa. Construction of public building. Plans, etc., at office of J. E. Cyr, Superintendent of Public Buildings, Post Office Building, Winnipeg, Man., at local post office and at department. Tenders called until 4 p.m., July 31.

Hull, Que.

By-law carried for erection of two fire halls, \$50,000. Owner, City of Hull, City Clerk, F. D. Boulton; architect, not chosen yet. Brick, metal roof. Tenders may be called soon.

Montreal, Que.

Tenders called for church, \$9,000, Ainsley road. Owner, Episcopal Congregation, Montreal West; architect, Peden & MacLaren, 20 St. Alexis, Montreal. One storey, 55 x 70, brick,

Hamilton, Ont.

Tenders to be called for church, \$12,000, Barton street east. Owner, Roman Catholic Diocese of Hamilton; Mgr. Mahoney, Dean; architects, S. A. Wardell, 110 Hunter street west. One storey, 130 x 57, stone foundation, brick, stone, cement, hot air heating, electric lighting, shingle roofing, cut stone. Plans, etc., with architect. Tenders will be called shortly.

Kingston, Ont.

Tenders called for post office. Owner, Department of Public Works, Ottawa. Additions and alterations to post office. Plans, etc., at department and on application to Wm. Newlands & Sons, architects, Kingston. Tenders received by secretary until 4 p.m., July 31.

Melfort, Sask.

School. W. W. Lachance, Saskatoon, has been chosen as architect for an 8-room school to be erected here.

Milton, Ont.

Proposed system of heating for county building. Owner, County of Halton; county clerk, W. Pantton, Mil-

ton. Steam heating. Plans and estimate not prepared yet.

Montreal, Que.

Work in progress for school, \$22,000, Laprairie street. Owner, Catholic School Commissioners; architect, W. E. Doran, 180 St. James street, Montreal; general contractor, J. B. Gratton, Ltd., 82 Mercier street, Montreal. Three storeys, brick and stone.

North Grimsby, Ont.

School. A by-law will be submitted to raise \$4,000 for the erection of a school in Union School Section No. 5, of this township.

Newdale, Man.

School. Tenders have been called by Municipality of Newdale for the erection of a \$12,000 school, 1-storey, brick and stone, 64x36, Muller hot air heating, pitch roof. W. A. Elliott, Brandon, architect.

Ottawa, Ont.

Tenders called for experimental farm building. Owner, Department of Public Works, Ottawa; secretary, R. C. Desrochers, Ottawa. Construction of Tobacco Curing Barn. Plans, etc., at department. Tenders received by secretary until 4 p.m., July 24.

Sherbrooke, Que.

Equipment required for fire hall, \$3,100. Owner, City of Sherbrooke, Que. Architect, L. N. Audet, Sherbrooke; general contractor, Chas. Veneau, Sherbrooke, Que. Hose and equipment will be required. Nothing definite can be decided until after council meeting.

Snowflake, Man.

Tenders called for school. Owner, Snowflake Consolidated S. D. No. 1111. Sec-treas., Jas. Fyfe, Snowflake. Work specified, cement, masonry, plastering, carpentry and painting. Plans, etc., at the Builders' Exchange, Winnipeg, or at office of E. Shilson, Snowflake. Tenders received until 5 p.m., July 15th.

Swift Current, Sask.

New plans prepared for hospital, \$25,000. Owner, Corporation of Swift Current, Sask.; architects, Sharron & Darrach, Swift Current and Regina, Sask. Two storeys, 74 x 73, brick, concrete foundation, cement work, cut stone, roofing paper, plate glass, electric lighting, cornice, paradox canvas roofing, interior finish, fir. Tenders exceeded amount of by-law. Architects will send out revised plans to firms who tendered, about July 14. Tenders probably received a week later.

Thamesville, Ont.

Tenders called for town hall. Owner, Corporation of Thamesville; architect, Watt & Blackwell, London, Ont. Two storeys and basement, brick and frame, concrete fndtn., cut stone, concrete blocks, artificial stone, steel beams, iron columns, steam heating, electric light-torial finish pine. Plans, etc., with architect. Tenders received until July 22, and woodwork, concrete foundation, hot air heating, electric lighting, Canada slate roofing, interior finish oak, cement, cut stone, marble, tile, mantels, ornamental iron, sheet metal, cornice, electrical work, telephone system, iron columns, ornamental columns and caps, art glass, etc. Tenders closed July 18.

Toronto, Ont.

Work in progress for hockey rink, \$8,000, Ravina road. Owner, Jesse Smith, 307 Pacific avenue, Toronto; architect, Ellis & Connery, Manning Chambers. One storey, 130 x 60, wood, concrete foundation, electric lighting, open plumbing, asbestos and ready roofing. Owner will build by day labor.

Alterations of plans for church, \$10,000. Owner, Davenport Methodist Church, Davenport road; architect, D. E. Smith, 77 Victoria street, Toronto. Brick, 72 x 60, brick foundation, steam heating, electric light, felt and gravel roof, maple flooring. It has been decided not to go ahead with this work until next spring.

Verdun, Que.

Plans being prepared for fire station, Woodlands. Owner, Town of Verdun. Official in charge, Town Engineer, Verdun. Work being done by corporation.

Vancouver, B.C.

Church. Plans are being prepared by Sharp & Thompson, 536 Hastings street W., for a 100x60 church for the congregation of the First Congregational Church, brick and stone construction, hot water heating, slate roof, tiles, electric lights, leaded glass, etc. Separate tenders will be called on completion of plans.

Tenders to be called for general hospital, superstructure, 10th to 12th sts. Owner, General Hospital Bldg.; Geo. Hadden, secretary, Vancouver; architect, Grant & Henderson, Williams Bdg., Vancouver. Three storeys and basement, stone and concrete wing. Tenders will be called shortly. Heating and plumbing let separately.

Watrous, Sask.

Tenders called for addition to school. Owner, Town of Watrous; secretary, N. Grest; architect, W. W. LaChance, Saskatoon. Erection of a 2-room b.ick bldg. Plans at office of architect of Waldon Co., 92 Princess street, Winnipeg, and the secretary. Tenders received by secretary until July 17.

Windsor, Ont.

Plans being prepared for addition to hospital, \$50,000. Owners, Hotel Dieu Hospital Association, composed of Nuns of the Catholic Church in Windsor; architect, John R. Boyde, Ouellette avenue, Windsor. Plans being prepared for a 3-storey addition to the present Hotel Dieu.

Westmount, Que.

Tenders called for fire station, Upper Level. Owner, City of Westmount, Que. City Surveyor, Architect Currie, Westmount. Erection of fire station, No. 2. Drawings, etc., at office of city surveyor after July 17th. Copies, etc., obtained on payment of \$15, which will be refunded, etc. Tenders received after July 17th until July 27th. Advertisement in "Tenders and For Sale Department" of this issue.

Winnipeg, Man.

Tenders called for supply of pedestals. Owner, City of Winnipeg. Secretary, Board of Control, M. Peterson. Supply and delivery f.o.b. Winnipeg, c.i. pedestals for supporting fire and police telegraph boxes. Plans, etc., obtained at office of the city electrician. Tenders addressed to the chairman, board of control, received until 11 a.m., July 20.

Yorkton, Sask.

Theatre. W. W. Lachance, Saskatoon has been chosen as architect for a theatre to be erected here.

CONTRACTS AWARDED**Lethbridge, Alta.**

Theatre, \$28,000. Owner, Alberta Loan & Investment Co., Lethbridge. General contractor, Wm. Watts, Lethbridge. Brick and steel. Contract let July 8th. Building to be completed by Sept. 1st.

Moose Jaw, Sask.

School, \$78,118. Owner, Public School Board. Architect, R. G. Bunyard, Moose Jaw; 2-storey and basement, 136 x 82, fireproof. General contractor, Thos. Grayson, Moose Jaw. Awarded July 5th.

New Westminster, B. C.

Masonic Temple. The contract for the erection of the Masonic Temple Building has been awarded to Snider & Brethour, Exchange Building, Vancouver. The building will be 3 storeys, 62 x 92, cost about \$35,000. The general contractors will receive tenders on plastering, painting, wiring, stone cutting and excavation. Work will be started immediately.

Renfrew, Ont.

Gymnasium. The contracts for a \$4,695 gymnasium, solid brick, 2 storeys, 35x80, were awarded as follows: General contractor, W. A. Moore; masonry, W. Vanderson; carpentry, John Roberts plastering, Robert Ferguson; heating, H. D. Moss; plumbing, John Conley, all of Renfrew. Building to be completed Sept. 1st, 1911.

Saskatoon, Sask.

Schools. The contracts have been awarded to Shannon Bros. & Cassidy, for the construction of two 14-room schools at a total cost of \$78,950 for each school, exclusive of plumbing, heating and ventilation, for which separate tenders will be called later. David Webster, architect for board.

Toronto, Ont.

Clubhouse, \$70,000. Owner, Ontario Club, Toronto. Architect, Sproat & Rolph, 90 Yonge street, Toronto. Contractor for masonry, Mr. Hughes, 216 Simcoe street, Toronto; iron work, Dominion Bridge Co., Toronto. Cement contract not let yet.

Residences**Dundas, Ont.**

Plans being prepared for residence, \$5,000. Owner, Mr. Cliff, Dundas, Ont. Architect, Stewart McPhie, Bank of Hamilton Chambers, Hamilton. 2½ storeys, 45 x 50, brick and stone, stone foundation, hot water heating, electric lighting, shingle roof, cement work, sheet metal work, electric bells.

Hamilton, Ont.

Plans prepared for four residences, \$5,200, Trolley street. Owner, B. Prott, Trolley street, Hamilton (private plans). Two storeys, 90 x 100, cement blocks, cement foundation, hot air heating, gas, lighting, shingle roofing. Owner will buy blocks and build himself.

Montreal, Que.

Dwelling, Joron & Renaud, 129 St. Lawrence street, will erect a 3-storey

dwelling house, 18 flats, wood and brick, stone foundation.

Tenders closed for residence, \$4,000. Owner, E. T. Stevenson, Herald avenue, Montreal W. Architect, Peden & MacLaren, 20 Alexis, Montreal. One storey, 30 x 28, brick, concrete foundation, electric lighting, galvanized iron roof, interior finish white ash, cement, marble, brick, ornamental iron, tile mantels, telephone system, plate glass, etc.

Work in progress for erection of a residence, \$2,800, on Boyer street. Owner, O. Lagouiere, 2537 St. Hubert street, Montreal. (Private plans). 2-storey, 25x32, brick, stone foundation, brick, tile, mantels, ornamental iron, telephone system, plate glass, etc.

Work in progress for new residence, \$3,500. (406 Clarke street). Owner, L. Sauve, 109 Lasalle street, Montreal. (Private plans). 3-storey, brick, stone foundation, hot water heating, artificial stone, electric bells, plate glass, etc.

Work in progress for residence, \$2,000. (374 St. Claire). Owner, J. Charbonneau, 2147 St. Lambert, Que. (Private plans). 2-storey brick, stone foundation, hot water heating, electric lighting, shingle roof, brick tile mantels.

Tenders called for residence, \$20,000. (Mount Rose avenue). Owner, Mr. T. Findlay, 10 Phillips Square, Montreal. 3-storeys 80x90, brick, concrete foundation, electric lighting, slate roof, cement, cut stone, artificial stone, structural and ornamental iron, sheet metal, pipe covering, electrical work, telephone system, electric bells, steel beams; ornamental columns, plate and art glass. Tenders will be called next week, close 10 days after.

Ottawa, Ont.

Tenders called for residence. Owner, W. H. A. Fraser, Nepean street; architect, W. E. Noffke, 26 Central Chambers, Ottawa. Required, hot water heating (2 boilers), plumbing, electric work, painting. Tenders received until July 17th.

St. Boniface, Man.

Tenders to be called for residence, \$3,500. Owner, J. P. Tremblay, Builders' Exchange, Winnipeg. Architect, H. B. Rugh, Union Bank Building, Winnipeg. Frame and cement plaster, concrete foundation, hot air heating, electric lighting.

Shawinigan Falls, Que.

Tenders called for 6 cottages, \$16,000. Owner, Shawinigan Real Estate Co., Shawinigan Falls, Que. Architect, Peden & MacLaren, 20 St. Alexis, Montreal. 1-storey, brick, concrete foundation, electric lighting, shingle roof, mantels, electrical work, telephone system, shingle roof, plate glass, etc. Tenders received after July 30.

Toronto, Ont.

Work in progress for residence, \$3,000. Owner, Mr. Rappaport. Architect, Ellis & Connery, Manning Chambers, Toronto. 2½ storeys, 16x36, brick and stone, stone foundation, interior finish, hardwood and pine. Owner will build by day labor.

Work in progress for residence, \$4,000. Owner, J. C. Eaton, 190 Yonge street. Architects, Wickson & Gregg,

59 Yonge street, Toronto. 2-storey, 39x33, brick, brick foundation, interior finish hardwood, cut stone, brick, tile, mantels, electrical work, etc.

Tenders called for residence, \$5,000. (Bloor street west). Owner, Dr. A. L. Murphy, 927 Bloor W., Toronto. (Private plans). 2½ storeys, 28 ft. 8 in. x 40 ft. 9 in., brick and stone, stone foundation, hot water heating, electric lighting, cut stone, brick, tile, mantels, structural iron, electrical work, steel beams, plate, art and prismatic glass, etc. Date of closing tenders not decided.

Residence. W. W. Hiltz, Broadview avenue, will erect a \$3,000 residence at Carlaw and Strathcona, 2½ storeys, 30x22, brick and roughcast, hot air heating, slate or shingle roofing. Will be erected by day labor.

Work in progress for residence, \$5,000, west side Indian Grove. Owner, W. E. Stewart, Toronto; architect, J. A. Harvey, Manning Chambers, Toronto. 2½ storeys, 38 x 24, brick and stone, stone foundation, hot water heating, electric lighting, open plumbing, shingle felt and gravel roofing, interior finish hardwood.

Work in progress for residence, Kinswood road. Owner, Elmer W. Harper, Cottingham street, Toronto; architect, E. R. Babington, 28 Toronto street, Toronto. Two storeys, 34 x 22, brick, brick foundation, hot water heating, electric lighting, open plumbing, shingle roofing, interior finish hardwood and pine, brick, tile, mantels, sheet metal work, electrical work. Owner will build by day labor.

Tenders called for three pairs of dwellings, \$5,600, 1277-87 Gerrard street east. Owner, W. J. Grant, 29 Callender street, Toronto; architect, Thos. Harris, 43 Howard Park avenue, Toronto. Two storeys, 33 x 35, brick and stone, stone foundation, hot air heating, open plumbing, shingle, felt and gravel roofing, cut stone, brick, mantels, cornice, electrical work, plate glass. Owner is open for tenders on all work but masonry and carpentry. Date of closing of tenders not decided.

Tenders called for 1 pr. residences, \$3,200. (Uxbridge Ave). Owner, E. Bracewell, 369 Perth avenue, Toronto. (Private plans). 2-storey, 38x29, brick and stone, stone foundation, cut stone, sheet metal work, shingle roof, electric bells, shingle stain, plate glass. Tenders called until July 19th.

Work in progress for residence, \$5,000. (Constance and Roncesvalles). Owner, M. E. Andrews, Howard Park and Roncesvalles, Toronto. Architect, J. A. Harvey, Manning Chambers, Toronto. 2½ storeys, 48x24, brick and stone, stone foundation, hot water heating, electric lighting, interior finish hardwood, etc.

Tenders to be called for one pair of residences, \$4,000, Grace street. Owner, Mr. Baumhart, 215 Gladstone avenue, Toronto; architect, J. Hunt Stanford, 34 Yonge Street Arcade, Toronto. 2½ storeys, 36 x 41, brick, stone foundation, cement work, sheet metal work, cut stone, hot water heating, combination lighting, shingle stain, pine and hardwood interior finish. Tenders received by owner after July 13th.

Tenders called for 2 pr. dwellings, \$10,000. Owner, Wilkinson & Co., Walmer road, Toronto. 2½ storeys, 45x34,

brick, stone foundation, combination lighting, shingle, felt and gravel roofing, interior finish hardwood, cut stone, brick tile, mantels lath, structural iron, elec. work, steel beams, plate and art glass. Tenders close July 26th.

Vancouver, B. C.

Apartment house. Plans have been completed for a 3-storey apartment house to be erected at the corner of Salisbury Drive and Parker street for the Caledonian Investment Co., brick 122x61, tar and gravel roofing, hot water heating, three marble entrances, etc. Tenders were called until July 11th.

Westmount, Que.

Tenders called for residence, \$4,000. Owner, G. N. Scott, Montreal. Architect, Peden & MacLaren, 20 Alexis, Montreal; galvanized iron roofing, interior finish white ash, cement, 1-storey, 30x28, brick, concrete foundation, electric lighting, steel beams, plate glass, etc. Tenders received after July 20, close July 30.

Winnipeg, Man.

Plans in progress for apartment house (Langside, near Armstrong's Point). Owner's name not to be made known. Architect, Paul M. Clemens, Brown Block, Winnipeg. Three storey and basement, brick and stone.

Winnipeg, Man.

P. M. Clemens, architect, has prepared plans for erection of a new apartment building on Langside between Cornish and Westminster to cost \$55,000.

CONTRACTS AWARDED

Halifax, N.S.

Residence, \$4,000, Seymour street. Owner, Jas. G. Jamieson, 581 Robin st., Halifax. General contractor, David Grey, 266 South street, Halifax. Foundation concrete, fireproof.

Residence, \$2,500, Jubilee road. Owner, Geo. Morton, 154 Almon street, Halifax; general contractor, Geo. Morton, 172 Agricea street, Halifax.

Montreal, Que.

Residence, \$17,000. Owner, A. A. Ayer, 362 Kensington avenue, Westmount, Que. Architect, Saxe & Archibald, Beaver Hall Hill, Montreal. Masonry, stone and brick, Reid, MacGregor & Reid, 228 St. Catherine W.; carpentry, H. Mercure, 1124 Rochel E.; roofing, Westmount Plumbing & Heating Co., Ltd.; heating and plumbing, J. A. Gordon, 301 St. Antoine street, all of Montreal. 3-storey, brick and stone.

Conservatory. The contract has been awarded to Reid, MacGregor & Reid, 668 St. Catherine street, Montreal, for the erection of a \$21,200 conservatory at 240 Drummond street, by R. B. Angus, Jr. & W. S. Maxwell, architects.

St. Agathe, Que.

Two bungalows, \$12,000. Owner, Mr. Herbert Molson, Drummond street, Montreal; architects, Robert Findlay, 10 Philips Place, Montreal; general contractor, John Thurm, St. Agathe des Monts. One storey, 40 x 35, brick and wood. Building to be completed December, 1911.

Sherbrooke, Que.

Tenement, \$4,000, London street. Owner, Mrs. T. Davidson, Sherbrooke (private plans); general contractor, J.

Gilbert Brown, Sherbrooke. Two storeys, wood, 40 x 48. Building to be completed October 1st.

Winnipeg, Man.

Residence, \$25,000. (Wellington Crescent). Owner, Peter Lyall, Jr. Architect, H. B. Rugh, Union Bank Building. General contractor, Peter Lyall & Sons, Winnipeg. Brick and stone, stone foundation, steam heating, electric lighting. Materials will be required.

Business Buildings and Industrial Plants

Alliston, Ont.

Factory. A \$10,000 factory building is contemplated. Wm. McBride and F. M. Brown, interested parties.

Coalmont, B.C.

Work in progress for hotel, \$20,000. Owner, L. Marcott, Coalmont (private plans). Three storeys, frame, rock foundation, felt roofing, pine interior finish. Tenders closed July 12th.

Calumet, Que.

Destroyed by fire, saw mills. Owner, Riordan Paper Co., 1 Beaver Hall Sq., Montreal. Managing director, C. Riordan; W. K. Trower, sec.-treas. Loss reported at \$200,000.

Edmonton, Alta.

Manufacturing plant, 150 miles west on G. T. P., Portland Cement Co., incorporated, with a capital of \$1,500,000. Engineer, Mr. Clossoskil, Edmonton. Parties interested, Lundy & McLeod, realty brokers, Edmonton. Stock being solicited; plans for buildings and machinery not completed yet. Specifications for the following have been prepared: Boilers, electric lights and power plant consisting of one 1,000 k.w. engine or turbine driven set; one 500 k.w. engine or turbine driven set; two 40 kw. driven exciters. The following will no doubt be required: Motors, steel for buildings, power crane, roasters, dry kilns, stokers, pumps, elevators, steam shovel, etc.

Hamilton, Ont.

Plans being prepared for factory, \$40,000, James street north. Owner, Diamond Flint Glass Co., James street north; architects, Stewart & Witton, 7 Hughson street south, Hamilton. One storey and basement, 300 x 150, steel frame, stone foundation, cement reinforced concrete, steel beams, tile roofing, structural iron. Two glass furnaces required.

Site purchased for factory, Aberdeen avenue. Owner, Parsons & Parsons, Cleveland and Main west, Hamilton. Company will build factory early next year. No plans prepared yet. Firm manufacturing collars and shirts now occupying temporary premises.

Montreal, Que.

Work in progress for flour mills, \$75,000. Owner, Dominion Flour Mills Co., Ltd., Brantford, Ont. Engineer, J. A. Jamieson, 313 Board of Trade Bldg., Montreal; general contractor, D. G. Loomis & Sons, Cote St. Paul, Montreal. Six storeys, 199 x 56, wood and brick, heating, plumbing and iron work contracts not let yet. The bulk of the machinery is still to be supplied.

Work in progress for office and

manufacturing building on St. Catherine street. Owner, Kellert & Sons, St. Catherine street, Montreal; architect, Hutchison, Wood & Miller, Royal Insurance Bldg., Montreal; general contractor, C. E. Deakin, 11 St. Sacrament street, Montreal. Heating, plumbing, sheet metal, iron work not let yet.

Tenders called for alterations to building, 533 St. Catherine street east. Owner, Senator J. M. Wilson Estate; architect, Saxe & Archibald, Beaver Hall Hill, Montreal.

Tenders to be called for offices, \$34,000, Longue Pointe. Owner, Montreal Locomotive Works, Ottawa Bank Bldg. Two storeys, steel and pressed brick, concrete foundation, cut stone, reinforced concrete, steel beams, fire escapes, structural iron, slate roof, telephone system, vaults, plate glass. Tenders received after July 18, until July 30th.

Preston, Ont.

Factory, \$8,000. Owner, Preston Woodworking Machinery Co., Ltd., Preston, has been formed. President, W. S. Hudson, Preston; general manager, M. Mullen; manager of works, H. Murray; sec.-treas., Allen Kerr, and plan erection of machine shop, 100 ft. by 100 ft., moulding shop, 40 x 60 ft.; concrete construction, steam heating, electric lighting, patent roofing. Mr. Mullen is superintending construction.

Quebec, Que.

Site purchased for bank, St. Peter st. Owner, International Bank; president, R. Forget, 73 Notre Dame west, Montreal. Site purchased for \$36,000.

Contemplated, factory. Owner, Dominion Corset Co., 216 Notre Dame W. Proprietor, G. E. Amyot. A new corset factory will be erected to replace that burned down last May.

Shawnigan Falls, Que.

Tenders to be called for extension to hotel, Cascade Inn. Owner, Shawnigan Real Estate Co., Shawnigan Falls; architect, Peden & McLaren, 20 St. Alexis, Montreal. One storey, brick, electrical work, marble, brick, plate glass. Tenders received after July 20th, close July 30.

Saskatoon, Sask.

Office Building. The Public School Board agreed to erect a modern office building instead of remodelling the school on 3rd avenue.

Toronto, Ont.

Work in progress for alterations to store, \$8,000. Owner, Liggetts, Limited, 106 Yonge street, Toronto; architect, Ellis & Connery, Manning Chambers, Toronto. One storey addition, brick and stone, felt and gravel roofing, skylights, electrical work, steel beams, prismatic glass.

Contemplated, store and offices, \$15,000, south side King street east, No. 95-97. Architect, R. A. Abraham, 71 Winchester street, Toronto. Three storeys, 42 x 102, brick, brick foundation, hot water heating, electric lighting, open plumbing, felt and gravel roofing, interior finish pine, cement, cut stone, brick, terra cotta, vaults, cornice, skylights, wire glass needed. Owner's name withheld by request.

Work in progress for warehouse, \$12,000, Ernest avenue. Owner, Consumer's Box & Lumber Co., Ernest avenue, To-

Tenders and For Sale Department

CITY OF REGINA

Sidewalk Construction

Sealed tenders addressed to the City Commissioners, Regina, and endorsed on envelope "Tender for Sidewalk Construction," will be received up to 12 o'clock noon, Friday, July 28th, 1911, for the construction of approximately 175,000 square feet of concrete sidewalks.

Particulars may be had upon application to the City Engineer.

A marked cheque for \$1,400 must accompany each tender.

The cheque of the unsuccessful tenderers will be returned.

The lowest or any tender not necessarily accepted.

(Signed) L. A. THORNTON,
City Engineer.

28-29

CITY OF REGINA

Pavement Construction

Sealed tenders addressed to the City Commissioners, Regina, and endorsed on envelope "Tender for Pavement Construction," will be received up to 12 o'clock noon, Friday, July 28th, 1911, for the construction of approximately 37,500 square yards of pavement and 24,000 lineal feet of curb and gutter.

Particulars may be had upon application to the City Engineer.

A marked cheque for \$5,000 must accompany each tender.

The cheque of the unsuccessful tenderers will be returned.

The lowest or any tender not necessarily accepted.

(Signed) L. A. THORNTON,
City Engineer.

28-29

CITY OF TORONTO

TENDERS

for the Construction and Placing of

GROYNES

in Lake Ontario at Kew Beach, Toronto

Tenders will be received by registered post only, addressed to the Chairman of the Board of Control, City Hall, Toronto, up to noon on Monday, July 24th, 1911, for the construction and placing of Groynes in Lake Ontario at the foot of the following streets:—

Woodbine avenue,
Waverley avenue,
Leuty avenue,
McLean avenue (Howard)
Beech avenue.

Envelopes containing tender must be plainly marked on the outside as to contents.

Specifications and form of tender may be obtained on application to the Department of Railways & Bridges, City Engineer's office, Toronto.

The tenderers shall submit with their tenders, the names of two sureties (approved of by the City Treasurer, not members of the City Council or officers of the Corporation of the City of Toronto, or in lieu of said sureties the bond of a guarantee company approved of as aforesaid).

The lowest or any tender not necessarily

F. S. SPENCE,
President of the Board of Control.
City Hall, Toronto, July 8, 1911. 28-29

Steam Shovels

We own and have for sale near Buffalo, N.Y., two Vulcan 75-ton 2½-yard steam shovels; late model, with new extra large boilers and in excellent condition; also one 70-ton. These will stand most rigid inspection and we are offering them at unusually low prices. Confer with us.

WILLIS SHAW MACHINERY CO.,
39 So. La Salle Street,
Chicago, Ill.

Trench Machines

Parsons—Cuts trench 27 in. to 60 in., to 20 ft. deep, fine order.

Parsons—With Mattes Back Filler, cuts trench 28 in. to 78 in. to 20 ft. deep. Overhauled and first class. Write us if you have anything to sell, or if in want of anything.

THE MALES CO.

No. 82 Perin Building, Cincinnati, O.



Department of Railways and Canals

TRENT CANAL

Lockgates and Valve Gates

Holland River Division

Sealed tenders addressed to the undersigned and endorsed "Tender for Lockgates and Valve Gates, Holland River Division," will be received at this office until sixteen o'clock, on Friday, August 4th, 1911.

Plans, specifications and form of contract to be entered into can be seen on and after this date at the office of the Chief Engineer of the Department of Railways and Canals, Ottawa, and at the office of the Superintending Engineer of the Trent Canal, Peterborough, Ont., at which places form of tender may be obtained.

Parties tendering will be required to accept the fair wages schedule prepared or to be prepared by the Department of Labor, which schedule will form part of the contract.

Contractors are requested to bear in mind that tenders will not be considered, unless made strictly in accordance with the printed forms, and in the case of firms, unless there are attached the actual signature, the nature of the occupation, and place of residence of each member of the firm.

An accepted bank cheque for the sum of \$2,000, made payable to the order of the Minister of Railways and Canals, must accompany each tender, which sum will be forfeited if the party tendering declines entering into contract for the work, at the rates stated in the offer submitted.

The cheque thus sent in, will be returned to the respective contractors whose tenders are not accepted.

The cheque of the successful tenderer will be held as security, or part security, for the due fulfilment of the contract to be entered into.

The lowest or any tender not necessarily accepted.

By order,
L. K. JONES,
Secretary.

Department of Railways and Canals,
Ottawa, July 7th, 1911.

Newspapers inserting this advertisement without authority from the Department will not be paid for it. 28-30

TOWN OF NORTH BAY

Water Works Extension

Sealed tenders endorsed "Tender A" and "Tender B," "Tender C" and "Tender D," will be received by the undersigned up to Saturday, August 5, 1911.

Contract A. The laying of approximately 46,945 lineal feet of water mains, placing valves, valve boxes, hydrants, etc.

Contract B. The laying of approximately 500 lineal feet of 18 in. steel intake pipe, the construction of concrete pump well on lake shore and the necessary connections to two pumps.

Contract C. The supplying of approximately 15,500 feet lineal 14-in. pipe; 500 ft. lineal 18-in. steel pipe; 2,550 feet lineal 10-in. pipe; 27,745 feet lineal 8-in. pipe; 1,100 feet lineal 4-in. pipe; and the necessary tees, crosses, curves, etc.

Contract D. The supplying of approximately 32 hydrants, 11 14-in. gate valves and valve boxes, 5 10-in. gate valves and valve boxes, 40 6-in. gate valves and valve boxes, 3 4-in. gate valves and valve boxes.

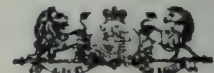
Separate tenders are desired for the supply of and laying of steel pipe, (2) cast iron pipe, and (3) wood stave pipe, in contracts "A" and "C".

Plans and specifications may be seen at the office of the Commissioner of Works, North Bay.

The lowest or any tender not necessarily accepted.

T. N. COLGAN,
Commissioner of Works.

North Bay, July 11, 1911. 29-31



Department of the Naval Service

Sealed tenders, addressed to the undersigned and endorsed "Tender for the Erection of Wireless Telegraph Station," at Midland, Ontario, will be received at this office until noon, on July twenty-fourth, 1911.

Plans, specifications and form of contract to be entered into can be seen on and after July tenth instant, at the office of the Superintendent of Wireless Telegraphs, Department of the Naval Service, Ottawa, the Office of the Agent of the Department of Marine and Fisheries, Parry Sound, Ontario, or the Office of the Postmaster at Midland, Ontario.

Persons tendering are notified that tenders will not be considered unless made on the printed forms supplied, and signed with their actual signatures, stating their occupations and places of residence. In the case of firms, the actual signature, the nature of the occupation, and place of residence of each member of the firm must be given.

Each tender must be accompanied by an accepted cheque on a chartered bank, payable to the order of the Honorable the Minister of the Naval Service, equal to ten per cent. (10 p.c.) of the amount of the tender, which will be forfeited if the person tendering decline to enter into a contract when called upon to do so, or fail to complete the work contracted for. If the tender be not accepted the cheque will be returned.

The Department does not bind itself to accept the lowest or any tender.

By order,
G. J. DESBARATS,
Deputy Minister.

Department of the Naval Service,
Ottawa, July 7th, 1911.

Newspapers will not be paid for this advertisement if they insert it without authority from the Department. 29-29

Corporation of the City of Nanaimo
B.C.

Street Paving

Tenders are invited for approximately 14,450 superficial yards of Asphaltic Macadam or other approved paving.

A plan of streets and further particulars may be obtained of the undersigned.

Sealed tenders endorsed "Tender for Paving" to be sent to the undersigned not later than July 31, 1911.

The lowest or any tender not necessarily accepted.

ALLAN WATERS,
City Engineer,
27-29

June 26, 1911.

CITY OF TORONTO

Tenders

For the

Construction of Cribs

At the City Yard, Princess Street
Toronto

Tenders will be received by registered post only, addressed to the Chairman of the Board of Control, City Hall, Toronto, up to noon on Monday, July 31st, 1911, for the construction of cribs at the City Yard, Princess street.

Envelopes containing tenders must be plainly marked on the outside as to contents.

Specifications and forms of tender may be obtained on application to the Department of Railways and Bridges, City Engineer's office, Toronto.

The tenderers shall submit with their tenders the names of two sureties (approved of by the City Treasurer, not members of the City Council or officers of the Corporation of the City of Toronto) or in lieu of said sureties the bond of a guarantee company approved of as aforesaid.

The lowest or any tender not necessarily accepted.

F. S. SPENCE,
President of the Board of Control.

City Hall, Toronto,
July 7th, 1911. 28-29

CITY OF TORONTO

Tenders for the

Supply of Paint

and for the

Cleaning and Painting of Bridges

Tenders will be received by registered post only, addressed to the Chairman of the Board of Control, City Hall, Toronto, up to noon on Monday, July 31st, 1911, for the supply of Paint, and for the Cleaning and Painting of Three Bridges in the City of Toronto.

Envelopes containing tenders must be plainly marked on the outside as to contents.

Specifications and forms of tender may be obtained on application to the Department of Railways & Bridges, City Engineer's office, Toronto.

The tenderers shall submit with their tenders, the names of two sureties (approved of by the City Treasurer, not members of the City Council or officers of the Corporation of the City of Toronto, or in lieu of said sureties the bond of a guarantee company approved of as aforesaid).

The lowest or any tender not necessarily accepted.

F. S. SPENCE,
President of the Board of Control.
Toronto, July 10, 1911. 28-29

FOR SALE

Complete Electric Generating Set, consisting of Leonard Peerless steam engine direct connected to 150 k.w. Canadian General Electric generator, 2,300 volts, 60 cycles; also condenser, switch-board, steam and exhaust piping, spare parts for engine and generator, and everything constituting the complete set as at present installed in the Thomas street lighting station of the Town of Brockville. This machine is in first-class order, having only been used on peak loads. It is now being replaced by a larger Belliss & Morcom engine with Swedish G. E. generator. Full particulars and price can be obtained from Laurie & Lamb, Consulting Engineers, Board of Trade Building, Montreal.

28-35



Department of Railways & Canals

Intercolonial Railways—Improvements at Halifax

EXTENSION OF TIME

The time for receiving tenders for Pier and Sheds has been extended from Thursday, the 20th day of July, 1911, to Monday, the 31st day of July, 1911, at 12 o'clock noon.

By order,
L. K. JONES,

Department of Railways and Canals,
Ottawa, June 5th, 1911.

Newspapers inserting this advertisement without authority from the Department will not be paid for it. 29-30

Toronto Main Drainage

Tenders will be received on Friday, August 4th, 1911, for the construction of Low Level Interceptor, Don Syphon (crossing under the River Don), and for the manufacture and delivery of the following:—

280 linear feet 30-inch Cast Iron Pipe.
5,984 linear feet 42-inch Reinforced Concrete Pipe.

1,985 linear feet 30-inch Reinforced Concrete Pipe.

2,315 linear feet 36-inch Reinforced Concrete Pipe.

Plans, specifications, forms of tender and conditions relating to tendering as prescribed in City By-laws may be obtained from the Main Drainage Works office of City Engineer, Toronto.

The lowest or any tender not necessarily accepted.

G. R. GEARY, Mayor,
Chairman, Board of Control.

City Hall, Toronto,
July 14th, 1911. 29-30

Tender

for

Macadam Highway

Tenders will be received up till July 29th, 1911, by the Board of Highway Commissioners for York County, for the supplying of machinery with material, labor and constructing the following highways or parts thereof:

- LAKE SHORE ROAD.
- WESTON ROAD.
- VAUGHAN ROAD.
- KENNEDY ROAD.
- KINGSTON ROAD.
- DUNDAS STREET.

Particular sections are more specifically described, specifications and forms of tender, which may be secured at the office of the Engineer, Room 6, 57 Adelaide street east, Toronto.

MR. R. J. BULL, Chairman.
E. A. JAMES, Engineer to Board.
J. A. RAMSDEN, Secretary. 29-30

CITY OF PORT ARTHUR

Notice

Sealed tenders, endorsed on envelope, "Tender for Completion of Storage Dam," will be received by the undersigned up to 6 o'clock p.m. of Tuesday, July 25th, 1911, for the completion of the Service Reservoir Dam at Current River Park.

Further information as to plans and specifications may be obtained from the City Engineer.

A marked cheque for 10 per cent. of the estimated amount of contract must accompany each tender.

The lowest or any tender not necessarily accepted.

J. McTEIGUE,
City Clerk.

Corporation Offices, Port Arthur,
July 13th, 1911. 29

COUNTY OF HALTON

Tenders

for Reinforced Concrete Arch and Viaduct

Sealed tenders, plainly marked as to contents, will be received by Wm. Panton, County Clerk, Milton, Ont., up to twelve o'clock noon of Tuesday, August 1st, 1911, for the construction of a Reinforced Concrete Arch of 135 ft. span, and 340 feet of Concrete Viaduct Approach, on the Middle Road between the Town of Oakville and the Township of Trafalgar.

Plans and specifications may be seen and all necessary information may be obtained at the office of the undersigned, 57 Adelaide street east, Toronto.

Lowest or any tender not necessarily accepted.

FRANK BARBER,
Consulting Engineer.

Toronto, July 17th, 1911.



Department of the Naval Service

Sealed tenders addressed to the undersigned, and endorsed "Tender for the Erection of Wireless Telegraph Station," at Tobermory, Ontario, will be received at this office until noon, on July Twenty-ninth, 1911.

Plans, specification and form of contract to be entered into can be seen on and after July 10th instant, at the office of the Superintendent of Wireless Telegraphs, Department of the Naval Service, Ottawa, the Office of the Agent of the Department of Marine and Fisheries, Parry Sound, Ontario, or the office of the Superintendent Engineer of Sault Ste. Marie Canal, Sault Ste. Marie, Ont., or the offices of the Postmaster at Owen Sound, Ont., or the Postmaster at Tobermory, Ont.

Persons tendering are notified that tenders will not be considered unless made on the printed forms supplied, and signed with their actual signatures, stating their occupations and places of residence. In the case of firms, the actual signature, the nature of the occupation, and place of residence of each member of the firm must be given.

Each tender must be accompanied by an accepted cheque on a chartered bank, payable to the order of the Honorable the Minister of the Naval Service, equal to ten per cent. (10 p.c.) of the amount of the tender, which will be forfeited if the person tendering decline to enter into a contract when called upon to do so, or fail to complete the work contracted for. If the tender be not accepted the cheque will be returned.

The Department does not bind itself to accept the lowest or any tender.

By order,
G. J. DESBARATS,

Deputy Minister
302 Contract Record, Toronto, Ont. 29-29

Newspapers will not be paid for this advertisement if they insert it without authority from the Department. 29-30

Tenders for Waterworks

Town of Dresden

Tenders addressed to J. T. Bridgwater, town clerk, Dresden, will be received up to noon on Wednesday, the 26th day of July next, for 4, 6 and 8 inch cast iron water pipe, about 13,000 feet in all, also about 35 hydrants, also two half million gallon steam driven pumps.

Plans and specifications may be seen at the offices of either of the undersigned. The lowest or any tender not necessarily accepted.

F. W. FARNCOMB, C.E.,
Consulting Engineer,
64 Bank of Toronto Chambers,
London, Ont.

J. T. BRIDGWATER,
Town Clerk,
Dresden, Ont.

28-29

CITY OF GUELPH

Tenders will be received by T. J. Moore, City Clerk, Guelph, Ontario, for the construction of a plain concrete arch bridge (two forty-foot spans), over the River Speed, Neeve street, Guelph, up to Saturday, July 29th, 1911.

Approximate amount of concrete is 385 cubic yards.

A marked cheque for \$100.00 is to accompany the tender.

Forms of tender may be obtained from the City Engineer.

Plans and specifications may be seen at the office of the City Engineer, or at the office of the Contract Record, Toronto.

L. MALCOLM,
Acting City Engineer.

Tenders for Steel Bridge

Sealed tenders marked "Tenders for Bridge," will be received up to noon, Saturday, August 5th, 1911, for the construction of two spans of 125 feet each and one span of 90 feet, over the Saugeen River.

Also tenders, marked "Tenders for Abutments," will be received up to the above date for the concrete work for two abutments and two piers for the above bridge.

Tenders will be opened at the December session of the County Council, December 6th, 1911.

Specifications may be had from the undersigned.

The lowest or any tender not necessarily accepted.

JAMES WARREN,
Engineer.

Walkerton, July 17, 1911.

Tenders for Steel Bridge

Tenders marked "Tenders for Bridge," will be received by the undersigned, Chesley P.O., up till August 3rd, 1911, for the erection of two steel bridges—one over Snake Creek, 10th Concession, Elderslie, and one on the County line, 7th Concession, Elderslie; the span of the bridges, 45 feet and 36 feet respectively. Also tenders for concrete abutments for same will be received at the same time.

Tenders will be opened at the County line bridge on Friday, August 4th, at 2 p.m.

Specifications for same may be had from James Warren, Engineer, Walkerton, after the 25th July.

The lowest or any tender not necessarily accepted.

(Signed) S. K. EWART,

Elderslie, July 17, 1911.

Positions Wanted

Advertisements under this heading one cent a word per insertion. Box No. ten cents extra.

WANTED—Works Manager or Superintendent's position on water, sewerage, dock, bridge or roadmaking. Highest references, 20 years experience on important public works. Box 302 Contract Record, Toronto, Ont. 29-29

Electrician, practical, theoretical and commercial, open for engagement; 20 years' experience in high tension, overhead and underground work; also designing, erecting and running power plants; good organizer and hustler; first-class references. Box 297, Contract Record, Toronto, Ont.

Business Buildings and Industrial Plants

(Continued from page 61)

ronto; architect, Ellis & Connery, Manning Chambers, Toronto. One storey, 211 x 62, frame covered with iron, concrete foundation. Brantford ready roofing.

Plumbing and steam fitting required for warehouse (Spadina and Sullivan st.). Owner, James Robertson Co., Ltd., Toronto; architect, A. A. Denison & Stephenson, Star Bldg., Toronto. Tenders called until July 17th.

Tenders called for factory, 441 King street west. Owner, F. H. Herbert (in trust), 63 Adelaide street east, Toronto. Architect, F. H. Herbert. Three storeys, 28 x 74, cement foundation, steel beams, brick, reinforced concrete, structural iron, felt and gravel roof, metallic lath, freight elevator, tile, skylights, plate and prismatic glass, electrical work. Tenders called until July 12th.

Vancouver, B. C.

Warehouse. Plans have been prepared by Wright, Rushforth & Cahill, 709 Dunsmuir, street, for a 6-storey mill constructed warehouse building to be erected on Beatty street, at a cost of \$60,000, by the Anglo-American Warehouse Co. Tenders closed July 8th.

Victoria, B. C.

Bank. Plans are being prepared for a new Union Bank Building, cost, about \$120,000, 6-storeys and basement, steel frame with hollow tile walls, steam heating, complete plumbing equipment, 2 passenger elevators and electric wiring. Work will be commenced immediately after awarding of contract. E. Cox, 209 Carter Cotton Building, architect.

Welwyn, Sask.

Tenders called for reconstruction of elevator. Owner, Farmers Elevator Co., Ltd.; sec.-treas., F. T. Collyer, Welwyn. Necessary material and adding 6 feet to the cribwork. lengthennig of the two legs subdividing four large bins, painting and making necessary alterations and repairs in machinery. Tenders received until July 18; work to be completed August 25.

Winnipeg, Man.

A. Congdon will build stores and apartments on n.e. corner of Portage avenue and McGee street. Cost, \$80,000. J. D. Atchison, architect, has prepared plans.

CONTRACTS AWARDED

Hamilton, Ont.

Factory. The contracts have been awarded for a 1-storey factory, 90x70, brick and steel, erected by Sawyer-Massey Co., on Wellington N., as follows: Cement and masonry, Geo. E. Mills, 614 King east, carpentry, Donald Campbell, 96 Burris; sheet metal, John E. Riddell, 12 Ferguson avenue; iron work, Hamilton Bridge Works, Stewart street, Hamilton. Stewart & Witton, Hughson St., S., architects.

Lethbridge, Alta.

Warehouse, \$26,000. (Fourth street S.). Owner, Western Supply & Equip. Co., Ltd., Lethbridge, Alta. Supervisor, J. Lockwood, C. E., Lethbridge, Alta. Successful contractors, Messrs. Bains & Davis, Lethbridge. 2-storey and basement, 50x125, brick.

Montreal, Que.

Work in progress for stables, \$15,000 (Redpath street). Owner, J. T. Davis, Redpath avenue, Montreal; architect, E. & W. S. Maxwell, Beaver Hall Sq., Montreal; masonry contractor, W. McArthur & Sons, 459 Clark avenue, Montreal; carpentry contractor, J. B. Gratton, Ltd., 82 Mercier avenue, Montreal; heating and plumbing contractor, T. O'Connell, 183 Ottawa street, Montreal. Two storeys, stone and brick.

Car Barns. The contract has been awarded for \$51,000 car barns, brick and concrete, being erected by the Montreal Street Railway.

Offices and Warehouse. The contracts for a 5-storey stone and concrete building to be erected by the Salada Tea Co. on St. Paul street have been awarded as follows: General contractors, Reid, Macgregor & Reid, 688 St. Catherine W.; masonry and cement, Reid, Macgregor & Reid, 688 St. Catherine W.; carpentry, D. M. Long, rear 39 Windsor; plastering, Z. Bouchard, 12 Bourget; heating and plumbing, John Sate, 152 Craig street; glazing and painting, A. Craig, 41 Jurors; iron work, Structural Steel Co., 107 St. James; roofing, Hickey & Aubut, 93 Dominion street.

Offices, \$80,000. (41 Union avenue). Owner, Wm. St. Pierre, 41 Union Ave., Montreal. Architect, Findlay & Spence, Beaver Hall Hill, Montreal. General contractor, Heffernan & Beck, Montreal. 6-storeys, 54x96, reinforced concrete.

Offices. (208 St. Catherine street W.) Owner, H. Kellert & Sons, 204 St. Catherine W., Montreal. Architects, Hutchison, Wood & Miller, Royal Ins. Bldg. Montreal. General contractor, C. E. Deakin, 11 St. Sacrament street, Montreal. 5-storeys, concrete.

Toronto, Ont.

Warehouse, \$40,000 (Bay and Wellington). Owner, W. R. Brock & Co., Ltd., Wellington street, Toronto; architect, A. R. Denison & Stephenson, 20 King street, Toronto; contractors, masonry, H. Needham, 348 Crawford street; carpentry, Young & Co., 87 Stafford street, both of Toronto; plastering, heating and plumbing to be let yet.

Factory, (Symington Ave.) Owner, W. D. Beath & Son, 193 Terauley street, Toronto. Contractor for foundation, Elnor & Brown, 249 Helens avenue. To-

(Continued on page 66)

BOILERS



Fitzgibbon Type of Boilers built for McLachlin Bros., Arnprior, Ont.

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Limited

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onto; Iron Work, McGregor & McIntyre, 73 Peail street, steel and concrete, concrete foundation, electric lighting, concrete, felt and gravel roof, 1-storey, 130x52, fireproof doors, structural iron and 2200 ft. metal sash and wire glass required. Contracts for reinforced concrete and skylights not let yet.

Moose, Jaw, Sask.

Bank, \$40,000. Owner, Bank of Montreal. Architect, Peden & McLaren, Montreal. General contractor, Navin Bros. Moose Jaw. 2-storey and basement, 50x60, brick and stone, concrete foundation, structural iron, hot water heating, electric lighting, marble, tile, metallic lath, electric bells, plate glass, cornice, artificial stone, vaults, interior finish oak and fir. Contract let July 8, R. G. Bunyard, architect, Moose Jaw, superintending work.

Vancouver, B. C.

Apartment House. The contract for the erection of a 4-storey brick store and apartment house at 155 Pender W. has been awarded to W. J. Pront, 1101 Hornby street. Hot water heating and hotel plumbing will be installed. Private plans.

Warehouse. The contract has been awarded to E. G. Baynes for the erection of a 5-storey brick block with basement, pressed brick, 75x135, \$55,000. Parr & Fee, architects.

Business Block. The contract has been awarded to Adkison & Dill for the erection of a 10-storey brick and reinforced concrete building at 325 Howe street for the National Finance Co.

Business Block. The contract has been awarded to Adkison & Dill for the erection of a \$30,000 block at 291 Harris street for Leon Way Company, brick construction.

Weyburn, Sask.

Equipment required for store, Third street. Owner, Lowes Bros., Weyburn, Sask. General contractor, F. Hussey, Weyburn. Two storeys, 25 x 70; cement. Required new bake oven, new counters, and show cases.

Power Plants, Electricity and Telephones

Brockville, Ont.

Equipment for sale. Power plant, (St. Thomas street Station). Engineers, Laurie & Lamb, Board of Trade Building, Montreal. Complete electric generating set, consisting of Leonard Peerless steam engine, direct connected to 150 kw. Canadian General Electric generator, 2,300-volts, 60-cycles; also condenser, switchboard, steam and exhaust piping, spare parts for engine and set as at present installed. Full particulars, etc., obtained from engineers. Advertisement in "Tenders and For Sale Department" of this issue.

Hochelaga, Que.

Gas Meter. The Montreal Light, Heat & Power Co., of Montreal, will erect a gas meter house at Hochelaga, cost \$7,000.

Nanaimo, B. C.

Plant of the new Ladysmith Lumber Company, Nanaimo, B. C. Damaged by fire 8th inst.; 2 kilne and shingle mill destroyed; sawmill saved; loss, \$15,000 (covered). Plant of the Wallace Ship-

yards, Ltd., N. Vancouver, the leading industry, swept early Tuesday morning, 200 employed in works, heavy stock on hand, loss \$50,000. President Wallace in England.

Penticton, B. C.

Tenders called for installation of generators. Owner, Municipality of Penticton. Engineers, F. H. Latimer, Penticton, B. C. Mather, Yuill & Co., Ltd., 429 Pender street, Vancouver. Supply of material and labor in connection with installation of two 100 K.V.A., 3-phase, 4,600 volt, 900 R.P.M. alternating current generators direct connected to impulse wheels operating at 2,045-ft. effective head; pressure pipe line about one mile of 10-in. and one mile of 12-in. pipe; switchboards, transformers, meters, distribution and street lighting system. Plans, etc., at offices of engineers. Tenders in duplicate received by F. H. Latimer until 8 p.m., Aug. 10th.

Building Permits

Edmonton, Alta.

The following permits were issued recently from the office of City Building Inspector Drabble: Cushing Bros., warehouse and power house, \$10,000; Mrs. E. Adkins, house, Seventeenth street, \$6,600; Mrs. I. Forbes, house, McKenzie avenue, \$3,500; W. Avison, four houses, Seventh street, \$12,000.

Saskatoon, Sask.

Recent permits include: W. W. Ashley, frame residence, Saskatchewan Crescent, \$4,000; J. Gilke, frame residence, 27th street, \$2,800; McDougall & McDermott, frame residence, 8th street, \$4,500; Burton & Bowes, frame residence, Broadway, \$3,000; W. Richardson, frame residence, 20th street, \$4,400; Government of Saskatchewan, brick and stone addition, lands' titles, \$22,500; D. Mills, frame residence, 11th street, \$3,000; Manley & McConnell, frame residence, Lansdowne, \$4,500; J. Porter, frame residence, 7th avenue, \$2,500.

Winnipeg, Man.

H. Hirsh, two dwellings, Redwood avenue, \$6,000; D. M. Webb, dwelling, Banning street, \$2,500; Union Bank of Canada, branch bank, Sherbrooke street, \$20,000; T. Olsen, dwelling, Strathcona street, \$3,500; G. R. Sherebrin, dwelling, McIntosh avenue, \$1,600; G. B. Wheeler, dwelling, Fisher street, \$4,000; G. L. Stanwood, apartment, Langside street, \$55,000; M. Kerszko, dwelling, Alfred avenue, \$1,200; A. Congdon, stores and apartments, Portage avenue, \$80,000.

Toronto, Ont.

J. B. Meadows, 2-sty. brick factory, 479 Wellington st. west, \$8,000; Col. Selby, six attached 2-storey brick veneer dwellings, Munro street, \$8,500; H. J. Jackson, three attached 2-storey brick dwellings, near Humber side on Quebec, \$7,700; J. Robertson Co., 5-storey brick warehouse, corner Spadina and Sullivan, \$105,000; A. Goddard, one pair semi-det. 2-storey brick dwellings, near Lennox on west side Euclid, \$5,500; R. S. Van Vlack, alterations to 3-storey brick apartment house, 80-82 Pembroke, \$5,500; Holy Trinity Church, 3-storey brick addition to parish house, 6 Trinity Square, \$8,000; Mrs. W. F. Sparling, 2½-storey stone dwelling, near Roxborough

on south side Edgar, \$10,000; G. A. Evans, 2½-storey brick dwelling, 310 Roxborough east, \$10,000; Saml. Young, jr., 2½-storey brick dwelling, Pricefield road, \$5,000; Deer Park Presbyterian Church, stone and brick church, cor St. Clair & Foxbar, \$60,000; Toronto General Hospital, one-storey brick addition to power house, College st eet, \$5,000; A. N. Garrett, 3-storey brick apartment house, northeast corner Howard and Glen road, \$30,000; R. D. McLeod, 2-storey and attic brick dwelling, northwest corner Lonsdale and Lawton, \$6,500; W. B. Dyson, five attached 2-sty. roughcast dwellings, brick fronts, corner Shirley and Northern Place, \$5,000; Jas. Bodie, one pair semi-det. 2½-sty. brick dwellings, north side Bain avenue, \$5,500; A. De Zorzi, two pair semi-det. 2-storey brick dwellings, Ossington Crescent, \$7,600; F. Merrill, 3-storey brick addition to factory, 93½ Church street, \$6,000; O'Keefe Brewery Co., 2-storey steel, brick and concrete warehouse and garage, near Gould, east side Dalhousie, \$15,000; W. W. Hiltz, four pair semi-det. 2-storey roughcast dwellings, 65-79 Chester avenue, \$15,000; C. Coulter, three pair semi-det. 2-storey brick dwellings, near Markham on London street, \$12,000; R. Lankin, two pair semi-detached 2½-storey r.c. dwellings, brick fronts, 152-4-8 Curzon, \$6,000; Board of Education, 2-sty. brick school, Manning avenue, \$10,000; Mr. McLaughlin, three attached 3-sty. brick stores, near Clinton on east side Bloor west, \$9,000; H. T. Love, 3-sty. brick store and dwelling, 492 Bloor W., \$7,000; Globe Publishing Co., 3-storey alteration and addition to offices, corner Yonge & Temperance, \$7,000; Wm. Hodgkinson, four rows of 3 att. 2-sty. roughcast dwellings, brick fronts, near Myrtle on Curzon, \$22,000.

Fires

Eganville, Ont.

Anglican, Presbyterian and Methodist churches, 2 newspaper offices and mills, \$250,000 loss.

Owen Sound, Ont.

Canada Cement Co's plant, Shallow Lake, loss not estimated.

Thorold, Ont.

Coniagas Reduction Smelter, loss about \$15,000.

Embrum, Ont.

Mr. Menard's residence, Mr. Benoit's hardware store, house and stables, etc., loss about \$20,000.

Business Notes

Parry Sound, Ont.

Change of location contemplated for factory. Owner, Brown Smith Turning Co., Broadbent, Ont. The above Company are contemplating moving their factory to Parry Sound. General Turning Business.

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TORONTO

Contract Record

ESTABLISHED 1886

A Weekly Journal of
Building, Contracting, Engineering, Public Works
Municipal Progress, Advance Information

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Vol. 25

July 26, 1911

No. 30

Building and Business

For the first six months of 1911 ending June 30th the reports of building operations from various centres, published elsewhere in this issue, indicate pronounced activity in all branches. In several localities a scarcity of material and labor disturbances hampered progress, but their effect was insignificant considering the report as a whole, and confidence is expressed even in the most conservative circles that the year 1911 will show a great advance in all the provinces, over previous years. The market reports show building materials to be fairly steady, although shortages in several instances have occasioned slight disfavor and momentary increase in prices. Brick, tiling, crushed stone, and other building materials are apparently moving with great freedom.

Looking beyond the limits of the building industry, much has recently developed to give business men in general encouragement in forecasting conditions for the last half of the year. From the west comes the report that agricultural interests are in most promising shape. The acreage under cultivation is much in excess of that of previous years, so that even though deterioration has been or may be experienced in some localities owing to the destructive heat wave, the total for the country should be more than satisfactory. The great basis of the prosperity of Canada seems to be well established. The railway developments throughout the Dominion suggest that the various companies are cognizant of impending enormous traffic in the transportation of agricultural products, while the farmers may be relied upon for a retention of the splendid purchasing power which has made them such excellent customers for all kinds of manufacturers of merchandise.

That the country is steadily developing into better financial shape is shown by the very satisfactory condition of our foreign trade. Our financial interests are in better shape than ever, to handle the marketing of the season's harvest, and furnish the necessary funds for the expansion in business which is ex-

pected to come. Several of our leading banks have quite recently increased their capital. Such procedure would indicate that they are at last beginning to measure up to the demand of the country for fresh banking capital, and that a large amount of this increase will be available for the requirements of industrial development this autumn.

The Railway Factor

A glance at the building statistics issued monthly during the last few years exhibits enormous development in the centres of western Canada. This may be attributed to Canadian zeal and enterprise, to the foresight of foreign capitalists, or to a score of similar sources. For this development, however, we cannot fail to pay a considerable amount of tribute to the railways of the Dominion. To them is due likewise the recent opening up of the north and also the older development of upper and lower Canada, themselves. From history we learn that 70 years ago the first railway in the Dominion, a line 16 miles in length, in the province of Quebec, was opened for traffic. Twenty-five years ago the first transcontinental train over the Canadian Pacific started from Montreal to Vancouver. In the intervening time Canada made very slow progress by comparison with the leaps and bounds of more recent years. This was due to the general impression that the country was as unproductive as it was frozen. The west was a desert, down to its absorption into Confederation, and the old fur traders declared it would never be anything else. We are told the Canadian Pacific was undertaken about this time with the object of preventing the newer Canada from Lake Superior to the Pacific coast from crystallizing into an American possession. Few persons had any great amount of confidence as to its future. It had to traverse huge tracts of doubtful country before reaching the prairies and the results expected from further progress toward the mountains seemed unsubstantiated. Twenty-five years ago the original securities of the Canadian Pacific Railway were selling at fifty cents per share, whereas at the present time they are selling for over \$2.40.

The Grand Trunk Pacific and Canadian Northern are following its example, and the results to be expected from the three transcontinental lines during the next twenty-five years, with due consideration for increased capital, increased credit, increased population, and increased enthusiasm, cannot be measured even with the pace set in the last twenty-five years.

The Gasoline Danger

Modern conditions are constantly calling for new legislation and regulations in connection with public utilities and many of the conveniences and necessities of daily life. A new illustration of this fact has just been brought to notice in Montreal in connection with fire insurance, says our Montreal correspondent. The popularity and constantly increasing use of the automobile necessitates the storage of gasoline in many places where it was formerly never seen, and considerable quantities of this useful but dangerous commodity are to be found sometimes in little suspected quarters, as well as in public garages, where naturally it will be stored for use.

Permits for storage of gasoline in large quantities,

such as for garages, are issued under the authority of the city council, but no complete separate list of these permits is kept at the City Hall. It will at once be seen that it would be very difficult for anyone to find out who has gasoline stored on their premises, and the more one thinks of this condition of affairs the more serious it appears to be. It is conceded by underwriters that any gasoline storage is liable to become a serious menace to the safety of neighboring property, if not, indeed, to the lives of residents in any locality. It is quite true that storage tanks are provided that are guaranteed to be perfectly safe, and these are made compulsory where large quantities of the volatile fluid are kept, but there are small quantities kept in many places where the protection is nil or next to useless.

A fire occurred the other day in which an incident occurred which is looked upon almost in the light of a precedent. This was at St. Jerome, Que. Fire destroyed a large section of the town, burning over a property owned by Mr. Beaulieu. On these premises was situated a gasoline reservoir buried several feet under ground in the manner usually approved by fire underwriters. This tank contained 180 gallons of gasoline. A short time after the flames had been extinguished around the place where the tank was, it exploded, the heat evidently having penetrated the earth covering the reservoir and generating gas which caused the explosion. This is causing no small concern in the minds of insurance men.

But it is the small public garages that are causing the most alarm among the underwriters. Too often careless chauffeurs, cleaners and helpers, regardless of the consequences to property or even to themselves, smoke in an atmosphere laden with the fumes of gasoline. Several serious fires have resulted in Montreal from this disregard for the ordinary laws governing personal safety.

Another aspect of the case is calling for consideration, and this is one which certainly calls for the serious attention of the special commission which is revising the city building by-laws. It is the situation of which there are too many examples in which a garage is established in the middle of a block surrounded by a variety of stores and dwellings facing on four streets bounding the square. More likely than not a garage has been created by the remodeling of an old stable or warehouse or small factory. Abutting on this, and attached to the rear portion of the stores and residences are usually frame sheds or back kitchens and probably other wooden outhouses. It is scarcely necessary to point out the extreme danger in which all these surrounding buildings are placed and increased fire risk to which they are subjected without any fault of the proprietors and which they are powerless to prevent. The increased risk to proprietors is likely to involve increased loss to insurance companies and this is a matter which appears to call for legislation or rules of some description. It cannot be denied that the situation is serious when garages can be planted down in the midst of such surroundings after all the properties in the vicinity have been insured. Much more is this the case when the construction of the garages is anything but fireproof, when the ceilings are low and when the employees either through ignorance or carelessness fail to observe the most elementary precautions that should be taken in such cases. When an insurance agent goes to the civic authorities to ask for a list of the garages that hold licenses or permits, and is told that

no such list exists, the permits being entered in the departmental books indiscriminately along with others, surely this is the climax of exasperation.

The Slate Industry of Eastern Canada

The latest report of the Geological Survey branch of the Canadian Department of Mines gives an account of the slate deposits and industry of Eastern Canada. That portion of the province of Quebec which lies south of the St. Lawrence River is traversed in a northeasterly direction by a series of serpentines and related rocks, known as the serpentine belt. This belt is important for its production of asbestos—a large part of the world's supply—and for deposits of chromite, soapstone, copper and antimony, which it is known to contain. The principal quarry of roofing slate now in operation in Canada and some promising bodies of marble are also intimately associated with the igneous rocks of this belt. The deposit of decorative marble at South Stukely, operated by the Dominion Marble Company, Ltd., lies within this district. Slate of good quality, both for roofing and other purposes occur in several places in the Ordovician and Cambrian strata adjacent to the serpentine belt. In a number of these places quarries were opened between 30 and 50 years ago, but most of them have long since been closed from one cause or another, principally, it would appear, from an insufficient market at the time they were operated. At the present time these conditions have apparently changed for the better, and the slate deposits might properly receive renewed attention. The imports of slate into Canada for the year 1908 had a value of \$131,069, while the slate produced in Canada during the same year, all of which came from this district, was valued at \$13,496.

The Ordovician slates are dark, or bluish gray in color, and have an excellent cleavage, nearly vertical, which may be at any angle to the bedding planes. These slates have been quarried at Danville, Corris, Brompton, Melbourne and New Rockland. The last mentioned quarry is the only one at present in operation in eastern Canada. The slate produced is of excellent quality. The new Rockland quarry has been operated almost continuously since 1868. During the past eight years it has been worked by Messrs. Frazer & Davies under a lease from the New Rockland Slate Company. Some 35 men are employed, two steam drills and three derricks are in operation, steam and water power are used. Only roofing slate is now made. The quarrying is done in open pits, the work being cut down in benches. While working on higher levels in a deep pit, the waste rock is allowed to accumulate to some depth in the bottom in order to lessen the loss from breakage of good slate by falling into the pit after blasting.

The Cambrian slates are green and reddish or purple in color, and where there is a mingling of these colors a handsome mottled slate results. The green color is known as the unfading green. They split less smoothly than the dark slate, having a coarser texture and are frequently not as strong. The quarries that have been opened usually show large bodies of slate free from quartz veins and sometimes having different colors in different parts of the same pit.

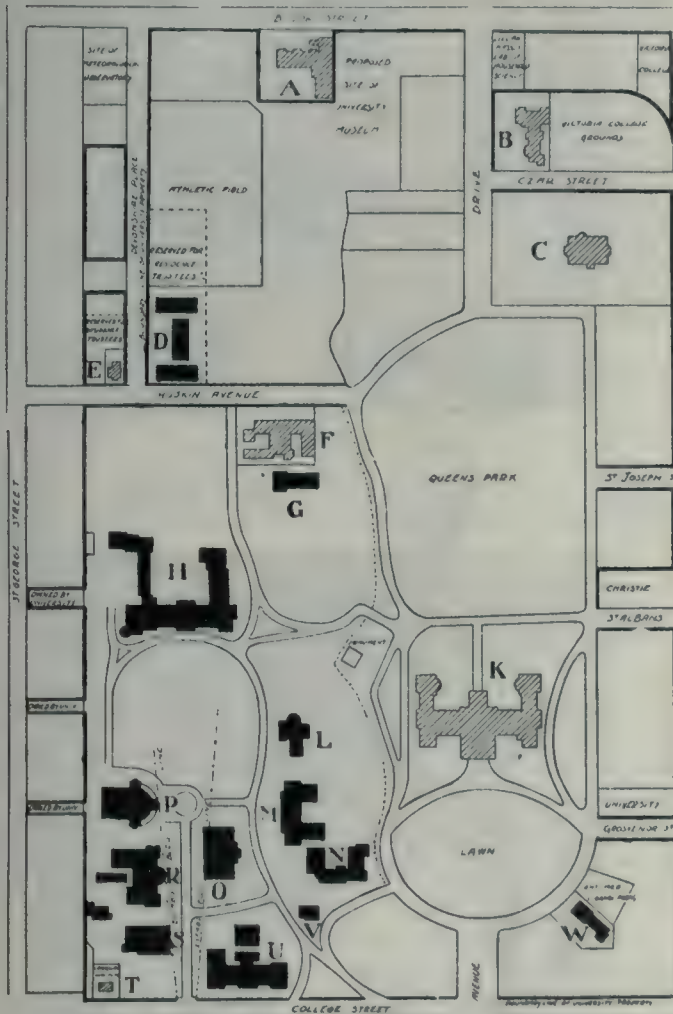
The corporation of Yorkton, Sask., have called for tenders for about 3,500 feet of water main and an equal length of sewer main.

The University of Toronto Heating Plant

Heating on Gigantic Scale—Lighting and Power also Centralized—Nearly Six Thousand Feet of Tunnelling

The new heating, lighting, and power plant that is at present being installed by the University of Toronto, will be, without doubt, the most up-to-date of its type in Canada, and will rank favorably with the best in American cities. Service is being provided for the various buildings in all parts of the University grounds. Fig. 1 shows the lay-out of the numerous buildings, and is intended to give an idea of the magnitude of the undertaking in supplying all the colleges with heat from the same source. Since this

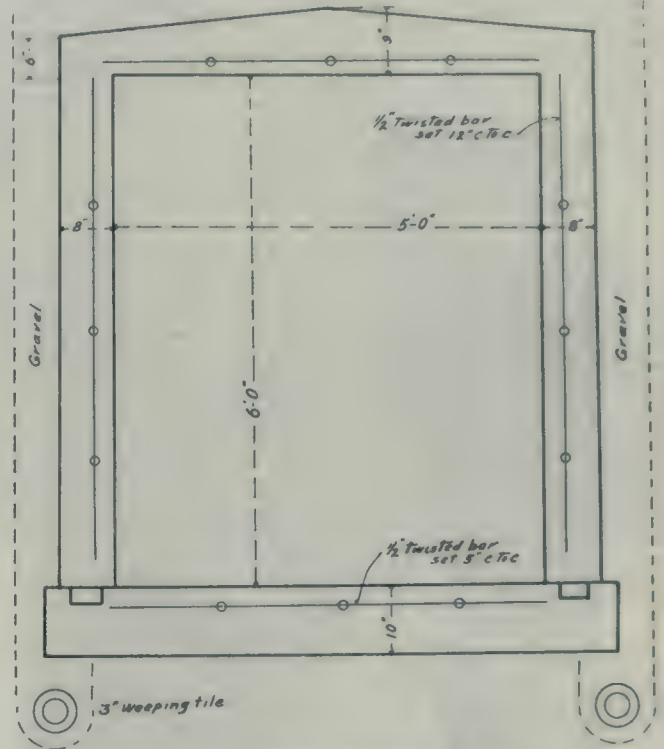
plete. Purdy & Mansell are the contractors for the power piping, while the John Inglis Company supply



General plan of University property.

plan was made there have been a number of additions completed or in the course of construction.

The Board of Governors have retained the firm of Darling & Pearson as their official architects on the work. Griggs & Holbrook are the engineers for the light, heat and power. The L. K. Comstock Company are contractors for the power house, tunnel system, as well as the entire electrical installation, Robertson Bros. being sub-contractors for the power house. Piping for the heating system, outside the power house, is being installed by W. J. McGuire Company, as well as all tying-in connections com-



Cross section of concrete tunnel.

the rigging of all apparatus and the installing upon the foundations.

Power Plant Equipment

This equipment at present consists of two bat-



Excavating south of Engineering Building, showing forms.

teries of B. & W. boilers aggregating 1,600 h.p. capacity, with provision for future boiler extension when necessary.

The units from the Physics and Mining power houses are going to be used in connection with the new plant, consisting of one 50 kw., one 100 kw., and one 150 kw. units, as well as the new 300 kw. unit being supplied by the General Electric Company. This portion of the power plant is also designed and constructed with the idea of taking care of extension work of the University and affiliated colleges.

Concrete Tunnelling

Starting from the power house there is installed a 6 feet by 6 feet concrete tunnel through the Medi-

batch mixers, the proportions being 1:3:5. Considerable trouble was experienced during the construction



Piping for low pressure steam main.

cal building, and branching on the west side of the Medical Building north and south. A branch main 5 feet by 6 feet runs south to the Thermodynamics building and west to the Physics, Chemical and Engineering buildings, with a branch connection at the northeast corner of the Thermodynamics building, leading south to the Mining and Milling buildings. The northerly main branch of the tunnel, starting from the Medical building, runs to the Museum, across the Carbrook property, with service branches to Domestic Science, Annesley Hall, Victoria Library, Victoria College, and Victoria Residences and Dining Hall. Service tunnels 3.5 feet by 6 feet are also run from the main branch tunnels to the various buildings en route, which include library, University College, Observatory, Gymnasium, Wycliffe and the Residences. When all parts are finally connected, twenty-seven buildings will be furnished with light, heat and power. The total tunnel system will be 5,875 feet long when completed, which includes all service tunnel connections.

The concrete has been machine mixed throughout,



Piling north of Czar St.

of the tunnel work owing to quicksand and other unusual soil conditions to be met, for which special

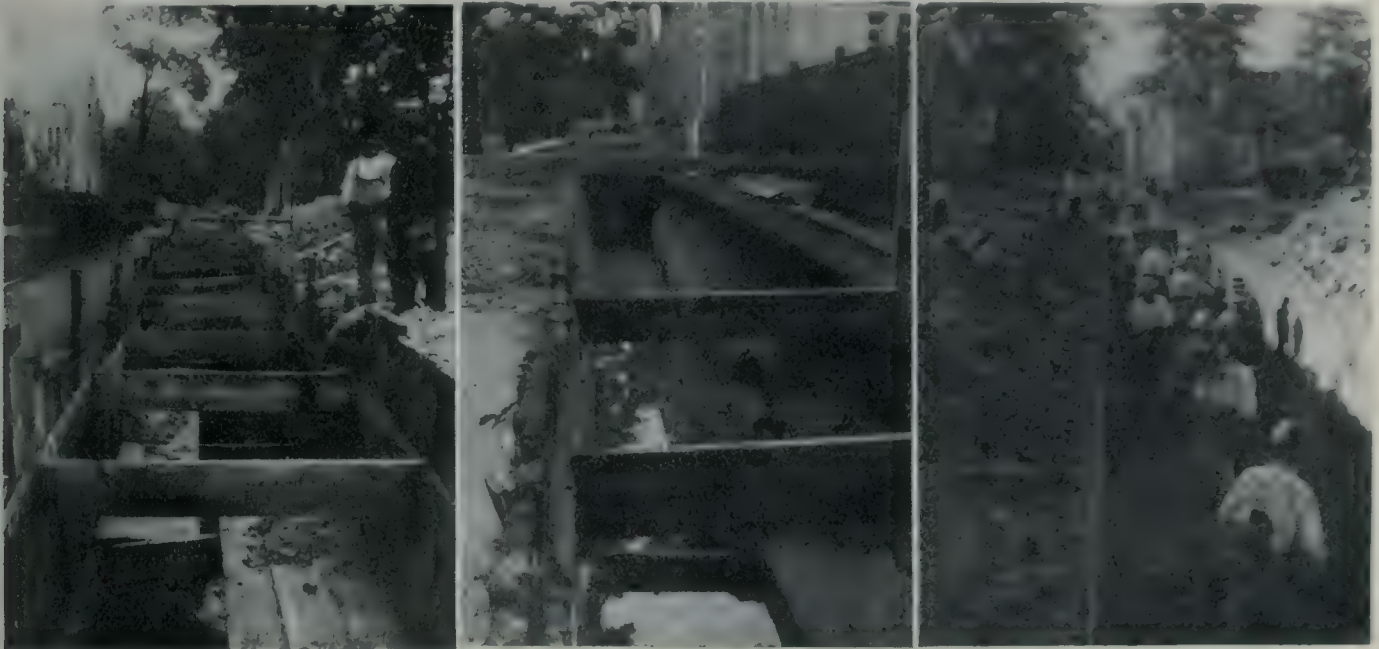


Timber forms ready for concrete roof.

sheet piling had to be used. No little amount of trouble was also occasioned by the unearthing of innumerable sewer, gas and water mains. Fig. 2 shows diagrammatically a cross-section of the tunnel, which in all cases is covered by at least two feet of back-fill. The floor slab, 10 inches thick, is laid first and groov-

Gravity Tanks

A noteworthy feature of the installation is the gravity tank method, whereby the individual heating systems in all the buildings are maintained uniform with regard to the water line at low level. From these gravity tanks all the water from the condensation is



Excavating south of Household Science Building, showing branch tunnel north of Hoskin Ave.

ed as shown. The ceiling tapers from 6 inches to 9 inches in the centre. The walls, 8 inches thick, as well as the floors and ceiling, are reinforced with half-inch twisted steel bars. The Hough spacers are being used in the setting of the reinforcing bars at the proper centres.

In the walls this steel is set 12 inches, centre to centre, and 5 inches centre to centre in the ceiling and floor. The diagram also shows longitudinal reinforcing bars set 3 in roof, side walls, and floor slabs. A 3-inch "weeping" tile is laid below the tunnel in gravel, which material also extends over the entire outside of the walls. An extra large manhole is used throughout the work for the admission of future piping. These manholes are in two sections with standard covers of double type. The entire tunnel is virtually complete south of the museum.

The Heating System

Starting from the power house there is a 20-inch steam main, with branch connections leading to the various buildings, diminishing in size as the decrease in load requires. Further, the tunnels contain a high pressure main with steam for domestic purposes, together with booster connections, to be brought into operation when an adequate supply of exhaust steam is unavailable. Together with the return main these pipes form the three lines occupying the tunnel. No mention is being made here of steam traps, drips, etc., for both high and low pressure mains, and innumerable other accessories that go to complete the equipment. It may be stated, however, that every provision has been made for items such as condensation line loss, which in this case, is calculated to be .1 to .09 pounds per square foot of heating surface per hour.

returned to the power house, where it is prepared to be used over and over again.

The working pressure of the boilers is 150 pounds and the intermediate pressure of the steam in the tunnels is to be fifty pounds, brought about by reducing valves in the power house. The actual heating pressure will be pre-determined by weather conditions, but not to exceed five pounds.

Electrical Installation

The electrical work also presented innumerable difficulties to be overcome in changing from the various old systems to a common three-wire distributing system. The power service is at 240 volts and the lighting service at 120 volts, d.c.

The power house is situated in the ravine and is sunk into the ground to obscure it from the vision of the Parliament Buildings, as well as from the University grounds in general. Another important feature is that this is the lowest point in the entire system.

The plant will be in operation when the University term begins in the fall.

Speed in concrete mixing and a perfect output accepted by the inspectors of the New York Public Service Commission, has been interestingly illustrated by a 1-yard Ransome mixer which mixes all the concrete used in the construction of a section of the Fourth Avenue Subway, in Brooklyn, for which the Tide-Water Building Company and T. B. Bryson of New York, are the contractors. 305 cubic yards of concrete have been turned out by the mixer and placed on the job in five and one-half hours, and this includes the time of such delays as caused by shifting the chutes, waiting for the cars, etc.

Mammoth Building Season for Canadians

Thirty per cent. Increase for First Six Months—Some Notable Figures from Twenty-Six Cities—Remarks from Building Inspectors

The returns for the first half of the year 1911 from twenty-six of the leading cities of the Dominion are compiled below, and compared with those of the corresponding half of last year. A number of the cities are shown in the table to have broken their previous records, and, taken altogether, the returns from this period of 1911 leads those of the first six months of 1910 by some \$15,000,000. Remembering that the year 1910 was Canada's banner year in the building line, and considering the backward spring that hindered early operations in many parts of the country, it is remarkable to note that this immense

increases are shown. Moose Jaw leads all with an increase of 700 per cent. over June, 1910. Kingston reports 403 per cent. increase, Medicine Hat 393 per cent., and Windsor 307 per cent., with Saskatoon and Guelph also over the 300 per cent. mark. A few cities show a decrease for June, namely, Brantford, Fort William, St. Thomas, Vancouver, Stratford and Brandon; Vancouver decreasing 22 per cent. and the latter two over 60 per cent. each.

For the six months ending June 30th seven cities report a decline in the value of their building permits. Ottawa, it will be remembered, showed a decrease of

Town or City	June, 1910	June, 1911	1st 6 mos. 1910	1st 6 mos. 1911	Approx. inc. % for 6 months
Toronto	\$2,302,550	\$2,384,400	\$9,820,648	\$11,939,953	22
Vancouver	1,162,940	906,706	6,885,880	9,188,406	33
Winnipeg	2,413,700	2,790,250	9,906,100	8,581,550	13*
Calgary	573,486	1,826,220	2,394,942	8,212,248	242
Montreal	1,585,254	1,780,860	7,126,880	7,305,816	2
Regina	255,318	716,025	1,342,003	2,936,930	111
Saskatoon	194,400	779,725	1,657,131	2,575,441	55
Hamilton	301,885	618,675	1,232,725	2,246,657	82
Edmonton	233,670	357,929	1,054,476	1,620,431	54
Victoria	227,600	250,800	1,202,835	1,432,585	19
Ottawa	302,000	404,975	1,690,025	1,393,370	12*
Moose Jaw	83,190	665,300	513,210	1,295,575	154
Brandon	98,950	30,725	401,700	803,574	101
Sherbrooke	150,000	350,000	300,000	675,000	125
Fort William	256,225	220,390	939,280	750,075	20*
Lethbridge	91,005	94,960	659,570	485,625	26*
London	38,586	44,756	452,466	458,423	1
Windsor	31,075	126,330	109,480	395,495	261
Port Arthur	65,375	183,450	310,465	315,660	2
Sydney, N.S.	69,789	98,247	204,652	382,052	87
Halifax	21,630	52,000	176,450	211,150	20
Strathcona	13,450	127,323	234,500	214,183	9*
St. John, N.B.	44,300	62,000	222,000	211,700	5*
St. Thomas	31,050	23,300	112,850	136,150	21
Kingston	11,545	58,125	100,143	136,462	36
Stratford	33,500	12,400	190,000	62,500	67*
	\$10,592,573	\$14,965,871	\$49,240,411	\$64,068,029	30
Increase for first six months of 1911 is 30 per cent.					*Decrease.

sum forms some 30 per cent. increase over last year.

It will be observed that Toronto still leads this list, while Vancouver and Winnipeg interchange for second and third place. Vancouver has been seriously handicapped since June 5th owing to a strike in all branches of building trades. A general sympathetic strike was called on that date by the central bodies of organized labor, but it finally became confined to the building trades, and paralyzed that branch of labor throughout the whole of June. It is owing to this, perhaps, that Vancouver, heading the list as it did for the first three months of the year, as is shown in the returns published in the Contract Record of April 26, is obliged to assume second place again.

In the matter of June building some remarkable

39 per cent. for the first three months of the year. Building has picked up slightly and the result is now a decrease of only 12 per cent. over last year's report. Lethbridge is still behind the records of last year, owing to the serious labor difficulties that were encountered early in the season. The conditions here were also affected to a certain extent by the miners' strike. According to Mr. Meech, however, prospects are brilliant for the remaining half year.

Winnipeg, Fort William, Strathcona, St. John and Stratford also report decrease in building operations, the latter amounting to over 65 per cent.

Turning now to the figures from those cities that have shown the greatest activity, from Prince Albert comes the announcement that it possesses a record

of 583 per cent. increase over the first six months of last year. The city of Guelph reports an increase of 323 per cent., and Windsor of 261 per cent. Calgary shows an actual increase of \$5,817,306 over last year's first six months, which is an enormous development, considering the 152 per cent. increase by which the records of 1910 exceeded those of 1909. It will be remembered that ten years ago the population of Calgary was approximately 4,000.

Comparing these returns by provinces, Alberta leads, with Saskatchewan second. Quebec, Manitoba and New Brunswick all show a slight decline, but in no case greater than one per cent.

The position that the city of Toronto occupies in this list is a very clear indication of prosperity. The returns for the month of June, 1911, do not show an excessive increase over June, 1910, but the increase of over \$2,000,000 worth of building for the first half of this year, corresponding to a percentage of 22, just doubles the increase of 1910 over January to June, 1909.

Moose Jaw, Sask.—Mr. W. F. Heal, City Clerk, writes: "The increase in building permits is the largest in the history of the city. Unusual activity prevails in every department of trades and labor, with a taxed demand for carpenters, bricklayers and concrete mixers. The civic improvement for the year will cost over \$650,000. There is no idleness among common laborers, while the demand for help in surrounding districts is very great. Several new hotels, two new school buildings and a number of business blocks are included in the building for this year. The street railway will be in operation before the end of July."

Victoria, B.C.—Although the returns for the month of June show a slight falling off from the previous month, which was the record for this year, the increase over the month of June, 1910, is, as shown, very substantial. July is expected to break all records in building activity as there is a number of large buildings projected, for which permits will be recorded this month.

Edmonton, Alta.—J. Walter Drabble, Inspector of Buildings, states: "Work has been seriously delayed for the past three months owing to a cement famine. Several fair sized blocks are in the process of erection and we expect the commencement of the new Grand Trunk Hotel, an eight-storey building, in a very short time. There is an exceptional demand for dwelling houses, and according to the number of dwellings being erected, it would seem that local builders are doing all they can to fill the demand."

Hamilton, Ont.—Mr. John Anderson, Building Inspector, states that prospects are very bright and the outlook increasing. There is abundance of building material and supplies, and no labor troubles are evident.

Saskatoon, Sask.—Mr. J. E. Harrison, Building Inspector, writes: "The building conditions in the city of Saskatoon are excellent. Good prices are being obtained for houses, rents are good, and not a single house is empty in this city. Residences are being sold as soon as completed, and in many cases are being sold directly off the plans. Real estate values are increasing rapidly, and trade and labor conditions are good. We have quite a number of large and important buildings in the process of erection."

Regina, Sask.—Mr. O. F. Falls, Building Inspector, states: "Prospects are very bright for future building in Regina. Permits have been issued for several large buildings to be commenced shortly." A conservative estimate of building permits for Regina for the whole year is placed at \$5,000,000. The total number of building permits issued to date equals the whole of the permits issued last year.

Winnipeg, Man.—According to the report of Building Inspector Rodgers, the city of Winnipeg is experiencing

very increased activities. For the month of June permits were issued authorizing the erection of buildings to the value of \$2,790,000. This exceeded by \$350,000 the previous record for any month, which occurred in March, 1910. This year it is the greater number of buildings, such as residences and apartment blocks, instead of large buildings, that is bringing up the total, and confidence is felt that the figures for 1911 will exceed those of last year.

Windsor, Ont.—M. E. Brian, City Engineer, writes: "With regard to the conditions of the building trade in Windsor, I would say that the permits for the first six months of this year have exceeded the values of the whole of those of last year by some \$3,500. We have already over \$20,000 worth of permits issued for this month and the prospects for the remaining half of the year are exceedingly bright. All the tradesmen in the city have been very busy."

Vancouver, B.C.—S. H. Jarrett, Building Inspector, states: "The month's business in Vancouver has been very much affected by the strike of June 5th of several branches of the building trades which are still out. The increase of two and a quarter millions over the first six months of last year is very satisfactory and I still feel confident of a corresponding increase for the next six months."

St. Thomas, Ont.—Mr. J. P. Freek, Building Inspector, states: "Building progress is slow at the present time, but the outlook is promising for a further advance later on in the season. There is considerable new dwelling construction in progress, and brightening up of old properties and modernizing them is also general, for a great amount of which returns are not made to the building department."

St. John, N.B.—S. Thomson, Building Inspector, writes: "The first three months of 1911 were very dull in the building line owing to the backwardness of spring, and were much below those of the past year. Since the first of April, however, building activities have greatly increased and indications are favorable for the remainder of the season."

Strathcona, Alta.—A. J. McLean, City Engineer, states: "There is a considerable number of private residences and public buildings in course of construction here at present, and an increase in the issue of building permits over June is expected for this month."

Sydney, N.S.—Mr. D. McD. Campbell, City Engineer, states that in Sydney the building operations are exceedingly brisk at present. Many new dwellings are being erected and the outlook for the remaining half of the year is, to say the least, excellent.

London, Ont.—Arthur E. Nutter, City Architect, writes: "Building conditions generally are flourishing. There are several works in prospect and there is every indication of this year's figures exceeding those of past years. Building work was somewhat slow in getting started this year, but has since more than made up for this discrepancy."

Sherbrooke, Que.—The city of Sherbrooke up to the present time has kept no record of building permits. Mr. F. J. Griffith, City Clerk, states the following: "The season of 1911 up to the present time has broken all records, and without doubt at least \$1,000,000 will have been expended before the end of the present season. Every contractor in this city is exceedingly busy and will be kept so until late in the fall. Operations are extended to all classes of buildings, and it might also be stated here that enormous extensions are being made to street railway, sewerage, and water systems, and electric power developments. There is a steady demand for all classes of workmen in the city and indications point to 1911 being a banner year in the building line for Sherbrooke."

Lethbridge, Alta.—H. W. Meech, Building Inspector, writes: "After a somewhat quiet half year it would appear that we are about to enter upon a good building period

for the remaining part of the year. The miners' strike has been rather a drawback but there are signs of this being settled in a short time. If this is so, then, with the present indication of enormous crops everywhere in the district owing to the recent heavy rains, we cannot fail to see the large number of building projects that are now under consideration quickly materialize."

Halifax, N.S.—Building construction in Halifax has taken a great jump, especially during the last two months, compared with the records of last year. For the month of June permits were issued for \$52,000 worth of building as against \$21,600 last year. A notable feature in this city, as well as in Sydney and St. John, is that building operations were behind in the earlier part of the season but advanced so rapidly as to show a favorable increase over the half year just passed.

Fort William, Ont.—S. Macnamara, Building Inspector, writes: "We have quite a number of large blocks in course of erection at the present time and tenders are being called for others, but the outlook is a little quieter than last season in the building line."

The Situation in Vancouver

Since June 5 the building trades of the city of Vancouver have been practically at a standstill, and although meetings of the building trades council have been held almost daily, no agreement has as yet been reached. The fact that all the unions which have applied to the international headquarters for assistance are receiving strike pay from this source, enables the men to take a more rational view of the situation. It is constantly declared by the labor leaders that the dispute will not end until employers make a move, and emphatically assert that they would remain on strike until the demands of the united organized labor movement were conceded. The employing builders on the other hand emphatically declare that they are justified in (1) protecting their members in their rights to manage their respective businesses, in such lawful manner as they deem fit and proper; (2) the adoption of a uniform system whereby members may ascertain "who is and who is not worthy of employment;" (3) the investigation and adjustment by the proper officers of committees of the Employers' Association of any question arising between members and the employees, when such question shall be submitted to the Association for adjustment; (4) to make it possible for any person to obtain employment without being obliged to join a labor organization, and to support such persons in their efforts to do so if discriminated against by union labor; (5) to protect its members in such manner as may be deemed expedient "against legislative, municipal and other political encroachments."

Recently there has been considerable talk of arbitration, and a resolution was published by the independent contractors agreeing to place matters in dispute with the building trades in the hands of the arbitration committee. It is generally agreed the battle is not as to whether the carpenters shall receive \$4.50 a day as previously demanded, or \$4.25 a day as offered by the contractors. The one paramount question appears to be whether or not open shop shall prevail in this city. At the present time every effort is being made to end the strike with the object being, closed or open shops, a peaceful, amicable and speedy settlement of hostilities. It is reported that a small number of men have quietly gone back to work.

Montreal Carpenters' Strike

On Tuesday, July 18th, a number of carpenters in Montreal decided to quit work unless their employers would agree to give a minimum wage of 35 cents an hour. When work commenced last March they were being paid from 22½ cents to 30 cents an hour for a nine-hour day. Recently there was an agitation to make 40 cents an hour the minimum wage. Quite a number of employers were reported to have consented to pay 35 cents an hour as a minimum, and believing that this rate would become general the agitation was dropped. Members of the Builders' Exchange, however, who have been fighting for years for the maintenance of the open shop system, and the payment of wages according to every man's ability, have not fallen in line with the 35 cents proposition, with the result above mentioned. At the time of writing it would seem that there are about 300 men in the ranks of the strikers. This is but a small proportion of the 1,500 journeymen carpenters that are said to be employed in the city at the present time, so that although the men declare that they will fight to the finish, it is not at all certain that those who received an all round increase of 10 per cent. on the first of July, and are now drawing good pay, will sympathize with the "outs" sufficiently to make the strike a success. Quite a number of employers have declared that they will not be seriously affected by the walk-out. Some contractors are reported to have conceded to the demand for the 35 cent. minimum, while others are determined to resist such a proposal which they consider unfair in view of the agreements made between the union and the contractors some months ago, and which are still in force. A large number of non-union men are employed in the city, which gives the employers confidence that the strike will not seriously obstruct building operations.

Building in Ottawa

Ottawa, July 18th, 1911.

While the building of smaller classes of residences is behind last year, there is so much work in the larger buildings, and in repairs, that there has seldom been a time when all the trades were busier.

One brick manufacturer stated that for several years past the brick men in this city have not been able to supply the demand and although many more are being produced this year than previously, all the firms are behind in their orders. He estimated that 25,000,000 brick would be used in Ottawa this year. This is somewhat larger than last season.

Common labor is very scarce. The railway construction, not only in the vicinity of the city, but in all parts of the country, has a great deal to do with the shortage. The farmers, who usually pick up any unemployed at this season, are finding it a very difficult task.

There is practically no change in the prices of building materials. The rates struck in the beginning of the year hold good, and generally speaking there had been abundance in all lines of supplies with the exception of brick.

V. V. Rogers is doing a big work in grading in Ottawa South. He has awarded a contract for some \$25,000 to O'Leary Brothers to cut down a hill and place it in a hollow spot and the work will begin this week.

There is some complaining that there had been no definite action taken with regard to the railway entrances into the city. Until this is done, the C. P. R. cannot begin the tunnel under the city. However, the absence of most of the cabinet ministers as well as the absence in

England of the heads of the C. N. R. and the Grand Trunk, has been largely responsible for this, and now that they have returned, a definite move in this regard is expected very soon. The decision on a site for the new departmental buildings has not been made, but now with the return of the ministers, it is expected that it will be announced very soon.

If the by-laws pass on September 6th in Ottawa, a great deal of additional civic work will be started. At this time the by-laws for a reinforced concrete high level bridge across the Rideau canal, at the end of Bank street, to cost \$130,000, will be submitted to the electors. The government is to pay \$80,000 and the city \$50,000. At the same time a by-law will be submitted to install an electric booster system for supplying the high buildings with water and fire protection, and will cost \$60,000. To provide for waterworks extension in Ottawa South, \$50,000 will also be asked. This, with the present west end drainage scheme and the other big civic works already under way, will make a very active fall. In a short time tenders will be called for considerable street pavement and some additional sidewalks will also be constructed.

While there is so great activity in civic building, private work is becoming more active than at any time this season. The seven-storey addition to John M. Garland & Sons warehouse has been started. It is of reinforced concrete. A. Leb. Weeks is the architect. The construction has been begun on the new Congregational Church, and while there is some delay, it is claimed that the Westminster Church, which will be a stone building, will be started in a month or so.

It is practically certain that the Beaver Board Company will erect a factory either in Ottawa or Hull very soon. The promoters state that the new factory will be on a very elaborate scale, combining artistic effect with utility, and that it will be an expensive structure.

The largest commercial building in course of construction is the Blackburn building. The first section, which faces on Metcalfe street, is eight storeys high, and the remaining two sections will each be ten storeys in height. The entire facade of the building is to be of Stanistead granite. W. E. Noffke is the architect.

The Half Year in Montreal

Montreal, July 19, 1911.

The value represented by the building permits issued by the building inspector of the City of Montreal for the first six months of 1911 was \$7,305,816. The total number of permits was 1,901. Last year the number of permits from January to June inclusive was 1,724, and the total value of buildings erected \$7,126,880. The number and magnitude, and also the variety of operations now under way is something remarkable even for the commercial metropolis of Canada. As an indication of the growth of building enterprises in this city in recent years it may be stated that last year the total value of permits issued was \$15,715,859, and the largest previous to that was under \$9,000,000, in 1906. This year therefore promises to be a record one even under the miserable system of keeping records which allows buildings to be entered at estimated values sometimes fifty per cent. below their actual cost. The following table shows month by month the value of permits issued so far this year:

January	\$ 365,840
February	642,428
March	1,101,577
April	1,711,971
May	1,981,385
June	1,780,860

There are said to be over 90,000 houses in Montreal and the records show that 621 new dwellings were started in the month of June.

The largest operations under way are the extensions to the Windsor and Place Viger stations of the C. P. R., the former estimated at some two million dollars and the latter \$1,500,000. Some large office buildings, flour mills, apartment houses, theatres, and hotels run all the way up from \$150,000 to a million dollars each.

Commencing with office buildings, the transportation building on St. Francois Xavier street between St. James and Notre Dame streets, takes the lead at an estimated cost of \$1,000,000. Diagonally across the corner is the Dominion Express Company's new building to cost \$600,000. Opposite this latter building is the Yorkshire building, like the others, ten storeys in height and fireproof throughout, costing something like \$100,000. In this class also may be mentioned the new Birks building on Phillips Square, the Blumenthal and Kellert building on St. Catherine street, and the "Herald" Offices on Craig street to cost \$150,000.

Among the hotels may be mentioned the New Freeman, formerly the Carsley department store block, the Mount Royal to be erected at the corner of St. Catherine and Peel streets, the Ritz-Carlton on Sherbrooke street west, the St. James Hotel extension, \$70,000; the Cartier hotel and office building, \$50,000.

Large apartment houses are being built in different parts of the city, showing that this class of building, of which Montreal has now a large number, is maintaining its popularity. Those now under construction may perhaps be headed by the Chalet apartments, costing \$150,000; the Shaftesbury, \$60,000; the Gloucester apartments, \$90,000; the Lincoln Avenue apartments, the Ouimet apartments, the Mountain View apartments (rebuilding after fire), and others.

Among the factory and industrial establishments are the following: The National Bridge Company's works at Longue Pointe, \$100,000; factory for N. A. Timmens, \$64,000; Pierre Brault, rebuilding factory after fire, \$35,000; A. Ramsay & Son Company, Limited, paint factory, \$27,000; J. C. McLaren Belting Company, factory, \$17,000; St. Lawrence Flour Mills (3,000 barrel) and elevator (350,000 bushels); Dominion Flour Mills (2,000 barrel) and elevator, costing about a million each; the Montreal Terra Cotta Lumber Company's plant, \$150,000; James Strachan, bakery, \$25,000; Stuart's, Limited, bakery, \$25,000; coal storage and handling plant for the Montreal Light, Heat & Power Company, \$70,000; Canada Paint Factory, \$16,000; United Shoe Machinery Company, factory, \$195,000; die factory, J. Dupre, \$25,000; Shawinigan Water & Power Company's power house, \$60,000; Wind Mill Point, elevator for Grand Trunk Railway, \$125,000.

The postal authorities, not to be behind in accommodation for the public, are rebuilding the St. James street half of the General Post Office, \$300,000. They are also building a new branch post office on St. Catherine street east, corner of Plessis at a cost of \$85,000. Another new post office in Westmount and others are under contemplation.

Educational institutions are also receiving attention. Good progress is being made on the Fairmount Avenue school, the additions to which are costing \$120,000. The commissioners have purchased land for a new high school for which plans are being prepared though it is doubtful if any work will be done before next spring. They have also purchased a large tract of land in Outremont for school purposes. Several schools have been completed during the present year. The Catholic School Board is also doing good work along this line. They are rebuilding the school recently burned down in Laurier Ward at an estimated

cost of \$55,000. A new school is being built in St. Edwards Parish to cost \$34,000. The St. Gabriel Brothers are spending \$50,000 on a school in Amherst Park, while others are being erected in Maisonneuve, Villeray and Point St. Charles. A new Catholic normal school is being built on Atwater Avenue to cost \$150,000. Nearly all of these schools and colleges are being constructed of fireproof material.

A number of churches are being erected in various parts of the city. Perhaps the most expensive one is that of St. Stanislas de Kotska parish, at \$142,000, with presbytery estimated at \$35,000 additional. The Presbyterians are preparing to build a new church for the congregation of St. Giles in Laurier Ward. They are also building in Verdun. The French Methodists are about to open a new church in Ontario street and the Jews in a short time will open a fine new synagogue in Westmount for the congregation of Temple Emanuel. The site of the former synagogue of this name was purchased by the Windsor Hotel Company on which to build a power house and laundry. The foundation stone has just been laid for a new church for the parish of St. Elizabeth du Portugal to cost \$56,000. A new Anglican church is about to be commenced at Montreal West.

The Y. M. C. A. is putting up three buildings at the same time, the new head office to be on Drummond street, costing over \$300,000, with branches in Westmount and in Laurier Ward, costing between fifty and a hundred thousand dollars each. The branches will be finished this fall, but it will be nearly a year yet before the head office will be ready for occupation.

The General Hospital is undergoing improvements and an extensive addition which will cost several hundred thousand dollars.

The Bank of Montreal will open a new branch in the new extension of Windsor Station at the corner of Atwater Avenue. The Molsons Bank, in addition to making extensive alterations and additions to their head office building, is erecting a new branch at Lachine at a cost of \$15,000.

Amusement caterers do not intend to forget the requirements of the public. Alderman Gauvin is about to erect a theatre at the corner of St. Catherine and Maisonneuve streets to cost \$155,000. A new Sparrow theatre is talked of and plans are being prepared for a theatre building on St. Catherine street near City Hall Avenue. Another theatre company has bought property on St. Catherine near St. Urban street for theatrical purposes. In this category also must be mentioned the Hippodrome, which will be nearly three times as large as any theatre now in Montreal. It will be capable of accommodating ten thousand people and the cost will run up into the hundred thousands.

The McGill Medical building, which was recently opened, belongs to this year's construction, although it was commenced many months ago. The new galleries of the Montreal Art Association, which will be built on Sherbrooke street west, will be an ornament to the city, the first half costing \$300,000, exclusive of furnishings. The head offices of the Artisans Canadiens Francais on St. Denis street at the corner of Vitre street, is now well up. It will cost over \$70,000 when completed. A four-storey building to contain stores and offices of superior character is being erected at the corner of Peel and St. Catherine streets at a cost of \$60,000. Another fine store and office building will be the "Coronation" building at the corner of St. Catherine and Bishop streets, costing \$75,000.

The rebuilding of the Moreau Street Contagious Diseases Hospital will commence shortly and be rushed to completion. Two buildings to be used for light manufac-

turing are going up near the corner of St. Alexander and Dowd streets. These are the Rolland building, costing \$50,000, and the Gillette Safety Razor Company's building to cost \$112,000. The St. Pierre store and office building in the Morgan block, Union avenue, is to cost \$80,000. The Rea building, with the additions recently completed, is now one of the largest and finest departmental stores in Canada.

The new jail which is being built at Bordeaux at a cost of two and a half millions, to accommodate 1,100 prisoners, is expected to be ready for occupation, in part at least, by February or March.

A great many store and warehouse alterations and office renovations are being carried out at an average of from twenty to thirty thousand dollars. At this figure some new fire and police stations are being erected in suburban sections of the city. Of a somewhat different character, although along the building line, is the construction of the Montreal dry dock, which will cost between three and four millions, and the widening of the C. P. R. bridge across the St. Lawrence between Lachine and Caughnawaga.

Another sign of prosperity is the large number of high class private residences that are being built in the outskirts of the city. These run all the way from \$25,000 to \$120,000. And this is not all. Among the projected building operations for which plans are being prepared, and some of which may be commenced this fall, are the new Grand Trunk Terminal offices, station and elevated tracks, for which plans have been prepared, calling for a total expenditure of \$8,000,000. A horse exchange is projected to cost a million dollars. The Engineers' Club and the St. James's Club are to be extended at a cost of practically a hundred thousand dollars each. The Jacobs building, already six storeys high, is to have four more storeys added as soon as arrangements can be completed. The Shedden Forwarding Company, Limited, purposes erecting a nine-storey building on their valuable property at the corner of Craig street and Victoria Square. The G. A. Holland & Son Company intend putting up a ten-storey building on the site of their present store on St. Catherine near Peel. A juvenile court is also planned, and it is expected that work will be commenced on this structure very shortly, as land has been bought for the purpose and the authorities declare that it should be built as soon as possible. The extension of railway plants and steel works, and the construction of municipal buildings, warehouses and private residences, in addition to those mentioned, are being talked of, so that there is every indication that this season will be the greatest in the history of building operations in Montreal.

As an indication of real estate values in the city of Montreal it may be stated that a corner lot known as the Boxer property, at the corner of St. James and St. Francois Xavier streets, diagonally across from the post office, has just changed hands at \$80 per square foot. The managers of the Mechanics' Institute have just refused \$60 per square foot for their property at the corner of St. James and St. Peter streets. The "Herald" property, facing Victoria Square on St. James street, just west of McGill, has been sold to a syndicate for \$232,000, or \$30 per square foot. Dominion Square Methodist Church on Dorchester street, across from the Windsor Hotel, has just been sold for \$350,000, which is \$15 a foot. This property was bought in 1864 for \$9,000. In 1894 it was appraised at \$120,000. Two years ago the officials were on the point of accepting what was then considered a good offer of \$230,000. Chalmers Presbyterian Church on St. Lawrence Boulevard was sold about a year ago for \$29,999. A few days ago it passed into the hands of new proprietors for \$40,000. These are only random figures which might be duplicated by many similar instances.

Demolishing Buildings in New York

It is quite probable that the average reader has very little conception at the present day of the extent to which buildings in leading cities of the country, and more particularly, perhaps, in New York, are being, and have recently been, demolished in order to make room for more modern and commodious structures. An idea of this may be gathered from the statement that during the past decade 8,000 buildings have been torn down on the Island of Manhattan alone for the purpose of making way for more modern improvements. Some of these have been single buildings, such for example as the 20-storey Gillender building, of steel skeleton frame construction, at Wall and Nassau streets, which was demolished in order that its site, with that of adjoining property, might be utilized for the erection of a 31-storey building. Again there have been times when whole areas have been swept away, notable examples of which are the site of the present Hudson Terminal Buildings, extending from Fulton to Cortlandt streets on Church; the Grand Central Station site, covering almost half a square mile in the heart of the city; the two square blocks upon which the Pennsylvania Railroad Station and Terminal now stands; the site of the mammoth Woolworth Building, and that of the Municipal Building, not to mention the extensive demolition of buildings that necessarily occurred to make way for the approaches to the various new bridges completed within the last few years.

Value of Buildings Demolished

According to the statistics contained in a very interesting article on "Razing of Buildings Now a Business Science," prepared by Allen E. Beals, and printed in the Record and Guide, the purchase in the last 21 years of old buildings in New York City by house wreckers or those whose business consists in part at least in the demolition of old buildings, aggregated nearly \$26,000,000, of which amount practically \$5,000,000 was the wrecking value of the buildings demolished in 1909. Eight years ago, according to the authority named, there were only seven house-wrecking companies in the city, while to-day there are 200. Some idea of wrecking values may be gathered from the fact that the hospital building at Twenty-third street and Lexington avenue was sold to a wrecking company for \$250, with the understanding that it would be removed from the site in twenty-one days. It proved to have a steel grillage foundation worth \$1,500. The same company began on June 1 to tear down the Hospital for Ruptured and Crippled, the Grand Central Palace and twenty other four and five-storey buildings in that vicinity, all representing a wrecking value of about \$10,000. The Gillender building already referred to was sold to wreckers for \$50,000, although it cost \$500,000 to build. One company tore down forty-two buildings in fifty-two days and among them was a massive brewery containing vast tonnages of machinery.

Dispositions of Old Materials

As to what becomes of the old material from the demolished buildings, Mr. Beals points out that common brick when cleaned of mortar will be sold to a second-hand material dealer for \$2 a thousand and they will eventually find their way into interior walls of many modern buildings at approximately \$3 a thousand. Since so-called new light-hard brick are

no longer permitted to be used in new buildings the demand for second-hand brick has continually increased. The only waste is the mortar between the joints, the plaster and the old bats that cannot be sold again as brick. While the Grand Central Terminal was being demolished the contractors are said to have shipped 100,000 old brick a day for almost a year to various points along the Hudson where the New York Central Railroad has some filling in to do. In this case no attempt was made to save the brick taken from these operations. The steel girders are also a source of barter. When they are standard shapes they are practically as good as new. A little emery wheel grinding and some waterproofing paint puts them in shape to go into suburban mills and factories and not infrequently into speculative apartments of the cheaper grade.

Wrecker Must Be Responsible

The wrecker of buildings must have great resourcefulness and a perfect organization in spite of the fact that his help is almost always of the unskilled labor class. He must be a keen judge of building material values to know whether there is any market to-day for black marble mantelpieces, iron, gas and water pipe, oak window sashes, mahogany stair railings and steps, hardwood flooring, etc., of the type used 10, 15, 20, perhaps 50 years ago. He must know what the market is for brown stone, for old heating apparatus, elevators, if the building contains such a device, and other material. If it is an office building that he is figuring on tearing down he must know whether there is at the time a good demand for second-hand girders and cast-iron columns, iron shutters, iron stairs and old vault lights. If he finds that the building which he is examining is of an irregular shape so that the cross beams and girders are of different lengths, if the doors are of extra size and the window frames smaller than those now being used or even larger, or the floor is badly cut up by partitions, he will naturally make his bid for the wrecking contract correspondingly low.

The system of taking wrecking contracts is different in almost every locality. In New York the owner never has to pay for the removal of a building. In Baltimore the owners of the "News" building paid \$22,000 to a contractor to remove the building and sold the salvage rights to one man for \$4,500. The destruction of a building requires more consideration than the mere matter of getting it down as quickly as possible. Dynamite could be used for that purpose provided the building was far away from other structures and pedestrians did not have to be protected.

Organization Secret of Success

The secret of the wrecker's success is in the organization he maintains. Most of the leading companies have a most perfect system, insuring economical demolition of buildings. They have several picked foremen who are expert appraisers of second-hand material and under these foremen from fifty to one hundred cheap laborers are employed. These are provided with crowbars, hammers or sledges, according to the type of work to be torn down, and the proportion of that which is to be saved. There is usually to be found among them an expert iron worker, who directs the careful removal of marketable steel girders and columns. Marble, granite and other building stone is also carefully taken out by these trained men.

The New Montreal Jail

In March next, according to present calculations, the new Montreal jail, which is under construction at Bordeaux, six miles from the old Montreal Jail, will be completed and the prisoners transferred to the new prison. The old prison was built to accommodate 250 persons of both sexes, but for many years only men have been incarcerated there, and room had had to be found for as many as four hundred at a time. The new jail will be for men only and will contain ample accommodation for 1,100 prisoners.

The ground area that will be covered by the new buildings and appurtenances will be about twenty acres and this will be capable of extension. The estimated cost of the new structure is, in round figures, \$2,500,000.

The design has been worked out in accordance with suggestions made by Governor Vallee, whose many years of experience and thorough study of the question have eminently fitted him for the important task of laying out a detention house for criminals that will at the same time give them suitable accommodation, and enable the prison staff to guard the prisoners efficiently and supply all their wants with the utmost convenience, combined with safety and economy. The plan shows a structure of six wings, branching out like the spokes of a wheel from a central rotunda. This rotunda will be 120 feet in diameter and two storeys high. From each storey a full view of the interior and exterior of each of the wings may be had. There will be six rows of cells in each wing with thirty-two cells in each row, and five aisles passing down between the different rows of cells from end to end. For prisoners awaiting trial the cells are eight feet wide, eleven feet long and nine feet high. For condemned prisoners the cells will be six feet three inches wide, eleven feet long and nine feet high. The space between the wings will be used by the prisoners for exercising. The plans call for 1,100 cells in the completed building, of which six hundred and fifty will be required immediately. The building will be of reinforced concrete, granite, pressed brick, and terra cotta, and will be perfectly fireproof. The administration building, just inside the main entrance, will be 180 feet long by 32 feet wide.

The food will be served to all the prisoners on the ground floor of the rotunda as they pass in from the yards to their cells. The next floor will contain the chapel for the Roman Catholic prisoners. The Protestants being only about twenty-five per cent. of the total prison population, will require a smaller chapel, which will be situated in the Administration Building. Governor Vallee is an advocate of the single cell system, such as obtains in Belgium, which tends to prevent the corruption of the young or first offenders by old and hardened criminals.

Not only has much thought been given to the arrangement of the cells and the matter of waiting on the prisoners in the most modern way, but special attention has been given to the method of locking them in their cells and opening the cell doors. It will not be necessary to go from cell to cell opening each door separately, for a system of levers operates in such a manner that every door on one side of a ward may be opened at once; or one-third of them may be opened at a time. Or, if desired, one alone may be opened and the remainder stay closed. Again, if

it is necessary to prevent the prisoners from slamming the doors back and forth they may be locked open. The thirty-three doors along one side of a wing weigh two tons, but these can be moved all at once by one man using the levers.

The jail buildings will be enclosed by two walls, the inside wall to be 18 feet high, and the outside one 24 feet high. There will be a space of 18 feet between the two. A broad avenue will run from the road that skirts the river up to the massive entrance in front of the Administration Building. The entrance is flanked by heavy stone abutments built into the high cement walls that surround the prison.

By the time the authorities begin to use the new jail, street cars will be running to the door. It is the intention that the prisoners shall be carried to and from the Court House in special cars. A switch will be put in branching from the Bordeaux line and leading inside the prison walls. It is expected that this service will be very effective, and the most up-to-date in existence.

It is the intention to establish work shops similar to those in connection with penitentiaries. It is believed that the men can be more profitably employed than in breaking stone.

The kitchen is a roomy apartment fitted up with every modern convenience. From the kitchen small trucks will run on narrow gauged tracks to a small elevator that runs up directly under the tower. This will carry the huge pots of soup to the six wickets on the main floor. Past this three times a day the prisoners will march, each one to receive his portion. This he will carry to his cell, where it will be eaten. Every prisoner will be in full sight of the guards while this procession is passing to and from the cells.

The dungeons are not dark and gloomy, but are light and airy. Unruly prisoners will not be manacled



nor chained to a ring in the wall, but outside the cell door is a hose and turncock.

The cells for the insane are also of novel construction. Each cell has three doors. Should an insane prisoner become unmanageable and violent the guards can enter the cell from three sides at once, and overpower him before he can injure anyone.

Provision has been made for the execution of murderers. In a recess where two wings meet, close to the central rotunda, there is a small balcony. Over the balcony protrudes a steel beam for use as a scaffold. The door leading to the scaffold is in the wall of the "condemned" cell. This is one of the largest cells in the jail; also one of the brightest. It is immediately under the eye of the guard who sits in the central cupola.

The jail will have its own power house, where electricity will be generated for the purpose of pumping the water that will be used throughout the building, as well as for heating and ventilation. The sanitary conveniences are of the very latest and most approved designs.

The architects appointed by the government to prepare the plans and have oversight of the construction in association with Mr. Brossard, are Messrs. Messrs. Marchand & Haskell, St. James street, Montreal.

The general contractors for this work are Messrs. J. B. Pauze & Company.

Cost Records in Construction Work

Ignorance of real costs is a danger whose seriousness every contractor will appreciate. What is less clearly appreciated is the extent to which real costs are not known, and the degree to which construction

estimates are based on gravely unreliable data. Discussing this matter, Sanford E. Thompson, consulting engineer, who has been associated for years with Frederick W. Taylor, the pioneer in scientific management, says:

Besides being of use as a preliminary step toward the introduction of scientific management, cost keeping, that is, cost determination of work in progress, is of value to the engineer for making up estimates and checking the work of the builder, and to the builder in bidding on subsequent contracts and keeping track of the cost of the work as it progresses from day to day. In construction work based on the principle of cost-plus-a-fixed sum, and other similar systems, the accurate recording of detail costs on different parts of the work is absolutely essential for submitting the accounts to the owners.

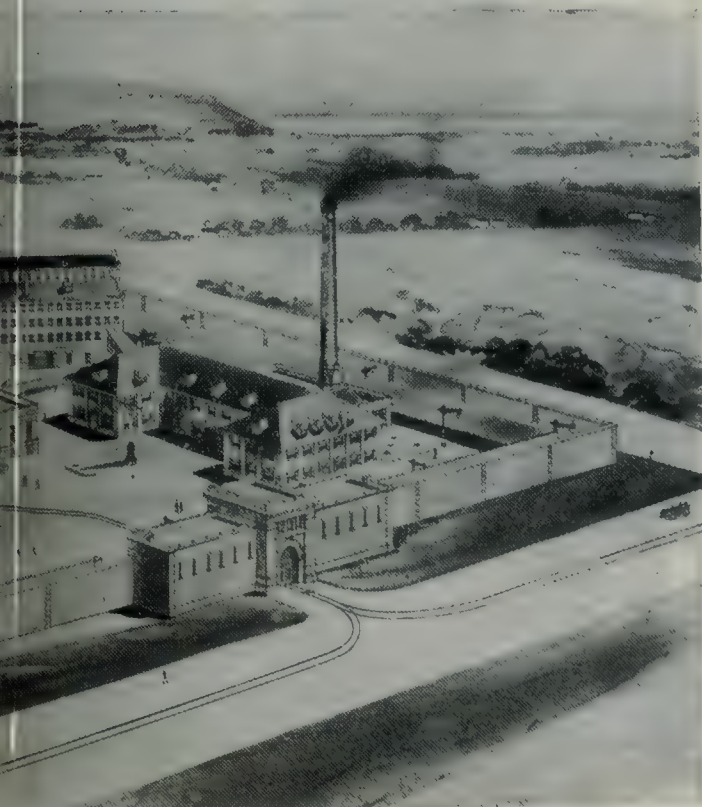
To accomplish any of these aims, the cost records must be accurate enough to serve:

- (1) As records for estimating cost of subsequent jobs.
- (2) For immediate use.
 - (a) To determine whether the builder is making or losing money.
 - (b) To fix any point of loss or of too small profit.
 - (c) As an incentive to the foreman and workmen.

As generally practiced, cost keeping is so approximate and inaccurate as to be of comparatively little value for any of these purposes.

The point just made may be illustrated simply by a comparison of the methods now usually employed in estimating materials and labor. In estimating materials the engineer or contractor notes every item, usually taking the schedule from the plans, and by adding a percentage for contingencies reaches a total which will check fairly well with the actual subsequent cost. Before he starts to do any work, he must order the required amount of each material separately, and the cost of each item is carefully looked into to see that the lowest figures are obtained consistent with the quality of the work required.

With labor, on the other hand, the plan heretofore adopted has been largely a system of guess work. Frequently one hundred or more carefully tabulated material items are set down while the estimate for labor is given in one lump sum, and yet the labor may amount to one-fourth or one-third the sum total of the materials. The variation in the actual cost of the labor from that given in the estimate almost always makes the difference between a profit and a loss to the contractor. These "guesses" at labor costs are commonly excused because it is claimed that the work done by different workmen varies to a great extent, or that it is impossible to provide for unforeseen contingencies. This, however, is merely dodging the whole responsibility. The real reason for such approximations is that the contractor usually does not know the time and cost of doing each kind of work with any degree of accuracy; and the fact is only just coming to be recognized that it is possible to determine in advance how fast each element of the work should be done nearly as accurately as the cost of supplies and materials are now determined, and that once having the fundamental data, it is possible to estimate labor nearly as accurately as material.



Winnipeg Electric Company's Chimney

The largest ferro-concrete chimney in the west, if not in the whole of Canada, is now under construction by the Winnipeg Electric Railway Company, for their new steam auxiliary plant east of Mill street, Winnipeg. The plant, which is now under construction, is designed to accommodate steam turbines with a capacity of 15,000 horse power, to be used as a stand-by for their hydro-electric plant at the Pinnawa channel of the Winnipeg River. It will supplement the present steam plant on Assiniboine avenue.

This chimney, which is being constructed by the M. W. Kellogg Company, of New York, will be 251 feet in height and will give accommodation for double the number of boilers to be placed in the first installation. Work has now been in progress for about two months and the contractors are considerably more than half way through, for they are above the 100-foot mark. With reasonable weather conditions they should be away by the middle of August.

The dimensions of the chimney are 251 feet in height, 13 feet inside diameter at the top, with a concrete cap, 22 feet 6 inches inside diameter at the base, and 25 feet outside diameter. The base is a solid monolith of ferro-concrete 35 by 35 feet and 5 feet 6 inches in depth. It is carried on 169 piles, each 45 feet in length, driven to bed rock. In the construction there is being used 13 tons of twisted steel reinforcing rods and 8 tons of wire mesh. The chimney is being carried up at the rate of six feet four inches every working day.

The formation at the plant is not particularly favorable to the construction of plant of this weight. The soil to bed rock is a combination of silt and clay, most subject to the softening action of water. For this reason extraordinary precautions were necessary in securing an adequate foundation. The base is exceptionally strong, there being no stint on the amount of steel used. The chimney proper starts with a shell 15 inches in thickness, tapering to six inches at the top. The reinforcing rods are carried up vertically, being spaced at the top by a framework held in position by a temporary platform which is accurately placed by means of a plumb bob dropped to a central stake in the base. Heavy steel wire mesh is then woven in with the rods.

The forms, inside and out, are of steel, and of a special design controlled by the contractors. They are constructed so as to permit of the desired taper, and are taken in with each change of elevation. All material is handled through the inside of the structure where an elevator and bucket hoisting plant have been installed.

In the base a mixture of 1:3:5 was used, but in the chimney only the cement and clean sharp sand are being used. It is mixed to a thin consistency in a polygon mixer and poured from there down a chute into a trough in the interior of the chimney. From there it is baled into buckets and hoisted to the top, where two men attend to the pouring. The mixture is of a heavily fluid consistency so that little or no tamping is necessary. It flows freely through the wire mesh and makes a clean smooth surface against the forms. A single layer is considered a day's work and is completed before operations cease at night. In fact, when delays have occurred during the day the men have had to work until 9 o'clock at night. By morning the concrete has set sufficiently to per-

mit the forms being raised and the work progresses continuously.

The new power plant has been practically completed up to the ground level, this being the heaviest part of the work. Ground was broken last fall and the foundation and sub-foundation work pushed throughout the cold weather, for it was found that the earth is more readily handled in deep excavations



when the frost is heavy. Under one half of the building is a huge well for the handling of the cooling water supply for the plant. It is built entirely of reinforced concrete. At a depth of 40 feet a trench was run to the Red River, and beneath the tracks of the Canadian Northern Railway, through which are carried the intake and outlet pipes of the system. This part of the system is in duplicate in order that there may be no delays due to the necessity of clearing away the accumulation of sludge from the river water.

The Prevention of Scaffold Accidents

No Stringent Rules Regarding Scaffolds in England—Master Builders and Workmen Differ as to Causes—Helpful Suggestions

Building operations conducted by the aid of scaffolding, and the various auxiliaries incidental to the use of scaffolding of all kinds, are necessarily of hazardous nature and, in spite of the most effective precautions that can be devised, accidents can scarcely be avoided at times.

At present building contractors are not fettered by legal enactments so far as concerns the design and construction of scaffolding, but, in addition to being subject to the responsibility established by common law, they are affected by the Notice of Accident Act, 1906, and the Workmen's Compensation Act, 1906. The second of these Acts makes the builder liable to pay compensation for personal injury resulting from any accident to a workman unless it can be proved that the injury was caused by "the serious and wilful misconduct of that workman."

While we do not believe that the provision in question has had any material effect on the design of scaffolding, it certainly has saddled master builders with an additional insurance rate, and, in the opinion of competent judges, has distinctly encouraged foolhardiness and want of care on the part of workmen. As shown by statistics, most of what may be termed scaffold accidents on buildings are caused by men slipping, stumbling, over-balancing, and tripping over obstacles, some are due to falling materials, some to the improper use of brick and other hoists, and a small percentage to the collapse of scaffolding and the breaking of ladders and planks.

Those who represent the men contend that insufficient scaffolding plant, unsuitable materials, and the absence of safeguards, are responsible for most of the accidents that occur. Others, representing builders' foremen, admit that accidents are occasionally due to faulty poles and putlogs, and defective tying, but state that the main cause is carelessness on the part of the men. Master builders agree generally with the foregoing statement, and attribute the bulk of the accidents occurring to carelessness, want of thought, the taking of unnecessary and undue risks, and the systematic neglect of safeguards provided.

We do not take the position that accidents never occur as the result of defective material or inadequate design, for unsuspected faults often exist in timber, and the building trade still includes some who do not accept the high standard of efficiency set by firms of good standing. Nor do we say that the men as a class are careless and wilfully neglectful of their own safety. But we cannot avoid the conclusion that the responsibility for mishaps rests less upon master builders than upon their men.

In confirmation of this view the following extracts may be quoted from the Report of the Building Accidents Committee, dated October, 1907.

Referring to scaffold construction, the Committee say:—

"We are convinced that serious dangers are due to insufficiency of plant and the use of defective materials for scaffolding, coupled with unskilled and careless workmanship in the erection of scaffolds. This is naturally the more likely to be the case with

the so-called 'jerry-builder,' than with the contractor for large works."

On the question of carelessness on the part of workmen, the report says:—

"It is of little use to require employers to provide safeguards unless the workers are also required to make proper use of them. Nearly all the master builders who gave evidence referred to what they call 'the carelessness of the workmen,' as a cause of accident. They say that accidents happen through the contempt which some workmen have for proper prudence and precaution in following their employment. So, too, an insurance company says that 'the greater proportion of building accidents could be avoided if it were possible to instil into workers the necessity of taking ordinary precautions, not only for their own sakes, but for the sake of others.' Without endorsing these opinions, we are convinced that workmen do run unnecessary risks, that they thoughtlessly remove planks or supports from one part of a scaffold to serve some other purpose, leaving a trap for others to fall into, and that they ride up on the crane load or in barrow hoists to save trouble of mounting ladders."

The cheerful optimism pervading builders' men in this country extends to workmen employed by engineering contractors, and prevails more or less all over the world. Nevertheless, it is the fact that precautionary measures on the part of employers are useless without voluntary co-operation from the employed, and we feel sure that builders in particular would be encouraged to make further efforts if their workmen would take care to observe the various safeguards already provided.

The inculcation of this spirit among builders' men may justly be regarded as one of the most effective means for reducing the number of scaffold accidents.

Although masters provide scaffold plant, and are responsible for the erection of the main scaffolding about a building, they cannot compel men to be cautious, nor can they insist upon the exclusive consumption of beverages which are favorable to sure-footedness and steadiness in walking. These matters come within the province of the men themselves, as also do the use of ladders, steps, trestles and planks for auxiliary purposes in connection with the main scaffolding.

So far as the latter is concerned, the practice of reputable firms leaves very little to be desired. In support of this view, we may refer the reader to the Home Office memorandum of January, 1902, and the Draft Regulations recommended by the Building Accidents Committee in 1907.

The only suggestions made with regard to scaffolding in the former are to the effect that all working platforms above the height of 10 feet should be provided with a fixed guard rail 3 feet 6 inches above the scaffold boards, and with a guard board close to the platform to prevent the fall of materials; that runs between different parts of a scaffold or building should be not less than 18 inches wide, and constructed or supported so as to prevent unequal sagging;

and that scaffold boards should be supported at each end by a putlog, and not be allowed to project more than 6 inches beyond the supports unless lapped by another board resting partly on or over the same putlog, and partly upon other putlogs.

Apart from clauses relating to scaffold construction generally, the latter document cannot be said to go far beyond the practice already followed by builders of good standing, the chief recommendations to employers for the prevention of scaffold accidents being: That boards in working platforms and runs shall be adequately supported; that gangways more than 5 feet high shall be at least 27 inches wide, and supported so as to prevent undue and unequal sagging; that single plank runs shall not be used more than 5 feet above the ground or floor, the width to be 18 inches, above 5 feet high, and 27 inches above 12 feet high, and provision made for undue and unequal sagging; that bricks, pipes, and chimney-pots shall not be used for the support of platforms, gangways, and runs; that working platforms shall have fixed guard rails, and continuous guard boards to prevent the fall for materials, and that openings in floors and working platforms shall be properly fenced.

Part II. of the Draft Regulations is somewhat more helpful, as it provides that workmen shall co-operate with employers by reporting any defects they may discover, by abstaining from interference with scaffolding plant, appliances, and safeguards, and shall not adopt unauthorized or unsafe means of getting about the building.

As our readers are probably aware, no regulations as to scaffolding have been issued since the presentation of the report mentioned, and the Building and Engineering Works Bill introduced in 1909 did not pass into law. Although further legislation does not seem to be necessary, it is probable that regulations governing the construction of scaffolding would be in the interests of conscientious builders because it would have the effect of discouraging undue economy on the part of speculative builders, and place competition on a more equal footing. But, for any future regulations to be equitable and satisfactory, they must impose definite responsibilities upon the men who use, and frequently misuse, scaffolding plant, appliances, and safeguards.—The Building Age.

Aesthetic Treatment of Concrete

Simplicity of intention in constructional design may issue, says Professor Beresford Pite, F.R.I.B.A., in a native or spontaneous aesthetic quality. For example, an undesigned beauty reached without treatment is often attained by such a structure as the Forth Bridge or a ferro-concrete silo. Again, mediæval architecture grew up as a constructive method without aesthetic purpose, and yet achieved results of great beauty. Consequently, he asked, "Is not the opportunity given by the new process of reinforced concrete building one that could be utilized for the erection of the much-desired original and modern style of architecture? Are the new material and method together sufficient motive?" It had to be asked whether truthfulness of design to constructive purpose and elemental soundness of proportion were in themselves sufficient to provide that pleasantness to the eye which is desiderated. Four conclusions might be safely drawn: First, we have no instinctive guidance towards an unbiased originality for a concrete architecture; second, abstract principles like

those invoked of proportion are of no assistance; third, superficial treatments, as by color, are insufficient for architectural expression, though valuable in assistance; fourth, the texture of concrete surfaces modifies and imparts special character to any forms employed for architectural purposes. Therefore, while modern considerations of utility and of novel constructional methods determine proportions, and may ultimately develop aesthetic qualities, the scholarly and critical analysis and employment of traditional architectural forms suitably modified for execution in concrete is the proper method for the aesthetic treatment of concrete. A historical review of the development of some characteristics of Egyptian, Greek, and Roman architecture furnishes proofs of the non-relation of aesthetic treatment to direct constructive facts. Idealized representations of ancient types form the basis of both Egyptian and Greek characteristics, while the Romans frankly separated the decorative from the practical purposes of architecture. In Gothic art, however, the constructive craftsman was the artist, and the development of decoration is integral with building craft. In other crafts, like wood and plaster work, motives are imitated from stonework, and illustrate the modifications produced by the texture of the material into the design of details—of this the Elizabethian ornamental plastered ceilings originating from Tudor vaultings are illustrations. Modern novelty of constructive method does not remove a necessity for study of architectural development. The latter will aid adaptation and modification, and thus pave the way for development. Modern Continental design is too eager to demonstrate that elasticity possible in employment of form in unusual architectural relations. At home we still are safely and timidly putting brick and stone fronts to concrete buildings. There is a great future before concrete building, and it deserves that close and patient architectural study which, deriving from the past, will give certainty to the future aesthetic treatment of the material.

The C. A. P. Turner Company, who make a specialty of reinforced concrete bridges, buildings and manufacturing plants, with headquarters in Minneapolis, have recently established a branch office in Winnipeg to take care of the Western Canada business. This office is situated in the Canada Block.

An official report shows that Canada produces 83 per cent. of the world's supply of asbestos. In 1909, 2,000 men were employed in the industry. In the Black Lake quarries, Province of Quebec, there are 15,000,000 tons of asbestos rock in sight. The Russians are the only real competitors in this business, and the Canadians do not fear much from them. A considerable proportion of the output is used in the production of asbestos protected metal, used for roofing and sheathing. Besides being fireproof, this material does not corrode and is not affected by moisture or acid. This branch of the industry is only a few years old, but is growing rapidly.

The contract for the installation of a waterworks system for Penticton, B. C., has been awarded to Messrs. Macdougall & Co., 532 Granville street, Vancouver. The contract included the laying of 20 miles of steel and cast iron pipe, and the construction of a reservoir, intake chambers, etc. The cost will be about \$65,000.

The La Salle Street Tunnel in Chicago

Old Tunnel Impeded Navigation—New Structure Difficult to Manoeuvre—Method of Placing Unique

The La Salle Street tunnel at present under construction in Chicago is unique, and the methods employed are novel, from an engineering point of view. For instance, one feature of note is that the steel tubes, as shown in the accompanying illustration, were built to the outside diameter, floating down adjacent to their permanent position, and lined with concrete. Comparing this with the methods employed by the Michigan Central Railway in constructing their tunnel across the Detroit River it will be observed that the operation is the reverse. The Detroit River tunnel consisted of two twin steel tubes in short sections, sunk and filled around with con-

crete. It was then necessary to remove the entire river section to meet with the requirements of the government. This was completed in March, 1907. After considerable investigation, the Board of Supervising Engineers adopted a plan for a tunnel as shown in the accompanying section. This tunnel is so designed, that it can ultimately be used in connection with a future subway, but at the present must be used by cars coming to the surface at either end.

The possibility of building this tunnel by the open cut method was considered, but the United States Government would not permit obstruction to navigation, and consequently the river section is built with a double floor steel shell as shown. This river section is built of twin steel cylinders, joined together and lined with concrete. The tubes do not form two complete cylinders, but they have been joined so that the circumference over-lapped. These tubes were made at the shipbuilding yards on the north branch of the Chicago River, and when completed, were floated down to place and sunk. This was an unusual and interesting feat, but the method of completing the concrete work is still more novel, and will be found of infinitely greater practical value because of the far greater number of smaller places in which it can be utilized. The tunnel sections consist primarily of an inner and an outer shell of steel, these being connected and strengthened by wing walls at appropriate intervals, and the design contemplating the ultimate filling of the space between these shells with concrete. The larger part of this concrete was placed while the tunnel was still at the ship yards, the object being to weigh it down to the water line so that a minimum amount of water would be required to sink it when it was towed to position. This left a space of about one-sixth of the circumference to be completed when the tunnel was finally located on the river bed.

What is of great interest, is the 3-ft. concrete wall separating the two tubes. This is practically a girder, 3 feet wide, by 17 feet high, and 278 feet long, and as this was poured in the drydock before the steel cylinders were moved down to their permanent position, constituted the stiffening girder which allowed the twin tubes to be handled down the river. When the steel work in the drydock was sufficiently completed, the interior wall was centred up, a section at

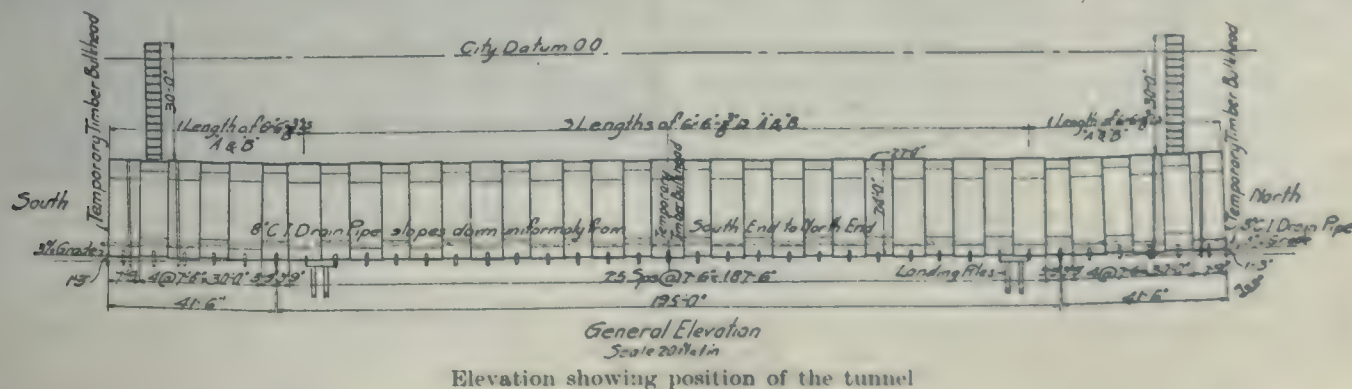


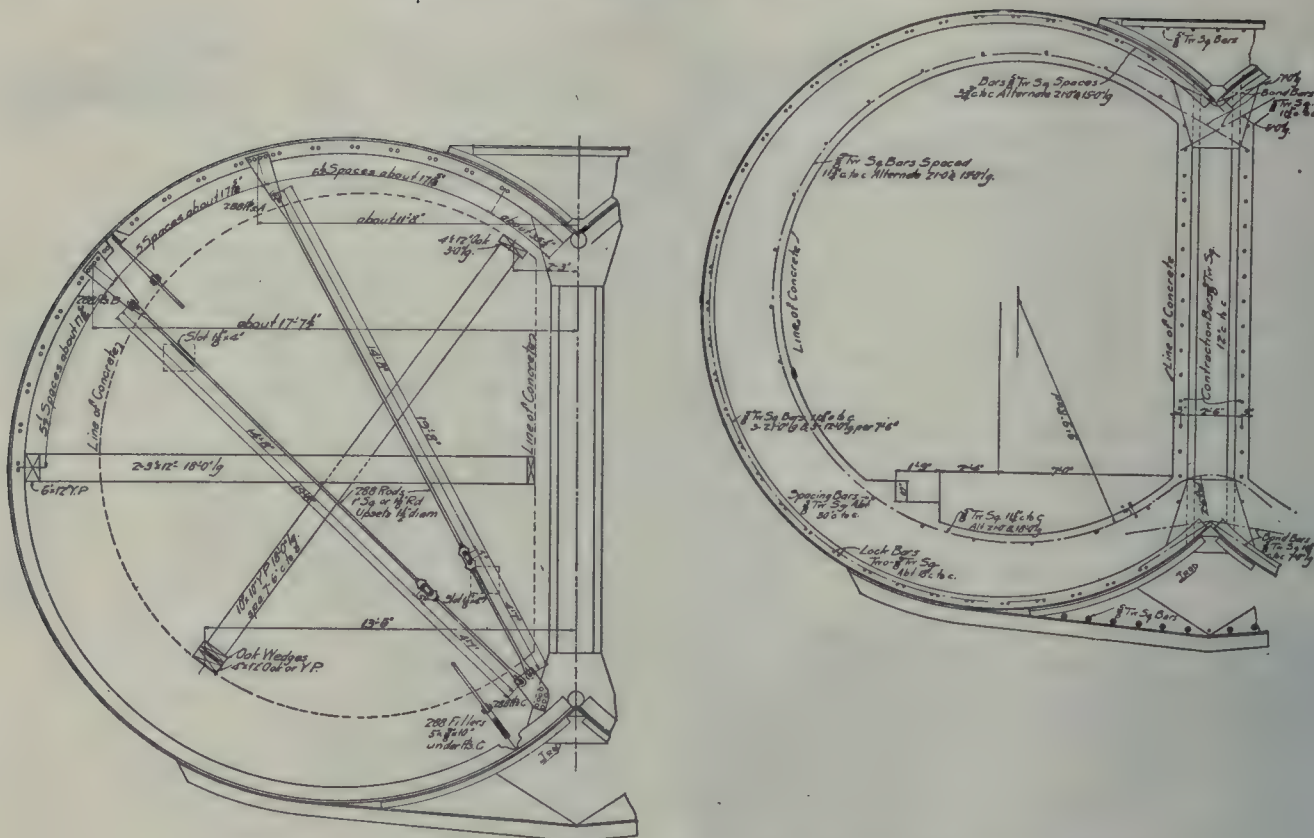
The twin steel tubes. At the left, steel work being erected, at the right, the steel completed

crete. These tubes were built in the shipbuilding yard, floated down the river, sunk to correct position on a pile foundation, and concrete was placed around them from a mixing plant on a scow.

In constructing this tunnel under the river at La Salle street the unusual problems encountered are responsible for the necessity of unique methods. The location of the new tunnel on the site of the old brought many complications. Added to this was the requirement that the tunnel should connect temporarily with the surface lines near Michigan street at the north end, and near Randolph street at the south end, and should be so designed that a connection could be readily made with the subway when building without interfering with traffic in the tunnel.

To review the work on the La Salle street tunnel, we find that the original tunnel, built in 1869-71, impeded navigation by not allowing the larger vessels to pass over it. In 1906, attempts were made to lower the roof of the tunnel, and resulted in failure.





On the left, details of temporary bracing, on the right, position of reinforcing steel

a time. Previous to this, the section of concrete between and below the tubes had been run, and the centering for the wall included a short section of both arch and invert. After the completion of the centre wall, reinforced as shown in the section, the ends of the tube were closed with bulkheads, and the tubes were floated down to position.

The lining for the tunnel was placed while they were floating adjacent to their permanent position. Two 1 cubic yard Foote mixers were set up on platforms at each end. They were mounted on rollers so that they could be rolled from one tube to another very easily, and the maximum wheelbarrow haul was one-half of the length of either tube. Mixers were worked alternately on eight hour shifts, and concrete was placed at the rate of 200 cubic yards in 8 hours.

Sections, five feet in width above the invert were first run. For running the sides and the arch, forms were used consisting of 2 in. x 6 in. ship-lap laid over segmental ribs built of 2 in. x 12 in. planks sawed to circumferential shape. As this arch was filled in, the two large tubes sank gradually until finally at about completion a very small portion of the top surface showed, and they resembled huge whale-backs lying there in the Chicago River.

In excavating the trench for the tunnel, the old tunnel floor made it a hard problem for removal. Dynamite and large dredges finally proved it.

In sinking, the tubes were suspended from scows at each end. Water was let into sections of the tubes through a 4-in. pipe at each end, with branches leading to the three compartments of each tube. The locks in the drainage canal at Lockport had been closed so that there was no interference with the current. The tubes landed on the sets of piles which had been driven to proper height, and were then filled around with clay and sand.

The most interesting feature, from our standpoint is, of course, the large girder used between the

two tubes. It is a rather unique use of concrete. Note in the detail of the reinforcing steel how the circumferential rods are carried up through the side



Tunnel showing position of girder and overlapping circumference

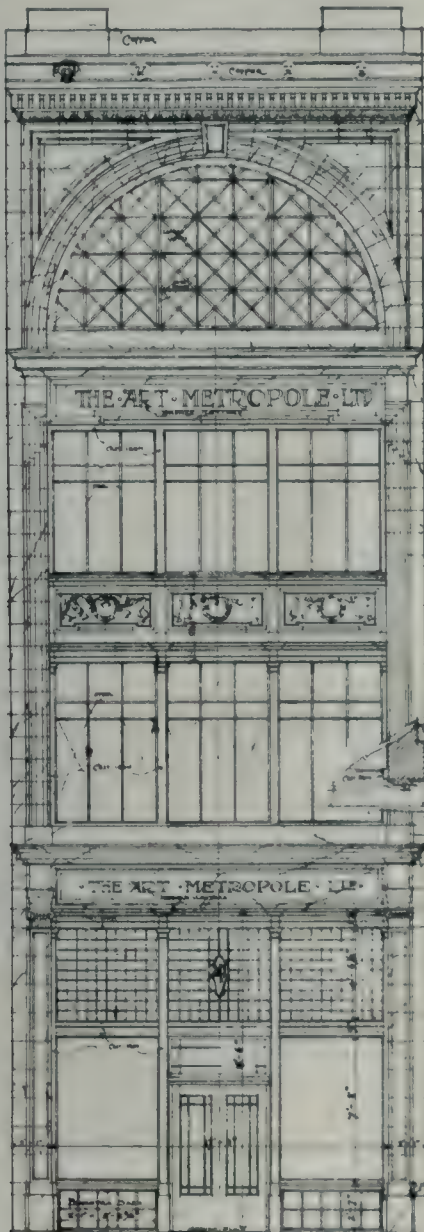
wall, and that the concrete both in the arch and invert, and also in the exterior fill in top and bottom, become part of the T-section of the girder.

The next step in tunnel construction will be to build the tube itself of reinforced concrete as was

done in large sewer work in Paris, building them completely first, and then placing them in position. It seems that this method of concrete-steel tubes for railroad crossing might be used much more extensively. If a series of buttresses could be built across the river, analogous to the first step in our present gravity dam construction, and on this foundation lay a steel-concrete tube, as used in the La Salle street tunnel, a combination bridge and dam would result which could be used to good purpose. The whole problem is one of the greatest interest, and this last instance presents an interesting use of a concrete lined tube made rigid with a reinforced concrete girder of rather unusual dimensions.

New Headquarters

The accompanying illustration is a front elevation of a new building in the course of erection on Yonge Street, Toronto, owned and to be occupied by the Art Metropole, Limited. The structure will be of brick



and steel construction, handsomely faced with stone, with an available floor area of 11,000 square feet, devoted to show and supply rooms, blue-print department and a picture gallery. Mitchell and White, Toronto, are the architects. Excavation work is well

under way, and it is expected that the entire building will be ready for occupancy early in October. The structure will cost in the neighborhood of \$35,000.

Quieter Homes

A plan that is being worked out successfully in several of the United States is to dispense with streets, as far as possible, in residential districts. The thoroughfare is no longer a street but a wide concrete sidewalk with broad stretches of lawns that extend back to the buildings. Delivery wagons approach from the rear of the houses through wide, clean, alleys; while automobiles can make use of intersecting streets so that they can stop within a few rods of any house in the block.

There are many advantages in this plan for residential sections, the clean appearance of such a place for homes, without dust or street refuse, being the first consideration. It is much quieter and more secluded, as there are no teams or drays clattering past; it is safer for the children, as there is no danger from speeding automobiles. Also, it is much more economical, as the owner who laid out the track did not have to allow so much area for street use; there is no expense to the householders for macadam or asphalt pavement; while each property owner's share of expense for the central sidewalk would be about equal to his assessment for a cement walk on an ordinary street. Of course, the business streets of these towns are laid out in the customary design.

Practical Limits of Concrete Mill Building

In the course of the discussion on the comparative cost of mill building at the recent annual convention of the National Association of Cement Users, L. C. Wason of the Aberthaw Construction Company, brought out the point that there is a sharply defined limit of load which determines whether concrete or mill construction is the most economical type. An example was cited of a factory building, built some years ago, in which economy was the first consideration. The floors were designed to carry 800 lb. per sq. ft. on 24 ft. spans and it was found that these conditions, reinforced concrete was by far the cheapest material, much cheaper than either structural steel or wood. In general, the economic limit is 200 lb. per sq. ft.; for lighter loads, mill construction is generally cheaper. For heavier loads reinforced concrete is cheaper in first cost.

The electrical resistance of plain concrete is the subject of a recent report of a German commission. The report contains the details of the methods of testing, the quality of the mixtures and determinations on electrical resistances of the concrete specimens in air, fresh water, salt water and artificially dried. The principal conclusions of these tests made on mortar blocks 8 x 8 x 36 ins. are as follows:

For a current above 0.1 amp., an increase in current brought about a reduction in resistance.

Resistance in the mortar or concrete decreased as the temperature increased.

The decrease in resistance for the same increase in temperature is the same in gravel concrete as in broken stone concrete but the former has the greater electrical resistance.

Resistance increased with drying and was greater in fresh air than in salt water.

Resistance increases as the amount of mixing water or the included water decreases.

Destructive Conflagrations

Fire losses throughout the Dominion have been extraordinarily heavy during past years. Thus, according to a compilation lately presented in a Canadian publication:

The fire losses in Canada for the first four months of the current year total \$5,361,875, an average of \$1,340,468 per month. This is equal to a daily loss of \$44,682. In other words, \$1,861 worth of property has been burned every hour since the new year dawned, or \$31 every minute. The losses for the past two years have been as follows:

Month	1909	1910
January	\$1,500,000	\$1,275,246
February	1,263,005	756,625
March	851,690	1,076,235
April	720,650	1,717,237
May	3,358,276	2,735,535
June	1,360,275	1,500,000
July	1,075,600	6,386,674
August	2,582,915	1,667,270
September	1,615,405	894,125
October	2,208,718	2,195,781
November	935,191	1,943,708
December	1,433,813	1,444,860

Total \$18,905,538 \$23,593,296

Adding to these figures the total for the first four months of 1911 gives a fire loss in 28 months of \$47,860,709, an average monthly loss of \$1,709,311. In addition, there has to be recorded a disastrous list of fire fatalities. During the first four months of the year 77 lives were sacrificed. In the 28 months since January 1, 1909, no less than 552 persons lost their lives in fires, a monthly average of almost twenty persons.

Average European Loss

The annual average loss of six nations in Europe were compiled from records of varying years and the years grouped, with this result:

Country	Annual fire loss.	Loss per capita.
Austria	\$7,601,389	\$0.29
Denmark	660,924	.26
France	11,699,275	.30
Germany	27,655,600	.49
Italy	4,112,725	.12
Switzerland	999,364	.30

Estimating Canada's population in 1910 at 7,500,000, the fire loss per capita in the Dominion was \$3.14, compared with \$2.70 in 1909, with an estimated population of 7,000,000.

The Canadian Underwriters' Association is deeply interested in this question of fire losses, and in Quebec it now exerts its whole influence to overcome conditions which in the past have compelled the exaction of high premium rates.

A C. P. R. Appointment

Mr. P. B. Motley has been appointed engineer of bridges by the management of the C. P. R. Mr. Motley succeeds Mr. C. N. Monsarrat, who was recently appointed chairman of the Quebec Bridge Commission. This appointment is in accordance with the principle of promotion usually observed by the C. P. R. authorities, as Mr. Motley had been for some time chief assistant to Mr. Monsarrat. Mr. Motley received his education and training in engineering in England and has been with the C. P. R. continuously since 1892. During the intervening period he has held various important positions in the designing office and also in practical construction work in connection with the building of steel and other bridges. Mr. Motley is a member of the Canadian Society of Civil Engineers. His promotion is undoubtedly well deserved, and he is receiving the congratulations of his professional associates, among whom he is well known and popular.

Concrete for Malt House

What will be, when completed, the largest malting plant in the world, is now in course of construction at Milwaukee, Wis., for the Hansen Malting Company, of that city.

This plant will have an annual capacity of 2,000,000 bushels of malt, and it will have storage facilities, provided by 18 circular tanks, each 20 feet inside diameter, and ten inter-space tanks, for 750,000 bushels of grain.

This plant is being built of reinforced concrete throughout, and its designers expect not only a better plant, but a cheaper one, by using concrete as their building material.

The plant comprises a malt-house, walls to be raised to an average of 75 ft., ground dimensions 167 x 197 feet; a grain cleaning house, 42 x 60 feet, walls to be raised 160 feet above grade; a power house, 30 x 45 feet; a one-storey office building, 30 x 35 feet; and a small dwelling house for the Malting Company's millwright.

As the constant vacuum must be maintained in the greater portion of the malthouse, and as the air within the malthouse contains a large proportion of moisture, brick walls have been found to leave much to be desired in this type of construction. Concrete walls will, it is claimed, be stronger and more impervious to moisture.

The A. Monsted Company, who are building this malting plant, are using thoroughly up-to-date methods. Their engineer, Mr. A. D. Whipple, has designed and patented a system of forms for the tanks which reduces the labor cost on this portion of the work to three-quarter cents per square foot of form. The circular forms are built of wood, metal lined, and are raised with jack-screws. Eight to ten jack-screws are required for each tank, and one workman is stationed on each tank form, which is decked over completely. One of the 18 men is the crew captain, who, by signal, conducts the operation of all the jack-screws simultaneously. On each circuit the entire form is raised one-eighth of an inch. It will be seen that the tank forms are kept in almost constant motion; the tanks being raised three feet each working day.

Concrete is being placed by the Wm. B. Hough Company's (Chicago) G-Y gravity system. This requires two men at the delivery spout and one man at the hoist, the wages of the three aggregating \$8.00 per day. As the average daily output of concrete is about eighty yards, the labor cost of placing the concrete is about ten cents (10c.) per cubic yard.

Reichert metal forms, manufactured by the Reichert Manufacturing Company, Milwaukee, are being used for the walls, the labor cost of handling them thus far on the job being nine-tenths of one cent (9/10c.) per square foot of form. Under the most favorable conditions, Mr. Whipple estimates the labor cost on wooden forms for this work would have been at least four cents (4c) per square foot of form. He estimates the total cost, lumber and labor, of wooden forms for the malthouse walls alone, at \$15,000. From data thus far available, the use of the Reichert forms will save at least \$7,000 over and above the purchase price of the large outfit of Reichert forms in use on the job.

The malthouse is of the Saladin-Prinz pneumatic type. F. L. Bader is the architect in charge.

Standard Specifications for Reinforcement

The following specifications have been submitted to the American Society for Testing Materials for adoption as standard for steel reinforcing bars for concrete:

- 1.—Steel may be made by either the open-hearth or Bessemer process. Bars shall be rolled from billets.
- 2.—The chemical and physical properties shall conform to the following limits:—

Properties considered.

	—Structural Plain Bars	Steel, Grade Deformed Bars	—Hard Plain Bars	Grade* Deformed Bars	Cold Twisted Bars
Phosphorus, max.—Bessemer	0.10	0.10	0.10	0.10	0.10
Open-hearth	0.05	0.05	0.05	0.05	0.05
Ultimate tensile strength, pounds per square inch	55,000-70,000	55,000-70,000	80,000 min.	80,000 min.	Recorded only
Yield point, min., pounds per square inch	33,000	33,000	50,000	50,000	55,000
Elongation, min. per cent. in 8 inches	1,400,000	1,250,000	1,200,000	1,000,000	5 per cent
Cold bend without fracture:	tens. str.	tens. str.	tens. str.	tens. str.	
Bars under ¾ in. in diameter or thickness	180° d. = 1t.	180 d. = 1t.	180 d. = 3t.	180 d. = 4t.	180° d. = 2t.
Bars ¾ in. in diameter or thickness and over	180° d. = 1t.	180° d. = 2t.	90° d. = 3t.	90° d. = 4t.	180° d. = 3t.

*The hard grade will be used only when specified.

3.—In order to determine if the material conforms to the chemical limitations prescribed herein, analysis shall be made by the manufacturer from a test ingot or blow of steel, and a correct copy of such analysis shall be furnished to the engineer or his inspector.

4.—Chemical determination of the percentage of phosphorus shall be made by the manufacturer from a test ingot taken at the time of the pouring of each melt of steel and a correct copy of such analysis shall be furnished to the engineer or his inspector. A check analysis may be made by the purchaser or his representative, in which case an excess of 25 per cent. above the required limits will be allowed.

5.—For the purposes of these specifications, the yield point shall be determined by careful observation of the drop of the beam of the testing machine, or by other equally accurate method.

6.—Tensile and bending test specimens may be cut from the bars as rolled, but tensile and bending test specimens of deformed bars may be planed or turned for a length of at least nine inches, if deemed necessary by the manufacturer, in order to obtain uniform cross-section.

Tensile and bending test specimens of cold-twisted bars shall be cut from the bars after twisting, and shall be tested in full size without further treatment, unless otherwise specified as in (c), in which case the conditions therein stipulated shall govern.

It is desired that the testing and acceptance for cold-twisted bars be made upon the hot-rolled bars before being twisted, the hot-rolled bars shall meet the requirements of the structural steel grade for plain bars shown in the specification.

7.—At least one tensile and one bending test shall be made from each melt of open-hearth steel rolled, and from each blow or lot of ten tons of Bessemer steel rolled. In case bars differing ¾ in. and more in diameter or thickness are rolled from one melt or blow, a test shall be made from the thickest and thinnest material rolled. Should either of these test specimens develop flaws, or should the tensile test specimen break outside of the middle third of its gaged length, it may be discarded and another test specimen substituted therefor. In case a tensile test specimen does not meet the specifications, an additional test may be made.

The bending test may be made by pressure or by light blows.

8.—For bars less than 7/16 in. and more than ¾ in. nominal diameter or thickness, the following modifications shall be made in the requirements for elongation:

For each increase of ½ in. in diameter or thickness above ¾ in., a deduction of one shall be made from the specified percentage of elongation.

For each decrease of 1/16 in. in diameter or thickness below 7/16 in., a deduction of one shall be made from the specified percentage of elongation.

The above modifications in elongation shall not apply to cold-twisted bars.

9.—Cold-twisted bars shall be twisted cold with one complete twist in a length equal to not more than twelve times the thickness of the bar.

10.—Material shall be free from injurious seams, flaws, or cracks, and have a workmanlike finish.

11.—Bars for reinforcement are subject to rejection if the actual weight of any lot varies more than five per cent. over or under the theoretical weight of that lot.

12.—When an inspector is furnished by the purchaser to inspect material at the mills, he shall have full access, at all times, to all parts of the mills where material to be inspected by him is being manufactured.

Chicago Leads in Concrete

Among the cities of the United States, Chicago stands at the head in the number and cost of concrete buildings. Figures gathered by the United States Geological Survey show that in 1909 there were put up in Chicago 519 buildings at a cost of \$9,849,800, or 32.31 per cent. of the cost of all concrete buildings erected in the country. Seattle, Wash., ranked second in expenditures for this type of construction.

In stone buildings, Chicago was also the leading city, reporting 83.69 per cent. of all erected, and 57.08 of the cost of these buildings, with an average cost of \$7,905. New York was second, with an average cost of \$111,617.

More money, however, is still spent on wooden buildings in Chicago than in any other city of the country, the cost of these in 1909 being \$13,538,880. San Francisco stood next to Chicago, with a total cost for wooden buildings of \$12,257,683.

A Great Subaqueous Tunnel

In a few months an interesting engineering feat will have been accomplished in Hamburg. This is the construction of a gigantic tunnel beneath the river Elbe, which has cost nearly eleven million marks, and has now been in progress for nearly five years. The tunnel, which comprises two tubes 6.06 m. in diameter and 450 m. long, is 6 m. beneath the bed of the river, which in the middle is 10 m. deep where the tunnel crosses. The tunnel ends at the one bank in the suburb of St. Pauli and at the other in Steinwarder, another suburb of Hamburg. The buildings on both sides of the river forming the entrances to the tunnel, with their mighty copper-coated domes and ornamented with reliefs and pillars, will constitute noteworthy sights of the town. At each entrance there are six elevators for pedestrians and vehicles, which operate almost without attendants, the starting, speeding up, slowing down, and stopping all being affected automatically. The power house for the elevators is also situated in the entrance buildings. The excavations for this tunnel were carried out with the aid of compressed air and required considerable engineering skill. The route between the points connected by this tunnel will be diminished by 4.2 kilometers.

Mr. Allan R. Macdonell, who has been for many years a partner in the railway contracting firm of Macdonell & O'Brien, died recently at Frimley Park, Surrey, England, at the age of 55 years. He had been ill for a considerable time, and went to England about two years ago. His wife was the daughter of the late Mr. John Ryan, formerly a contractor of Brockville, Ont.

Trade Notes and Items of Interest

Plans are being prepared for three sedimentation tanks for the town of North Toronto.

The Good Roads Association will hold their annual convention at Brandon, Man., from July 24th to July 28th.

The survey for the new gravity water supply main for the city of Calgary has just been commenced.

At a recent meeting of the Master Builders' Exchange, St. John, N.B., Mr. Robt. Maxwell was elected president and Mr. C. F. Stevens, secretary.

The F. H. McGuigan Construction Company, of Toronto, has been awarded the contract for the construction of the filtration plant for the corporation of Montreal.

The city of Victoria is now in possession of three new fire pumps lately arrived from England to complete the high pressure system that is being installed in that city.

The corporation of Oshawa is progressing with its sedimentation tank project. The successful contractors for this construction are Messrs. Murray & Spencer, Niagara Falls, Ont.

The Canadian Mineral Rubber Company, of Victoria, have installed part of the machinery for their new asphalt-ing plant, and it is expected that they will be in readiness for all demands within a short time.

Peter Lyall & Sons, Limited, Montreal, have secured the contract for erecting a one-storey steel and cement hockey rink, with seating capacity for 8,500 people, to replace the present rink on Mutual street, Toronto.

Mr. A. B. Garrow has been temporarily placed in charge of the work of construction on the trunk sewer septic tank system, Toronto, to succeed Mr. Blanchard, who resigned to become city engineer of Lethbridge.

After four years of tedious preparation construction work has been commenced on the Coquitlam dam for the British Columbia Electric Railway. The dam will be built of concrete and rock, and will be 800 feet in length, 730 feet wide and 75 feet high.

At an estimated cost of \$2,500,000 a dry dock will be constructed at Prince Rupert, B.C. Some 5,000 creosoted piles will be used in the wharf construction. Extensive use will be made of concrete, all the structures to be built on concrete piers resting on bed rock.

Winnipeg census returns show an amazing growth of the city in five years. The final figures have not been determined yet, but returns from districts that are completed show that there will be well up to 200,000 people in Winnipeg, and those suburbs which are virtually a part of the city.

Prince Rupert surveyors are taking soundings for the preparation of plans for floating dry docks at Hays Creek. A Dominion subsidy of three and one-half per cent. and \$2,000,000 for twenty years has already been devoted by the Dominion Government to the Grand Trunk Pacific for the work. Operations will commence in a very short time.

The Foundation Company, Limited, Bank of Ottawa Building, Montreal, have been awarded the contract for the reconstruction of Pier No. 4 of the Yamaska River bridge, on the main line of the Quebec, Montreal & Southern Railway at Yamaska, Que. During the spring floods this pier was considerably damaged by ice, rendering its reconstruction necessary.

The dispute over the rate of wages paid in the city of Winnipeg to bricklayers and masons has been finally settled, says a report from the Builders' Exchange. This union has been on the verge of a strike since the opening of the building season. The new agreement provides for an eight-hour day with Saturday a half holiday, the rate of pay to be 67½ cents per hour.

Moose Jaw will soon have an excellent public water works system. The water will be taken from the stream known as Sandy Creek and will give Moose Jaw an ample supply for some years, of pure water good for all domestic and industrial purposes. The investigation, report and recommendation were made by Mr. Walter J. Francis, of Montreal, as consulting engineer.

The partnership of the well-known firm of engineers, Ross & Holgate, has been dissolved, and henceforward the business will be continued under the name of R. A. Ross & Company.

Mr. Henry Holgate, who has been associated with Mr. Robert A. Ross for the past ten years, has joined the Cedar Rapids Power Company, and will take over the control of that concern as president. Messrs. Ross & Holgate, during their partnership, were concerned with the establishment of some of the best known electrical works in the country, notably the Hydro-electric and the West Kootenay Companies. They were also consulting engineers for the Canadian Pacific Railway, and it was under their supervision that the Angus shops were laid out. Mr. Holgate was chairman of the commission which was appointed to investigate the cause of the collapse of the Quebec bridge.

Railway Notes

D. F. MacArthur has been awarded the contract for building seventy miles of grade for the Alberta Central Railway.

The Canadian Northern Railway propose to complete 550 miles of new line in Alberta this year. Steel is being laid at present upon three of the lines under construction.

The new Canadian Northern Railway depot at Brandon, Man., will be finished and open for traffic about August 1st. The contract for the Canadian Pacific Railway depot has been let to the Brandon Construction Company at \$60,000 and is to be finished by December.

The Canadian Locomotive Works has been awarded the contract by the Railway Department for the building of five locomotives for the Intercolonial Railway, costing \$114,000. The Canadian Car Company secured a contract amounting to \$334,800 for box cars, dump cars, etc. The Nova Scotia Car Company are also building one hundred freight cars at a cost of \$112,000.

What is estimated to be the greatest task in railway construction since the building of the Canadian Pacific Railway is that of 163 miles of line for the Canadian Northern Railway between Hope and Kamloops. Various contractors are organizing their forces and establishing their construction camps with a view to pushing on the work with all possible speed. The expenditure involved is estimated at from \$15,000,000 to \$18,000,000. In all, tunnels aggregating over three miles in length will have to be driven. The longest ones are one of 2,000 feet near Yale and one of 2,400 feet near Kamloops Lake.

The Railway Commission at Ottawa has recently issued an important order for the protection of the general public, which states that the railway company shall protect by a watchman any highway crossing at which an accident has happened causing bodily injury or death to a person using the crossing, until the board has had the accident investigated and the crossing examined. Another order issued requires all railways to file with the board within sixty days a statement showing the number, class and weight of each locomotive on the line, and whether or not equipped with dump ash pans to avoid the necessity of employees going beneath the locomotives.

Contracts Department

News of Special Interest to Contractors, Engineers, Manufacturers and Dealers in Building Supplies.

Information for insertion in these columns is invited from Architects, Contractors, Engineers, etc.

Waterworks, Sewerage and Roadways

Amherst, N.S.

Tenders called for dredging. Owner, Department of Public Works, Ottawa. Secretary, R. C. Desrochers, Ottawa. Tenders received until 4 p.m., July 25.

Chilliwack, B.C.

Under consideration, purchase of machinery. City Engineer, T. B. Croly. Cement pipe making plant to supply pipe for the new sewerage system. The council are also considering the widening of Yonge street.

Carlisle, Ont.

Tenders called for grading and leveling. Owner, Township of East Flamboro, Ont.; Tp. Clerk, G. Church, Carlisle; engineers, Tyrell & Mackay, 7 Hughson street south, Hamilton. Cutting down of certain hills in sub-division No. 1 East Flamboro near Fireproofing Company's works. Estimated amount of material to be moved, 3,000 cubic yards. Plans, etc., at office of engineer. Tenders received by secretary until July 27.

Gravenhurst, Ont.

A by-law will be submitted on Aug. 5 for the raising of \$7,000 to erect a steel water tank.

London, Ont.

Tenders called for waterworks. Owner, Waterworks & Electrical Department, City of London. General Superintendent, H. T. Glaubitz, London. 3,300 feet 18-in. and 1,600 feet 12-in. c.i. pipe, with valves and specials. For specifications, etc., write superintendent. Tenders received until noon, Aug. 12th.

Moncton, B.C.

Tenders called for reservoir dam, \$50,000. Owner, City of Moncton; engineer, John Edington, Moncton. Dam 50 ft. high, 800 ft. long. Materials required, gate house of cement, concrete tunnel, c.i. pipe, reservoir capacity, 270,000,000. Tenders called until July 27.

Milton, Ont.

Tenders called for arch and viaduct. Middle road, between Oakville and Tp. of Trafalgar. County Clerk, Wm. Pantton, Milton, Ont; consulting engineer, E. Barber, 57 Adelaide street east, Toronto. Construction of reinforced, concrete arch, 135 ft. span and 340 ft. concrete viaduct approach. Plans, etc., at office of engineer. Advertisement in "Tenders and For Sale Department" of this issue.

Montreal, Que.

Tenders received for sewers, Highland avenue. Owner, City of Montreal. Engineer, Geo. Janin. Brick, 2 ft. by 3 ft. Tenders closed July 20th.

North Vancouver, B.C.

Engineer's report of waterworks, etc. City engineer, G. S. Hanes. The engineer reported the required supply of 10,000 feet of 8-in. and 10-in. c.i. main pipe; constructing of a 16-in. main across 17th street; also widening of 4th street.

New Westminster, B.C.

Tenders called for sewer pipe, west end. Owner, City of New Westminster, B.C.; city clerk, W. A. Duncan; engineer, J. W. Blackman, City Hall, New Westminster. Tenders for laying twelve miles sewer in west end, man-holes, etc., close July 24th.

New Glasgow, N.S.

Tenders called for dam, Forbes Lake. Owner, Municipality of New Glasgow, N.S.; clerk and treasurer, J. Roy, New Glasgow; engineer, C. A. Mitchell, Bank of New Brunswick Building, New Glasgow. Labor and material for concrete and earth dam, about 300 ft. long, and 25 feet high. Specifications at office of C. A. Mitchell. Tenders received by engineer until 3 p.m., July 25.

Outremont, Que.

Tenders called for sewers. Owner, Town of Outremont; acting secretary-treasurer, F. Schofields. About 1,785 lin. yds. of 2 x 3 brick sewers. Plans, etc., at office of town engineer. Tenders received until July 19th by secretary-treasurer.

Ottawa, Ont.

Machinery required for waterworks. Owner, city of Ottawa; engineer, N. J. Ker, Ottawa. One spur gear. Tenders received by secretary waterworks committee until August 1st.

Port Arthur, Ont.

Tenders called for storage dam, Current River Park. Owner, City of Port Arthur; city clerk, J. McTeigue. Completion of the service reservoir dam. Plans, etc., obtained from city engineer. Tenders received until 6 p.m., July 25, by city clerk. Advertisement in "Tenders and For Sale Department" of this issue.

Qu'Appelle, Sask.

Tenders called for drain, northwest from here. Owner, Department of Public Works, Regina. General contractor, Foote. 30,000 cubic yards to be removed. Tenders received by F. I. Robinson, Department Public Works, until August 1st.

Quebec, Que.

Tenders to be called for waterworks, \$700,000. Owner, city of Quebec; city engineer, W. D. Baillarge, Quebec. 5 miles cast iron pipe, new main, 40 in. Tenders will be called shortly.

Raymond, Alta.

Proceeding of council, waterworks extension. General contractor, W. I. Gray, Minneapolis, Minn. The council sanctioned the raising of loan of \$10,000. A reservoir is to be constructed.

Sudbury, Ont.

Waterworks extension. A by-law will be submitted on the 31st July to raise the sum of \$15,000 for the extension of the waterworks system. T. Godfrey, clerk.

Toronto, Ont.

Proceedings of board of control, intake pipe, \$259,900. City Clerk, W. A. Littlejohn; city engineer, C. H. Rust; city engineer will report on the tender of Miller, Cummings & Robertson for laying intake pipe.

Tenders called for paving. Owner, City of Toronto; chairman of board of control, G. R. Geary. Asphalt bitulithic, and concrete pavement; grading; concrete curbs; concrete walks. Tenders received by chairman until noon, August 1st.

Toronto, Ont.

Tenders called for macadam highway. Owner, York County Board of Highway Commissioners; chairman, R. T. Bull; secretary, J. A. Ramsden; engineer, E. A. James, Room 6, 57 Adelaide street east, Toronto. Supply of machinery, material, labor and construction of (a) Lake Shore road; (b) Weston road; (c) Vaughan road; (d) Kennedy road; (e) Kingston road; (f) Dundas street. Specifications at office of engineer. Tenders received by board until July 29. Advertisement in "Tenders and For Sale Department" of this issue.

Tenders called for main drainage. Owner, city of Toronto; G. R. Geary, chairman of board of control. Construction of low level interceptor, Don Syphon (crossing under River Don); also manufacture and delivery of the following: 280 ft. 30-in. c.i. pipe; 5,984 ft. 42-in. 1,985 ft. 30-in., and 2,315 ft. 36-in. reinforced concrete pipe. Plans, etc., obtained from main drainage works, City Hall. Advertisement in "Tenders and For Sale Department" of this issue.

Vancouver, B.C.

Tenders called for pavement and curb. Owner, City of Vancouver, B.C.; W. McQueen, city clerk. About one mile cement concrete curb, asphalt pavement on 10th Ave., creosoted wood block pavement; Dunley ave. and Broadway, bitulithic pavement with stone blocks in the tracks on Park Drive. Tenders received by city clerk until July 25th.

CONTRACTS AWARDED

Maisonneuve, Que.

Sewage, \$65,000. Owner, Corporation of Maisonneuve; engineer, J. E. Vanier, 5 Beaver Hall Square, Montreal, Que; general contractor, Harris Construction Co., Ltd. Brick and steel pipes required. Contract awarded July 17th.

Oshawa, Ont.

Sedimentation tank. Owner, town of Oshawa; W. E. N. Sinclair, Mayor;

consulting engineer, T. Aaird Murray, C.E., Lumsden Bldg., Toronto; town engineer, Frank Chappel, Oshawa; successful contractor, Messrs. Murray & Spencer, Niagara Falls, Ont., \$6,248. Bids were opened July 11th.

Toronto, Ont.

Pumping Station. The contracts for the erection of a pumping station by the city of Toronto on Eastern avenue have been awarded as follows: Lathing and plastering, M. Hutchinson, \$1,337; roofing, George Sinclair, \$293; carpentry, M. Hutchinson, \$1,208; masonry, Wm. Forbes & Sons, \$25,990; painting and glazing, H. W. Johnston, \$278; plumbing, Fred Armstrong Co., Ltd., \$630.

Railroads, Bridges and Wharves

Brandon, Man.

Work in progress for depot, \$60,000. Owner, Canadian Pacific Railway; general contractor, Brandon Construction Co., Brandon. Three storeys, brick and stone. Heating and plumbing not awarded.

Calgary, Alta.

By-laws carried for engineering, \$55,000, for cement substructure and bases for street railway extensions.

County of York, Ont.

Tenders to be called for bridge, over Don River, Lot 6, Con. 2. Owner, County of York; engineer, Frank Barber, 57 Adelaide street east, Toronto. Fifty-foot span, reinforced concrete arch. Tenders received until July 31.

Dartmouth, N.S.

Plans being prepared for ferry entrance, \$20,000, George street, Halifax. Owner, Dartmouth Ferry Commission, Dartmouth. One storey, 60 x 40, wood, electric lighting, cement work, brick, sky lights, electrical work, electric bells, plate glass. Tenders to be called as soon as plans have been approved by city engineer of Halifax. The ferry dock will also be rebuilt.

Fort Frances, Ont.

Tenders called for station. Owner, Canadian Northern Railway; architect, R. B. Pratt, 289 Garry, Winnipeg. Three storeys, 116 x 24, brick, concrete foundation, steam heating, electric lighting, shingle roofing, interior finish hardwood, cement, cut stone, brick, tile, metallic lath, structural iron, sheet metal, pipe covering, electrical work, electric bells, shingle stain, steel beams, plate glass. Tenders received at Winnipeg, Fort Frances, Fort William and Port Arthur, until July 22.

Guelph, Ont.

Tenders called for bridge, over River Speed, Neeve street. Owner, City of Guelph; T. J. Moore, clerk; Acting City Engineer, L. Malcolm. Construction of concrete arch bridge (two 40-ft. spans) approximate amount of concrete, 385 cubic yards. Plans, etc., at office of city engineer or Contract Record, 220 King street west, Toronto. Tenders received until July 29th, by city clerk.

Golden, B.C.

Tenders to be called for bridge, \$50,000. Owner, department of public works, Victoria, B.C. Engineer, J. E. Griffiths, public works engineer, Victoria. New swing bridge across Columbia river, 42 miles south of Golden, to provide facilities for settlers of Win-

dermere district. Tenders are expected to be called this month; also for construction of bridge at Trail.

Grand Falls, N.B.

Supplies needed for round house, \$100,000. Owner, Grand Trunk Pacific Railway, Montreal. Contractors, Power & Brewer, Grand Falls, N.B. Building supplies required.

Moncton, N.B.

Contemplated, bridge, \$30,000, St. George street. Owner, Intercolonial Railway, Moncton; engineer, W. B. McKenzie, Moncton. One span, 200 feet, 40 feet width, concrete, abutments iron. Work to commence soon, to be built by day labor.

A preliminary survey has been started by the I. C. R. engineering department for a subway under the northern railway crossing on upper Main street. Work will be started shortly.

The Moncton Tramway, Electricity and Gas Company are to start laying pipe from their natural gas wells in Albert County during the week commencing July 17. About a mile of the trench has been dug. The entire pipe line will be completed in eight weeks.

Tenders called for freight shed. Owner, Dept. of Railways and Canals, Ottawa; secretary, L. K. Jones. Construction of freight shed on the quay wall. Plans, etc., at office of chief engineer, Dept. of Railways & Canals, Ottawa; chief engineer, I. C. R., Moncton, N.B., at office of Board of Trade, Halifax. Tenders received by secretary until noon, August 1, 1911.

Prince Rupert, B.C.

Plans being completed for dry dock. Official in charge, T. H. Pillsbury; resident engineer G. T. R., Prince Rupert. 5,000 creosoted piles to be used for wharf construction. Extensive use will be made of concrete, all the structures to be built on concrete piers resting on bed rock. Estimated cost, \$2,500,000.

Sudbury, Ont.

Improvement of Streets. A By-law will be submitted on the 31st of July for the raising of \$46,500 for the improvement of streets and \$35,000 for the erection of a bridge over Nolan's Creek. T. J. Godfrey, clerk.

Saskatoon, Sask.

Proposition accepting the proposition of Evans Syndicate for the street railway and power plant.

St. John, N.B.

Department of Public Works of Canada are shortly to call for tenders for 1,900 feet of wharf at Sand Point, St. John. Specifications are being printed; details are not available.

Tenders called for miscellaneous work. Owner, City of St. John; city engineer, W. Murdoch. Replacing of Rodney wharf, West St. John. Sewer excavation, backfill and cartage in designated streets. Water pipe excavation. Laying of asphalt sidewalks in designated streets. Cash deposit with each bid and tenders to be addressed to Common Clerk, Room 3, City Hall. Tenders to close, August 1st.

Tp. of North Dorchester, Ont.

Tenders called for bridges. Owner, County of Middlesex; W. B. Lane, Tp. Clerk. Two concrete bridges. Plans and specifications at county engineer's office, county buildings, London. Tenders received by Tp. Clerk until July 31.

Toronto, Ont.

Work in progress for extension to freight sheds, \$4,156, Front and Cherry streets. Owner, MacKenzie, Mann & Company, 1 Toronto street, Toronto. One storey, 164 ft. 6 in. x 38 ft., mill construction, sheeted with galvanized iron, cedar posts, electric lighting, felt and gravel roof. Work will be done by day labor.

Vancouver, B.C.

Tenders to be called for wharf and freight shed, \$400,000, west of Sugar Refinery. Owner, The Great Northern Railway. Wharf, 800 x 148, freight shed, 1,008 wide, creosoted piling and modern machinery for handling cargo will be installed. Tenders will be called shortly. Construction will probably start in about five weeks' time.

Victoria, B.C.

Sea Wall. Tenders will be called shortly for the building of the Ross Bay Sea Wall. Plans have been prepared by Cecil B. Case, engineer, and it is understood that specifications will be based upon these.

CONTRACTS AWARDED

Churn Creek, B.C.

Suspension bridge, Lillooet District. Contractor, C. Gardiner Johnson & Co., Vancouver. Contract includes galvanized crucible steel wire cable and accessories. Amount of cable to be used, 485 feet 1½ in., 3,438 ft. 2¾ in., 1,141 ft. 1¾ in. and 320 ft. 1¼ in.

Millbank, Ont. (3 miles south)

Bridge. Owners, Perth & Waterloo Counties; engineers, Bowman & Connor, Berlin, Ont. Successful contractor, J. B. Lichty, Wellesley, Ont. Construction of concrete abutments at \$5.50 per cubic foot.

Prince Rupert, B.C.

Tunnel, mile 44. Owner, Grand Trunk Pacific Railway. Contractor, Foley, Welch & Stewart; engineer in charge, C. G. Van Arsdol, Hazelton, B.C., 1,600 feet long. Work is to be rushed to permit main line of G. T. R. to use tunnel by next winter.

Raleigh, Ont.

Bridge, Tp. of Raleigh and Government Drain No. 2. Owner, County Council; engineer, W. G. McGeorge, Chatham. Span 30 feet each, concrete and steel foundation. Contractor, A. S. Everitt, Thamesville, Ont.

Toronto, Ont.

Railroad. Owner, Canadian Northern Railroad. Contractors, Foley Bros., St. Paul; Northern Construction Company, Winnipeg.

Whiteman's Creek.

Bridge, \$3,400, 2½ miles northeast of Burford Village. Owner, County of Brant; A. E. Watts, clerk, Court House, Brantford; engineer, W. H. Fairchild, Brantford; general contractor, H. Vanderlip, Cainsville, Ont. Reinforced concrete girder bridge, two abutments, centre pier, two clear spans of 40 feet each. Expanded metal for boor, Kahn bars for girders. Cement supplied by county.

Public Buildings, Churches, Schools, etc.

Belleville, Ont.

New tenders called for two schools. Owner, board of education, Belleville;

etary, W. T. Diamond; architect, R. Manning Chambers, Toronto. Construction of two schools. Plans, etc., office of secretary or architect. Tenders received by secretary until July 27.

Chatham, Ont.

Owner, board of education, Chatham; architect, Jas. L. Wilson, Chatham. Two storeys and basement, 70 x 90, 8-room, brick and frame, stone foundation, indirect heating, electric lighting, tile composition, hard wall plaster, floor finish, cut stone, terra cotta, armored concrete, reinforced concrete, artificial stone metallic lath, structural iron, ornamental iron fire escape, cornice pipe covering, electric and electric bells. Tenders received until July 29.

Chippewa, Ont.

Tenders called for school, \$15,000. Owner, W. Myers, Chippewa; architect, M. Borter, Niagara Falls, Ont. Tenders received until August 1st by Thos. Hammerfelt, secretary public school board, Chippewa.

Chippewa, Ont.

Tenders called for public building. Owner, Department of Public Works, Ottawa; architect, R. C. Desrochers, secretary. Plans, etc., on application to Thos. A. Hastings, Postal Station F, Yonge st., Ottawa, local post office and at the department. Tenders received until 4 p.m. August 8, by secretary.

Fort William, Ont.

Grandstand. The West Algoma Agricultural Association will erect a \$5,000 grandstand on the Agricultural grounds. Carl Wirth, architect. Tenders called on the 7th and closed on the 10th.

Fort William, Ont.

M. C. A. Building. The directors have decided to purchase the Grand Hotel property on Queen's Square, as site for the new Y. M. C. A. building, \$18,000. The property comprises 366. Plans will be prepared immediately and tenders will be let without delay.

Hamilton, Ont.

Addition to Hospital. A by-law will be submitted on July 25th for the raising of \$22,873.33 for the purchase of property adjoining City Hospital for hospital purposes. S. H. Kent, city clerk.

Hamilton, Ont.

Tenders called for school, Caroline St. Owner, board of education; secretary, R. H. Foster; architect, Munro & Mead, Main and Hughson streets, Hamilton. Installation of heating and plumbing fixtures. Plans, etc., at office of the architects. Tenders received until July 22nd by secretary. Plumbing includes installing new lavatories.

Highbridge, Alta.

Work delayed for church, \$80,000, Fourth ave. and Tenth street. Owner, St. Patrick Roman Catholic Church. Tenders received, too high, lowest in neighborhood of \$150,000. No contract awarded. Doubtful if anything further will be done this year.

New Westminster, B.C.

Contemplated, Y. W. C. A. Building, Fifth and Seventh streets. Building committee, Mrs. Maxwell, Mrs. Ferguson; secretary, Mrs. De Pencier. Site plan; canvas for funds to be started.

It is proposed to construct the basement of the new building this year.

School. Plans have been prepared by Gardiner, Mercer & Gardiner for a new school on the north side of Sixth ave. Two months allowed for clearing site, etc.

Addition to Penitentiary. The new wing contemplated for the penitentiary will provide accommodation for about 260 prisoners and will be of brick and stone. Architect, E. J. Adams. Inspector of Prisons, G. W. Dawson.

Nelson, B.C.

Enlargement to School. The school trustees are contemplating the enlargement of the school in the Hume School District.

Nanaimo, B.C.

Proposed extensions to club building, \$15,000. Owner, Athletic Club; architect, A. Forrester, Nanaimo. Accommodation includes provision of swimming tanks, Turkish baths, gymnasium, reading rooms, etc. Plans will be ready shortly.

Pembroke, Ont.

Tenders called for library, \$13,000. Owner, Corporation of Pembroke, Ont.; Town Clerk, A. J. Fortier; architect, F. C. Sullivan, Bank of Ottawa Building, Ottawa. Reinforced concrete, brick, Kahn system of reinforcement. Tenders received by J. H. Reeves, secretary, until July 24.

Stratford, Ont.

Proceedings of council, public building. City clerk, R. R. Lang. The council authorizes raising of \$5,000 debentures for new ventilation and heating for Collegiate Institute. A by-law to raise the sum of \$12,000 for erection of an abattoir was given its first reading.

St. John, N.B.

Tenders called for mortuary chapel, Fernhill cemetery; architect, G. Ernest Fairweather, St. John, N.B. Erection of mortuary chapel and receiving tomb. Superintendent Clayton of the cemetery has lately visited Montreal, Boston and other cities. Tenders received by architect until July 26th.

Revelstoke, B.C.

Tenders called for post office and government offices. Owner, Department of Public Works, Ottawa; R. C. Desrochers, secretary; architect, Thos. Henderson, New Westminster, B.C. 2 storeys, 46 x 68, concrete, stone and brick, concrete foundation, hot water heating, electric lighting, gravel roof, interior finish, hardwood, cement, cut stone, marble, brick, tile, mantels, reinforced concrete, metallic lath, sheet metal, metal ceiling, roof or siding, cornice, skylight, fireproof doors and windows, electrical work, telephone system, ornamental columns and caps, plastic relief work, plate glass. Tenders closed July 24.

Plans prepared for theatre. Owner, Hugh Calder; architect, F. Neil Brodie, St. John, N.B. 49 x 108. Private tenders to be invited.

Sherbrooke, Que.

Tenders to be called for office, \$4,000. St. Francis street. Owner, Colgenest & Fils; architect, L. N. Audet, Sherbrooke. Three storeys, reinforced concrete and brick, concrete foundation, electric lighting, cement, brick, vaults. Tenders called after July 22.

Tilbury, Ont.

Tenders called for public building. Owner, Department of Public Works, Ottawa; R. C. Desrochers, secretary; engineer, H. J. Lamb, London, Ont. Plans, specifications, etc., may be obtained at the office of the engineer, post office, Tilbury, and at the department of public works, Ottawa. Tenders received until 4 p.m., August 8, by secretary.

Toronto, Ont.

Work in progress for school, \$11,000. 53 St. Clair avenue. Owner, Haverhill College, 53 St. Clair avenue, Toronto. Architect, Wickson & Gregg, 59 Yonge street, Toronto. Two storeys, 32 x 45, brick, cement foundation, shingle and galvanized iron roofing, steel beams.

Equipment required for boiler house, \$6,000, Victoria, street. Owner, Sisters of St. Joseph, Bond street, Toronto; architect, A. A. Post, 15 Toronto street, Toronto. Three boilers and valve pumps required. Tenders for construction all closed.

Victoria, B.C.

Tenders called for school. Owner, Department of Public Works. Tenders are called until July 31st, for a large one-room frame school at Columbia Gardens, Ymir District, also for one small one-room school at Long Lake, Kamloops District, until August 4th.

Vancouver, B.C.

Proposed work on two fire halls. Owner, City of Vancouver, B.C.; city clerk. Committee appointed to select sites comprises Ald. Williamson, Chief Carlisle, etc. City Electrician was instructed to report on electrical equipment for the new sub-stations to be built in the city.

Plans prepared for addition to high school, \$125,000, Parker street and Colton Dr. Owner, Board of Education; secretary, C. W. Murray. Addition of 12 rooms with auditorium, reinforced concrete. Tenders called shortly.

Whitby, Ont.

Contemplated, addition to Ladies' College, \$80,000. Owner, Education Department, Methodist Church, Richmond street, Toronto. Rev. T. Graham, D.D., secretary; Prof. Hare, Principal Ladies' College. Only two wings will be erected at present, costing about \$30,000. Three storeys and basement, including gymnasium, isolated hospital, etc.

CONTRACTS AWARDED

Fort William, Ont.

The contracts have been awarded as follows for school on Miles street: painting, Robertson & Cantwell, Fort William; plumbing, Superior Heating & Plumbing Co., Fort William.

Fredericton, N.B.

Contract to be awarded for restoration of Cathedral. Owner, Christ Church; architects, Delaney Robinson, New York, care Bishop Richardson Fre. Members Building Committee, Bishop Richardson; Very Rev. Dean Schofield, Cannon Neals, and Dr. T. C. Allen. Estimated cost \$75,000. Insurance \$55,000. The contract for repairs is expected to be signed shortly with Moses Mitchel, contractor, Fredericton.

Hope, B.C.

Lock-up and government offices. Donald J. Macrea, Victoria, has been

awarded contract for the erection of lock-up and government offices by the Provincial Government.

Leduc, Alta.

The contract for the building of the new school at Leduc has been awarded to Mr. Wm. Deitz, of Calgary.

Newdale, Man.

School, \$12,000. Owner, Municipality of Newdale; secretary-treasurer, Johnson; architect, W. A. Elliott, Brandon, Man; general contractor, R. Willioughby, Brandon. One storey, brick and stone, 64 x 36. Muller hot air heating, pitch roof. As far as can be learned contract will be given as about.

Welland, Ont.

The contracts for the erection of the new 8-room public school in the south part of the town have been awarded as follows: Masonry, W. S. Homan, Niagara Falls; carpentry, metal and painting, J. E. Cutler, Welland; electric wiring, Frank Clifford, Welland; plumbing and heating, J. H. Crow, Welland.

Toronto, Ont.

Excavation. Government House, Toronto. Owner, Provincial Government; secretary, W. D. McNachten; contractor, Thomson Bros., Toronto.

Vancouver, B.C.

Two schools. Owner, Board of Education; architect, J. H. Bowman, Crown Building, Vancouver; general contractor, Herrett & Co., 1029 Westminster avenue, Vancouver. One at Rosenberg road, \$29,369; other at 43hr street, \$29,934. Two storeys, 108 x 64, brick and stone.

Wolfville, N.S.

Post office and custom house, \$40,000. Owners, Dominion Government, Ottawa; O. Ewart, architect, Ottawa; general contractor, A. Hood, Shelburne, N.S. Saskville stone and Avonport brick, Hantsport stone foundation, hot air heating, electric lighting, felt roof, fire escapes, cornice, roofing paper. Work to start in ten days; finish, 1912.

Residences

Fort William, Ont.

Tenders called for residence, \$4,000, Arthur and Norah. Owner, Jas. A. Davidson, Fort William; architect, R. E. Mason, Fort William. Three storeys, brick veneer, concrete foundation. Tenders called until July 18th.

Halifax, N.S.

Plans being prepared for four dwellings, \$25,000. Owner, Halifax Realty Co.; J. W. Regan, president, Carlton Place, Halifax; architect, A. G. Gates, the Nova Scotia Telephone Bldg., Halifax. Plans and specifications will be ready in a fortnight.

Moncton, N.B.

Tenders called for parsonage, Queen street. Owner, Trustees of the Central Methodist Church; secretary, F. A. McCully; architect, F. Neil Brodie, St. John. Plans and specifications at office of Mr. I. W. McAnn, Queen street, Moncton, and with the architect. Tenders closed July 25.

Montreal, Que.

Residence. Alf. Gravel, 12 St. Hubert street, will erect a \$5,000 residence

at 96 Marie Anne street, two storeys, 30 x 66, brick, stone foundation, brick, tile, mantels, cornice, electrical work, electric bells, plate glass.

Residence. O. Michand, 1152 Rachel, will erect a \$6,000 residence at 152 Delorimier, three storeys, 49 x 50, brick, stone foundation, brick, tile, mantels, electrical work, electric bells, plate glass.

Residence. Mr. Ouilette, 307 Delisle street, will erect a \$6,000 residence at 339 Fabre street, three storeys, 29 x 50, brick, stone foundation, hot water heating, electric lighting, brick, tile, mantels, ornamental iron, cornice, telephone system, electric bells, plate glass.

Tenders closed for residence, \$7,000, Harvard avenue. Owner, City Realty Investment Co., 92 Notre Dame street, Montreal, private plans. Two storeys, brick and stone foundation, cement work, cut stone, steel beams, hot water heating, electric lighting, tile, mantels, ornamental iron electrical work, telephone system, plastic relief work, plate glass. Tenders closed July 15.

North Vancouver, B.C.

Work in progress for apartment house and stores, \$12,000. Owner, North Vancouver Improvement Company, Vancouver; architect, Wm. F. Gardiner, 347 Pender street, Vancouver. Two storeys, 50 x 70, brick, concrete foundation, heated by flues, electric lighting, tar and gravel roofing, cement, brick, tile, mantels, structural iron, electrical work, plate glass.

Revelstoke, B.C.

Tenders closed for apartment house, \$25,000. Owner, H. F. McKinnon, Revelstoke; architect, John Dunn, Revelstoke. Two storeys, 40 x 90, brick and stone, concrete foundation, cement work, reinforced concrete, metal ceiling, metallic lath, steel beams, iron columns, plastic relief work, hot water heating, electric lighting, metal roof, bowling alley in basement, boiler house, etc. Tenders closed July 13.

St. John, N.B.

Plans to be prepared for rectory, north end. Owner, St. Lukes Anglican Church; architect, G. E. Fairweather, Germain street, St. John. Plans to be prepared at once.

Strathcona, Alta.

Work in progress for four residences, \$4,000 each. Owner, Alberta University; architect, Wilson & Herald, Strathcona; general contractor, McSporren & Co., Strathcona. Three storeys, 36 x 50, brick.

Toronto, Ont.

Tenders to be called for three attached residences, \$4,500; north side Melville avenue. Owner, H. W. Sharpe, 19½ Adelaide street east, Toronto; architect, J. Hunt Stanford, 34 Yonge Street Arcade, Toronto. Two storeys, 40 x 44, frame, brick foundation, hot air heating, combination lighting, open plumbing, shingle roofing, interior finish pine, cut stone, brick, mantels, electrical work, electric bells, shingle stain, plate and art glass. Tenders received after July 20.

Work in progress for dwelling, \$7,000, Russell Hill road. Owner, Alex. H. Rodgers, 12 Wellington street east, Toronto. Architect, Wickson & Gregg, 59 Yonge street, Toronto. Two and one-half storeys, 36 x 40, brick, stone foundation, hot air heating, electric

lighting, shingle roof, hardwood interior finish, cement work, cut stone, mantels, metallic lath, cornice, electrical work, shingle stain, steel beam plate and art glass.

Residence. W. E. Tweedy, 434 Parliament street, will erect a \$3,000 residence at s. s. Glendale avenue, two and one-half storeys, 43 x 18, brick, stone foundation, shingle roofing.

Pair dwellings. N. Cooper, Humberside avenue, will erect a storey residence at 26 Hickson avenue, brick, stone foundation, shingle roofing.

Work in progress for two pair detached residences, 69-73 Duggan avenue. Owner, H. E. Simpson & Company, Delaware avenue, Toronto; architect, Thos. Harris, 43 Howard Park avenue, Toronto. Two and one-half storeys, 33 x 42, brick and stone, stone foundation, hot air heating, combination lighting, open plumbing, shingle roofing, stone, brick, tile, mantels, cornice, electrical work, plate glass. Owner will build by day labor.

Tenders to be called for one pair dwellings, \$4,000, Shaw street. Owner, Taylor & Grosvenor, 789 Shaw street, Toronto. Two storeys, 48 x 34, brick foundation, hot air heating, combination lighting, open plumbing, shingle roof, brick, tile, mantels, cornice, electrical work, electric beam shingle stain, plate glass. Tenders will be asked for heating, lighting and plumbing in about four weeks.

Work in progress for three residences, \$6,000, 357-61 Grace street. Owner, J. W. Brown, 229 Christie street, Toronto; architect, R. H. Finney, Victoria street, Toronto. Two and one-half storeys, 29 x 47, brick, stone foundation, hot air heating, combination lighting, shingle, felt and gravel roofing. Work to be done by day labor.

Work in progress for pair dwellings, \$5,000, 45 Duggan avenue. Owner, E. Simpson, Delaware avenue, Toronto; architect, Thos. Harris, 43 Howard Park avenue, Toronto. Two and one-half storeys, 42 x 33, brick, stone foundation, hot air heating, combination lighting, shingle, felt and gravel roofing. Work will be done by day labor.

Tenders called for residence, \$4,000, Brunswick avenue. Owner, Dr. Slaught, Toronto; architect, H. Bryan Gilbride, 47 Wellington street east, Toronto. Two storeys, brick, brick foundation, hot water heating, gas and electric lighting, slate roof. Hardwood interior finish, mantels, plate glass. Tenders called by architect for all trades until July 28.

Tenders to be called for two residences, \$30,000, 95 Castle Frank road. Owner, W. A. Noble, Hamilton; architect, W. J. Peppiatt, 329 Carlton street, Toronto. Two and one-half storeys, 34 x 50, brick, stone foundation, hot water heating, electric lighting, shingle roofing, cut stone, marble, brick, mantels, skylights. Tenders will be called for everything but masonry by architect within a week.

Tenders called for dwelling, \$3,800, 28 Walter street. Owner, D. H. Atkinson, 12 Walter street, Toronto; architect, J. H. Galloway, 23 Toronto street, Toronto. Two and one-half storeys, 44 x 42, brick and stone, stone foundation, hot water heating, electric lighting, open plumbing, shingle roofing.

terior finish hardwood. Owners open tenders for about a week.

Tenders to be called for pair dwellings, \$4,300, Beresford avenue west, Toronto. Owner, McIntosh, Bradshaw, Tinson & Moore, 328 Brunswick avenue, Toronto. Two and one-half stys., brick, stone foundation, hot air heating, electric lighting, open plumbing, hingle roofing, cut stone, tile, mantels, plate glass. Tenders will be called on everything but carpentry and will be open for a few weeks.

Dwellings. Arthur Edmonds, 157 Wymington avenue, will erect pair semi-detached dwellings on the east side of Pauline avenue, two and one-half stys., 2 x 41, brick, stone foundation, shingle, tile and gravel roofing.

Work in progress for dwelling, \$5,000, Dalton road. Owner, J. G. Near, Dalton road, Toronto; architect, Thompson & Belfry, 43 Victoria street. Two storeys, 31 x 29 ft. 6 in., brick and stone, brick foundation, hot water heating, electric lighting, slate roof, interior finish Georgia pine, cut stone, brick, tile, mantels, cornice, shingle and plate glass.

Work in progress for five bungalows, 17,500, Pleasant boulevard. Owner, Brinell & Richards, 186 Bedford road, Toronto. Two and one-half storeys, 19 x 34 each, brick, stone foundation, hot water heating, electric lighting, hingle roof, cement work, cut stone, brick tile, mantels, cornice, electrical work, electric bells, shingle stain, plate and art glass. Work will be done by day labor.

Vancouver, B.C.

Residence. Plans have been prepared for a \$12,000 residence to be erected by G. H. Cottrell, tenders for which are now being called.

Residence. Plans have been prepared by Claude P. Jones, architect, for a \$12,000 residence to be erected by G. H. Cottrell, tenders for which are now being called.

Tenders to be called for apartment house, Bridge and Eighth avenue. Owner, Mr. Mathews, Cumberland, B.C.; architect, Wm. F. Gardiner, 347 Penner street, Vancouver. Two storeys, 80 x 30, brick and mill construction, concrete foundation, heated by flues, first class cement, marble, brick, tile, mantels, fireproofing, structural iron, cornice, skylights, fireproof doors and windows, electric work, telephone system, steel beams, plate glass, art glass. Tenders to be received after July 24th.

Winnipeg, Man.

Work in progress for residence, \$7,000, Ethelbert street. Owner, Dr. Raymond Brown, Somerset Bldg., Winnipeg; architect, C. E. Bridgman, Winnipeg. Two and one-half storeys, stone and frame, stone foundation, hot water heating, electric lighting, shingle roof, hardwood interior finish.

Tenders called for apartment block and stores. Owner, A. Congdon; architect, J. D. Atchison, Bank of Toronto Bldg., Winnipeg. Tenders for the general work and for plumbing and heating will be received by the architect until noon, July 24.

Tenders called for apartment block, \$55,000, Langside near Armstrong's Pt. Owner, C. L. Stanwood, Winnipeg. Architect, Paul M. Clemens, Brown Block, Winnipeg. Three storeys and

basement, brick and stone, stone foundation, steam heating, electric lighting. Tenders closed July 22.

CONTRACTS AWARDED

Brantford, Ont.

Priest's residence, Palace street, \$10,000. Owner, Roman Catholic Church, Rev. Dean Brady, Brantford. architect, Robt. Clohesy, 236 James street south, Hamilton, Ont.; general contractor, Hewson & Wright, Brantford. Two and one-half storeys, 40 x 40, hot water heating, electricity and gas, slate roof, hardwood and Georgia pine finish. Heating, plumbing and plastering contracts not let yet.

Hamilton, Ont.

Residence, Fairmount avenue, \$4,000. Owner, W. Aitchison, Queen street S., Hamilton; architect, J. A. Armes, Federation Life Bldg., Hamilton; general contractor, R. Tope, 191 Robinson st., Hamilton. Two storeys, 45 x 40, brick and stone, hot water heating.

Montreal, Que.

Dwelling. The contract has been awarded to John Wighton for a two-storey brick and wood dwelling to be erected by K. E. Thorne at Cote des Neiges Road. Saxe & Archibald, Beaver Hall Hill, architects.

Residence, Pine avenue, \$25,000. Owner, Bank of Montreal; architect, R. Findlay, Beaver Hall, Montreal; general contractor, J. H. Hutchison, 64 St. Ambrose street, Montreal. Three storeys, 45 x 46, brick and stone, stone foundation, hot water heating, electric lighting, oak interior finish. Tenders closed July 14.

Renfrew, Ont.

Residence. The contract for the erection of a \$3,000 residence by J. R. Durbrow was awarded on July 2nd to J. A. Jamieson, Renfrew.

Toronto, Ont.

Residence. The contracts for the \$8,000 residence to be erected by Mrs. Armour have been awarded as follows: Masonry, W. J. Glenister, 161 Macpherson avenue; carpentry, 296 Westmoreland avenue; plastering, F. W. Goulding, Balloil street; heating and plumbing, P. N. Huffman, 30 Cowan avenue, decorating, W. M. Weeks, 43 Richmond street east; tiling, G. L. Robinson, 556 Delaware avenue.

Business Buildings and Industrial Plants

Alberto, P.E.I.

Machinery for sale for mill. Owner, George Gard. Rotary mill, 10-in. four-sided moulders, surface planer, buzz plane, bandsaw, table sand papering machine, foot power mitreing machine, 25 h.p. engine and 40 h.p. boiler.

Aylesford, N.S.

Contemplated, canning factory. Owner, Robert Simpson Co., Halifax, N.S. To be built this fall or next spring.

Qu'Appelle, Sask.

Proposed construction of flour and grist mill. Party interested, D. Moore, S. Qu'Appelle, Sask. Capacity of mill, 100 bbl.

Amherst, N.S.

Probable extension for factory. Owner, Canada Car Co., Montreal, Que.; president, N. Curry. Mr. Curry has announced that if land adjacent to the

Amherst plant can be acquired at a reasonable figure a large extension may be built at an early date. Work is plentiful and he desires to increase the passenger shed 50 per cent.

Bradenbury, Sask.

Plans in progress for store, \$12,000. Owner, Walton Bros., Bradenbury, Sask.; architect, W. A. Elliott, Brandon, Man. Two storeys, 30 x 50, brick, cement work, hot air heating, oil lighting, flat roof, B. C. fir interior finish. Two stores on ground floor, apartment suites above.

Chatham, Ont.

Contemplated, addition to bakery. Owner, Palmer Bros., Chatham. Tenders for this will be called in the early fall.

Edmonton, Alta.

Hotel. Tenders have been called for the construction of an hotel at the corner of Namayo and Rice street by Northern Hotel Company, three storeys, frontage 75 feet, cost \$100,000; architect, R. W. Lines, Molson's Bank Bldg., Edmonton.

Guelph, Ont.

Plans revised for Wellington Hotel. Owner, Winter Fair Board; president, John Bright, London; secretary, A. P. Westervelt; architect, W. A. Mahoney, Guelph. Tenders will be called shortly. J

Hamilton, Ont.

Contemplated purchase of storage tank. Owner, City of Hamilton; chairman fire committee, Ald. Clark. Oil storage tank for gasoline auto fire truck.

Tenders closed for garage, \$4,000, James street. Owner, J. Porteous, 551 York street, Hamilton; architect, Mills & Hutton, Bank of Hamilton Chambers, Hamilton. One and three storeys, brick, stone and steel, stone foundation, cement work, cut stone, steel beams, hot water heating, electric lighting, tar and gravel roof, tile, skylights, coal chute. Contract let in a few days. Oil storage tank needed.

Halifax, N.S.

Tenders to be called for bank, \$75,000, Granville and Duke streets. Owner, Merchants Bank of Canada; architect, Ald. Gates, Nova Scotia Telephone. Two storeys, 60 x 36, granite and glazed terra cotta, granite foundation, interior finish Italian marble, cement work, marble, terra cotta, fireproof, metallic lath, structural iron, vaults, fireproof doors and windows, pipe covering, plate glass, etc. Tenders received after July 22.

Jasper Park, B.C.

Hotel. W. P. Hinton, General Passenger Agent of the G. T. P., said a hotel would shortly be built at Jasper Park, B.C.

Ladner, B.C.

Plans being prepared for sawmill (45,000 capacity). Owner, the McLelan Lumber Co., 744 Hastings street west, Vancouver, B.C. Purchase of equipment probably on Mr. McLelan's return this week. Arrangements to construct expected to be completed by August 1.

Medicine Hat, Alta.

Tenders received for gas well. Owner, City of Medicine Hat; engineer, A. K. Grimmer, Medicine Hat. Natural gas well, 1,200 feet deep, 10 in. diameter

Tenders and For Sale Department

Tenders for Steel Bridge

Tenders marked "Tenders for Bridge," will be received by the undersigned, Chesley P.O., up till August 3rd, 1911, for the erection of two steel bridges—one over Snake Creek, 10th Concession, Elderslie, and one on the County line, 7th Concession, Elderslie; the span of the bridges, 45 feet and 36 feet respectively. Also tenders for concrete abutments for same will be received at the same time.

Tenders will be opened at the County line bridge on Friday, August 4th, at 2 p.m.

Specifications for same may be had from James Warren, Engineer, Walkerton, after the 25th July.

The lowest or any tender not necessarily accepted.

(Signed) S. K. EWART,

Elderslie, July 17, 1911. 29-30



Department of Railways & Canals

Intercolonial Railways—Improvements at Halifax

FURTHER EXTENSION OF TIME

The time for receiving tenders for Pier and Sheds has been further extended from Monday, the 31st day of July, 1911, to Thursday, the 10th day of August, 1911, at 12 o'clock noon.

By order,

L. K. JONES,

Department of Railways and Canals,
Ottawa, July 17th, 1911.

Newspapers inserting this advertisement without authority from the Department will not be paid for it. 30-31

TOWN OF NORTH BAY

Water Works Extension

Sealed tenders endorsed "Tender A" and "Tender B," "Tender C" and "Tender D," will be received by the undersigned up to Saturday, August 5, 1911.

Contract A. The laying of approximately 46,945 lineal feet of water mains, placing valves, valve boxes, hydrants, etc.

Contract B. The laying of approximately 500 lineal feet of 16 in. steel intake pipe, the construction of concrete pump well on lake shore and the necessary connections to two pumps.

Contract C. The supplying of approximately 15,500 feet lineal 14-in. pipe; 500 ft. lineal 16-in. steel pipe; 2,550 feet lineal 10-in. pipe; 27,745 feet lineal 8-in. pipe; 1,100 feet lineal 4-in. pipe; and the necessary tees, crosses, curves, etc.

Contract D. The supplying of approximately 32 hydrants, 11 14-in. gate valves and valve boxes, 5 10-in. gate valves and valve boxes, 40 6-in. gate valves and valve boxes, 3 4-in. gate valves and valve boxes.

Separate tenders are desired for the supply of and laying of steel pipe, (2) cast iron pipe, and (3) wood stave pipe, in contracts "A" and "C".

Plans and specifications may be seen at the office of the Commissioner of Works, North Bay.

The lowest or any tender not necessarily accepted.

T. N. COLGAN,
Commissioner of Works.

North Bay, July 11, 1911. 29-31

Toronto Main Drainage

Tenders will be received on Friday, August 4th, 1911, for the construction of Low Level Interceptor, Don Syphon (crossing under the River Don), and for the manufacture and delivery of the following:—

280 linear feet 30-inch Cast Iron Pipe.

5,984 linear feet 42-inch Reinforced Concrete Pipe.

1,985 linear feet 30-inch Reinforced Concrete Pipe.

2,315 linear feet 36-inch Reinforced Concrete Pipe.

Plans, specifications, forms of tender and conditions relating to tendering as prescribed in City By-laws may be obtained from the Main Drainage Works office of City Engineer, Toronto.

The lowest or any tender not necessarily accepted.

G. R. GEARY, Mayor,

Chairman, Board of Control.

City Hall, Toronto,

July 14th, 1911.

29-30



Department of Railways and Canals

TRENT CANAL

Lockgates and Valve Gates

Holland River Division

Sealed tenders addressed to the undersigned and endorsed "Tender for Lockgates and Valve Gates, Holland River Division," will be received at this office until sixteen o'clock, on Friday, August 4th, 1911.

Plans, specifications and form of contract to be entered into can be seen on and after this date at the office of the Chief Engineer of the Department of Railways and Canals, Ottawa, and at the office of the Superintending Engineer of the Trent Canal, Peterborough, Ont., at which places form of tender may be obtained.

Parties tendering will be required to accept the fair wages schedule prepared or to be prepared by the Department of Labor, which schedule will form part of the contract.

Contractors are requested to bear in mind that tenders will not be considered, unless made strictly in accordance with the printed forms, and in the case of firms, unless there are attached the actual signature, the nature of the occupation, and place of residence of each member of the firm.

An accepted bank cheque for the sum of \$2,000, made payable to the order of the Minister of Railways and Canals, must accompany each tender, which sum will be forfeited if the party tendering declines entering into contract for the work, at the rates stated in the offer submitted.

The cheque thus sent in will be returned to the respective contractors whose tenders are not accepted.

The cheque of the successful tenderer will be held as security, or part security, for the due fulfilment of the contract to be entered into.

The lowest or any tender not necessarily accepted.

By order,

L. K. JONES,

Secretary.

Department of Railways and Canals,
Ottawa, July 7th, 1911.

Newspapers inserting this advertisement without authority from the Department will not be paid for it. 29-30

BUCKET CRANE

FOR SALE—One 10 to 15-ton No. 1 Brown ing Locomotive crane, standard gauge, 4-wheel truck, 38 ft. steel boom, 8 x 10 engines, equipped to handle clam or orange peel. Will furnish with or without bucket. Attractive price, fine condition, quick delivery. Inspection here.

WILLIS SHAW MACHINERY CO.,

39 South LaSalle Street,
Chicago, Ill.

FOR SALE

Complete Electric Generating Set, consisting of Leonard Peerless steam engine direct connected to 150 k.w. Canadian General Electric generator, 2,300 volts, 60 cycles; also condenser, switch-board, steam and exhaust piping, spare parts for engine and generator, and everything constituting the complete set as at present installed in the Thomas street lighting station of the Town of Brockville. This machine is in first-class order, having only been used on peak loads. It is now being replaced by a larger Belliss & Morcom engine with Swedish G. E. generator. Full particulars and price can be obtained from Laurie & Lamb, Consulting Engineers, Board of Trade Building, Montreal. 28-35

CITY OF GUELPH

Tenders will be received by T. J. Moore, City Clerk, Guelph, Ontario, for the construction of a plain concrete arch bridge (two forty-foot spans), over the River Speed, Neeve street, Guelph, up to Saturday, July 29th, 1911.

Approximate amount of concrete is 385 cubic yards.

A marked cheque for \$100.00 is to accompany the tender.

Forms of tender may be obtained from the City Engineer.

Plans and specifications may be seen at the office of the City Engineer, or at the office of the Contract Record, Toronto.

L. MALCOLM,

Acting City Engineer.

29-30

Tender

for

Macadam Highway

Tenders will be received up till July 29th, 1911, by the Board of Highway Commissioners for York County, for the supplying of machinery with material, labor and constructing the following highways or parts thereof:

- LAKE SHORE ROAD.
- WESTON ROAD.
- VAUGHAN ROAD.
- KENNEDY ROAD.
- KINGSTON ROAD.
- DUNDAS STREET.

Particular sections are more specifically described, specifications and forms of tender, which may be secured at the office of the Engineer, Room 6, 57 Adelaide street east, Toronto.

MR. R. J. BULL, Chairman.

E. A. JAMES, Engineer to Board.

J. A. RAMSDEN, Secretary. 29-30

Tenders Wanted

Tenders are required for about 3,300 feet of 18-inch and 1,600 feet of 12-inch cast iron pipe, with a number of valves and specials. Tenders received not later than noon, August 12th, 1911. For specifications and forms of tender write H. J. Glaubitz, General Superintendent, Waterworks and Electrical Departments, London, Ont. 30

CITY OF GUELPH

Tenders

Tenders will be received by T. J. Moore, City Clerk, Guelph, Ontario, for the construction of a reinforced concrete arch bridge and viaduct over the Canadian Pacific Railway and the River Speed, Guelph, up to Tuesday, August 8th, 1911.

Approximate amount of concrete is 521 yards. A marked cheque for \$400 is to accompany the tender.

Forms of tender may be obtained from, and plans and specifications seen at the office of the City Engineer, Guelph, or at the offices of the Contract Record and Canadian Engineer, Toronto, Ont.

Plans and specifications may also be obtained for the sum of \$5.00 per set, which will be returned upon return of plans.

Lowest or any tender not necessarily accepted.

L. MALCOLM,

Acting City Engineer.

Guelph, July 21st, 1911. 30-31



Department of Railways and Canals

Intercolonial Railway

FREIGHT SHED at HALIFAX

Sealed tenders addressed to the undersigned and endorsed "Tender for Freight Shed at Halifax," will be received at this office until 12 o'clock noon of the 1st of August, 1911, for the construction of a Freight Shed on the Quay Wall at Halifax, N.S.

Plans, specifications and form of contract to be entered into may be seen and full information obtained on and after this date, at the office of the Chief Engineer, of the Department of Railways and Canals, Ottawa, and at the office of the Chief Engineer of the Intercolonial Railway at Moncton, N.B., or at the office of the Board of Trade, Halifax.

Parties tendering will be required to accept the fair wages schedule prepared or to be prepared by the Department of Labor, which schedule will form part of the contract.

Contractors are requested to bear in mind that tenders will not be considered, unless made strictly in accordance with the printed forms, and in the case of firms, unless there are attached the actual signature, the nature of the occupation, and place of residence of each member of the firm.

An accepted bank cheque for the sum of \$2,000,000 made payable to the order of the Minister of Railways and Canals must accompany each tender, which sum will be forfeited if the party tendering declines entering into contract for the work, at the rates stated in the offer submitted.

The cheque thus sent in will be returned to the respective contractors whose tenders are not accepted.

The cheque of the successful tenderer will be held as security, or part security, for the due fulfillment of the contract to be entered into.

The lowest or any tender not necessarily accepted.

By order,

L. K. JONES,

Department of Railways and Canals,
Ottawa, July 17th, 1911.

Newspapers inserting this advertisement without authority from the Department will not be paid for it. 30-31

Tenders

Sealed tenders address to the undersigned will be received until Monday, August 7th, for the construction of a Municipal Drain in the Township of Minto. The estimated amount of excavation is 21,000 cubic yards, and the work must be completed by November 1st, 1912.

Profile and specifications can be seen at the office of the undersigned.

W. D. McLELLAN,

Clerk of Minto,

Harriston, Ont. 30-31

Tenders for a Steel Bridge

Sealed tenders marked "Tender for Bridge," will be received by the undersigned up to noon on Monday, August 7th, 1911, for the construction of a 40-foot span over the Humber River, on the Seventh Line, Albion Township, about one mile from the Village of Paigrave.

Specifications may be obtained from the undersigned.

The lowest or any tender not necessarily accepted.

C. R. WHEELLOCK,

County Engineer.

Orangeville, July 22, 1911.

30-31

Tenders for Steel Bridge

Sealed tenders marked "Tenders for Bridge," will be received up to noon, Saturday, August 5th, 1911, for the construction of two spans of 125 feet each and one span of 90 feet, over the Saugeen River, 10th Concession, Brant.

Also tenders, marked "Tenders for Abutments," will be received up to the above date for the concrete work for two abutments and two piers for the above bridge.

Tenders will be opened at the December session of the County Council, December 6th, 1911.

Specifications may be had from the undersigned.

The lowest or any tender not necessarily accepted.

JAMES WARREN,

Engineer.

Walkerton, July 17, 1911.

20-30

Canadian Delivery

Nine Steel Skips, 4 ft. 6 in. x 2 ft. 6 in. x 5 ft. 6 in. Good order.

Twenty h.p. Stat. Boiler, 10 ft x 3 ft. No front. Good order.

Hayward O. P. Bucket, one extra blade; almost new.

Porter 14-ton Locomotive, 36 in. gauge, cyls. 9 x 14; first class.

Twenty-two Western two-way dump cars, 36 in. gauge, four cubic yards; good.

Terry & Tench Stiff Leg Derrick, Bull wheel, boom 14 in. x 14 in. x 55 in.; first class.

Eight Continental two-way dump cars, four cubic yards, used two months; first class.

Twelve K. & J. two-way dump cars, four cu. yds.; used two months.

10 in. x 10 in. x 12 in. Gould Cent. Pump, belt driven. New.

No. 7 Pulsometer Pump, 5 in. x 4 in. Used one year.

Two Leonard 25 h.p. engines, used 1 and 6 months.

Six Lockwood 4-yard Automatic Steel Dump Skips. New.

Twenty-four new drag scrapers.

Steam hammer for sheet piling; used one week.

Write us if you want to buy or sell.

THE MALES COMPANY,

No. 82 Perin Bldg., Cincinnati, O.

CITY OF REGINA

Tenders

for the Construction of Water Works Supply Mains and Two Concrete Basins

Sealed tenders addressed to the City Commissioners, Regina, and endorsed on envelope "Tender for Waterworks Supply Main Construction," or "Tender for Construction of Concrete Basins," as the case may be, will be received up to 12 o'clock noon, Friday, August 4th, 1911, for the:

(a) Trenching, laying and backfilling for approximately 11,200 lin. feet 18-in. steel pipe, and 1,000 lineal feet of 16-in. Cast Iron Pipe.

(b) Construction of a 2,000,000 gallon concrete High Level Basin. And the construction of a 225,000 gallon concrete pump well.

Particulars may be had upon application to the City Engineer.

A marked cheque for \$500 must accompany each tender for Waterworks Supply Main Construction.

A marked cheque for \$1,500 must accompany each tender for Construction of Concrete Basins.

The cheques of the unsuccessful tenderers will be returned.

The lowest or any tender not necessarily accepted.

(Signed) L. A. THORNTON,

City Engineer.

30

TOWN OF WILKIE

Sealed tenders will be received by T. A. Dinsley, Secretary-Treasurer of the Town of Wilkie, until noon, Monday, August 21, 1911, for supply and delivery of the following machinery, materials, and performance of certain works:

Tender A.—Electrical Machinery—

(1) One 60 kw. 3-phase, 60 cycle, 2,200 volt a.c. Generator.

(2) One Exciter for above.

(3) One marble switchboard, instruments and switches.

(4) Three 2,200 voltmeters, back geared to pumps.

(5) Five transformers for lighting system.

(6) Series Tungsten street lighting system.

(7) Approximately 25 cwt. of weather-proof copper wire (line material, guy wire, arms, pins, insulators, etc.).

(8) Cedar poles.

Tender B.—One 100 I. H.P. Internal Combination Engine—

Tender C.—Pumping Machinery—

(1) One working head and deep well cylinder.

(2) One-half million gallon pump.

(3) One air compressor.

(4) Necessary shaftings and belting.

Tender D.—

One Pneumatic Storage Tank.

Tender E.—

Approximately 1,100 ft. 8-inch c.i. water pipe.

Approximately 4,900 ft. 6-inch c.i. water pipe.

Approximately 2,000 ft. 4-inch c.i. water pipe.

Approximately 15 hydrants and 22 valves.

Tender F.—

Trenching, laying cast iron water pipes, hydrants, valves, etc., and back filling.

Tender G.—

Erection of power house and construction of reservoir.

Plans and specifications may be seen at the office of the secretary-treasurer of the Town of Wilkie, or on application to the Engineers, McArthur & Murphy, Room 8, Bottomly Block, Saskatoon, Sask.

A marked cheque for five per cent. of amount of the tender must accompany each bid.

The lowest or any tender not necessarily accepted.

McARTHUR & MURPHY, Engineers

Bottomly Block, Saskatoon, Sask.

T. A. DINSLEY, Secretary-Treasurer.

Wilkie, Sask.

30-31



To Contractors

Separate tenders endorsed "Tender for New Government House," addressed to the undersigned, will be received at this Department until noon of Tuesday, August 22nd, for the stone and brick work, fireproofing, steel work, roofing and carpenter work, for the new Government House in Chorley Park, Rosedale, Toronto. Plans and specifications may be seen at this department.

An accepted bank cheque payable to the order of the Hon. J. O. Reaume, Minister of Public Works, for five per cent. of the amount of the tender, and the bona fide signatures and addresses of two sureties, must accompany each tender. Cheque will be forfeited to the Crown in the event of the successful tenderer refusing to carry out the work within ten days after acceptance. The department will not be bound to accept the lowest or any tender.

By order,

H. F. McNAUGHTEN,

Secretary Public Works Department.

Department of Public Works, Ontario, Toronto, July 21st, 1911.

Newspapers publishing this advertisement without authority will not be paid for it.

30-31-32-33

Positions Vacant

Advertisement under this heading one cent a word per insertion. Box No. ten cents extra

AGENTS WANTED United States firm manufacturing sawmill, well-drilling and prospecting machinery, desires to secure Canadian representatives. For particulars write E. J. McIntyre, 4059 Perry street, Chicago, Ill. 30-31

FOREMAN WANTED.—Wanted, a Construction Foreman on a large mill to be erected in Toronto, one who understands masonry, carpentry, and steel construction, also familiar with local conditions. Engagement September 1st. Apply Box 305, Contract Record, Toronto. 30-31.

SUPERINTENDENT WANTED.—Superintendent of Construction; a man thoroughly familiar with all kinds of form work for reinforced concrete buildings, must be a first-class man. First class salary. State experience and give references. Box 306, Contract Record, Toronto. 30-31

Positions Wanted

Advertisements under this heading one cent a word per insertion. Box No. ten cents extra

Electrician, practical, theoretical and commercial, open for engagement; 20 years' experience in high tension, overhead and underground work; also designing, erecting and running power plants; good organizer and hustler; first-class references. Box 297, Contract Record, Toronto, Ont. 29-30

Business Buildings and Industrial Plants

(Continued from page 61)

at bottom. Contractor to supply casing tested to 1,500 lb. pressure; also drilling apparatus. Tenders closed July 20.

Montreal, Que.

Tenders closed for bank, \$30,000, 200 St. James street. Owner, Molson Bank. Architect, H. A. Stone, 84 St. Frances Xavier street, Montreal. Two storeys, 66 x 90, stone foundation, brick and stone, cement work, steel beams, hot

water heating, electric lighting, marble, tile, mantels, ornamental iron, cornice, electrical work, telephone system, electric bells, plate glass. Tenders called July 15th.

Tenders to be called for bank interior fittings, Windsor street annex. Owner, Bank of Montreal, Montreal. Architect, Peden & MacLaren, 20 St. Alexis street, Montreal. Bank on ground floor, new C. P. R. Windsor Station. Contract just awarded for concrete vault work to C. E. Deakin, 11 St. Sacrament street; vault doors, Ahern Safe Co., Ltd., Montreal. Tenders for interior fittings to be called shortly.

Tenders to be called for offices. Owner, Sheddon Forwarding Co., 31 Victoria Square, Montreal; architect, Brown & Wallace, 32 Canada Life Bldg., Montreal. Nine storeys, steel and concrete, cut stone, concrete foundation, reinforced concrete, hot water heating, electric lighting, marble, tile, mantels, passenger elevators, structural iron, ornamental iron, cornice, telephone system, plate glass. Tenders called after July 20th.

Nanaimo, B.C.

Plans being prepared for stores and offices. Owner, James Young; architect, A. Forrester, Nanaimo. Three storeys, 60 x 132, 63 rooms, brick, concrete.

Proposed building of stores and offices, \$20,000. Owner, Victor Janey; architect, A. Forrester, Nanaimo, B.C. 2 storeys, 51 x 132, concrete basement, brick superstructure. Plans in course of preparation.

Oshawa, Ont.

Contemplated, manufactory. Party interested, J. D. Storie, Ontario Malleable Iron Company, Oshawa. Equipment required for first class up-to-date brick making plant. Site has been purchased. The question of utilizing electric power is being discussed.

Ottawa, Ont.

Tenders to be called for commercial building, Sparks street. Owner, Blackburn Bros., Ottawa; architect, W. E. Noffke, Central Chambers, Ottawa. Ten storeys, 45 x 65. Tenders called for stone work (grey granite) and brick work in about two weeks.

Tenders called for bakery, two buildings. Owner, Slinn-Shouldis, Limited, Ottawa; architect, James Mather, Wellington street, Ottawa. Two storeys, 97 x 123, 45 x 90, steam heating (2 boilers), electric lighting. Tenders called for plumbing, plastering, painting and electric wiring work and transmitting until July 23.

Prince Rupert, B.C.

Work in progress for office and stores, \$10,000. Owner, David H. Hays, Prince Rupert; architect, W. L. Barker, Third avenue, Prince Rupert; general contractor, Coast Construction Company, Prince Rupert. Cement and excavation, Toni Christiansen, Prince Rupert. Two storeys and basement, 50 x 100, wood, cement foundation, hot water heating, electric lighting, electric fixtures, three lavatories and fixtures, art glass and electric door opener needed.

Qu'Appelle, Sask.

Rural telephone line. Work waiting for contractor to commence construction; about ten miles in length. Write W. G. Vicars, S. Qu'Appelle, Sask.

Ste. Therese, Que.

Rough plans accepted for bank. Owner, Molsons Bank, Montreal; architect, Philip J. Turner, Board of Trade, Montreal.

St. Thomas, Ont.

Contemplated, addition to bank building, Talbot street. Owner, Molson Bank, Montreal, Que; architect, P. J. Turner, Board of Trade, Montreal. Cut stone. Tenders will be called shortly.

Sedgewick, Alta.

Mr. J. I. McLeod, of Spokane and Calgary, is said to have purchased iron ore areas near here. Large steel works, involving expenditure of many millions, may be erected.

St. John, N.B.

Tenders to be called for brick block, Union and Brussels streets. Owner, Bishop Casey, Roman Catholic Diocese of St. John. Three storeys, 40 x 80, steam heating, electric lighting. Tenders will be called the latter part of this week.

Toronto, Ont.

Destroyed by fire, business building, Queen street. Owner, Thomas Thompson Estate. Loss as follows: Copeland Chatterton's stock of office equipment, interior fittings, desks and writing machines, books, etc., by water, \$10,000. James Hartman's bowling alley, by fire and water, \$2,000; the Oriental Billiard Room, \$2,000; Sergeant's Mess of the 10th Royal Grenadiers, \$10,000.

Work in progress for store and dwelling, \$6,000, E. S. Bloor street. Owner, H. W. Macdonald, Toronto; architect, J. A. Harvey, 502 Manning Chambers, Toronto. Three storeys, 16 x 52, brick and stone, hot water heating, electric lighting, open plumbing, felt and gravel roof, cement, cut stone, brick, metallic lath, cornice, skylights, electrical work, electric bells, steel beams, plate glass.

Tenders called for three buildings, \$4,000, east side Perth avenue. Owner, W. Burton, 1253 Dufferin street, and G. Howard Gray, 304 Lumsden Bldg., Toronto. Two storeys, 44 x 40, brick, concrete foundation, hot water heating, electric lighting, open plumbing, felt and gravel roofing. Tenders received for a week.

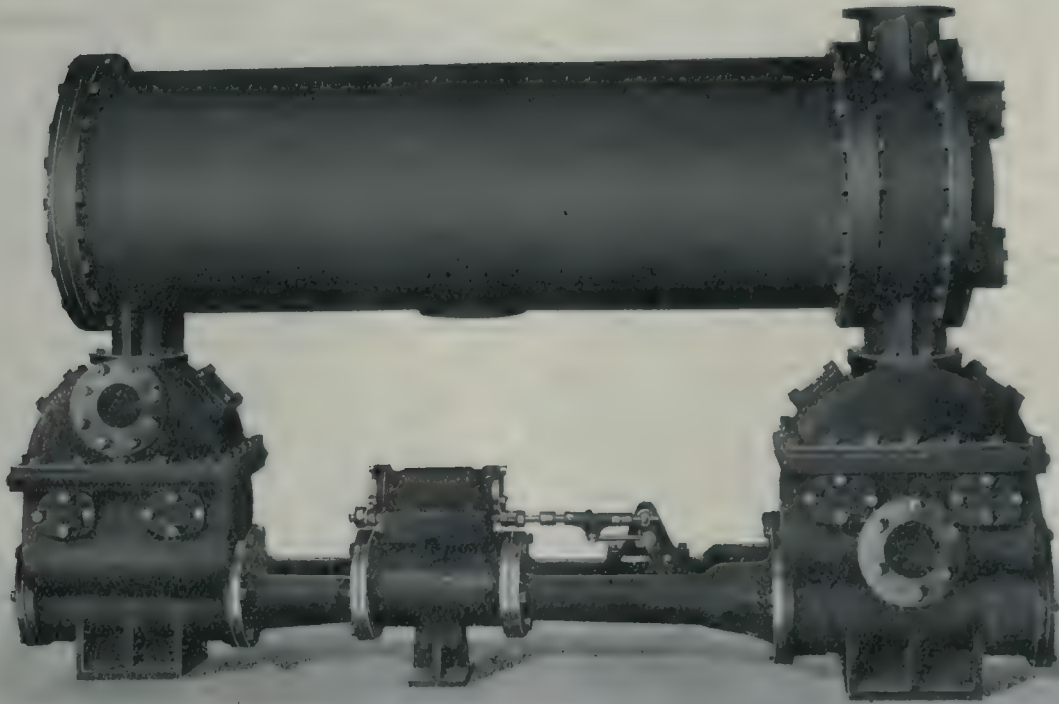
Work in progress of two attached stores, Cor. Bloor and Ossington. Owners, J. W. Walker, 501 Palmerston Bld., Toronto; architect, J. Hunt Stanford, 34 Yonge Street Arcade, Toronto. Three storeys, 120 x 50, brick and stone, stone foundation, hot water heating, electric lighting, open plumbing, felt and gravel roof, cement, cut stone, marble, brick, tile, mantels, metallic lath, structural iron, sheet metal, metal ceiling, cornice, skylights, electric work, electric bells, steel beams, iron columns, plate and art glass. Owner will build by day labor.

Garage. An automobile garage is to be built at the corner of Bloor and Schultz, 4 La Plaza, Jarvis and Charles streets, Toronto.

Warehouse. F. R. Cowan, 100 Duchess street, is the architect for a \$10,000 warehouse to be erected at 51 Britton street, two storeys, 68 x 62, brick, stone foundation, electric lighting, felt and gravel roofing.

Work in progress for addition to

CONDENSORS



Condensor built by The John Inglis Co., Limited

BOILERS, ENGINES, PENSTOCKS,
Water Towers, Steel Tanks, Heavy Plate
Work, Condensers, Air Compressors, Pump-
ing Machinery, Special Machinery of all kinds

Let us Submit Prices.

The **John Inglis Company**

Engineers and Boilermakers

Limited

14 Strachan Ave., TORONTO, Canada

store, \$4,000, Yonge street. Owner, Robert Barron, Ltd., 724 Yonge street, Toronto; architect, Geo. W. Gouinlock, Temple Building, Toronto. One storey, 18 x 66, brick, concrete foundation, electric lighting, felt and gravel roof, cut stone, artificial stone, electrical work, asbestos materials, steel beams, refrigerator.

Westmount, Que.

Contemplated, Garage, St. Catherine and Metcalf streets. Owners, A. E. Rollitt & Co., Montreal; architect, P. J. Turner, 121 Board of Trade Building, Montreal. Two storeys, 150 x 100, fireproof throughout, reinforced concrete, freight and passenger elevator.

Wolfville, N.S.

Contemplated, bank, \$10,000. Owner, Royal Bank of Canada; manager, R. Crighton, Wolfville; supervisor of branches, A. D. McRae, Royal Bank of Canada, Halifax. Construction will probably start in 1912.

Winnipeg, Man.

Materials required for bank, \$15,000, Sargent and Sherbrooke streets. Owner, Union Bank of Canada. Architect, Jordan & Over, 47 Canada Life Bldg., Winnipeg. Two storeys, brick, stone foundation, steam heating, electric lighting, felt and gravel roof, interior finish oak. Contract awarded.

Work in progress for warehouse. Owner, W. Ackland & Son, Winnipeg; architect, Frank R. Evans, Somerset Block, Winnipeg; general contractor, Claydon Bros., Winnipeg. Four storeys, brick and stone, felt and gravel roofing, electric lighting. Materials to be called for.

Work in progress for warehouse, Henry avenue. Owner, Royal Crown Soap Co., Winnipeg; architect, J. H. G. Russell, 1110 McArthur Bldg., Winnipeg. Addition to present plant, 3-storey mill construction, steam heating, electric lighting, asphalt roofing. Materials are required.

Tenders called for steam heating system. Owner, City of Winnipeg; secretary board of control, M. Peterson. Complete steam heating system for offices of sub-station No. 1 on King street. Plans, specifications, etc., at office of the power engineers, Carnegie Library Bldg., Winnipeg. Tenders will be received by the chairman until 11 a.m., July 24.

Tenders called for five stores, \$20,000. Owner, E. McKenty, Winnipeg. Architect, F. R. Evans, 506 Somerset

Block. One storey at present, brick and stone, concrete foundation, steam heating, electric lighting, felt and gravel roof. Tenders received by owner until July 26th.

Tenders to be called for hotel (Selkirk). Owner, Grand Trunk Pacific Railway, Montreal, Que.; architect, Ross & McFarlane, 1 Belmont street, Montreal. Foundation, concrete and pile, stone and brick, copper roof, interior finish, fireproof. Estimated cost upward of a million. Tenders received after July 25th.

Yorkton, Sask.

Department Store. The Hudson Bay Company will establish a department store at Yorkton. Plans are being prepared and building operations will commence on August 1. Building to be 150 x 120, three storeys, freight and passenger elevators.

CONTRACTS AWARDED

Brantford, Ont.

Additions to bakery, Colborne street. Owner, J. McHutchison, 363 Colborne street, Brantford. General contractor, A. J. Cromar, Brantford. Two storeys, 40 x 56 and 27 x 65, brick, concrete foundation.

Carleton Place, Ont.

Bank building, \$10,000, Bridge street. Owner, Union Bank, Quebec; architect, J. P. McLaren, Ottawa; masonry contractor, Coles & McGregor; wood work, Mr. McKay, Ottawa. 2 storeys and basement, 36 x 50, brick, stone foundation, hot water heating, electric light, iron roof, hardwood finish, vaults, plate glass.

Fort William, Ont.

Traders Bank branch, \$30,000, Victoria. Owner, Geo. A. Graham, Fort William; architect, C. Wirth, Fort William; contractor, M. H. Braden, Fort William. Three storeys, 25 x 100, solid brick, terra cotta. Heating and plumbing contract not let yet. Fixtures and furnishing supplied by Traders Bank.

Hillsboro, N.B.

Plaster mills, \$100,000. Owners, Albert Mfg. Co., Hillsboro, N.B. Four storeys, wood and iron, stone foundation, steam heating, fireproofing, brick, structural iron, sheet metal work. The above price is said to include equipment.

Hamilton, Ont.

Garage, \$4,000, James street. Own-

er, J. Porteous, 551 York street, Hamilton; architects, Mills & Hutton, Bank of Hamilton Chambers, Hamilton; general contractor, Geo. Congdon, 31 Inchbury, Hamilton. One and three storeys, 24 x 124, brick, steel and stone. Contract was let July 15.

Two stores, \$6,000, Main and Sherman avenue. Owner, J. Morrow, Bank of Hamilton Chambers, Hamilton; architect, Stewart McPhie, Bank of Hamilton Chambers; general contractors, Bennet & Thwaites, 52 Farleigh avenue north, Hamilton. Work to be done by day labor. Contract was let July 17.

Montreal, Que.

Offices, \$80,000, 41 Union avenue. Owner, Wm. St. Pierre, 41 Union avenue, Montreal; architect, Findlay and Spence, Beaver Hall Hill, Montreal; general contractor, Hefferman & Beck, Montreal. Six storeys, steel and concrete.

Brass shop. The contract has been awarded to D. G. Loomis & Sons, Montreal, for the erection of a \$60,000 brass shop by the Canadian Pacific Railway.

Offices. The contract for a \$5,000 office building, brick, two storeys, 26 x 58, being erected by E. & W. S. Maxwell, at 6 Beaver Hall Square, has been awarded to Messrs. P. Lyall & Sons, Ltd., 213 Board of Trade Bldg., Montreal. Plans prepared by Claude P. Jones, architect.

Ottawa, Ont.

Office building, Sparks street. Owner, Blackburn Bros., Ottawa. Architect, W. E. Noffke, Central Chambers, Ottawa; contractor for steel, Dominion Bridge Company, Montreal. Steel, 10-storeys. Contract for second section of building about 300 tons.

Winnipeg, Man.

Bank, Portage avenue and Smith st. Owner, Sterling Bank of Canada; architect, James Chisholm & Son; general contractor, Carter-Halls-Aldinger Co., Winnipeg. Nine storeys, terra cotta, pressed brick.

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Railway Tactics

The Grand Trunk Pacific Railway Company has occasioned much adverse criticism along the Pacific coast, according to the Western Lumberman, owing to the fact that recently an order for some 8,000,000 feet of lumber for construction work in the west went to Seattle firms, despite the fact that large British Columbia mills capable of handling the contract were waging stiff competition among themselves, and quoted very low figures in an effort to get the order. Attention was also drawn to the fact that a Seattle firm has been awarded the contract for the company's \$300,000 wharf in Vancouver, and that all repairs to the company's steamers are made at Seattle shipyards. A report is now issued that a further order of 5,000,000 feet is on the point of being placed with Washington firms.

From a consideration of the above facts it would appear that the lumbermen of British Columbia have just cause for their complaint. The quality of Canadian lumber compared to that which the Seattle firms were prepared to provide is perhaps a point strong enough to turn a decision of this kind. It would not appear likely that the Grand Trunk Pacific Railway Company would ignore the British Columbia mills on the contention that they are unable to supply such a large order. It is altogether probable that the tenders from all firms were considered alike, and that the successful tenderer drew up the closer bargain, and that the saving of dollars and cents was in this case a decided factor. It does not seem likely that, all things being equal, the Grand Trunk Pacific would cross the line for their supplies. The company would be much more likely to patronize the Canadian mills, were the prices in any way nearly equal.

The editorial goes on to contrast the action of the Canadian Pacific Railway Company in purchasing a million and a half feet of choice lumber from a Canadian firm at a price considerably in excess of the quotation from Washington firms, and quotes Vice-president Whyte as follows: "It is the policy

of the Canadian Pacific Railway, as it has always been, to patronize and support Canadian industries, and not to shave the profit of these industries too close, as it is by their development and success that the permanent and dependable traffic of the Canadian road is built up."

Considering that the Grand Trunk Pacific Railway's bonds are guaranteed by the people of Canada, who will be taxed to pay part of the cost, the whole of the operating expenses, and the sum of the interest demanded by the bond holders, it is only natural that they should be interested in whether the company spends its money with an inclination towards the up-building of the country's interests.

Quantity Surveyors

There are numerous instances where extensions of time to tenderers for preparing their bids are impossible, and where a reasonable length of time between the call for tenders and its closing, recommended editorially in a previous issue of the Contract Record (July 5), is not available. It is in a case of this type that quantity surveying would prove invaluable to contractors and manufacturers, and to the engineers as well. It is most needed here, and when once begun, general adoption will eventually follow.

Quantity surveying is a business in itself in northern England, and is being largely adopted in the London district. Some architects and engineers in England do their own quantity surveying and make it a success. As a rule, however, their practice extends only to the limits of their own work, which may not be extensive enough to warrant large outlay of time and office force for compiling complete price lists of materials to cover all branches of the work satisfactorily. The more desirable and reliable method is that of the engineer who makes quantity surveying his entire business. He is called upon, during the preparation of the specification, to figure out the cost to the contractor of the material in the quantities required. He tabulates his results in a column opposite each item. The result is a specification that specifies concisely and explicitly. A brief perusal of it is sufficient to satisfy the contractor or manufacturer as to whether the work is suitable to his capacity regarding equipment, materials, and labor, to render it a profitable enterprise for him. He can align his capabilities to suit the requirement, and decide directly without the usual loss of time.

Another beneficial result is that one set of calculations suffices for all the tenders. The quantity surveyor receives his pay in the form of a commission on the amount of the accepted tender, the percentage being in the neighborhood of 2 or 3 per cent. If a dozen firms tender for the work each receives an equal benefit from his services and each pays one-twelfth of the amount that would have been incurred by the twelve companies, each taxing its estimating office (if it possessed one) with the same work.

The constant haggling over extras is also eliminated. The contractor's price generally exceeds largely the engineer's valuation of any work that has been done additional to that mentioned in the specifications. Here the quantity surveyor's figures could be resorted to with ease. For instance, if the owner decides that an additional ten feet of brick wall would improve his property sufficiently to warrant his building it, the contractor feels safe in going ahead with it

when properly requested. He knows that the brick item in the quantity survey is behind him, and that it forms the basis for his extra remuneration, which will be pro rata.

A conscientious quantity surveyor could soon work up a good business and, keeping his data strictly up-to-date, should be able to take care of a large list of specifications, as the work relative to each would be largely clerical. Architects and owners in Toronto could well keep a dozen such offices busy, and the field throughout Canada is significant.

That a material profit would be derived by manufacturers and contractors is obvious and the result would likewise be a considerable benefit to the architects and owners as well. Specifications would tend to become explicit as to requirement of quantities, and conditions for their installation.

Inspection of Street Work

The Bureau of Public Efficiency of Chicago is passing considerable criticism upon asphalt pavement work in that city. The fault-finding, according to the Engineering Record, is mainly directed against inspection and workmanship, particularly in the matter of temperature regulation.

Anybody acquainted with the trouble which a contractor has in getting his materials on the job in good condition, when the haul is long from the plant to the street, and in getting them laid properly with only partly trained men, will sympathize with him. When a large amount of asphalt paving is being laid it is very hard to get experienced, resourceful and energetic foremen and good workmen, even at wages considerably higher than are paid for similar work under ordinary conditions. But these circumstances have nothing to do with the fact that the contractor has agreed to lay a pavement of prescribed character, and that the inspectors are on the job to see it is done. The best of specifications are of trifling value if their requirements are ignored, and just as much attention should be paid to organizing, training and supervising the inspectors as to studying the details of the specifications. Until this is done, so that the city may be certain it gets what it contracts for, it is well to think very seriously over one of the bureau's most important recommendations. This is to cut down the depth of the pavements laid on streets not subject to heavy travel from 9½ to 7 inches. It is suggested that 4 inches instead of 6 inches of concrete might be used, 1½ inches of close binder as at present, and 1½ inches instead of 2 inches of wearing surface. Had such construction been used on the 500,000 square yards of asphalt pavement laid in 1910 on residential streets, the bureau estimates that a saving of over \$200,000 would have been effected. Theoretically this may be correct, but as the thin pavements require, even more than those now laid, the best kind of material and workmanship, it would be wise to improve the inspection of street work before reducing their factor of safety so much as is suggested. The proposal is plainly a good one; the difficulty is to ensure its execution properly.

Storage of Cement

It is not generally recognized how quickly the finely-ground cements of to-day are depreciated by storage of the ordinary kind on works. Cement is usually received on a job packed in sacks, and is very

often obtained in large consignments, and has to be stored on the works. Sheds are provided, generally of flimsy construction, which offer plenty of opportunity for the passage of air through them, being built, for instance, of boards, the joints of which are fairly open. The moist air that passes through the storage sheds gets taken up rapidly by the finely-ground cement, which cakes, and one finds after a short while the outside portions of the sacks to be quite hard. This is often aggravated on works near any water-logged soil, or in connection with bridges, the covering over of a stream with a culvert and such-like, by the erection of a shed with boards nailed to upright posts just stuck in the ground and without any proper floor, the cement being merely stacked on open boards laid direct on the ground. In some cases the cement has been stored for the winter in such situations. Of course, there is every opportunity of moist air being in association with the cement, which naturally depreciates with great rapidity, and in a week or two loses half or more of its strength.

The old clause which was inserted in specifications in the past, requiring the cement to be stored in thin layers and turned over from time to time, was distinctly advantageous with the coarsely-ground cement which was the custom in the earlier period of manufacture, and which frequently contained free lime, but the cement of to-day is entirely different, and it requires a different treatment. The finer ground a cement is, of course, the better it is, and therefore we see the foolishness of storing the modern cement for some time before usage. If, as often must be the case, the cement is to be taken in large consignments, then it should be stored in air-tight bins—that is to say, compartments into which moist air is not permitted to pass; but in most cases it is possible to arrange the consignment so that the cement is used while fresh, very shortly after it is received from the manufacturer. The product sent out by the manufacturer is good enough for use straight away.

We require the cement to give us a strong concrete—that is to say, strong in compression—and, as we have said, the storage for a few weeks can only result in reducing the strength of the concrete to perhaps a half, and that means that we are losing 50 per cent. of value. The importance, therefore, of speedy usage or proper air-tight storage of cement is obvious. —(Concrete & Constructional Engineering).

Proposed amendments to the building by-law of Calgary, shortly to be submitted to the council for ratification, provide for the extension of the business area or fire limits of the city in order to insure a better standard of construction in general. The proposed changes, if adopted, will make it necessary for owners of buildings over six storeys to erect their buildings of fireproof construction, and to fireproof five and six story buildings on the first and second floor, according to each respective height. In all other buildings, mill or slow burning construction will be required, while all tenements or apartments or buildings with three storeys, will have to be of fireproof construction.

Wrecking the old buildings on the site of the new city hall at Spokane, Wash., was done by day labor and netted the city a profit of \$1,811.40, according to a report of the foreman in charge of the work. This is \$1,061.40 more than the best offer made by outside parties. The net receipts from salvage were \$5,062.91, and the net cost of wrecking buildings was \$3,251.51.

German Methods in Town and City Planning

Methods Differ from Those in America—The Corporation is Sovereign—Successful System of Taxing the Unearned Increment

By Frederick C. Howe.

Town planning in Germany is characterized by a comprehensive unity fully in keeping with the scientific character of the nation. Nothing is haphazard, nothing is left to chance, nothing is omitted from the calculations. Analysis of all the elements controlling the city and its proper planning precedes constructive work. It is this frank investigation of every influence affecting municipal life that distinguishes the town planning movement in Germany from that of America. In this country the city planning movement is thus far ineffectual to produce permanent and fundamental change because of our unwillingness to face the controlling influences of transportation, the unchecked license of the land owner, the unrestrained freedom of property in all its forms. Thus far, city planning in America has limited its vision to those sides of the question which do not conflict with the claims or abuses of private property.

This fundamental difference between the German city and our own is most plainly seen in the laws and municipal ordinances of the two countries relating to land. In Germany the city is sovereign. It controls the land owner and the builder in the interest of the community. The rights of the community are superior to the right of any individual, and the health, convenience, comfort and well-being of all the people are superior to and must control the rights of the land owner or the speculator.

In America on the other hand, the city is almost helpless. It has very limited powers and these are specially granted—usually after it is too late for them to be of value. Rights of eminent domain are strictly construed against the city and must be exercised with great care. Excess condemnation, in order that the city may acquire some of the profits accruing from its own improvement is denied, as is the acquisition of land for any other than enumerated things. The right of special assessments for benefits conferred is carefully prescribed by statute, varies greatly in different communities and leaves but little discretion to the cities. The individual can lay out streets of such width as he wills. He can sewer them and pave them, build them up with tenements or skyscraping apartments and the city cannot successfully protest. In the face of all our knowledge of the vice, crime and disease which the tenement produces, old conditions in our larger cities are certainly producing themselves and the cities are helpless to prevent it.

In Germany the city is as sovereign over the property within its limits as it is over the people. It can regulate both by municipal ordinances. Its powers are ample. It enjoys nearly complete home rule. In America, on the other hand, the city is in chains to the state legislature, the real estate interests and the franchise corporation. It has the most limited powers of city building, has little autonomy and is so cramped, cabined and confined with restrictions that its powers are of little value.

The German city predicates town planning on a

thorough control of the land within its limits. It treats the land as the foundation of municipality, just as does the architect when he erects an office building. City planning is fundamentally a land question. We can see this in Washington, where the city was originally designed by Major L'Enfant and President Washington in an unbroken country. The beauty of the city is attributable to the generous provision for streets, avenues, open spaces and sites for public buildings. Its commanding beauty is due to the free hand enjoyed by its designers in the control of the land.

The German city controls the land within its limits in a variety of ways. It fully recognizes the importance of its foundations. The principal methods of regulation are the following:

Street Building and Planning

In the decades which immediately followed the Franco-Prussian war, the German city followed the rectangular gridiron type of streets so universal in America, because this street plan was satisfactory to the land speculators. This period of city building in Germany presents the same monotonous suburban sections as are to be found in this country. A revolt arose against this type of streets in the closing years of the nineteenth century when street planning assumed the importance it deserves. To-day every city has a street plan as has Washington, D.C., mapped in the City Hall far in advance of the city's present growth. All street construction work is done by the city directly with its own engineer, landscape artists and contractors. A large area is undertaken at once, thus decreasing the cost and enabling it to be done in a symmetrical way. To these plans the private owner must acquiesce. He is not permitted to lay out his own streets, to pave or sewer them or control their width or character. Broad radial avenues or boulevards in conformity with the original city plan run through every new section. These streets vary from 100 to 200 feet in width. They are parked and beautified and serve as a recreation and promenade way. Side streets are of ample width and are designed to harmonize with the city plan.

The cost of such development is first paid for by the city, but is assessed back upon the property benefited according to established rules. A considerable time is permitted within which the assessments can be paid by the owner, the cost being carried by the city at a low rate of interest. Thus the suburban developments of German cities are harmonious, beautiful and suited to the needs of the city.

Slum areas are forever precluded, while great economy in cost is secured through the permanency of the construction. At the same time the land owner is protected from his irresponsible neighbor, who often disfigures an entire territory by jerry construction and speculative indifference to the rights of the adjoining community. The land owner is required to dedicate a certain percentage of his holdings for streets and open spaces, and the city is authorized to take from 30 to 40 per cent. without compensation.

* Read before the Third National Conference on City Planning at Philadelphia Session.

The assumption is that the development work enhances the value of the adjoining property sufficiently to pay for the street development as well as the area dedicated to public uses.

The Zone System

German cities are divided into building zones in each of which the height of buildings and the amount of land which may be covered by improvements is strictly prescribed. These building zones are like the fire zones of our cities, but are prescribed to prevent congestion and the reappearance of the tenement slum. They are hygienic regulations insuring beauty as well as proper sanitation. A larger area can be covered by structures in the business section than in the outlying zones, the percentage being determined by the uses to which the land would naturally be put.

These building regulations preclude the reappearance of tenement conditions and insure beautiful and harmonious development with a uniform sky line in each zone of the city.

Industrial Sections

Within certain limits municipalities control the nature of suburban development. Factories which in any way offend the neighborhood in which they are located may be required to move to the suburbs, on the general theory that a man must so use his property that it does not interfere with a like use on the part of his neighbor. Municipal by-laws also control the factory and industrial areas. This is done by the building regulations referred to above as well as by the natural proximity to railways, docks and harbors. The territory immediately adjoining the railways is dedicated to industrial uses, and factories are required in many cities to locate on that side of the city away from the prevailing winds. This reduces the smoke nuisance to a minimum. These regulations are not made arbitrarily, but are fixed by obvious conditions. In territory surrounding an industrial area, house building regulations are adjusted to working men's homes, as are the street plans.

Land Ownership

The German city has always been a landlord on a large scale. From earliest times German villages have owned forests and other land in common and have used it for the gathering of fuel, for forestry and agriculture. With this heritage of tradition, the transition was easy into the ownership of municipal land, and German cities are buying, holding and selling land the same as private individuals. Berlin, for instance, owns land to the extent of 240-8-10 per cent. of its total area, including the land held outside of its boundaries. Frankfurt, a city of 335,000 population, owns 48 9-10 per cent. of the land within its limits; Mannheim owns 35 4-10 per cent. of its own land and Hanover 37 7-10 per cent. of the land within its limits.

Much of the land so owned is in streets, open spaces and parks, but very large areas are also owned and rented or held for speculative purposes.

Cities anticipate their future needs in a far-sighted, intelligent way. Before a new territory is opened up for residence, the city authorities acquire land for play-grounds, gardens and sites for school houses and other public buildings. The purchase of these lands far in advance of the city's growth, saves the city from prohibitive prices and the necessity of cramping the sites of public buildings. It also makes possible the most generous provision for recreation and open spaces, and in the new suburbs of German

cities, play grounds and gardens of the greatest variety are found within easy walking distance of almost every home.

This policy of land acquisition is but part of the far-sighted outlook on ordinary city growth and is defended on the grounds of ultimate economy as well as on those of proper city building. Only by this policy it is possible to provide adequately for the orderly and harmonious development of the city.

Taxing the Unearned Increment

After discussing the question of excess condemnation whereby increasing land values are made to pay the cost of many municipal undertakings, and the safeguarding of riparian rights by German municipalities, Mr. Howe took up the subject "German Experiments in Taxing the Unearned Increment," as follows:

Improved land is taxed less heavily than unimproved land. This tax has spread very rapidly to other cities and is yielding a very substantial return.

In the spring of this year the German Parliament, recognizing the obvious justice of this measure, adopted a bill unifying the unearned increment tax of the cities and appropriating a portion of its yield to Imperial and State purposes. The local ordinances of the various cities are repealed by this act. Under this bill the revenue of the Imperial Government is estimated at \$6,000,000 per annum, which is approximately one-half of the total yield. Ten per cent. goes to the several states of the empire and forty per cent. is retained by the cities. Municipalities are authorized to increase the rate of federal taxation and retain the excess return in their local treasuries. Under this new Imperial bill, ten per cent. of the land speculators' profits are taken if the increase in value amounts to ten per cent. of the value of the property. From this it rises to a rate of thirty per cent. of the profits where the increase in value amounts to forty per cent. or more.

Municipal authorities assert that the unearned increment tax has a tendency to discourage land speculation. The burden of the tax leads to the sale and development of property and the lower rate on improved property discourages speculation still more. In addition to this, it yields a very substantial revenue, the city of Hamburg collecting \$800,000 from this source last year.

The German experiment has been widely heralded in this country and proposals have been put forward for the taxation of unearned increment according to the German method. We have already, however, a much more efficient means of reaching increasing land values and a much more effective method of discouraging speculation and of forcing land into use. Up to very recently, Germany had no experience in valuing land at its capital value; the system which obtains in this country. In taxing property they adopted a method more in harmony with their system and traditions of local taxation.

In America land values are assessed in all our states each year, every other year, or at most, every fourth year. The cities of New York, Boston and some other communities separate land values from improvement values in making their assessments. These cities better than any other, show in the tax returns the increase in land values, and open up to calculation the fund available for taxation. Cleveland revalued its real property in 1910 and discovered that in ten years' time land values had increased by \$177,-

000,000. During the same period population had increased by 172,000. The increase in land values amounted to \$1,000 per capita. The reports from other cities indicate that this proportion obtains pretty generally in growing cities.

This source of revenue can be easily tapped by abandoning the taxation of improvements and personality and permitting the whole burden of local taxation to fall upon land values. This can be achieved in some states by a simple act of the legislature; in others by constitutional amendment. The result would be to increase the tax on land values and correspondingly augment the revenues of the communities from this source.

This is the method employed in the cities of western Canada and especially in Vancouver. In the latter city improved values were reduced by 25 per cent. in the first instance; by 50 per cent. in the second, then to 25 per cent., and finally, taxes on houses and improvements were abolished altogether. All of the direct revenues of this city are now being collected from a tax on land values.

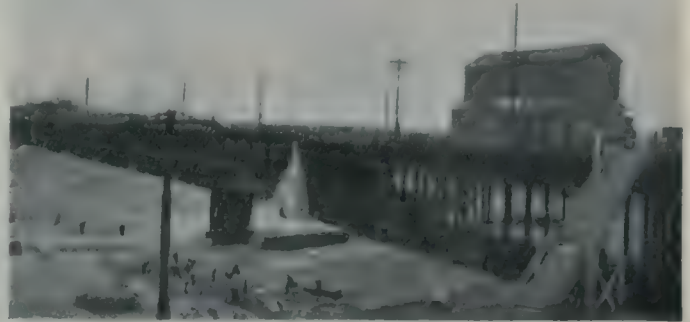
The result of this shifting of taxation is perfectly obvious. It encourages building operations and stimulates the use of land. It becomes too costly to hold land idle. The result is an encouragement to building and the beautification of structures. There is no fear in the minds of the owner of being penalized for improvements. Further than this, speculation is discouraged. If the tax is high enough, it is made impossible. The burden of taxation is so heavy that land can no longer be held out of use. When the taxes increase to this point, land values begin to depreciate rather than constantly to appreciate, which opens up sites for building, for homes and for development.

It is conceivable that with the tax increased sufficiently, private land values will disappear altogether, for the city will have appropriated the entire rental value in taxation. This method, suggested in part by the Committee on Congestion in New York City, which proposed reducing the taxation on improvements to one-half that on land values, is infinitely preferable to the German system, for it not only will yield adequate revenues, but it imposes a permanent burden upon land speculation and gives a continuous stimulus to improvements.

New Montreal Viaduct

The largest and most costly viaduct in or around Montreal is probably that built over the Place Viger Railway Station yards along the line of Notre Dame Street. To permit of the enlargement of the Viger yards it was necessary to remove hundreds of thousands of cubic yards of earth which constituted the mound between Craig street and the water front. On the site of this land was a number of prominent buildings, including the Montreal Brewery, Viau Company's biscuit factory, Paquette's planing mill, and a number of stores with dwellings overhead. This left a big gap and destroyed the continuity of Notre Dame street. As it was necessary for this prominent thoroughfare to be kept open for traffic a temporary bridge was erected, and operations were commenced for the construction of a huge cement viaduct of reinforced concrete which has now been practically completed by the contractor, Mr. E. G. M. Cape. This viaduct is 1,006 feet long. The floor of the bridge, which is at the same time the roof of the viaduct, is

26 feet above the ground, and 52 feet wide, allowing plenty of room for two car tracks, two traffic roadways and two passenger sidewalks. In the viaduct are twenty bays of an average length of twenty feet each. Through a number of these, railway tracks enter the yards at both ends. The space under the bridge, except at the points where the tracks pass through, will be utilized for freight purposes; and on



The Notre Dame Street Viaduct at Viger Station, Montreal

the south side of the viaduct will be two large warehouses or sheds—one for incoming and the other for outgoing freight. These will be built of steel and concrete. The work has just been commenced on them, the contract having been awarded to Mr. C. E. Deakin. At present there are twelve tracks in the yard, but there is space for seventeen, which will be separated by the usual promenades and roofed over. It will be late in the fall before all the improvements being made at the Place Viger station will be completed.

Sliding Forms for Concrete Walls

An article appears in a contemporary describing a novel method of erecting forms for concrete work. The forms are arranged to slide continuously up the wall as the concrete is poured. These are built four feet in height and are easily lifted by screws working against the pipes placed in the poured walls. The present development for these forms is for high, straight walls, but it would seem that there is plenty of opportunity for their wider application.

The cost of the labor under these forms is estimated to be in the neighborhood of 32 cents per square foot of forms for the making, and about 1 cent per square foot of wall for raising. From this it is easy to calculate where the line may be drawn between stationary and sliding forms.

If we assume that the labor cost on wall forms for building is 8 cents per square foot, and the labor on the sliding forms costs 32 cents per square foot for building the forms to 4 feet in vertical height, and 1 cent per square foot for raising them, then the point at which a wall, using sliding forms, will equal the cost of a wall using ordinary forms, will be about 18 feet in height of wall. Above that point the cost of labor on the forms would be 8 cents per square foot for stationary forms as against 1 cent for sliding forms.

It is obvious that the application of sliding forms is limited to buildings with straight plumb walls, as the forms are at present constructed. It would seem, however, that concrete design might be adapted in some cases for the use of such forms.



The Proposed Edmonton-Strathcona Bridge.

The Edmonton-Strathcona Steel Bridge

Immense Double-Decked Structure has Piers Completed—Illustration Shows Interesting Form-Work

Special to the Contract Record.

The above illustration shows the appearance this magnificent double decked structure will present when completed.

The requirements called for a single line of railway, two street railway tracks, a traffic roadway and

feet wide, is to be spanned by three large steel spans of approximately 293 feet in length, carried on four massive concrete piers which reach to a height of 96 feet above low water. The long approach to the river on the south side consists of steel towers carrying 49-foot truss spans and connected by similar spans of 97 feet 8 inches in length. On the Edmonton or north side of the river the structure consists of concrete piers and steel bents, with one steel tower.

The river piers are of mass concrete, being 40 by 80 feet at the base and carrying on this area a sloping cutwater which rises at an angle of 60 degrees to a height of 26 feet above low water and then dies into the main body of the pier at a flatter angle. The top portion of these piers, which have a batter of 1 in 15 on all four sides, is slightly enlarged by a curve at the top and finished off with a coping. The two large piers on the north and south banks of the river are of similar design, but without the cutwater, and are 42 by 54 ft. 6 in. and 37 ft. 6 in. by 54 ft. 6 in. on the base respectively.

The method of adjusting the forms and of hoisting the concrete is shown in the illustrations; the one showing two of the four piers practically completed in so far as concrete work is concerned, and the third in an earlier stage of construction.

At the present time, three of the piers have been completed, and work has been commenced upon the abutment on the south bank of the river. The foundations for the pedestals in both river banks are also installed.

two sidewalks. This necessitated the design of the bridge being of the double deck type, the upper deck to carry the tracks, the lower the roadway. The arrangements of the upper deck provide for a single line of railway with a street car line on each side; while the lower deck consists of the roadway, 23 feet wide in the clear, with two 8-foot sidewalks carried on brackets. The river, which at this point is 800



Strathcona Bridge Looking North, River Piers Under Construction.

Work on the Canadian Pacific Railway dock extension at Victoria has been commenced and will be rushed with all speed, as an enlarged docking space is sorely needed.

British Dust-Problem Statistics

The Roads Improvement Association has made an investigation of the dust problem in the United Kingdom and the results have been published. The information was obtained by circularizing the road authorities in different parts of the country.

In regard to the preparation of the road for treatment with tar, 56 surveyors pointed out the necessity of thoroughly cleansing the road from dust by sweeping it first with machine brooms and afterwards with hand brooms. Other replies, while more general, indicated that the road should be in good condition.

As to the kind of tar used and the price, 134 authorities used crude or ordinary gas tar; 25 used distilled or refined tar; and 6 used oil-gas tar. The prices

Asked as to what material was spread over after treatment, 77 authorities replied that they used sand; 37 used small ($\frac{1}{4}$ inch) granite chippings and granite dust; 10 used large (over $\frac{1}{4}$ inch) granite chippings; 14 used limestone chippings or dust; 8 used slag chips or slag dust; 19 used road grit removed from the road before treatment; and 15 used local materials, such as shingle, pea gravel, cinder dust, etc. In 5 cases no material was placed on the road after treatment. Several surveyors express the opinion that granite chippings are the best material.

As to the method of spreading the tar and the cost, in 84 cases hand spreading was used, while machine spreading was practiced in 49 cases.

The average cost for treating the road surface, including all expenses of preliminary sweeping, tar, sand, or other material spread after treatment, and labor, varied between 1.4 cents and 6 cents per square yard. The usual cost was 2 to $2\frac{1}{2}$ cents when machine spread and $2\frac{1}{2}$ to 3 cents when hand spread. Where two coats had been given the cost of the second coat was much lower than the first.

In 61 cases the treatment lasted a season, 6 to 9 months; in 54 cases, 12 months; in 5 cases, over 12 months; and in 5 cases less than a season. In several cases when giving the road a second treatment it was necessary to treat only the centre of the highway, the sides remaining in fairly good shape. In some districts the treatments lasted two years.

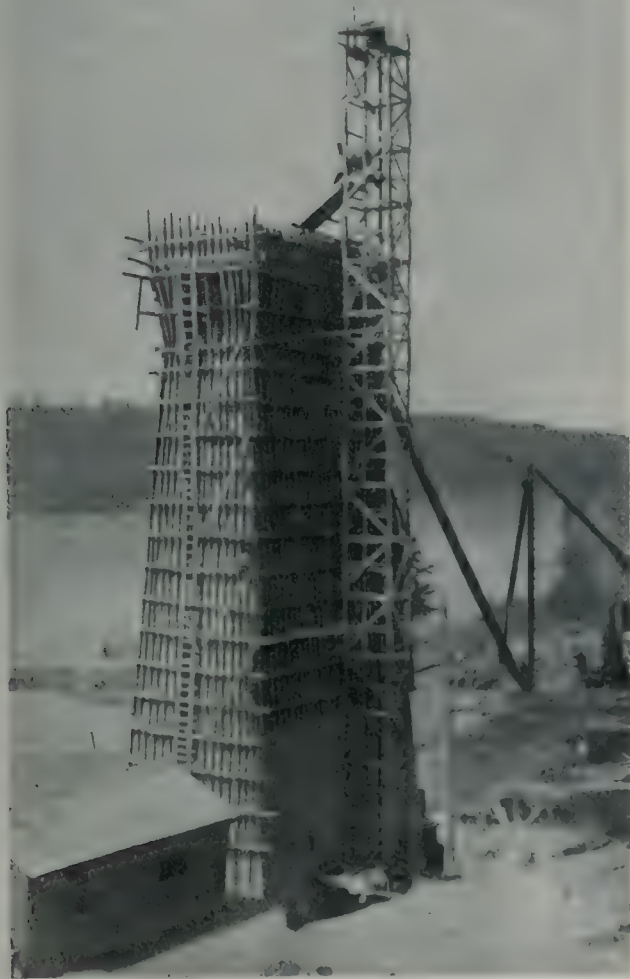
Calgary can well point with pride to its municipally owned and operated street railway system. Installed in July, 1909, with only $16\frac{1}{4}$ miles of tracks and four cars, it has been a revenue producer from the commencement. More cars were added as rapidly as possible and during the first six months of its existence the system showed a net profit of \$10,001.37. In 1910 the system had 22 miles of tracks and operated 18 cars. The revenue for 1910 was \$214,778.44, with a profit of \$101,739.90 over operating expenses, or \$55,815.28 after interest, sinking fund and \$10,000 contingent account was set aside.

During the first four months of 1911, from January 1st to April 30th, the revenue was \$88,336.97, and operating expenditure \$63,935.90, leaving a net profit, after deducting interest, sinking fund and five per cent. of gross earnings as a contingent fund, of \$24,401.60. The receipts for the month of June, 1911, amounted to \$32,300.

The system as it stands at present cost the rate-payers about \$500,000. On this investment a profit of 18 per cent. has been made.

During 1911 an additional \$500,000 will be spent for the purpose of laying 22 miles of trackage and purchasing 12 additional cars to successfully operate the extension of the system.

Waterproofing blue prints, to be carried into wet mines or tunnels, is accomplished by the following process, according to the "Mining and Scientific Press." Immerse in melted paraffine until saturated a number of pieces of an absorbent cloth 1 foot or more square. When withdrawn and cooled they are ready for use at any time. To apply to a blue print, spread one of the saturated cloths on a smooth surface, place the dry print on it with a second waxed cloth on top, and iron with a moderately hot flatiron. The paper immediately absorbs paraffine until saturated, and becomes translucent and completely waterproof.



Strathcona Bridge, Pier on North Bank Under Construction.

varied from 2 cents to 8 cents per gallon, the usual price being between 4 and 5 cents. Twenty-nine authorities used specially prepared tarry materials, such as Tarvia, Tarmite, Clare's Patent Tar Compo, and Dustabato.

In 33 cases the area treated per gallon of tar was between 3 and 5 square yards; in 99 cases it was between 5 and 7 yards; in 19 cases, between 7 and 9 yards; and in 5 cases more than 9 yards. When specially prepared tarry materials, oil-gas tar, or ordinary tar mixed with oil was used, the average spread to the gallon was greater than when crude or distilled tar was employed.

The Manufacture of Asphalt Paving Blocks

The Process Requires Accuracy in Combining Ingredients—Subjected to Numerous Physical and Chemical Tests—Example of Block Analysis

By Howard C. Hottel

Asphalt blocks are being used extensively on the residence streets of our larger cities and also for streets of heavy traffic in the smaller towns, and have become quite a factor in paving work.

The average asphalt block contains from 6 per cent. to 8 per cent. of asphaltic cement or bitumen, and the remainder, comprising over 90 per cent., is composed of crushed stone, known as the mineral aggregate, the coarsest particles of which are not larger than $\frac{3}{8}$ -in., and exceedingly fine dust or filler, composed of limestone or cement, or a mixture of the two.

Trap rock has been found to make the best mineral aggregate. The stone brought from the quarry is first crushed and then separated mechanically into two classes, called fine and coarse material. The former, as it leaves the crusher, passes into a storage bin and seldom contains any stone larger than 0.1 in.; the latter enters another bin and contains the larger particles of stone.

The fine and coarse stone flow by gravity from the storage bins to a rectangular shaped weighing box mounted upon a scale. The proportion of fine material, coarse material and filler are weighed into the box and then dumped into the mixer.

The mixer consists of a rectangular shaped shell with semi-circular bottom, through the centre of which there are two horizontal square shafts, fitted with blades, or teeth, as they are commonly called. The teeth are made in two different shapes, called right-hand and left-hand, and are so set upon the shafts that when the shafts revolve they work the material horizontally towards the centre, and at the same time are continually tossing it vertically.

After the fine and coarse material and filler have been dumped into the mixer, the asphalt cement is then poured or run directly into the warm, dry mixture.

In the preparation of the asphalt cement great care is taken in combining the asphalt and flux. The asphalt is weighed out, melted and raised to a temperature of about 300 deg. F. The flux which has also been previously heated is slowly run into the melting tank containing the asphalt. The two are then agitated, with air or steam, until thoroughly mixed, which generally requires from three to four hours.

The result of mixing the asphaltic cement with the dry mineral aggregate produces within two or three minutes an absolutely homogeneous mass. After this is accomplished the hot mass is discharged into a truck or dump car by pulling a lever, which opens a slide in the bottom of the mixer.

The hot mixture is then ready to be shaped into the form of a block. The block presses are operated by electric power and the hot mixture as it falls into the mold box is subjected to a total of one hundred and twenty tons pressure. This pressure is applied to the top, bottom and two sides of the block by four springs. The hot mixture is carried by the dump car to a platform above the press. From here it is

shoveled into a hopper which leads down to the mold box. The press is then started, and after the springs have compressed the hot mass into the form of a block, it is carried forward, as the springs relax, and falls upon a sloping iron plate. Here it is caught up by a laborer, measured and inspected. If it is out of shape or distorted it is cast aside. If it measures up satisfactorily, it is placed upon a conveyor and is cooled by passing through water. After emerging from the water bath, in which they have remained from 15 to 20 minutes, the blocks are again measured, placed upon cross conveyors, loaded upon cars and are then ready for shipment.

One batch of 1,500 pounds, from the mixer, will make from 70 to 80 blocks, and a plant with five presses in operation has a capacity of from 20,000 to 30,000 blocks a 10-hour day.

Physical and Chemical Tests of Asphalt Blocks.—

Various physical and chemical tests are made upon asphalt blocks to determine their probable efficiency. The principal ones include breaking, rattler and impact tests, while the main chemical one is the extraction of the bitumen.

The breaking test is made as follows: The block is placed upon two lateral supports with the widest face uppermost. These supports are equidistant from the middle of the block and the pressure is applied, at the middle, along a straight line across the entire width of the block. As the wedged shaped piece of cast iron passes down upon the block, the amount of pressure required to break the block is automatically registered. It should be noted here that the block which gives the highest value in this test is not necessarily the best block, as one made with an extremely hard asphalt cement gives a higher test than one made with a cement of greater softness, which quality is more desirous in a cementing material. The value obtained by this test is also known as the modulus of rupture, and if it is required to perform the test at other than ordinary temperatures, it can be done under water cooled or heated to the temperature desired.

The impact test is supposed to represent as nearly as possible the blows of traffic. The block is firmly placed upon a cement base and the blow is delivered through a spherical end plunger resting upon the centre of the widest face of the block. The block is so adjusted that the spherical end of the plunger is pressed firmly upon it by two spiral springs, which surround the plunger guide rods. The blow is struck by a hammer weighing 2 kilograms, which is raised by a rope and pulley, and released automatically. The test consists of a 1 cm. fall of the hammer for the first blow, and an increased fall of 1 cm. for each succeeding blow until the block breaks. The number of blows required to break the block represents the toughness. This test can be made at nearly any temperature desired and is easily operated. It was first designed by L. W. Page, director of the United States Office of Public Roads, for the purpose of testing rock.

The rattler test is supposed to represent the wear and tear upon a pavement from horses' hoofs and wagon wheels. It consists of placing from 18 to 20 blocks in an iron shell, which is made to revolve. After the blocks have been tightly wedged into position, so that they will not move and so that they present a level surface, a shot charge of fifty pounds is next placed in the rattler. The shot are composed of 2½-in. cast iron cubes, having sharp corners and weighing about four pounds each. The cover is then placed upon the rattler and it is revolved at a uniform speed of 37 revolutions per minute. The revolutions of the rattler are recorded automatically upon a dial and one test consists of 10,000 revolutions.

The blocks are weighed before and after the test and the loss in weight calculated to percentage and the average loss reported. This test can be performed at almost any temperature desired, providing the rattler is installed inside a small ammonia refrigerating compartment which can be operated in conjunction with the rattler. Out of over thirty different tests made by the writer upon blocks made from Trinidad asphalt, Bermuda asphalt, Gilsonite and Bermudez asphalts and California Pitch, the average loss was 8.7 per cent. The highest loss of any one lot of blocks was 10.98 per cent., the lowest of any one lot 7.02 per cent.

The percentage of bitumen is obtained by extracting with either cold carbon bisulphide or hot benzol. The former determination is made by placing several hundred grams of the mixture from which the block is made, in a bronze cone. The cone comes in two pieces, and after the material is placed inside, the top piece is firmly fastened to the bottom with a felt ring intervening. Carbon bisulphide is then poured in through openings in the top, the cone is swung in a small centrifugal machine having an unusually high speed, and the solvent filters out through the felt ring. The operation is repeated until the solvent comes through clear. The latter method consists of placing the material in a Soxhlet apparatus and making a continuous extraction with hot benzol.

The analysis of a block picked out at random is herewith appended:

Size—12 x 5 x 3 inches.

Weight in air—15 lbs. 7 oz.

Weight in water—9 lbs. 4 ozs.

Specific gravity—2.5.

Voids—2.3 per cent.

Appearance of block—Compact.

Impact at 77 deg. F.—46.

Bitumen—7.3 per cent.

Passing 200 mesh sieve—17.1 per cent.

" 100 " " 6.3 "

" 80 " " 4.0 "

" 50 " " 4.0 "

" 40 " " 3.3 "

" 30 " " 1.7 "

" 20 " " 6.3 "

" 10 " " 12.0 "

" 8 " " 8.0 "

" 4 " " 28.0 "

Retained on 4 " " 2.0 "

Specific gravity of mineral aggregate—2.92.

Character of mineral aggregate—Contains weathered stone.

Penetration of asphalt cement—30.

Ductility of asphalt cement—15cm.

Average loss in rattler—7.5 per cent.

The density of the mineral aggregate is then se-

cured by using either Jackson's or La Chaslier's apparatus, the same as are used universally in determining the density of cements. The mineral aggregate is then passed through various sieves in order to determine whether it is graded properly, and this completes the analysis of an asphalt block.

From the amount of bitumen, the density of the block and the density of the mineral aggregate, the voids are computed. Some of the better grades of block will run as low as one per cent. in voids, which goes to show that the mineral aggregate is thoroughly coated with the asphalt cement and that enough filler has been added to make a compact block.

—Good Roads.

Testing Concrete Materials

A progress report on testing materials and specimens of concrete was given by the Tests Standing Committee of the Concrete Institute at its annual summer meeting in London. The materials employed in concrete were classified under the headings of coarse material, sand, cement, water and steel. The report dealt with coarse materials for reinforced concrete that passed a ¾-in. mesh but were retained on a ¼-in. mesh screen, and classified them as pit gravel, crushed pit gravel, river gravel, crushed river gravel, sea gravel, crushed sea gravel, crushed rock, crushed brick, crushed slag, clinker and coke breeze, but did not recommend slag, clinker and coke breeze as suitable for reinforced concrete. Very little information had been presented to the committee on the grading of coarse materials and sand, but it was of the opinion that to obtain the best results in concrete these materials should be properly graded.

As the result of tests, the rejection of sand that is not retained on a No. 50 screen was recommended. It had been found, the report states, that standard sand and cement in a proportion by weight of 3 to 1 had a crushing strength of 2,789 lb. per square inch after 28 days, and porphyritic granite or blue whinstone crushings which passed a No. 30 sieve, including all dust, had a strength of only 606 lb.; the tensile tests were respectively 234.6 and 104 lb. per square inch. The crushing strength should be ascertained by means of cubes of 3 parts of standard sand to 1 part of cement by weight, made up and treated similarly to briquettes of sand and cement for the tensile test. These cubes should be 3 inches on a side and the crushing strength not less than ten times the tensile strength at twenty-eight days, as required by the British standard specifications.

Steel reinforcement should show an ultimate tensile strength of not less than 60,000 lb. per square inch, an elastic limit of at least 34,000 lb.; the contraction area at fracture should be not less than 45 per cent.; a bar 1 inch or less in diameter should show an elongation of not less than 25 per cent., measured on a length equal to eight times the diameter of the bar tested. If the bar is over 1 inch in diameter the elongation should be measured on a length equal to four diameters of the bar, and should be not less than 30 per cent. All steel should be subjected to a bending test to an angle of 180 deg. around a diameter equal to that of the piece tested, without fracturing the skin.

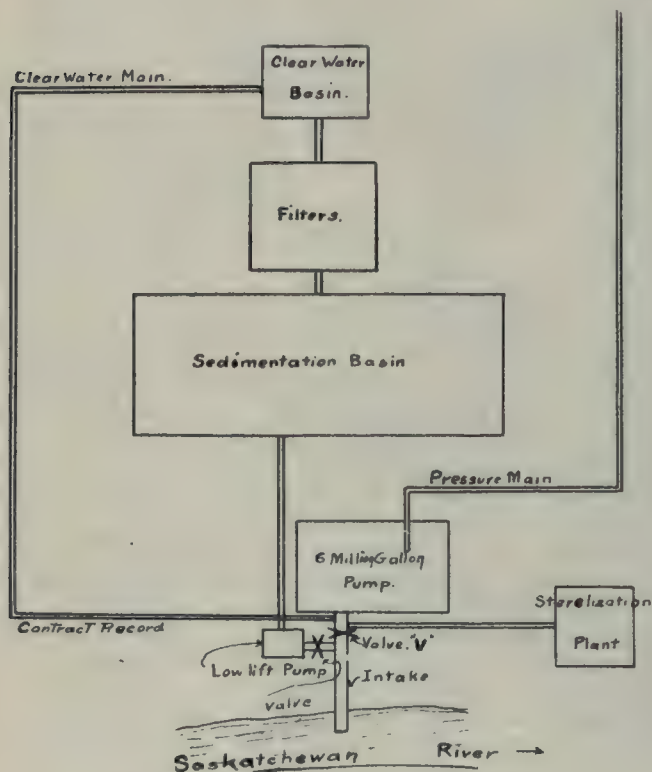
The sawmills of the Riordan Paper Company at Calumet, Que., were destroyed by fire at a loss of nearly \$1,000,000.

City of Edmonton Sterilization Plant

Turbidity of Saskatchewan River in Summer causes Annoyance—Chloride of Lime Apparatus Employed—Description of the Plant

By H. P. Burrell, Special to the Contract Record

The City of Edmonton, which is situated on the north bank of the Saskatchewan River, draws its water supply from the river direct by means of intake pipes, which are carried out into the river. In the winter months the water is pumped directly from the river to the mains, as at this time of the year the water is clear. In the summer months, however, when the water is very turbid, the filters are put in use, and part of the water supplied is filtered. As there is no settlement higher up the river, the water can be considered free from bacteria, and for this reason the system was considered satisfactory until last winter.



Diagrammatic sketch of Pumping Plant.

In December, 1910, a typhoid epidemic broke out in the city of Strathcona, which is separated from Edmonton only by the river, and soon became so serious that the authorities decided to sterilize their supply of water. This water, which was drawn, like Edmonton's, from the river, was allowed to filter through the gravel of the river bed, and was pumped into the mains from wells, while the water from Edmonton had no filtration or treatment of any kind whatever.

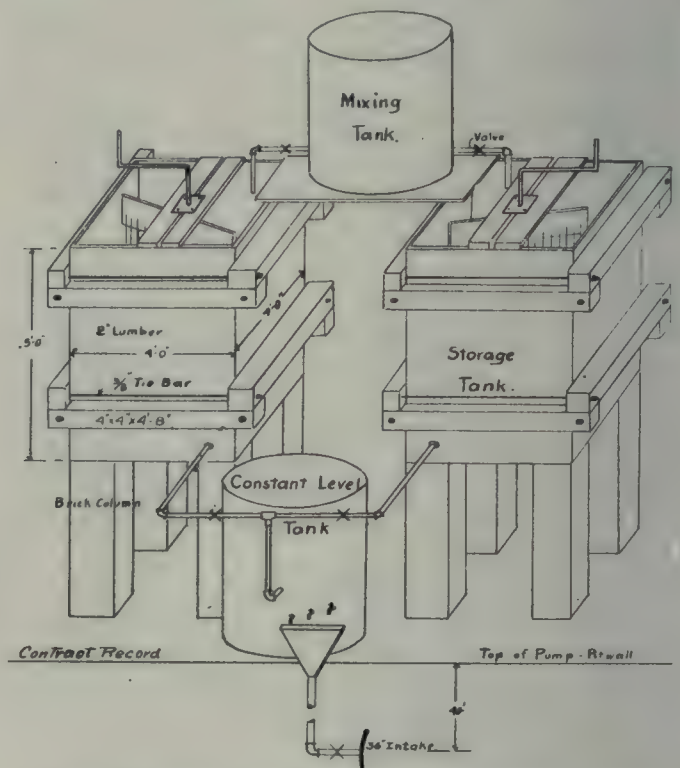
Although the epidemic was confined to the south side of the river, the City Commissioners of Edmonton thought it advisable to erect a sterilization plant, so that should anything occur to warrant it, the water could be sterilized.

The water is pumped into the mains by two pumps, each with a separate intake and separate main

for some distance after leaving the plant. The two pumps consist of a centrifugal pump direct coupled to an electric motor having a rated capacity of three million gallons per diem, and a triple expansion steam pump of six million capacity per diem.

It was decided to place the sterilization plant where it could treat the water pumped by the six million gallon pump, the smaller unit being kept more as a stand-by, and if the water from both pumps were to be treated, it would mean fitting up two independent plants for reasons given above.

Fig. 1 gives a general idea of the pumping plant, the plan in choosing this layout being to draw the



Prospective sketch showing general disposition of plant.

water through the 36-in. intake and in winter to pump it direct into the mains. In the summer, however, the valve V would be closed and the water lifted by a low-lift pump to the sedimentation basin, from which it was to flow by gravity to the clear water basin by way of the filters. From here it would find its way back to the intake, back of the valve V, and so into the pump.

The sterilization plant had to be so placed that the solution would flow into the intake, after all possibility of contamination was over. As the clear water basin is uncovered, the solution is fed in back of the valve V and is thus available for both summer and winter. The solution will be thoroughly mixed in the mains for it to act before delivery to the consumer. The pump stands in a pump pit over forty

feet deep and the sterilization plant stands on the wall of the pump pit over the intake.

The plant (see Fig. 2) consists of one mixing tank, from which the solution flows into two storage tanks fitted with agitators, from there to a constant level tank, and then to the intake.

The mixing tank is made from a 2-foot concrete sewer pipe with the bottom closed in with a 1 to 3 cement mortar. The sides of the pipe were also brushed over with cement to make them quite water-tight.

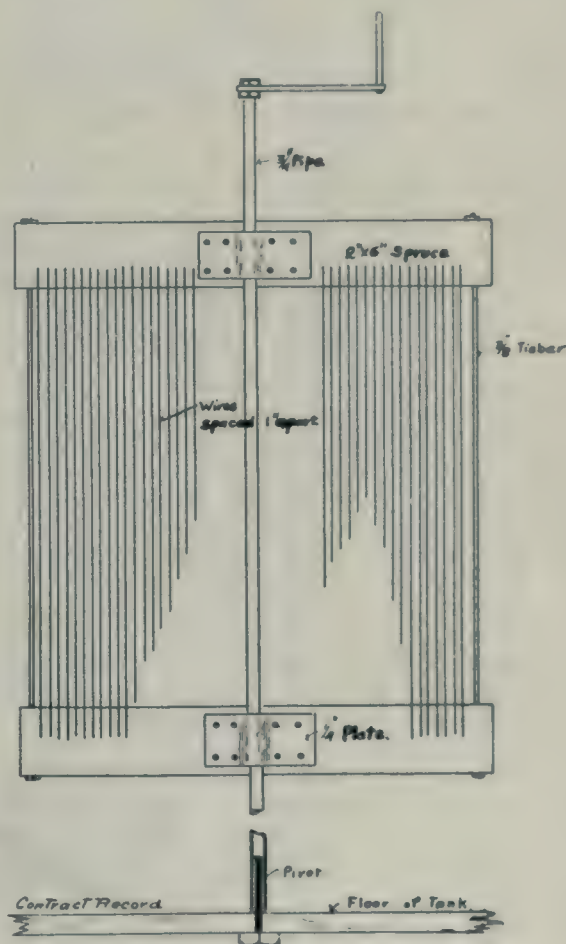
Graduations are provided giving the amount of water required for 1, 1.5 and 2 pounds of chloride of lime to give one-half per cent. solution. A 1-inch water main was extended to give water to the mixing tank, as a great deal of time is taken up making the solution. When the chloride of lime is completely dissolved, the solution flows by way of two 1-inch iron pipes, fitted with valves, into the two storage tanks. These tanks are built of 2-inch tongued and grooved pine and are 4 x 4 x 5 ft. high. The sides are held against bulging by 4 x 4 in. pieces of tamarac, tied together with $\frac{3}{8}$ -in. bolts. The agitators are made as follows: to a $\frac{3}{4}$ -in. iron pipe 6 feet long, are bolted two pieces of 2 x 6 in. lumber, 3 ft. 6 in. long (see Fig. 3). These pieces are held together at their ends by two $\frac{3}{8}$ -in. bolts, and from other points, about 1 inch apart wire strands are stretched from one to the other. The top end of the pipe is fitted with a handle and the lower end fits over a bolt, which goes through the base of the tank and forms a pivot. The agitators worked very well, the wires causing a great many currents in the solution. The inside of these tanks was painted with three coats of waterglass, to see if this would protect the wood from the action of the solution. The tanks, however, proved to be far from water-tight, and so they were plastered with cement mortar one-half inch thick on metal lathing, so that the waterglass was not given a trial. From the storage tanks, the solution flows through two 1-inch pipes, fitted with valves, to the constant level tank. This is also made out of 2-inch sewer pipe and fitted with a float valve to regulate the supply, and three taps with different hydrostatic heads, to regulate the discharge. The float valve worked very well, and as the opening is only one-half inch and the solution brought to it by two 1-inch pipes, the flow is so much faster through the valve, that there is next to no chance of incrustation changing the flow in the future. The taps are placed at 17-in., 18-in. and 19-in. from the water level, and each tap is opened to its fullest capacity when in use. The reason for this was, that it would not be satisfactory to use the taps partly open, owing to the uncertainty that would exist as to the amount flowing through the taps. The taps used were found to give too great a discharge, so that the ends were plugged with solder and drilled with holes $\frac{3}{32}$ inch in diameter. Here also the flow would be very fast through the regulating aperture, so that there would be hardly any chance of incrustation here to change the flow.

From the taps the solution flows into a funnel, and from there into the intake by way of a 1-inch pipe. Just before the pipe connects with the intake, a valve has been fixed, and when the plant is working, the valve may be partly closed, so that the pipe is partly full of solution, this preventing the pump from sucking air. When not in use the valve may be closed completely and all air shut out.

The graduation of the apparatus was based on the

revolutions per minute of the pump. For a certain number of revolutions, certain taps had to be opened, and if the speed of the pump varied, the combination had to be changed to suit the new speed.

Owing to the fact that this plant acted only on the water pumped by the six million gallon pump, and that at the time of the installation this pump was under repairs during the day, tests on the water could not be carried out, as there was always a lot of untreated water in the mains. However, as the solution used was one-half per cent., and the displacement per revolution of the pump also known, it was easy to calculate how much solution would be used for a given speed of the pump. The storage tanks were filled up and the level of the solution carefully ascertained after the tap to be tested had run long enough to insure the level in the constant level



Agitators for storage tanks.

tank having become constant as with the taps closed. The level was about $1\frac{1}{2}$ inch higher than when the plant was in operation. The solution was then allowed to flow for twelve hours, and the difference in level being ascertained, the amount of flow per minute through the tap could be calculated, and thus the corresponding number of revolutions per minute of the pump for that tap found. This was done for each tap and each combination of taps giving the table below.

No. of tap to be used per R.P.M. of pump.						
R.P.M. . . .	20	27	30	37	50	57
Tap No. . . .	1	1 & 2	3	3 & 2	1 & 3	1, 2 & 3

For permanent operation the water could be tested, and thus any uncertainty as to the slip of the

pump and value of free chloride in the chloride of lime would be of little account.

If a plant of this description be not in use, it should be washed out and allowed to stand dry, since if not, the rust will eat into the iron parts of the float valve, change the level in the constant level tank, and render all former graduations useless. In fact, all steel or iron around such a plant much be well looked after, as the chloride of lime soon rusts it.

Building Laws

The first requisite is clearness—what the law intends must be quickly and readily understood. A code should also, as far as possible, be concise in form. Its provisions should be expressed in short, separate sentences, not in long involved paragraphs. Precision is of vital importance. All terms should be carefully defined. On the other hand, such laws must be so drawn as to stand the test in the courts. In a word, they should be as if written by laymen for laymen, and yet at the same time so carefully drawn that every word has its exact legal value and says neither more nor less than is intended.

The great and vital thing overshadowing all others in importance is that there shall be uniformity of treatment for all persons affected by a building code. There must be no discrimination between individuals, nor any opportunity for such discrimination. Affecting, as it does, vast property interests, it must be based upon foundations of justice and fairness.

Discretionary Powers.—And yet, it is at this point that most building laws fail, viz., in their treatment of the granting of discretionary power to the enforcing officials. Every architect and every builder will tell you that he is in favor of discretionary power, that it is essential, as the building industry is a constantly changing one and because building laws cannot be rigid.

There must be flexibility to them or the building industry will suffer; the architect must have free play for the exercise of his originality. If you question him, however, he will admit that it is in the exercise of this discretionary power that municipal corruption lies.

In this subject is wrapped up nearly everything of importance in a building code. There is little use in providing with minute care for the thickness of walls of certain heights, the methods of building firestops, the way in which plumbing shall be vented, if at the same time you give to your enforcing official the power to change all these requirements in his discretion.

Even with honest public officials, large grants of discretionary power are unsafe. They inevitably lead to favoritism, discrimination, arbitrary use of authority and nullification of the legislative intent.

There is much misunderstanding about the question of discretionary power, not only in regard to what it is, but also as to its necessity. In my opinion, the position of architects, builders and others in favor of large grants of power cannot be successfully maintained. Their contention, however, that building codes should be elastic enough to provide for changes and improvements in methods of construction is sound.

One does not involve the other. It is entirely feasible to provide sufficient elasticity to permit the use of new material and new processes as these develop,

without at the same time vesting in the enforcing officer the power to modify and set aside every provision of your building law. The granting of such power breaks down every principle of sound government. From time immemorial it has been recognized that enforcing officers should not also be legislative ones.

The New York City Code is a local ordinance, adopted by the aldermen, who meet once a week, and it is very easy—if some provision of a building law is wrong—to secure the necessary amendments to it through the regular legislative channels. No hardship is thus involved.

This is the only way in which building codes should be amended, namely, by the legislative bodies which enact them, not by administrative officers. Most important of all, however, is the fact that when a code is amended in this manner, the code is amended generally and affects all citizens equally. The public also is aware of what is going on and knows what it has to expect. It is also in a position to make known to the local legislative officials the reasons for or against any proposed change, and bring to bear upon them the full force of public sentiment.—(Record and Guide).

Prepared Roofing

Since the wholesale destruction of our forests and the general rise in the cost of shingles and other building materials, a demand for some other roofing material as a substitute has been created throughout the country. To meet this demand, materials of all classes—sheet metal, clay products, slate, cement and finest grade of refined asphalt—have been used to manufacture an article for this purpose. Unfortunately there has been much deception in this trade, says the Carpenter and Builder, for there has hardly been a roofing whose merit has won it a position in the market, but it has been followed by a cheap article with a cheap price, which from its looks could hardly be detected from its better made competitor.

There is one thing clear, however, which is, that the prepared or "ready" roofings have come to stay; that they are filling a position in our markets where there has been a lack; and to-day they hold one of the foremost places in the general building trade among high grade roofing materials. Further, a man who really wants a good roofing can get it by asking for it, provided he does not merely buy on a price basis but purchases those grades made by the standard concerns throughout the country.

Prepared roofing might be classified under two heads: 1, smooth surfaced roofings; 2, gravel, feldspar, slate chips, or other mineral surfaced roofings.

Smooth Surfaced Roofings

The smooth surfaced roofings have one layer of felt, which is usually saturated with an asphaltic liquid. This felt is surfaced on both sides with a thin coat of asphaltic material and finished with soapstone or something of similar character. In making the better grades of roofing they simply increase the thickness of this saturated felt, using similar asphaltic coatings and finishing materials. The terms "one-ply," "two-ply," etc., used to distinguish different grades, thus refer to the thickness of the felt and not to separate layers of material. In all reliable brands good quality felt is required in the manufacture, good material used in saturation, and great pains taken that

the felts are thoroughly saturated and literally filled with the asphaltic products used for this work. The manufacture of the felt is itself a most important consideration, as it requires skill and care to combine the necessary high absorptive power with sufficient tensile strength. Smooth surfaced roofing is supposed to be coated every few years and the coating for this purpose is sold by the manufacturer.

Mineral Surfaced Roofings

The surfaced roofings are made mostly from high-grade asphalts, applied on top of a foundation of alternate layers of felt and asphalt, the felts being lighter than those used in the smooth surfaced roofings. The upper layer of this asphalt is thicker and is heavily coated with gravel, mica, slate or some other mineral rock. These roofings differ from the smooth surfaced in that the latter depend largely upon the saturated felt, both for strength and durability, while in the rock-surfaced roofings this is not the case, the chief function of the felts being to support a greater amount of weather proofing material. There must be enough felts in the foundation to carry this extra material and furnish strength enough for easy handling in the trade and in application.

The roof is based on the theory that the asphalt and mineral surfacing used in its construction is in itself, when properly applied, indestructible, while the felt is more perishable—as is proved by the fact that it is of little use in a roof until thoroughly saturated with the asphalt mixture. Thus, in making roofing for high-grade buildings, where permanent durability is necessary, the mineral surfacing and asphalt are increased in quantity rather than the burlap or felt. These roofs have to be recoated at but rare intervals when manufactured from a good grade of asphalt.

Although the smooth surfaced roofings and the gravel or mineral surfaced roofings are often sold and recommended in competition with each other for similar purposes, and though both, when properly made, are good roofs, they really belong in two different classes of trade. The smooth surfaced goods—which are much lighter in weight than their gravel and mineral surfaced competitors, are used for the lighter construction work. They find a ready sale among merchants and dealers throughout the country, and, because of their lightness in handling and comparative cheapness in price, appeal to the general trade. Smooth surfaced roofing has one great drawback, however, that for some reason—possibly because its use has spread so rapidly—there are more cheap imitations of it than of any other roofing material in the country, and its purchase should be based on careful investigation.

The gravel and mineral surfaced roofings are sold largely in the general trade, but more particularly where permanent roofs are wanted. They make a fine appearance on residences and all classes of buildings when properly applied, and the fact that they are heavier than the smooth surfaced goods appeals to the higher class trade; but the difference in weight interferes with some grades of mercantile business because it makes an extra bother in handling. As a result, this business drifts towards large permanent work, such as fine business blocks, large buildings for factory and railway use, a large class of farm buildings, etc. An intermediate roofing is made by most of the manufacturers of the gravel and mineral surfaced roofings for the cheaper and lighter trade by using sand instead of gravel surfacing and a lighter top coat of the asphalt covering.

In prepared roofings quality as well as looks must be considered. Without exception, the manufacturers of high-grade roofings have recognized this fact and standard grades of refined asphalt are used in the manufacture of the roofing in combination with best grades of long-felt, wood felts of high absorptive power, insuring thorough and complete saturation.

Water-tight Joints

The first question an architect or practical builder considers in connection with a prepared roofing is the joint. This point needs attention. Some recommend using for the joints the hard cement of which the roofing is made, instead of the liquid cement. This hard cement is not quite so easy to apply, as it must be raised to the proper temperature; but it is more likely to ensure a tight roof. Some makers also lap the sheets from three to six inches instead of the regular two inches. A still greater improvement appears when a close weld with hot asphalt is made with the upper sheet to the two-inch lap of the lower surface of the under one, from which the mineral surfacing has been removed, leaving a surface heavily coated with asphalt.

The six-inch welded joint illustrated herewith, made by one of the leading manufacturers, merits special mention, for it not only has the principle of the joint produced by removing the mineral surfacing, leaving the heavily coated asphalt surface ready for the hot weld; but, in addition, has a four-inch extension of single felt beyond the ungraveled, marginal edge, which, when coated with hot asphalt of right temperature, gives an additional weld of a layer of felt as permanent as any other of the layers of felt used in the composition of the roofing. This joint is so perfected that it is not necessary to drive a nail through from the top of the roofing, all the nails necessary to be used being driven through the lower sheet into the roof and covered with the upper layer, which is then welded to the lower sheet.

The growth of the prepared roofing business during the last few years has been marvelous. Twenty-five years ago shingles, galvanized iron, tin, and slate represented all the grades of roofing sold, except a cheap felt for temporary work. To-day, in practically every city in the United States, from one to dozen different brands of high-grade roofing material are sold by the dealers. In Canada, nearly every town has dealers handling roofing, while in Buenos Ayres, S.A., at the recent exposition, the highest prizes were awarded to three grades of prepared roofing manufactured in the United States, and a fourth received honorable mention.

A recent suggestion regarding fireproof construction involves an idea which could be worked out to the benefit of better construction—that of levying taxes in relation to the risk from fire. If a fire tax were levied separately, the tax to be graded in proportion as the structure involved increased or decreased hazard, the net result would be to encourage the forms of construction which would decrease the fire risk. There could be no objection to admitting the public benefit by decreasing the risk in the form of a lower tax than such construction which tends to increase the risk. The present method of taxation tends to encourage the cheaper form of construction and also to penalize the safer construction by making it bear a proportion of its share of the cost of fire protection which the construction does not require.



Interior of No. 1 Structural shop showing both right and left sections

New Plant of National Bridge Company

**Extensive Steel Plant in Operation—Admirable Location—
Rapid Construction—Mr. J. L. Brower is General Manager**

Special to the Contract Record

Power has been turned on and the work in the shops started for this, the newest of the large steel companies in Canada. As first stated to the Contract Record last January, the plant was expected to be complete and in working order about July 1st, or just six months from the date that ground was first broken for the main buildings.

The machinery is all installed and all parts of the shops are now working full time. Power is supplied

eastern section of Montreal and also has access to the St. Lawrence River wharves adjoining the company's property. Very rapid construction has been made, and this is creditable also to Canadian manufactures, as the manager has stated that about 80 per cent. of the machinery has been manufactured in Canada.

The present capacity of the plant is 20,000 tons, which will be increased to 40,000 tons by the erection



Front View of National Bridge Plant at Longue Pointe

by the Shawinigan Falls lines of the Montreal Light, Heat & Power Company. No steam is used except for the heating of the buildings in winter. The staff organism is complete, even to the smallest detail, and a large number of draughtsmen are now engaged on contracts for a number of buildings and bridges.

The plant is located directly on the Canadian Northern Railway lines near Dominion Park, in the

of No. 2 bridge shop during the coming winter. This will bring the new plant to first or second place in the ranks of the bridge and structural companies in Canada for size and capacity.

The buildings now complete and in use are the main No. 1 structural shop 350 feet by 137 feet, and the power house, machine shop, templat shop, erection and paint houses, and stick yard, running of 80-

foot span and 400-foot run, the shipping yard, runway and cranes, 50 feet by 150 feet.

Among the numerous contracts already booked and going through the shops are the steel work for the Arena Gardens Company's rink, Toronto; the new power house for Canadian Westinghouse Company, of Hamilton; the St. Henry car barns for the Montreal Street Railway Company; the Strachan Building, the Walter Baker Company's building, extension to Macdonald College at St. Anne's and the Beauchemin foundry at Sorel.

The plant and mechanical equipment was designed and the construction carried out under the supervision of the general manager of the company, Mr. J. L. Brower, M.C., C.E., who is well known in the steel business.

The general contractors for the building were Messrs. Peter Lyall & Sons, to whom great credit is due for the rapid construction during the severe weather of the winter months.

The National Bridge Company is capitalized at \$4,000,000, only a part of which has been issued. The directors are all men of large means and prominent in the financial world, and include Messrs. J. N. Greenshields, Wm. Lyall, W. G. M. Shepherd, H. W. Beauclerk and the Hon. Robert Mackay.

A number of houses are now being built adjoining the works for employees, and further extensions are being planned.

Building Operations in Winnipeg

While the building permits issued in the city of Winnipeg for the first six months of the present year are slightly below those of the corresponding period of 1910, the difference is but a slight one, and lacking some of the large individual items which advanced last year so rapidly, would seem to represent an even greater development. There is one comment which should be made on this year's figures, and that is in the way of regret that they only include the building actually within the city, while there are many thousands of dollars' worth of work being done just outside the city limits. These districts receive a certain amount of fire protection from the city's service, for a large part of them can be reached from the city's hydrants in case of necessity; they are connected with the city telephone centrals, and they have the advantage of the same railway fares.

Another feature of the year is the rapidity with which the work is being carried on. The entire absence of labor troubles of a serious nature, and the fact that building materials have been plentiful at easy prices, have had a great deal to do with the amount of construction undertaken. Labor, too, has been plentiful and of fair quality. The erection of the grand stand at the Industrial Exhibition affords an instance of the elasticity of the labor situation. Without interfering with work in progress the city was able to secure sufficient capable men to erect a stand containing three-quarters of a million feet of lumber in five days. It took day and night shifts to accomplish the work, but it was done on time. Then, too, the material was available, and the rush demand for this amount of stuff has not crippled the local supply.

There is a large amount of residential building in this season's operations, probably a greater percentage than ever before, and it is notable that there has been a marked improvement in the character of the residences being built. This applies to the speculative building as well as to the homes. The large items in

this year's programme are the three banks now in course of erection. When completed they will be among the finest structures in the city.

This year has also seen an increase in the number and size of the ferro-concrete buildings. These, with terra-cotta or tile facings, have won rapidly to popularity, and it is predicted that the next few years will see concrete an even greater factor in Winnipeg's building situation. In the past, mill construction has been favored for warehouses, but several heavy fire losses during the past two years have demonstrated the insecurity of this type of building.

At the present time there is every indication that this year will exceed last year's building figures by a couple of millions at least. There are many who insist that there will be at least a twenty-five per cent. advance, and it must be confessed that there is a certain amount of justification for their optimism. The first two weeks of July saw the permits advance by leaps and bounds until now they are well in advance of last year's figures. This advance was forecasted in the Contract Record several months ago, when the question of the new provincial health by-law was taken up. The Provincial Act, passed at the last session of the House, placed stringent regulations upon apartment and tenement houses. Plans then in preparation were held up, but a stay was granted until July 15 for the new Act coming into force. The result was a heavy rush at the building inspector's office during the closing days of the extended period. It is predicted that if the Act is permitted to remain in force, it will materially affect the development of apartment houses, and it is expected that amendments will be submitted at the next session of the House.

Another factor in the building situation has just developed which may have a great effect on the year's figures. It is the announcement that the C. P. R. is planning extensive improvements and enlargements to their present hotel and depot. An annex will be built, a part of the depot will be raised two storeys to give more office room, a special building will be erected to house the Dominion Express, Railway Mail department, heating system and hotel employees, while on the north side of the track there will also be a large structure put up to make room for enlarging departments which cannot be adequately accommodated at present. If the Lord Selkirk Hotel of the Grand Trunk Pacific is also proceeded with this year, the 25 per cent. increase estimate will be well within the mark.

Concrete Pavement

That concrete will eventually prove to be the best obtainable and only truly economical paving material for streets and roads there can be no reasonable doubt. Not in the form of patented "granitoid" or "litholite," or any other imaginary, mysterious or exclusive way of false pretenses to make the price higher than it should be, but just simple, well understood and properly designed low-priced concrete. As a finished proposition it is reasonable to expect that it will not be "everlasting" or "faultless," or any other impossible and undesirable thing—simply the cheapest good paving, fully up to all sane requirements, and low in cost to keep repaired in a condition to meet the needs of traffic. There will never be a scarcity of good material for concrete aggregate, and Portland cement can be produced in sufficient quantities to take care of even this much of a demand.—Rock Products.

Progress on the Horseshoe Dam, Alberta

From the accompanying illustration it is evident that good progress has been made on the great concrete dam that is being built across the Bow river at Horseshoe Bend, some 80 miles east of Calgary. This dam is being erected by the Irrigation Department of the Canadian Pacific Railway to divert water into the main canal of the east section of the irrigation block. It will consist, when completed, of an earthen embankment on the south bank of the Bow river, and a reinforced concrete spillway in the existing river channel, connected at its northerly end with the canal head gates. The river is approximately 600 feet wide at this point, its south bank having a gravel beach several hundred feet in width, and gradually rising to the general prairie elevation. The earthen embankment upon it will be about 7,000 feet in length,

The spillway will take care of a flow of 100,000 second feet of water, the total length of weir being

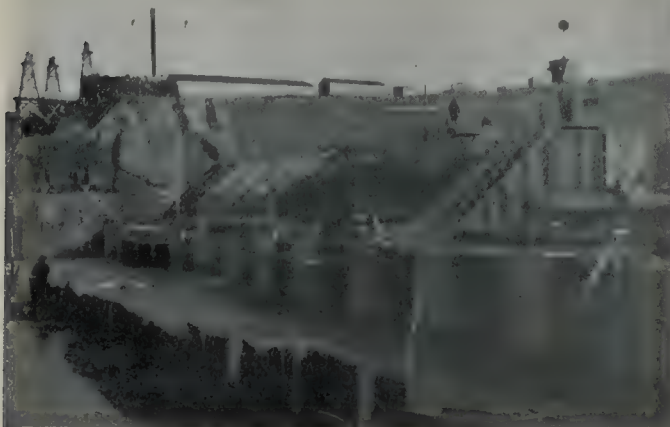


Excavation for main canal "B" bed



Horseshoe Bend Dam on Bow River under construction, May 20

and 350 feet in width at the thickest part of the base, containing approximately one million cubic yards of



Horseshoe Bend Dam looking north

earth. Its upper slope will be paved with boulder concrete or reinforced concrete slabs.

about 600 feet in order to prevent an excess head at the crest.

The structure will be 720 feet in length, between abutments. The overflow crest will be at a maximum height of forty feet, above which eleven feet of water will be retained by structural steel gates, either in the form of segmental Taintor gates or by "Stoney" sluices. The spillway will contain about 40,000 cubic yards of concrete and 1,250 tons of reinforcing steel.

One of the illustrations shows the excavation of the main canal bed. This excavation is two and one-half miles in length and is 90 feet wide with a maximum depth of fifty feet.

A description of the spillway and of the nature of the river banks at this point was given in the Contract Record of April 19.

The city of Moose Jaw has lost no time in going ahead with its new water supply system, and the firm of Walter J. Francis, consulting engineers, of Montreal, have been engaged by the Moose Jaw authorities to design and supervise the development of the Sandy Creek system. Mr. Francis is at present

on the ground and preliminary work has been started. The city expects that the new source of supply will be delivering water to the citizens of Moose Jaw in twelve or fifteen months. This development means the enlargement of Sandy Creek and the laying of a pipe line nearly twelve miles long; it will probably also include a purification system and a pumping plant. The cost of the work may run anywhere from \$400,000 upwards. It is quite possible that the Sandy Creek development is only the commencement of a huge system of water supply for a large area in the southern central part of Saskatchewan taking water from the South Saskatchewan River near the head of the Thunder Creek Valley, and supplying Moose Jaw, Regina, Weyburn, and numerous smaller places. This, however, is a project to be worked out in the future. The cost of the South Saskatchewan system will probably exceed \$5,000,000. Indeed, the ultimate scheme may involve an expenditure of \$20,000,000, when carried out to a conclusion. It is likely that such an undertaking will have to be handled by a specially appointed water commission, composed of representatives of all the municipalities interested, the three great railway companies and the provincial and federal governments.

Large Steel Reservoir at Alexandria

The Alexandria Water Company, Limited, Scotland, has recently completed one of the largest, if not the largest, single-compartment steel reservoir in the world. The internal dimensions of the reservoir are 160 feet in diameter by 25 feet, or 24 feet up to the overflow, giving a useful capacity of 3,080,000 gallons. The following are the thicknesses of plates employed: Bottom plates, $\frac{7}{8}$ in. thick; first course, 15/16 in.; second course, 13/16 in.; third course, $\frac{5}{8}$ in.; fourth course, $\frac{1}{2}$ in.; fifth course, $\frac{3}{8}$ in., and sixth course, 5/16 in. The total weight of the tank, with rivets, is about 388 tons.

The reservoir stands on a series of small brick walls 2 feet thick each, and standing 2 feet apart, so as to leave all the rivets in the bottom plates exposed to view. The whole of the rivetting was done by means of Arrol hydraulic riveting machines, a pressure of 60 tons being employed for the 1-in. rivets and $\frac{7}{8}$ -in. rivets, the smaller rivets being pressed by smaller machines. The calking was done entirely by hand and by native labor; and on the completion of the work, when the reservoir was filled, there was scarcely any further calking required, the riveted joints being tight.

The work of erection was begun on December 6, 1910, and the water was put in and the reservoir filled on April 11, 1911. The whole of the inside of the reservoir is painted with three coats of bitumastic solution. This new reservoir was made to replace an existing iron reservoir of half the capacity 150 feet in diameter by 15 feet deep, and in order to maintain the town's supply during the four or five months' interval, a stand-pipe was fixed 10 feet in diameter by 25 feet high, and this can always be used in case of repairs, or painting being required to be done to the new reservoir. A light parapet wall has been built all around the reservoir, and the latter has been covered over with galvanized iron sheeting.

The cost of the work, including taking down old reservoir, supply and erection of new reservoir, also alterations to pipe connections and new parapet wall, is about \$37,500. The designs for the work were prepared under the supervision of Mr. H. R. C. Blagden, M.I., Mech. E., manager of the Alexandria Water Company, Limited, and the contractors were the Barrowfield Iron Works, Limited, Glasgow.

Industrial Advance in Calgary

In a letter to the Contract Record, Mr. Richard Harrison, Building Inspector for Calgary, states that building operations were somewhat retarded by the shortage of cement during the early part of the summer and that this drawback is still felt in a minor degree. Terrt cotta is being used extensively in Calgary this season, being shipped both from the United States and England, and a good supply of Alberta Clay Products Company's material also being used.

The outlook for the future is very bright, considering that both the Grand Trunk Pacific and the Canadian Northern Railway announce that they intend to have depots in Calgary this year or the earliest part of next year, and that it is almost certain that the C. P. R. shops will also be located there.

The Alberta Silicated Pressed Brick Company are erecting a plant in Calgary costing in the neighborhood of \$60,000. This is the second company in Calgary making this class of brick, the other firm being the Calgary Silicate and Pressed Brick Company. There are nine plants for burnt clay bricks within easy radius of the city, and working at full pressure to meet the demand. There is the Alberta Portland Cement Company, with one plant within the limits of the city, and another a few miles out, both plants having an output of 3,000 barrels per day.

English Road Making

An important piece of road construction has recently been entered upon in the completion of a missing link in the Fosseway, a great highway dating from Roman times and extending from Lyme Regis, in Dorset, through Bath, Cirencester, Leicester, and Newark to Lincoln, a total distance of 215 miles.

In the neighborhood of towns the construction of streets is constantly taking place, but no such length of ordinary rural highway as this missing link in the Fosseway has been constructed in England for the past thirty years. Roads in England are of the most frequent description, and there has been little need for further construction until the advent of self-propelled traffic.

The chief of the ancient roads of England were those originally marked out by the Romans, and generally it can be said they crossed from the south to the east and from the south to the northwest. These are the Fosseway and Watling Street, and crossed in the county of Warwickshire. Generally they have been maintained as highways by the various public authorities through whose areas they happened to pass, but in some isolated districts where the roads have not been necessary or desirable for linking up large towns, portions have never been maintained as ordinary roads, but have been continued as bridle or drift roads without any telfordizing or macadamizing. In England these terms are called, respectively, "foundationing" and "surfacing."

Owing to the advent of self-propelled vehicles every effort is now made in England to render the old direct roads available for the better convenience of through self-propelled traffic.

The high level intercepting sewer for the city of Toronto is nearing completion, and will be in use this fall. The low level sewer is not so far advanced, owing to the inability of the contractors to get a supply of brick, some little time ago. A good supply is being furnished at present, but it is hardly likely that the work will be completed this year.

Lightning Protection

Protection from lightning is a subject that recurs with the coming of each springtime. In the violence of an atmospheric electric disturbance, accompanied by the awe-inspiring flashes of lightning so common with the thunderstorms of the northwest, there are few who have not desired the protection of a lightning-proof shelter. The probability of an individual building being struck by lightning is really very slight, but there is always a possibility of such an occurrence and also that the stroke might be attended with considerable violence, or the building might take fire.

How Lightning Causes Damage

The formation of lightning is very imperfectly understood, but experience with its vagaries and a knowledge of the laws of high-tension electric currents has estab-

Value of Metal Roofed Buildings

Buildings with metallic roofs that are properly connected with the earth are far better protectors from lightning than could be given by rods. Buildings that are completely covered with sheet metal and well connected with the earth are practically lightning proof. Covered in this manner, buildings have been known to be repeatedly struck by lightning without the least damage. The sheet iron granary, so common in the west, when well connected with the earth may be considered lightning proof. The ground connections mentioned above may be made of metallic rods that extend well into the earth and are securely fastened to the metallic covering of the buildings.

In considering the form of lightning conductors it is well to keep in mind the fact that a metal covered building well connected with the earth is practically lightning proof, and that one with a metallic roof, well grounded, is ex-



Sectional Steel Bins Assembled

lished a fairly good understanding of the methods of constructing lightning conductors for all ordinary discharges. It is very well known that lightning is the discharge of a large amount of electricity in a very short space of time and that whatever affords it a passage to the earth is likely to be badly damaged, unless the vehicle happens to be a good conductor of electricity and of sufficient size to transmit the amount of electric energy the flash contains; in which case it passes away doing no damage at all.

As a storm develops the electrically charged clouds pass over the earth to break down the resistance of the intervening air, the resulting discharge will pass into the earth by the most convenient path. This is commonly some high object that extends up from the earth. If the object is a conductor of electricity and connected with the earth, the lightning will pass into the ground without the least damage being done, but if it is not a good conductor, the havoc wrought in an instant is sometimes appalling.

cellently well protected if not perfectly safe. If, then, the roof of a building possesses a metallic ridge, eaves-troughs and downspouts, these will afford very good protection if they are well connected and well grounded. A roof covered with a metallic screen, as a chicken screen, makes an excellent protector when properly grounded.

It must be remembered that the ground connection is a positive necessity and too much care cannot be exercised in its construction. The earth is the great reservoir of electrical energy and it is always at zero potential. If a discharge of lightning can be directed into the moist earth by a conductor its energy is soon dissipated, but the ground connection must be of considerable area and extend well into the moist earth. A piece of galvanized iron pipe driven into the ground seven or eight feet makes a good "ground." Large buildings must have two or more such "grounds." The connecting wires must be securely fastened to the ground connections.

Size of Conducting Wires

In the matter of conducting wires, the United States Weather Bureau, in a bulletin on Lightning and Lightning Protection, recommends a No. 3 galvanized iron wire (Brown & Sharpe gauge) as amply sufficient in size for ordinary lightning protection. If metallic downspouts are used as conductors the connections should be made with the "grounds" with riveted joints. Copper conductors give no better protection from lightning than iron if the iron is kept covered to prevent it from rusting.

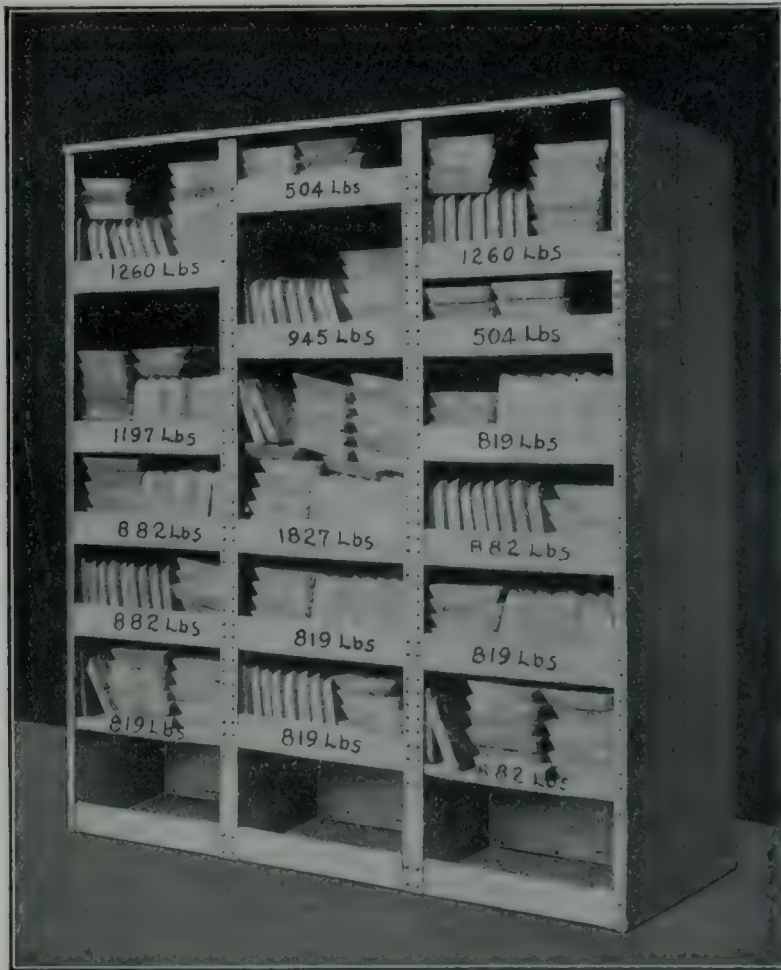
Wire fences are often the cause of damage by lightning because of the method of construction. If the fence wires are grounded the danger from this cause will disappear. Ground wires may be made of ordinary fence wire and should be connected with each of the wires of the

demn themselves for being too narrowminded to fortify and protect themselves against the fiery foe.

Such examples as these have opened many eyes and to the doctrine of forethought is due much of the success of steel. Business man, heeding the necessity of protection against every untoward contingency, are building bulwarks of steel about them. They have discarded wood, and others are following their example.

So, as the transition progresses, it reaches out into every office, store, factory, warehouse, jobbing house and so on down the list. The cry on every hand is "fireproof—it must be fireproof." Business men demand fireproof buildings because they want their property, their stock, their business thoroughly protected.

An essential in this all-round fireproofing is the dis-



Sectional Steel Bin Loaded for Test

fence and extend into the ground three feet. Such "grounds" should be made for each 100 feet of fence.

How Steel Bins Aid in Fire Protection

By G. P. Blackiston

The matter of fire protection is of the utmost importance in every business, but it is a striking fact that thousands of merchants and manufacturers take no cognizance of the necessity of this protection. They are generally disposed to let well enough alone—inasmuch as they "haven't been burned out yet, so let everything take care of itself as it is."

These are the men who, after the disaster that comes unexpectedly upon them and overwhelm them, ruefully look back upon their old time optimistic complacency and con-

carding of everything that is a fire contributor. One of the latest and newest products of this kind placed on the market for store, factory and warehouse fixtures is the steel bin, manufactured by the Berger Manufacturing Company of Canton, Ohio.

Steel bins are coming into favor for storing small stock of every description in bulk. Hardware dealers and other merchants are using them, while they are being introduced into many factories where it is essential that small parts be kept conveniently at hand. They are constructed of steel, and reinforce the other steel construction of the building, for they do not feed flames but assist in the general plan of protection.

One of the biggest manufacturing companies in the great Pittsburgh industrial district not long ago adopted a plan something like this, of having steel compartments in a great room, protected on all sides with steel—like a gigantic vault—for the storage of valuable blue prints.

Brick and Terra-Cotta Columns

Some interesting tests of brick and terra-cotta block columns have been made at the Engineering Experiment Station of the University of Illinois, and appear in the Brickbuilder.

For brick, stone, and terra-cotta masonry structures, designers commonly use stresses which are low in comparison with the strength of the constituent materials. Various reasons exist for this—possible variations in material, chance for poor workmanship, opportunity for settlement and resulting unconsidered stresses, the desire to avoid tensile stresses in masonry, imperfect knowledge of the properties of the completed structure, etc. In some types of structure mass and volume are important considerations, and strength is subordinate. In many applications, however, the strength of the structure is of first importance, and a knowledge of the actual properties of the structure is essential to safe and economical construction. Frequently designers use stresses as high as their information and the usual rules of practice will permit, and make sections as small as these considerations warrant. The utilization of the working capacity of a structure is generally advantageous. This is especially true when the better grades of material are used, and when workmanship is known to be first-class. Much information is available on the strength and other properties of constituent materials like mortar, brick, stone and terra-cotta, but relatively little is known of the properties of built-up structures. Anything that adds to our knowledge of such construction should be helpful, and it was with a view of obtaining further information on the properties of short built-up columns or piers that the tests herein described were undertaken.

Dimensions of the Columns

The work described in this article includes tests of 16 short columns or piers of brick, and 16 columns built of terra-cotta blocks. Although long column action seems not to enter into these compression test pieces, they will be termed columns by analogy to the use of the term column for other compression members of not greater slenderness ratio. The length varied from 10 feet to $12\frac{1}{2}$ feet. In lateral dimensions the brick columns were $12\frac{1}{2}$ by $12\frac{1}{2}$ inches, and in the terra-cotta block columns the range was from $8\frac{1}{2}$ by $8\frac{1}{2}$ inches to $17\frac{1}{2}$ by $17\frac{1}{2}$ inches. The brick used in the construction of the columns were of two grades—an excellent class of building brick and a soft grade selected as representative of interior bricks. The terra-cotta blocks were of good quality. Dicerent qualities of mortar and different grades of workmanship were used. The loads were applied continuously to failure in most cases, but tests were also made with repeated applications of the same load. Central loading of the column was used in most cases, but in some tests the load was applied eccentrically.

All the tests were made in the 600,000 lb. Riehle vertical screw testing machine in the Laboratory of Applied Mechanics of the University of Illinois. The machine head moved at the rate of 0.05 in. per minute, except in some cases where the load was repeated, when a speed of 0.10 in. per minute was used. The load was generally applied by increments of about 25,000 lb. on the column, but for the columns built of lean mortar or of clay-brick the increment was smaller. The load was applied through a spherical bearing block, except where the column was loaded eccentrically. In arranging the columns for eccentric loading, a half-inch square steel bar, about 20 inches long, was placed 1 inch off the centre of the column under the lower bearing block, and a similar bar in a corresponding position on the top of the upper bearing block. The load was applied to the column through these bars.

In all of the brick column tests the first evidence of dis-

tress observed was a faint popping sound, which seemed to proceed from the interior of the columns. As the load was increased, the popping noises were heard more frequently and were louder. As the load was further increased, the action of the columns depended to a great extent on the quality of the mortar used. The columns in which the richer and stronger mortar was used gave little or no additional evidence of distress until a load a little below the maximum was reached, when spalling of the mortar at the corners of the columns, or the formation of longitudinal cracks through the vertical joints, gave warnings of impending failure; after the beginning of spalling or the formation of longitudinal cracks was observed, the failure was generally very sudden and complete. In this class of columns (those with 1:3 Portland cement mortar) the debris showed that failure was precipitated by the formation of longitudinal cracks through each vertical joint. These cracks generally extended throughout about the upper two-thirds of the length of the column, beginning near the middle and extending both ways. Such failures were extremely violent and sometimes involved hazard to observers, and often proved destructive to measuring instruments. The failures came with such slight warning that despite repeated efforts the operator was unable, except in two tests, to stop the movement of the testing machine, after evidences of failure were observed, in time to avoid reducing the upper two-thirds of the column to a mass of broken bricks and mortar scattered over the laboratory. The design of this machine is such that it may be stopped and the motion completely reversed almost instantly. The columns referred to were the ones laid up carelessly. They were less rigid than the others of the same materials, and hence took on load more slowly.

Features of the Tests

The phenomena of the test of the clay-brick columns did not differ greatly from those of shale brick with 1:3 Portland cement mortar, except that on account of the reduced rigidity the load was applied more slowly and the failures were less sudden and violent.

The failures of the columns in which the 1:5 Portland cement, natural cement or lime mortar was used, were similar to those described above, except that they rarely got beyond the spalling and cracking stage. In these tests the formation of the vertical cracks could readily be observed. The freedom from sudden collapse was probably due to the yielding of the joints, and the fact that the testing machine does not follow such yielding instantaneously. It must not be inferred that under an actual load such columns would not have failed as suddenly and completely as the others. Where natural cement or lime mortar was used the mortar gradually disintegrated and reduced to powder.

No direct comparison of the strength of the lime mortar columns with the strength of the mortar can be made (since no test of the lime mortar were made), although it is evident that the low values observed are due to the low crushing strength of the mortar. From the action of these columns during the tests it seems evident that the lime mortar broke down at a load which was proportionately very much lower than that carried by the cement mortar. From the early signs of distress exhibited by these columns it seems doubtful if they would continue to carry a load greater than about one-third the maximum load given in the test, while for the shale brick columns built with Portland cement mortar, the load at which the first signs of distress were observed was from 50 per cent. to 75 per cent. of the maximum load carried.

For the two columns built of underburned clay bricks and 1:3 Portland cement mortar, the average load carried was 1,600 lb. per square inch. The ratio of this load to

the load taken by the shale brick columns tested at the same age is 0.32. The ratio of the crushing strength of the clay brick to that of the shale brick is 0.37.

It is evident that the strength of any brick or block structure is influenced greatly by the quality of the mortar used. These comparisons indicate that, for the columns tested, the strength of columns built from the same bricks is closely proportional to the strength of the mortar used in their construction, and the strength of columns built of different bricks using the same mortar is closely proportional to the crushing strength of the bricks.

These tests indicate that the crushing strength of the brick is as important a factor in the strength of a structure of this kind as the quality of the mortar used. The most economical structure would seem to result from using a mortar comparable in strength with the brick. Such considerations are generally unnecessary, except in design of columns, piers, etc., which are to sustain excessive unit loads.

If the load at which the column first shows signs of distress by popping sounds represents the maximum permanent load which the column would carry, then this load is the one on which the factor of safety should be based, and not the load carried momentarily before failure.

The Terra-cotta Columns

The terra-cotta block columns were built and tested in two lots, an interval of about one year separating the times of making the tests. The cement used was the same brand in both years, though the lots were different. The columns were generally made in sets of two, each set being constructed and loaded similarly. The tests resembled those of the brick columns in many respects.

Generally, the terra-cotta block columns gave no signs of distress until a load near the maximum was applied, when cracking noises similar to those described for the brick columns were heard. This was soon followed by the formation of longitudinal cracks through the vertical joints, or the spalling of the horizontal mortar joints at the corners of the columns, either of which was immediately followed by sudden collapse of the column. The failures of these columns were even more violent than those described for the brick columns. The smaller columns showed more variation in the manner of failure than the large ones. The characteristic form of failure for the 12½-in. by 12½-in. columns was a sudden total collapse, immediately following the appearance of longitudinal cracks through the vertical joints near the middle. Failure sometimes occurred with no warning, except the continued shortening of the column under the increasing load.

The columns loaded eccentrically failed by splitting from end to end along the vertical mortar joint which was parallel to and nearer the loading bar.

Both brick columns and terra-cotta block columns gave high strengths in all cases where strong mortar and care in building were used. For central loading, the strength of the brick columns ranged from 3,220 to 4,110 lb. per square inch, and the strength of the terra-cotta block columns from 2,700 to 3,790 lb. per square inch, the columns having the highest resistance not failing at the full capacity of the machine. The effect of the strength of the mortar is apparent in the carrying capacity developed in the columns lower loads were found in columns built with 1:5 Portland cement mortar than in those with 1:3 Portland cement mortar; still lower loads in those with 1:3 natural cement mortar, and still lower loads in those having 1:3 lime mortar. The effect of the quality of the bricks is shown in the columns made with inferior bricks, which carried only 31 per cent. as much as columns built with the better grade of brick. In the case of the terra-cotta columns, the blocks which were culled out as somewhat in-

ferior gave a column strength perhaps 30 per cent. less than the columns built with superior blocks. The effect of the attempt to represent hurried or careless workmanship in two brick columns and in three terra-cotta block columns, was a loss in strength of about 15 and 25 per cent., respectively.

Trade Notes and Items of Interest

Ottawa is contemplating the erection of a high level bridge across the Rideau Canal. The structure will be of reinforced concrete, with six spans, and will be 760 feet in length, including approaches.

As a result of a by-law submitted to the ratepayers, the sewer commission of Berlin has recently been abolished. The city council has appointed a committee of its members to take over the management of the sewerage work.

An indication of the largely increased business being transacted in Calgary is forcibly shown by the civic license department. During 1910 the receipts were \$53,000. This amount was equalled for the first five months of 1911, and will reach at least \$75,000 before the close of the year.

The city of Brandon has been recommended in an engineer's report to install a sedimentation basin. The form of basin recommended is one consisting of two parts, each with a capacity of 2,340,000 gallons, and to be filled by centrifugal pump. The basin will be of concrete construction.

It is stated that the new floating dock for the city of Montreal, which is being built by Vickers' Sons & Maxim, will be completed at their shipbuilding works at Barrow-in-Furness, England, by the time the navigation season opens next year. The dock will be brought across the Atlantic and installed immediately.

With a total of approximately 1,000 men engaged in civic works, independent of those employed by contracting firms doing city jobs, and a monthly payroll of approximately \$66,000, Victoria is making a new record for activity in carrying out works of improvement. The payroll is the largest in the history of the city.

A committee has been appointed for the local park board to look into the general question of oiling and watering the roads through Vancouver's large natural park, Stanley Park, which has many miles of roadways through its scenic extent. This information may be of interest to firms handling oiling and watering apparatus or holding patents for oiling materials.

Herbert B. Rugh, architect, Ninth Floor, Union Bank Building, Winnipeg, has consolidated his business with Ross and MacFarlane, architects, of Montreal, in respect to their western business, under the firm name of Ross & MacFarlane, architects, of Montreal and Winnipeg, retaining Mr. Rugh's present offices. Mr. Rugh will be manager of the western office and have charge of all western work, including, besides his own, the Selkirk Hotel in Winnipeg for the Grand Trunk Railway, and large hotels in Edmonton and Prince Rupert.

We understand that Mr. Leonard Andrews, M.I.C.E., managing director of the Key Engineering Company, London and Manchester, who spent some months in Canada on behalf of his company last year, was so impressed by the possibilities for British products in Canada that he has been commissioned by several of the largest engineering manufacturers in Great Britain, to make a further visit to Canada to ascertain the best means of improving trade relations in engineering appliances between Canada and Great Britain, and that he has now returned to this country for that purpose. He will stay for a short time at the Windsor Hotel, Montreal, before leaving for the west.

Contracts Department

News of Special Interest to Contractors, Engineers, Manufacturers and Dealers in Building Supplies.

Information for insertion in these columns is invited from Architects, Contractors, Engineers, etc.

Waterworks, Sewerage and Roadways

Assiniboia, Man.

Tenders called for waterworks, Deer Lodge sub-division. Secretary-treasurer, Kirkfield Park, Man; consulting engineer, Col. H. K. Ruttan, Winnipeg. Construction of sewers and waterworks. Specifications at office of St. James Realty Company, Bank of Nova Scotia Building, Winnipeg. Tenders received until July 31st by secretary-treasurer.

Cardston, Alta.

By-laws carried for gravity water system, \$40,000. Owner, Municipality of Cardston. Engineer, R. E. MacArthur, Lethbridge, Alta. System, gravity. N.B.—The by-law to raise \$5,000 for completion of pure water system in Wingham, Ont., was also carried.

Chilliwack, B.C.

Under consideration, purchase of machinery. City Engineer, T. B. Croly. The proposition to buy plant superseded by that to purchase material for cement sewer pipe.

N.B.—Victoria, N.B., is also in the market for large quantities of drainage and sewer pipe. By-law for \$300,000 partly appropriated for this.

Collingwood, Ont.

Tenders called for sewers. Town engineer, K. S. Macdonell. Construction of about 700 feet of 10-in. sewers. Tenders received by engineer until noon, August 1st.

Glacier Point, B.C.

Tenders called for concrete tower, etc. Owner, Dept. of Marine and Fisheries, Ottawa; Deputy Minister, A. Johnston. Erection of reinforced tower, dwelling, boat house and oil shed in the Strait of Juan de Fuca. Plans, etc., at Department, Ottawa, at agency of this department, Victoria, and at the post office, Vancouver. Tenders received until August 26th.

Gravenhurst, Ont.

A by-law will be submitted on August 5 for the raising of \$3,000 for the construction of cement sidewalks and crossings.

Halifax, N.S.

Plans in progress for pipe house, \$3,000, Chain Lake. Owner, City of Halifax; engineer, F. W. Doane, 25 Young avenue, Halifax. Two storeys, concrete and granite, concrete and steel roof. Plans to be submitted for approval of city council at next meeting.

Proposed work on sewers, \$7,000, Bilby, Young and Gottingen streets. Owner, City of Halifax; engineer, F. W. Doane, 25 Young avenue, Halifax. Construction of 400 feet, Bilby; 800 on Gottingen, 250 on Young street. City Engineer preparing plans to be approved by council next meeting.

Harriston, Ont.

Tenders called for municipal drain, Tp. of Minto; township clerk, W. D. McLellan, Harriston, Ont. Construction of municipal drain; estimated amount of excavation, 21,600 cubic yds. Specifications at office of clerk. Tenders received by clerk until August 7th.

Moose Jaw, Sask.

Tenders called for sewer and water extensions. Owner, City of Moose Jaw; clerk, W. F. Heal; city engineer, J. M. Wilson. Laying of approximately 16,885 lin. ft. of sewer and water extensions and supply of all cast iron, vitrified tile, pipe and specials, etc. Plans, specifications, etc., with engineer. Tenders received until 8 p.m., August 14, by city clerk.

New Westminster, B.C.

The tender of the Dominion Glazed Pipe Cement Co., of Vancouver, for sewer pipe for the west end has been recommended for acceptance.

N. Buxton, Ont.

Tenders called for grading, Townline road, between Tp. of Raleigh and Tilbury E. Earth must be removed to easterly side of road so that when completed it makes a level top width of not less than 20 feet. Tenders received until noon July 29th, by R. Clark, North Buxton.

Ottawa, Ont.

Equipment to be installed, waterworks. Owner, City of Ottawa; city engineer, N. J. Ker, Ottawa. Booster pumps to increase water pressure (700 h.p.), electric motors and two turbine pumps. By-laws for this to be submitted to electors in September.

Port Arthur, Ont.

Specifications prepared for waterworks. City engineer, L. Jones, Port Arthur. New force main, 2 miles, cast iron, new stand pipe, (\$40,000), 50 diam., 100 feet high. Tenders not yet called for.

Red Deer, Alta.

\$54,000 will be expended on waterworks and sewers.

Regina, Sask.

Tenders called for waterworks. Owner, City of Regina, Sask.; city engineer, L. A. Thornton. (a) Trenching, laying and backfilling for about 11,200 lin. ft. 18-in. steel pipe and 1,000 lin. ft. 16-in. c.i. pipe; (b) Construction of a 225,000 gal. concrete pump well. Particulars to be had on application to city engineer. Tenders received by city commissioners until noon, August 4th. Advertisement in "Tenders and For Sale Department" of this issue.

Revelstoke, B.C.

Tenders called for pipe line, \$12,000. Owner, City of Revelstoke; city clerk, Bruce A. Lawson; engineers, Smith, Kerry & Chace, Toronto. Material and construction of a 6-foot pipe line at power works. Plans, etc., at office of

city clerk. Tenders received by clerk until August 1st.

Southampton, Ont.

Tenders called for waterworks. Owner, Town of Southampton; town clerk, J. C. Eckford. Construction of intake pipe and filter basin. Plans, etc., at office of town clerk and at office of engineers, Bowman & Connor, 36 Toronto street, Toronto. Tenders closed July 27th.

Toronto, Ont.

Proceeding of board of control, intake pipe, \$259,900. City clerk, W. A. Littlejohn; city engineer, C. H. Rust. Board recommended acceptance of tender from Roger Miller & Son, \$259,900. Other tenders, Capt. Leslie, cost plus 20 per cent.; Cummings & Robertson, cost plus 20 per cent.; Capt. Midford, cost plus 20 per cent.; Cummings & Roberson also offered to fix a maximum cost of \$225,000, including their commission.

Vancouver, B.C.

The following tenders have been received for paving: Messrs. Thompson & Stewart, grading of Queensbury avenue from Third street to the city limits, \$14,760; A. R. Gibson, of Lonsdale avenue, from the wharf to Keith road, \$11,160.40; two bids for laying the sewer east and west of Lonsdale avenue, as follows: R. E. Lee, west side, \$10,945; east side, \$13,410; Romano, Pinto & Co., east side \$13,000; west side \$12,000.

Wetaskiwin, Alta.

Equipment required for sewage disposal works, \$6,000. Owner, Corporation of Wetaskiwin; city engineer, W. L. Crane. One-storey concrete foundation, concrete and frame covering. Automatic valves required.

Equipment required, engineering. Owner, Corporation of Wetaskiwin; engineer in charge, G. R. Taylor. Waterworks; one steam pump, one steam compressor. Estimated cost, \$10,000; also one vaporization gas engine. Date of calling for tenders not set yet. Extensions to poles and lines are also planned.

Whitewood, Sask.

Cement sidewalks and crossing. Owner, Corporation of Whitewood, Sask; secretary, C. S. Barber. Whitewood; contractor, H. M. Keeley, Brandon. Construction of 33,000 feet of cement sidewalks and crossings, 18 cents per square foot.

Wilkie, Sask.

Tenders called for machinery, materials, etc. Owner, Town of Wilkie; T. A. Dinsley, sec.-treas.; engineers, McArthur & Murphy, Bottomly Block, Saskatoon. (A) Electrical machinery; (1) One 60 k.w., 3-phase, 60 cycle, 2,200 volt a.c. generator; one exciter for above; one marble switchboard, instruments and switches; three 2200 volt motors back geared to pumps; five

transformers for lighting system; series Tungsten street lighting system; about 25 cwt. of copper wire (line material, etc.), cedar poles. (B) One 100 h.p. internal combination engine. (C) Pumping machinery; one working head and deep well cylinder; one 250,000 gallon pump; one air compressor, necessary shaftings and belting. (D) One pneumatic storage tank. (E) About 1100 ft. 8 in. c.i. water pipe; 4,800 ft. 6 in. c.i. water pipe; 2,000 ft. 4 in. c.i. water pipe; 15 hydrants and 22 valves. (F) Trenching, laying c.i. water pipes, hydrants, etc. (G) Erection of power house and construction of reservoir. Plans, etc., at office of secretary-treasurer, or on application to Engineers. Tenders received by secretary-treasurer until Aug. 21.

Windsor, Ont.

Tenders to be called for sewer outlet, \$8,000. Owner, City of Windsor; city engineer, M. E. Brian. Reinforced concrete outlet under Grand Trunk at Parent avenue. Tenders to be called shortly.

Winnipeg, Man.

Proposed work on sewers and paving. Owner, City of Winnipeg; secretary board of control, M. Peterson. Sewers, John, Helen and Ainsley sts.; asphalt No. 2, Selkirk; asphalt No. 1, McPhillips; granolithic walks, north side of McMillan, Princess, Clark and three other streets. The above is on the order books to be completed this year.

CONTRACTS AWARDED

Port Arthur, Ont.

The contract has been awarded to the Warren Bitulithic Paving Co., of Toronto, for 700 feet of paving and 2,200 feet of curb.

Thorold, Ont.

Paving. Owner, Corporation of Thorold; clerk, D. J. C. Munro, Thorold; engineer, J. C. Gardner, Niagara Falls, Ont. 5,000 lin. feet of 16-ft. macadam road. Successful contractor, D. Walker, Thorold, 57 cents yard; others tendered up to 70 cents.

Railroads, Bridges and Wharves

Brockville, Ont.

Tenders called for extension to tunnel, Bay Rock. Owner, Department of Public Works, Ottawa; C. Desrochers, secretary. Chief engineer, J. G. Sing, Confederation Life Bldg., Toronto. Plans, specifications, etc., at Dept. of Public Works, Ottawa, at the office of the engineer, and with the postmaster at Brockville. Tenders received by secretary until 4 p.m., August 21.

Chapeau, Que.

Tenders called for steel bridge. Owner, Dept. of Public Works, Ottawa; secretary, R. C. Desrochers. Plans, specifications, etc., at Dept. of Public Works, Ottawa, and at the office of J. G. Sing, district engineer, Toronto. J. L. Michaud, district engineer, Merchants Bank Building, Montreal, and with the postmaster at Pembroke, Ont. Tenders received by the secretary until 4 p.m., August 8.

Edmonton, Alta.

John Walters, lumber dealer, of Strathcona, has purchased Big Island from the Dominion Government and will convert it into a summer resort. A large pier will be built at the island this summer.

Guelph, Ont.

Tenders called for bridge, over C.P.R. and River Speed. Owner, City of Guelph; T. J. Moore, County Clerk; acting engineer, L. Malcolm. Construction of reinforced concrete arch bridge and viaduct. Approximate amount of concrete is 251 yards. Marked cheque of \$400 to accompany each tender. Plans, etc., at office of Contract Record, 220 King street west, Toronto. Plans, etc., obtained on receipt of \$5 to be refunded on return of plans. Tenders received until August 5th by city clerk. Advertisement in "Tenders and For Sale Department" of this issue.

Halifax, N.S.

Extension of time for pier and sheds, deep water terminals, I.C.R. Owner, Dept. of Railways and Canals, Ottawa; secretary, L. K. Jones, Ottawa. Construction of reinforced cement; concrete pier and sheds at the Deep Water Terminus, Intercolonial Railway. Plans, etc., at office of chief engineer, Department of Railways and Canals; office of the chief engineer, I. C. R., Moncton, N.B.; consulting engineer, J. Kennedy, Montreal. The time for receiving tenders has been extended from 31st July to noon of August 10.

North Vancouver, B.C.

Re-construction contemplated of shipyard. Owner, Wallace Shipyards, Ltd. Plant destroyed by fire on 11th inst. President Wallace has returned and is looking for a site on the North Arm for erection of new buildings.

Ottawa, Ont.

Electric railway from Smith's Falls to Kingston is being promoted. Engineers will have ground early in August. Line to follow Rideau Railway and Canal.

The Morrisburg & Ottawa Electric Railway construction will probably commence this fall. Almost direct line from Ottawa to Morrisburg with only one bridge.

Contemplated, bridge, \$130,000, across Rideau canal high level. Owner, City of Ottawa; city engineer, N. J. Ker. Reinforced concrete bridge, 6 spans, with approaches 760 ft. length; without approaches, 346 ft., iron railings. By-law to be voted on in September.

Palgrave, Ont.

Tenders called for steel bridge, over the Humber River on the 7th line. Owner, Tp. of Albion. County Engineer, C. R. Wheelock, Orangeville, Ont., 40 ft. span. Specifications, etc., with engineer. Tenders received by engineer until August 7.

Port Arthur, Ont.

Plans prepared for bridge, Current River. Owner, City of Port Arthur; engineer, L. Jones, Port Arthur. One span, open spandrell, reinforced arch, ribbed walls, 130 feet. Tenders not yet called for.

Railroad to Sellwood Jct. Owner, Canadian Northern Railway; engineer, Wicksteed, Port Arthur; general contractor, Foley Bros. & Larson; subcontractors, 50 miles, Port Arthur east. T. P. Walsh, Minneapolis, Minn. 100 miles, Nepigon Construction Co., Nepigon, Ont. This division is 50 miles east of Port Arthur.

Princeton, B.C.

The Great Northern Railway have commenced laying steel from Princeton

to Coalmount. Engineer in charge, L. M. Hale, Princeton.

Quebec, Que.

Plans approved for station, \$850,000. Owner, Grand Trunk Pacific; architects, Marchand & Tanguay, Quebec. Part 4 storeys, granite, iron and marble cut stone, structural iron, ornamental iron, terra cotta, steel beams, steam heating, electric lighting, iron and glass roof, sheet metal work, freight and passenger elevators, telephone system, plate glass. Tenders called shortly. Foundation will be extra work.

Souris, Man.

Tenders called for station. Owner, Canadian Pacific Railway. Brick and stone, cement work, pitch roof, electrical work. Plans, etc., with superintendents at Brandon, Souris and with divisional engineer, Winnipeg. Tenders received until August 2nd.

St. John, N.B.

Tenders will be called shortly for the construction of 1,900 feet of sea wall and wharf at West St. John.

Tenders called for car barn, Wentworth street. Owner, St. John Railway Co., Dock street; general manager, H. M. Hopper. Brick and steel. Tenders addressed to H. M. Hopper received until July 31st.

Trail, B.C.

Tenders to be called for bridge, \$150,000. Owners, Dept. of Public Works, Victoria, B.C.; engineer in charge, Waddell & Harrington, 1012 Baltimore ave., Kansas City, Mo.; J. E. Griffiths, Public Works Engineer, Victoria. New bridge across Columbia at Trail. Four through-truss riveted spans, each 170 feet long, and 8 feet roadway and steel cylinder piers.

Tenders called for bridge over Columbia river. Owner, Department of Public Works, Victoria; Public Works Engineer, J. E. Griffiths. (1) Substructure and erection of superstructure; (2) manufacture and delivery of steel superstructures, metal, bridge. Plans, etc., at government offices, Rossland, Nelson and New Westminster; road superintendent, E. McBride, Granville street, Vancouver, and at the department. Separate tenders on above received by Minister of Public Works, Victoria, until August 31st.

Truro, N.S.

Tenders called for I. C. R. station and freight sheds, Inglis street. Owner, Dept. of Railways, Ottawa. Deputy Minister, A. W. Campbell. Part 2 storeys, 296 feet long; freight sheds, Brunswick and Yonge street, 700 feet in length. Estimated cost, \$500,000. Tenders are called until August 1st.

Vancouver, B.C.

The Great Northern Railway will construct a pier 800 feet long on waterfront property in Vancouver.

The contract for the construction of a 250 ft. wharf for the Segur Oil Company, 319 Pender St. W., has been awarded to Hind Bros., wharfage contractors, foot of Gore Street.

Victoria, B.C.

Tenders called for sea wall. Owner, Board of Works, Victoria; engineer, C. B. Case. Construction of sea wall. Alternate tenders and plans will be accepted. Tenders received until August 2.

Winnipeg, Man.

Application to be made for bridge, across Assiniboine at Osborne street. Solicitor, T. A. Hunt, Winnipeg. Plans for proposed new bridge, etc., deposited with Minister of Public Works and Registrar, Winnipeg, June 29. Application for approval of plans to be made one month from date of deposit.

CONTRACTS AWARDED**Chilliwack, B.C.**

Work in progress for bridge, \$1,035. Owner, Corporation of Chilliwack. The contract for the bridge over Hope river has been awarded to Messrs. Nichol and Stringer for \$1,035. It is to be a wooden bridge. Work has been started. The city has decided to build another bridge. City engineer instructed to draw plans.

Drayton, Ont.

Bridges. Owner, Wellington County, Ont.; warden, M. Fox, Drayton; engineers, Bowman & Connor, 36 Toronto street, Toronto; successful contractor, Chas. Matteni, Fergus, Ont., \$4,350. The following tendered: W. White & Son, Toronto, \$5,395; E. C. Lewis, Toronto, \$7,285; H. Croff, Quelp, \$5,316; John Murray, Toronto, \$5,400; about 767 cubic yards in all.

Halifax, N.S.

The contract for a \$75,000 mill at Millview, Halifax, being erected by W. A. Moir & Co., Argyle St., Halifax, has been awarded to W. A. Ronnan & Co., Halifax.

Heathcote, Ont.

The contract for the concrete bridge to be erected at Heathcote has been awarded to A. Cooper & Bros., Collingwood, \$1,125.

Kamloops, B.C.

The municipality of Kamloops will spend \$200,000 in developing a power plant at Barrier River.

Port Arthur, Ont.

Breakwater, Bare Point, Rainy River District. Owner, Department of Public Works, Ottawa; engineer, E. B. Temple, Port Arthur; general contractor, Thunder Bay Construction Co., Port Arthur.

Sault Ste. Marie, Ont.

Railway. Owner, Algoma Central Railway; chief engineer, R. S. McCormick, Algoma Central Railway, Sault Ste. Marie. General contractor, Kennedy & McArthur (Superior Construction Co.) From Hobon on C. P. R. N. to the National Transcontinental Railway, 142 miles west of Cochrane, a distance of 101 miles. Work includes construction work to sub-grade and in addition track laying and ballasting.

Taft, B.C.

Railway station, \$3,000. Architect, M. K. McQuarrie, Revelstoke; general contractor, G. D. Shaw, Revelstoke, \$2,900; McCarthy bid, \$3,100. No sub-contractors on this project.

Vancouver, B.C.

The contract for the railway from Bull Creek to the summit of the West Fork of the Kettle River, has been awarded to L. M. Rice & Co., Fairfield Building, Vancouver.

Public Buildings, Churches, Schools, etc.**Arcola, Sask.**

Tenders called for school. Owner, Public School Board; secretary, J. R. Donaldson. Erection of addition to school building. Tenders received until August 1st.

Brandon, Man.

Equipment required for fire hall appliances. City engineer, R. E. Speakman, Brandon. On recommendation of city electric inspector Small, city decided on 18th inst. to purchase following through Northern Electric Co.: 1 storage battery, switchboard of 4 circuits, 1 automatic repeater for 4 circuits, 1 motor generator set for charging storage battery, 1 automatic lighting switch, 1 punch register, date and time stamp, 1 take-up reel, electric stall door locks.

Chatham, Ont.

Tenders to be called for billiard hall and bowling alley, \$8,000, King street. Owner, Wm. Baby, Sr., Chatham; architect, J. L. Wilson & Son, Chatham. Two storeys and basement, 26 x 140, concrete, brick and frame, concrete foundation, steam heating, electric lighting, composition roofing, interior finish plaster and wood, cement, cut stone, brick, terra cotta, tile, artificial stone, metallic lath, structural and ornamental iron, fire escapes, sheet metal work, cornice, pipe covering, electrical work, steel beams, plastic relief work, plate art and prismatic glass. Tenders received after July 31st, close August 12th.

Denman Island, B.C.

Tenders called for school. Owner, Department of Public Works, Victoria, B.C.; architect, J. E. Griffith, Victoria, B.C. Plans, specifications, etc., at office of the Government Agent, Cumberland, B.C.; Geo. Dalziel, secretary school board, Denman Island, and at the Department of Public Works, Victoria, B.C. Accepted cheque for \$200 to accompany each tender. Tenders close at noon, August 10.

Forest, Ont.

Plans being prepared for library, \$5,000. Owner, Free Library Board; architect, W. A. Mahoney, Guelph, Ont. Two storeys, 34 x 34, brick, stone foundation, cut stone, hot water heating, electric lighting, slate roof, interior finish, Georgia pine, plate and art glass. Tenders will be called in about two weeks.

Kingston, Ont.

The Salvation Army are to have a new barracks on Princess St., near Calgary Street.

Lethbridge, Alta.

Plans are being prepared for a Detention Home for children to be erected in the west end of the city on First street south.

London, Ont.

Tenders called for school house, Reserve of the Chippewas. Owner, Department of Indian Affairs, Ottawa; assistant deputy, T. D. McLean, Ottawa. Erection of frame school. Plans, etc., at office of S. Sutherland, Indian agent, Delaware, and at the post offices, London and Strathroy. Tenders called until noon, August 7th, by J. D. McLean.

MacLeod, Alta.

Plans are being prepared by the Dominion Public Works, for a new post office building.

New Westminster, B.C.

Tenders to be called for two schools, \$45,000, Sapperton and North road. Owner, New Westminster School Trustees; architect, Gardiner & Mercer, New Westminster. Three storeys, frame, stone foundation, shingle roof, interior finish fir. Tenders received after August 11; contract probably let about August 20.

New Westminster, B.C.

The Sisters of St. Mary's Hospital are contemplating the addition of a \$20,000 wing.

Ottawa, Ont.

Tenders called for hospital. Owner, Lady Grey Hospital; architect, A. Le B. Weeks, Canada Life Bldg., Ottawa. Fire escapes. Tenders received until July 29th.

Port Arthur, Ont.

Plans prepared for Sailors' Institute. Architect, F. Urry, Port Arthur, and Head of Institute, Peter McCrae. Building to be three storeys.

Port Arthur, Ont.

Work delayed, building and engineering. Finnish Co. Operative Trading Co., no further move made; nothing likely to be done this year. Riley, Ramsey Co., Ltd., not likely to build. Decision influenced by action of New Storage Co. Repairs and additions to municipal building held over. Engineering, Pavements on Pearl, Cameron, and Algoma streets, will not be gone on with this year.

Prince Albert, Alta.

Plans out for an eight-room school to be erected this summer and a by-law for two more will be voted on.

Prince Rupert, B.C.

Work in progress for theatre block, \$30,000, Second avenue. Owner, Westholme Lumber Co., First avenue, Prince Rupert; architect, W. L. Barker, Third avenue, Prince Rupert. Two storeys, 100 x 100, frame, concrete foundation, cement work, fireproofing, fire escapes, felt and gravel roof, metal ceiling, asbestos materials, electrical work, plate and art glass. Westholme Co. will build. Extensive marble and electrical work required.

Regina, Sask.

Clemesha & Colman, architects, will complete plans for the new St. Andrews Church in Moose Jaw, to cost \$100,000.

Regina, Sask.

Sale reported, site for plant, Scarth and Twelfth avenues. Owner, J. H. Ashdown, Hardware Co., Bannatyne E., Winnipeg, 75 x 125 feet, site of Assiniboia club house. Plans for new club house being revised by Darling & Pearson, architects, Winnipeg.

Saskatoon, Sask.

Plans accepted for Y. M. C. A. building, \$36,000, 24th street. Owner, Y. M. C. A.; secretary, Miss S. Little, Toronto; architect, Thompson, Daniel & Colhurst. Three storeys and basement, reinforced concrete construction, ornamental iron, brick with terra cotta. Excavation to commence at once.

St. John, N. B.

Tenders called for three-storey block. Owner, Right Rev. Bishop Casey, Roman Catholic Bishop of St. John; architect, F. Neil Bridie, St. John. Tenders closed July 28.

Toronto, Ont.

Tenders to be called for church and Sunday school, \$60,000, corner of College and Montrose. Owner, West Presbyterian Church, Toronto; architects, Gordon & Helliwell, Confederation Life Building, Toronto. Various trades required. Tenders called during the next week.

Work in progress for synagogue, \$10,000. Shipman and Maria. Owner, Congregation of Israel, Shipman and Maria, Toronto; architects, Ellis & Connery, Manning Chambers, Toronto; general contractor, H. Greenblatt, 1 Bolar st., Toronto. One storey, brick, stone foundation, electric lighting, open plumbing, slate roofing, cut stone, brick, cornice, electrical work.

Tenders called for police station, Claremont street. Owner, City of Toronto, G. R. Geary, chairman board of control. Masonry, carpentry, galvanized iron and roofing, gas fitting and plumbing, hot water heating, electric wiring and light fixtures, plastering, painting and glazing, tiling. Plans with city architect. Tenders received by G. R. Geary until noon, August 1st.

Tenders called for addition to schools. Owner, Separate School Board, Toronto; architect, Chas. Read, Confederation Life Building, Toronto. Two-storey additions to Holy Family School, Close avenue, and St. Anthony's School, Gladstone avenue, brick, stone foundation, steam heating, open plumbing, felt and gravel roofing, cement work, cut stone, brick, fireproofing, structural iron, sheet metal work, cornice, roofing, steel beams. Tenders closed July 31.

Victoria, B.C.

It is proposed to erect a new high school opposite Camosun street, the rear of the building being near Vining street.

Tenders received for building. Owner, Union Club, Victoria; architect, L. R. Rixford, Victoria. Reinforced concrete. Tenders received after July 25th.

Messrs. Murray & McKinney, contractors, will erect a new block to the University School to be used as class rooms. The new building will be brick with necessary heating plant and all modern appliances.

Tenders to be called for extension of public buildings, Parliament Square. Owner, Department of Public Works, Victoria; architect, F. M. Rattenbury, Victoria. Two wings, 3-storeys, granite, fireproof. Total cost, including library block, which will be central, \$750,000. Tenders to be called soon.

Welland, Ont.

Contemplated, Church. Owner, Holy Trinity Church; building committee, J. R. McCollum, Wardens Cox and Boyle. Plan the erection of a new church to cost \$15,000.

Wetaskiwin, Alta.

Equipment required for additions to fire hall, MacDonald street. Owner, Corporation of Wetaskiwin; architect, J. H. Knight, Wetaskiwin; fire chief, H. Whitehead. Two-storey frame and metal structure, tin roof. Required, 100 ft. new cotton rubber lined hose, two sets fire dept. drop harness, hydrant shut off gates and shut off nozzles; new hose wagon (team drawn).

Windsor, Ont.

Plans prepared for Fair buildings, \$10,000. Owners, Windsor and North Essex

Agricultural Society, H. J. McKay, Windsor, secretary; architects, Jacques & Williamson, Windsor. Four buildings, each 34 x 60, wood and glass, concrete floors. Two of the buildings to be erected this year in time for the fall fair.

Winnipeg, Man.

A 2-storey municipal hall will be erected at St. James, brick veneer, stone foundation, \$8,000.

Wynyard, Sask.

Tenders called for school. Owner, Public School Board, Wynyard; secretary, R. Denovan; architect, W. W. La Chance, Saskatoon, Sask. Erection of school. Plans, etc., at office of Waldon Heating Co., 92 Princess street, Winnipeg, and with the secretary. Tenders received until August 5th by secretary.

CONTRACTS AWARDED**Fort William, Ont.**

Y. M. C. A. Building. Owner, Y. M. C. A., Fort William; architect, R. E. Mason, Fort William; general contractor, M. H. Braden, Fort William, \$76,702; heating, Northern Engineering Co.; plumbing, Anderson & Co., both of Fort William. Four storeys, solid brick, 100 x 100, cement foundation, cut stone, structural iron, fire escapes, fireproof doors, electrical work, steel beams, iron columns. Work will commence immediately.

Montreal, Que.

The contract has been awarded to John Wighton, 16 Sussex street, for an \$8,500 club house to be erected by the Montreal Racquet Club on Concord street, 3 storeys, brick and roughcast, 23 x 100. H. C. Stone, architect.

The contract has been awarded for a \$2,800 church for the Presbyterian Diocese of Montreal, on Hamilton avenue, to A. Lacroix, 25 Stanley avenue, St. Lambert.

Medicine Hat, Alta.

School. Owner, Public School Board. Architect, W. T. Williams; contractor, A. P. Burns, Medicine Hat, \$69,550. Two storeys, brick and cut stone, 65 x 130. Board is appropriating \$8,550 for furnishing of school, consisting of blackboards, etc. Building to be completed January 1.

Newdale, Man.

School, \$12,000. Owner, Municipality of Newdale; architect, W. A. Elliot, Brandon, Man.; general contractor, R. Willoughby, Brandon. One storey, brick and stone, 64 x 36, Muller hot air heating, pitch roof. Sub-contracts not let yet.

Preston, Ont.

The contract for the Roman Catholic Church on Duke street, awarded as follows: Messrs. Wirsching Bros., mason and stone; Messrs. Reizel Bros., of Berlin, carpenters. Heating and plumbing not yet awarded. Mr. Holmes, architect.

Swift Current, Sask.

Hospital, \$22,430. Owner, Town of Swift Current; architect, Sharon & Darrach, Regina and Swift Current; general contractor, Bernard, Regina. Heating contract not let yet.

Vancouver, B.C.

Rink. Owner, Patrick Bros (Denman and Georgia); general contractor, W. G. Gillett, 41 Hutchinson Block. 450,000

No. 1 common brick and some pressed brick, 7,250 yards of plaster, 1,200 bbls. of lime, steel posts and girders, felt roofing, sheet metal work, ornamental fire escapes, and plumbing. Tenders on above closed July 24th. Further time allowed on plumbing and wiring.

Herrett & Co., contractors for the schools at Cluff avenue and Rosenberg road and 43rd and Ontario, are ready for sub-tenders on the following lines: Mill work, plumbing, plastering, painting, brick work, roofing and heating. Excavation awarded about Tuesday, July 18.

Victoria, B.C.

The Canadian Wire Goods Mfg. Co., Hamilton, have been awarded the contract for installation of automatically releasing emergency system of opening doors for the provincial jail. Recommendation of steel stairways to replace wooden ones has not yet been acted upon.

Winnipeg, Man.

General Hospital. Successful contractor, Carter Halls Aldinger Co., Winnipeg, \$287,000. Other tenderers were: C. W. Sharp & Son, \$312,806; Kelly Simpson Construction Co., \$200,213; Lyall Mitchell Co., \$277,204; Wallace & Atkin, \$272,767; Claydon Bros., \$272,577.

Residences**Brockville, Ont.**

Tenders to be called for alterations to residence. Owner, M. M. Brown; architect, A. Stuart Allaster, Brockville. Two and one-half storeys, hot water heating, electric lighting, interior finish graining, sheet metal work, pipe covering, electric work, art glass. New heating and lighting system required. Tenders received after August 1st.

Hamilton, Ont.

Plans being prepared for ten houses, Huron street; architect, Stewart McPhie, Bank of Hamilton Chambers, Hamilton. Two storeys, 20 x 28 each, brick and stone, stone foundation, hot air heating, gas and electric lighting, shingle roof. Estimated cost of each, \$1,400.

Montreal, Que.

Private garages being erected by the following: R. H. MacDonald, Cote Rd., Westmount, \$275; J. O. E. Blackwell, Roslyn avenue, Westmount, \$300; Hiram L. Piper, Arlington street, Westmount, \$600; A. G. Beyers, Belmont street, Westmount, \$500; J. H. Hand, Belmont street, Westmount, \$400; W. H. Creed, 630 Roslyn avenue, Westmount, \$1,000. The following buildings are in the course of construction in Westmount: M. A. A. A., 250 Peel street, is building a large club house, \$75,000, reinforced concrete, contractors, Atlas Construction Co.; the Steeling Press, Ltd., St. concrete and brick, \$9,000; W. K. Graf-fety, Elm avenue, residence, stone and brick, Sydenham avenue, \$11,000; W. J. Munroe, 333 Grosvenor avenue, residence, concrete, stone and brick, \$12,000. Mr. Gouin, Bellevue street, Westmount, residence, \$4,000; Mr. Williams, 494 Elm avenue, residence, stone and brick, Mount Pleasant avenue, \$5,500; Mr. G. H. Hand, Lansdown street, residence, \$18,000.

Montreal, Que.

Nelson Garage, 2055 Dufferin street, \$4,000 residence, 386 Huntley street, 3

storeys, 25 x 100, pressed brick, stone foundation.

Port Arthur, Ont.

Work in progress for residence, \$40,000, Dawson road. Owner, F. S. Wiley, Port Arthur; general contractor, R. Hamer, Port Arthur. Two and one-half storeys, 45 x 105, cut and sawn stone, brick and concrete. Foundation laid in 1910; stone for construction is now being prepared. As far as can be learned no sub-contracts have been let. Building not to be finished this year.

Toronto, Ont.

Tenders called for residence, \$10,000, Russel Hill road. Owner, J. G. Hay, Toronto; architect, Chadwick & Beckett, Toronto street, Toronto. Two and one-half storeys, 44 x 35, brick and stone, stone foundation, hot water heating, electric lighting open plumbing, shingle roofing, interior finish red oak, cement work, cut stone, brick, tile, mantels, artificial stone, cornice, electrical work, plate and art glass. Tenders close August 3.

Work in progress for two pair dwellings, \$8,000, Pape avenue. Owner, Hayes & Caldwell, 101 Victoria street, Toronto. Two and one-half storeys, 30 x 38, brick, brick foundation, hot air heating, electric lighting, open plumbing, shingle roofing. Owner will build by day labor.

Tenders to be called for detached house, \$3,500, south side Walker avenue. Owner, H. B. Reeson, 14 Summerhill ave., Toronto; architect, J. Hunt Stanford, 34 Yonge street Arcade. Two and one-half storeys, 23 x 36, brick, stone foundation, hot water heating, combination lighting, open plumbing, shingle roofing, cement work, cut stone, brick, electrical work, plate and art glass, etc. Tenders received after July 26, close August 5.

Work in progress for pair buildings, \$5,400, west side Denison avenue. Owner, C. Laurie, 105 Denison avenue, Toronto. Two and one-half storeys, 30 x 42, brick, stone foundation, hot air heating, electric lighting, open plumbing, slate, felt and gravel roofing, cement work, brick, tile, mantels, cornice, electrical work, electric bells. Owner will build by day labor.

Tenders to be called for residence, \$7,000, Wychwood Park. Owner, Mrs. A. K. Goodman, Wychwood Park, Toronto. Two storeys, 54 x 32, brick, stone foundation, hot water heating, electric lighting, slate roofing, hardwood floors, cement work, cut stone, brick, terra cotta, tile, mantels, metallic lath, electrical work, plate glass. Tenders received by J. E. Johnson, 314 Grace street, Toronto, after August 1st.

Tenders called for two pair dwellings, \$10,000, Cawton avenue. Owner, J. J. McKinney, 87 Beatrice street, Toronto; architect, Wm. Ainlay, 149 Beatrice st., Toronto. Two and one-half storeys, 42 x 30, brick, stone foundation, hot air heating, electric lighting, open plumbing, shingle roofing, cement work, brick, tile, mantels, electrical work, electric bells, plate glass. Tenders called on all work but masonry and carpentry.

Tenders called for residence, \$4,000, Brunswick avenue. Owner, Dr. Slade, Toronto; architect, H. Bryan Gilbert, 47 Wellington street, Toronto. Two and one-half storeys, brick, brick foundation, hot water heating, gas and electric lighting, slate roof. Hardwood interior finish,

mantels, plate glass. Tenders called by architect for all trades until July 28.

Toronto, Ont.

Work in progress for private dwelling, \$4,500, south side Westminster ave. Owner, R. E. McDonagh, 253 Spadina avenue, Toronto. Two and one-half storeys, 16 ft. 6 in. x 44, brick and stone, stone foundation, hot air heating, electric lighting, open plumbing, slate roofing. Owner will build by day labor.

Work in progress for dwelling, \$3,500, 150 Westminster avenue. Owner, E. P. Atkinson, 100 Roncesvalles avenue, Toronto. Two and one-half storeys, 33 x 21, brick and stone, stone foundation, electric lighting, shingle roofing, interior finish hardwood, cement, cut stone, brick, plate glass, etc. Owner will build by day labor.

Wm. Whitelaw, 51 Ruskin Ave., \$3,500 residence at 85 McVetty Ave., 2½ storeys, 22 x 34, brick and stone, stone foundation, shingle roofing.

J. Thompson, 165 Prescott Ave., pair dwellings west side Perth Ave., \$4,000, 2 storeys, 36 x 29, brick and stone, stone foundation, shingle, felt and gravel roofing.

Mrs. E. Garton, 163 Macdonnell Ave., dwelling, \$3,000, 92 Geoffrey St., Toronto, 2 storeys, 16 x 38, brick and stone, stone foundation, shingle roofing, cement work, cut stone, brick, tile, mantels, plate glass.

J. Jennings, 99 Ritchie Ave., pair dwellings, \$5,000, east side Ritchie Ave., 2 storeys, 37 x 34½, brick and stone, stone foundation, shingle, felt and gravel roofing.

J. H. Robinson, 109 St. John's Rd., dwelling, \$2,500, Evelyn Ave., 2½ storeys, 22 x 30, brick, stone foundation, hot air heating, electric lighting, shingle roofing.

Vancouver, B.C.

Tenders to be called for apartment house, \$6,000, Keefer street. Owner, Mrs. Snyder, Vancouver; architects, Campbell & Dawson, Exchange Building, Vancouver. Two storeys, frame, concrete foundation, hot water heating, electric lighting. Tenders received after July 27th.

Tenders to be called for apartment house, \$350,000, Nelson between Burrard and Thurlow. Owner, E. D. Boucher, Vancouver; architect, Stroud & Keith, Carter-Cotton Building, Vancouver. Ten storeys, 66 x 131, steel and concrete. Tenders received after August 15th.

Tenders called for residence, \$10,000, Shaughnessy Height. Owner, Mrs. A. N. Winters; architect, Somervell & Putnam, Pacific Block, Vancouver. Two storeys, brick veneer, stone foundation, hot water heating, electric lighting.

Work in progress for apartment house, 2425 Main street. Owner, P. Lee; architect, Stroud & Keith, Carter-Cotton Building, Vancouver; steel contractors, J. Coughlan & Sons, Carter-Cotton Bldg. Six-storey, steel. Part of steel has been delivered. Architect will probably call for tenders shortly.

Westmount, Que.

Tenders called for residence, Westmount avenue. Owner, M. S. Stevenson, 244 Victoria avenue; architect, P. J. Turner, 121 Board of Trade, Montreal. Three storeys, pressed brick and stone, stone foundation, metal casements, lead

glazing, mahogany and chestnut finishing. Tenders received until July 31st.

Windsor, Ont.

Tenders to be called for residence, \$4,000, Ouelette avenue. Owner, Louis Deziel; architect, Jacques & Williamson, Windsor. Two storeys, 27 x 37; frame and stucco, brick foundation, cut stone, iron columns, hot water heating, electric lighting and gas, shingle roof, shingle stain, electrical work, oak interior finish. Tenders received after August 3 until August 10th.

Yorkton, Sask.

Tenders called for residence. Owner, Bank of Toronto, Yorkton; architect, Wm. Bruce, 22 McDermot avenue, Winnipeg, Man. Plans and specifications at the Bank of Toronto, Yorkton and with architect. Tenders received by architect until July 28.

CONTRACTS AWARDED

Brockville, Ont.

The contracts for a \$4,200 residence for Dr. W. H. Woodrow, on Hartley St., have been awarded as follows: Masonry, Alex. Anderson; carpentry, S. Watson; cement, O. Anderson; plastering, G. Barclay; heating and plumbing, Brown & Semple; sheet metal, W. Harrison; stone work, A. Anderson, all of Brockville.

Ottawa, Ont.

The contracts for a residence to be erected on Nepean St., by W. H. A. Fraser, of 180 Metcalfe St., have been awarded as follows: Plastering, Brooks & Davis, Ottawa; heating, McKinley & Northwood, Rideau St. W. E. Noxke, architect, Central Chambers, Ottawa.

Port Arthur, Ont.

The contract for the erection of a \$3,500 residence by H. E. Rogers, has been awarded to Lester Carn, Port Arthur. Building to be 2 storeys, brick veneer and concrete.

Vancouver, B.C.

Residence, \$4,300. Owner, J. Souter, 1137 Davie street, Vancouver; architect, Thos. Hooper, Winch Building, Vancouver; general contractor, J. Sinfield, 647 Grove street, Vancouver. Two storeys, frame. Contract was let July 20.

Business Buildings and Industrial Plants

Brandon, Man.

Machinery required for elevator. Owner, Maple Leaf Milling Co., Brandon. Machinery for 40,000 bushel elevator now under construction. No further details available owing to temporary absence of manager.

Brockville, Ont.

Charter applied for, Brockville Atlas Motor Co., Hamilton street. Parties interested, T. J. Storey, of the Canada Carriage Co., Brockville; W. H. Comstock, ex-M.P., C. W. MacLean. Plans for the first building are completed. One storey, 150 x 50, concrete foundation, brick walls, suspension roof.

Tenders to be called for stores and flats, \$6,000. Owner, F. L. Kincaid, Brockville; architect, A. Stuart Allaster, Brockville. Two storeys, 50 x 48, brick, stone foundation, electric lighting, composition roofing, interior finish white pine, cement work, brick, artificial stone, structural iron, sheet metal work, sky-

lights, pipe covering, electrical work, electric bells, roofing, sheathing and deafening paper, steel beams, plate and prismatic glass. Tenders received after August 1st.

Cap. Rouge, Que.

Tenders called for workshop, \$2,000.-000. Owner, Grand Trunk Pacific; architects, Marchand & Tanquay, Quebec. Stone foundation, brick, stone, steam heating, cut stone, terra cotta, tile, pipe covering, steel beams, electric lighting, structural iron, telephone system, electric bells, sprinkler system, machinery of all kinds. Tenders may be advertised any day.

Chatham, Ont.

Damaged by fire, store. Owner, The McDonald Furniture Company; damage, \$8,000 to building and \$16,000 to furniture, \$8,000 of this being covered by insurance. Building will be repaired and a complete set of furniture installed.

Dauphin, Man.

Tenders called for hotel. Owner, J. Clark; architect, J. H. Bossons, Dauphin. Brick and stone. Plans, etc., at office of architect. Tenders called until July 29th.

Tenders called for hotel, \$50,000. Owner, Jos. Clarke, Dauphin; architect, J. H. Bossons, Dauphin. Four storeys, 50 x 150, brick, concrete foundation, steam heating, electric lighting, interior finish oak, cement work, cut stone, reinforced concrete, metallic lath, fire escapes, freight and passenger elevator, electric work, electric bells, iron columns. Tenders closed August 1st.

Drayton, Ont.

By-law carried for mill. By-law carried (172 for and only 1 against) to grant a loan of \$4,000, free site, etc., to Canadian Flax Mills, Ltd.

Espanola, Ont.

Plans being prepared for hotel. Owner, The Spanish River Pulp & Paper Co., Espanola, Ont.; architect, H. W. Angus, North Bay, Ont. 37 x 150, brick veneer, concrete foundation, hot water heating, electric lighting, brick, structural iron, fire escapes, pipe covering, electric bells, roofing, sheathing and deafening paper, steel beams. Tenders called later.

Fort George.

Al. Johnson will at once rebuild his hotel, which was destroyed by fire recently.

Guelph, Ont.

Tenders called for stores and offices, \$12,000. Owner, W. E. Buckingham, Guelph; architect, W. F. Colwill, Guelph. Three and one storey, 46 x 90, brick and stone, artificial stone, stone foundation, cement work, terra cotta, structural iron, iron and skylight roof, ornamental iron, sheet metal work, steel beams, iron columns, hot water heating, electric lighting, plate and art glass. Tenders closed August 1st.

Tenders to be let for newspaper building, \$27,000. Owner, H. Gunner and B. G. Gunner; architect, W. A. Mahoney, Guelph. Four storeys, 47 x 49, brick and stone, stone foundation, steel beams, cut stone, terra cotta, artificial stone, hot water heating, vaults, freight and passenger elevators, fire escapes, prismatic glass, electric bells. Old building remodelled, addition as above. Tenders to be let shortly.

Tenders to be called for horse stables,

\$8,000. Owner, Winter Fair Board, Parliament Buildings, Toronto; architect, W. A. Mahoney, Guelph. One storey, 40 x 282, brick, stone foundation, three furnaces, electric lighting, iron roof, metal ceiling. Tenders to be called this week; subway to be built between old and new building.

Tenders to be closed for factory, \$35,000. Owner, Independent Tire Co., Guelph; architect, W. A. Mahoney, Guelph. Four storeys, 60 x 260, brick, stone foundation, reinforced concrete, flat, tar and gravel roof, steel beams, iron columns, fire escapes, freight elevator, machinery. Tenders not let, awaiting sale of stock.

Halifax, N.S.

Plans being prepared for addition to factory, \$12,000, Argyle street. Owner, Moirs, Ltd., Argyle street; architects, Dumeresque & Cobb, St. Paul Building, Halifax. Six storeys, reinforced concrete, cut stone, armored concrete, fire-proof doors and windows, electrical work.

Hamilton, Ont.

Work in progress for garage, \$1,400, Bold street. Owner, T. C. Sealy and J. A. Ames, Federal Life Building, Hamilton; architect, Hamilton Architectural Company, Federal Life Building, Hamilton. One storey, 40 x 60, brick, stone foundation, hot water heating, electric lighting, tar and gravel roof. Ames will build garage. Oil tank wanted.

Tenders called for factory, \$40,000, Victoria avenue north. Owner, Otis Fensom Co., Ltd., Hamilton; architects, Stewart and Witton, 7 Hughson street, Hamilton. Two storeys, 271 x 75, steel, frame, brick, steam heating, structural iron, electric lighting. Iron making machinery required. Tenders received after July 27 until August 5th.

Medicine Hat, Alta.

By-laws to be submitted for engineering and construction. Owner, City of Medicine Hat, Alta.; city clerk, W. F. Heal; city engineer, A. K. Grimmer. The following will be submitted on August 24th: \$3,385 for the improving of the market buildings; \$650 for the purchase of a site for a sub-fire station; \$76,000 for the extension of the gas plant.

Montreal, Que.

Machinery required for flour mill. Owner, Dominion Flour Mills Co., Ltd., Brantford, Ont. Engineers, J. A. Jamieson, 313 Board of Trade Building Montreal; general machine contractor, the Nordyke & Marmion Company, Indianapolis, Ind. Tenders will be called shortly by General Machine Contractors for heating and electric motor control machinery. Tenders received by engineer.

Moose Jaw, Sask.

Re-construction of business building, Main street. Owner, J. D. Reed; architect, Story & Van Egmond, Regina. Excavation contractor, W. E. Rawson, Moose Jaw. Six storeys. Building collapsed on the 18th inst.

Milton, Ont.

Work in progress for brick works, \$100,000. Owner, Brandon Brick and Tile Co., Ltd. Building is partly constructed. Appliances of different kinds will probably be required.

North Sydney, N.S.

Contemplated, business building. Owner, Alex. MacDonald, North Sydney. Alex. MacDonald will in the near future build a large building on the site recently purchased. It is understood that the building will be for tailoring and the upper part will be for offices.

New Glasgow, N.S.

Sale of plant, woodworking and sawmill, Barney's river. Party interested, J. D. & P. A. MacGregor, Ltd., New Glasgow. Woodworking factory and sawmill, etc., well equipped, on Intercolonial Railway, with siding; ample water power; farm of 150 acres; house; mill dam, etc.; about 1,00 acres of woodland suitable for the manufacture of furniture or any line of hardwood. In addition to standing timber plenty of birch, maple and beach.

New Westminster, B.C.

The Canadian Western Lumber Co., at Fraser Mills, will spend about \$300,000 in extending their plant, which will include a sash and door factory and cedar shingle mill.

North Bay, Ont.

The Sweet Machinery & Foundry Co. will locate a new plant at Cobalt, Ont.

Orillia, Ont.

Specifications in progress for factory, \$200,000. Owner, Tudhope Co., Ltd., Orillia, Ont. Two storeys, nine buildings, 310 x 78; 290 x 80; 95 x 80; 55 x 20; 290 x 80; 160 x 80; 130 x 80; brick and slow burning, cement foundation, steam heating, electric lighting, machinery. Webb & Sons, Orillia, have contract. Work to be done by day labor and to commence at once.

Oshawa, Ont.

A new company (Brick, Limited) has been organized to do business in Oshawa, capitalization \$40,000. They will manufacture bricks and tiles. 12 acres of land has been bought and the purchase of machinery has already begun. Mr. Wm. Lowe, manager.

Point Grey, B.C.

Reeve Bowser will erect a large business block on the southwest corner of Wilson road and West Boulevard.

Princeton, B.C.

Plans being prepared for bank, \$10,000. Owner, A. E. House Co., Princeton; architect, F. Clerk King, Princeton. Two storeys, frame, concrete foundation, steam heating. The building will be used for office also.

Preston, Ont.

The Pattinson Woolen Mill are extending their mills to the extent of \$60,000.

The Crown Furniture Co., addition to their factory, 60 x 140. Contract awarded to Wirsching Bros.

The Preston Car & Coach Co., addition to factory, 60 x 200, metal clad, \$8,000.

The Buffalo Shed Co. are building a factory, 40 x 140. Cement and glass, patent roofing.

Machinery required for woodworking plant. Owner, Preston Woodworking Machinery Co., Preston; superintendent, M. Mullen; manager, W. T. Murray. Preston. Tenders are being called for the following: planers, lathes, drills, shapers, milling machines, gears, cutters, screw cutting machines, key seating ma-

(Continued on page 66)

Tenders and For Sale Department

Canadian Delivery

Canadian Rand New Giant Drill, No. 431. Complete.

Ingersoll "Little Giant" Rock Drill, No. 3¼. Complete; good order.

Jas. Cooper Mfg. Co., No. a Small Rock Drill. Good order.

American Steam Pump, 6 x 4 class, with valve, piping and elbow. New.

Emerison Pulsometer Pump, size B. New.

Two Lidgerwood Cableways. Complete.

Brown 10-ton Hoist; overhauled. First Class. Stone Screen for crusher, 24 in. x 4 ft. of 2-in. holes, 2 in. of 1 in., shaft and gear.

Thirty horse power upright boiler, 46 in. x 10 ft., complete. Good order.

THE MALES COMPANY,
No. 82 Perin Bldg., Cincinnati, O.



Department of Railways & Canals

Intercolonial Railways—Improvements at Halifax

FURTHER EXTENSION OF TIME

The time for receiving tenders for Pier and Sheds has been further extended from Monday, the 31st day of July, 1911, to Thursday, the 10th day of August, 1911, at 12 o'clock noon.

By order,

L. K. JONES,

Department of Railways and Canals,
Ottawa, July 17th, 1911.

Newspapers inserting this advertisement without authority from the Department will not be paid for it. 30-31

TOWN OF NORTH BAY

Water Works Extension

Sealed tenders endorsed "Tender A" and "Tender B," "Tender C" and "Tender D," will be received by the undersigned up to Saturday, August 5, 1911.

Contract A. The laying of approximately 46,945 lineal feet of water mains, placing valves, valve boxes, hydrants, etc.

Contract B. The laying of approximately 500 lineal feet of 16 in. steel intake pipe, the construction of concrete pump well on lake shore and the necessary connections to two pumps.

Contract C. The supplying of approximately 15,500 feet lineal 14-in. pipe; 500 ft. lineal 16-in. steel pipe; 2,550 feet lineal 10-in. pipe; 27,745 feet lineal 6-in. pipe; 1,100 feet lineal 4-in. pipe; and the necessary tees, crosses, curves, etc.

Contract D. The supplying of approximately 32 hydrants, 11 14-in. gate valves and valve boxes, 5 10-in. gate valves and valve boxes, 40 6-in. gate valves and valve boxes, 3 4-in. gate valves and valve boxes.

Separate tenders are desired for the supply of and laying of steel pipe, (2) cast iron pipe, and (3) wood stave pipe, in contracts "A" and "C."

Plans and specifications may be seen at the office of the Commissioner of Works, North Bay.

The lowest or any tender not necessarily accepted.

T. N. COLGAN,
Commissioner of Works.

North Bay, July 11, 1911.

29-31

Tenders

Sealed tenders addressed to the undersigned will be received until Monday, August 7th, for the construction of a Municipal Drain in the Township of Minto. The estimated amount of excavation is 21,600 cubic yards, and the work must be completed by November 1st, 1912.

Profile and specifications can be seen at the office of the undersigned.

W. D. McLELLAN,

Clerk of Minto,
Harriston, Ont.

30-31

Tenders for a Steel Bridge

Sealed tenders marked "Tender for Bridge," will be received by the undersigned up to noon on Monday, August 7th, 1911, for the construction of a 40-foot span over the Humber River, on the Seventh Line, Albion Township, about one mile from the Village of Palgrave.

Specifications may be obtained from the undersigned.

The lowest or any tender not necessarily accepted.

C. R. WHEELOCK,

County Engineer.

Orangeville, July 22, 1911.

30-31



Department of Railways and Canals

Intercolonial Railway

FREIGHT SHED at HALIFAX

Sealed tenders addressed to the undersigned and endorsed "Tender for Freight Shed at Halifax," will be received at this office until 12 o'clock noon of the 1st of August, 1911, for the construction of a Freight Shed on the Quay Wall at Halifax, N.S.

Plans, specifications and form of contract to be entered into may be seen and full information obtained on and after this date, at the office of the Chief Engineer, of the Department of Railways and Canals, Ottawa, and at the office of the Chief Engineer of the Intercolonial Railway at Moncton, N.B.; or at the office of the Board of Trade, Halifax.

Parties tendering will be required to accept the fair wages schedule prepared or to be prepared by the Department of Labor, which schedule will form part of the contract.

Contractors are requested to bear in mind that tenders will not be considered, unless made strictly in accordance with the printed forms, and in the case of firms, unless there are attached the actual signature, the nature of the occupation, and place of residence of each member of the firm.

An accepted bank cheque for the sum of \$2,000,000 made payable to the order of the Minister of Railways and Canals must accompany each tender, which sum will be forfeited if the party tendering declines entering into contract for the work, at the rates stated in the offer submitted.

The cheque thus sent in will be returned to the respective contractors whose tenders are not accepted.

The cheque of the successful tenderer will be held as security, or part security, for the due fulfilment of the contract to be entered into.

The lowest or any tender not necessarily accepted.

By order,

L. K. JONES,

Department of Railways and Canals,
Ottawa, July 17th, 1911.

Newspapers inserting this advertisement without authority from the Department will not be paid for it. 30-31

CITY OF GUELPH

Tenders

Tenders will be received by T. J. Moore, city Clerk, Guelph, Ontario, for the construction of a reinforced concrete arch bridge and viaduct over the Canadian Pacific Railway and the River Speed, Guelph, up to Tuesday, August 8th, 1911.

Approximate amount of concrete is 521 yards. A marked cheque for \$400 is to accompany the tender.

Forms of tender may be obtained from, and plans and specifications seen at the office of the City Engineer, Guelph, or at the offices of the Contract Record and Canadian Engineer, Toronto, Ont.

Plans and specifications may also be obtained for the sum of \$5.00 per set, which will be returned upon return of plans.

Lowest or any tender not necessarily accepted.

L. MALCOLM,

Acting City Engineer.

Guelph, July 21st, 1911.

30-31

TOWN OF WILKIE

Sealed tenders will be received by T. A. Dinsley, Secretary-Treasurer of the Town of Wilkie, until noon, Monday, August 21, 1911, for supply and delivery of the following machinery, materials, and performance of certain works:

Tender A.—Electrical Machinery—

(1) One 60 kw. 3-phase, 60 cycle, 2,200 volt a.c. Generator.

(2) One Exciter for above.

(3) One marble switchboard, instruments and switches.

(4) Three 2,200 voltmeters, back-geared to pumps.

(5) Five transformers for lighting system.

(6) Series Tungsten street lighting system.

(7) Approximately 25 cwt. of weather-proof copper wire (line material, guy wire, arms, pins, insulators, etc.)

(8) Cedar poles.

Tender B.—One 100 1 H.P. Internal Combustion Engine—

Tender C.—Pumping Machinery—

(1) One working head and deep well cylinder.

(2) One-half million gallon pump.

(3) One air compressor.

(4) Necessary shaftings and belting.

Tender D.—

One Pneumatic Storage Tank.

Tender E.—

Approximately 1,100 ft. 8-inch. c.i. water pipe.

Approximately 4,800 ft. 6-inch c.i. water pipe.

Approximately 2,000 ft. 4-inch c.i. water pipe.

Approximately 15 hydrants and 22 valves.

Tender F.—

Trenching, laying cast iron water pipes, hydrants, valves, etc., and back filling.

Tender G.—

Erection of power house and construction of reservoir.

Plans and specifications may be seen at the office of the secretary-treasurer of the Town of Wilkie, or on application to the Engineers, McArthur & Murphy, Room 8, Bottomly Block, Saskatoon, Sask.

A marked cheque for five per cent. of amount of the tender must accompany each bid.

The lowest or any tender not necessarily accepted.

McARTHUR & MURPHY, Engineers
Bottomly Block, Saskatoon, Sask.

T. A. DINSLEY, Secretary-Treasurer,
Wilkie, Sask.

30-31

BUCKET CRANE

FOR SALE—One 10 to 15-ton No. 1 Brown-ig Locomotive crane, standard gauge, 4-wheel truck, 38 ft. steel boom, 8 x 10 engines, equipped to handle clam or orange peel. Will furnish with or without bucket. Attractive price, fine condition, quick delivery. Inspection here.

WILLIS SHAW MACHINERY CO.,
39 South LaSalle Street,
Chicago, Ill.

FOR SALE

Complete Electric Generating Set, consisting of Leonard Peerless steam engine direct connected to 150 k.w. Canadian General Electric generator, 2,800 volts, 60 cycles; also condenser, switchboard, steam and exhaust piping, spare parts for engine and generator, and everything constituting the complete set as at present installed in the Thomas street lighting station of the Town of Brockville. This machine is in first-class order, having only been used on peak loads. It is now being replaced by a larger Belliss & Morcom engine with Swedish G. E. generator. Full particulars and price can be obtained from Laurie & Lamb, Consulting Engineers, Board of Trade Building, Montreal.

28-35

TOWN OF GLEICHEN Alberta

Waterworks

Sealed tenders, addressed to the undersigned, will be received until 18 o'clock, on Friday, 11th August, 1911, for the following:—

One 54-in. x 14-ft. Return Tubular Boiler and Stack.

One 500-gallon per minute Duplex Steam Pump.
One Air-compressor and Air-lift Pump.

Specifications and all information may be obtained at the offices of the engineers, the John Galt Engineering Company, 317 Portage avenue, Winnipeg, Man.

The lowest or any tender may not necessarily be accepted.

W. J. BURR,
Secretary-Treasurer.

Gleichen, Alberta. 31-31

CITY OF MOOSE JAW Saskatchewan

Sewer and Water Extensions

Sealed tenders will be received by the City of Moose Jaw, addressed to the undersigned City Clerk, until 8.30 p.m., on Monday, August 14th, 1911, for the laying of approximately 16,885 lin. feet of sewer and water extensions, as well as for the supply of all cast iron and vitrified tile pipe and specials, etc.

Any tender received after the above stated time will be declared informal.

Plans and specifications for the construction work may be seen at the office of the City Engineer, and specifications for the supply of materials may be obtained from the City Engineer's office upon application.

The lowest or any tender not necessarily accepted.

J. M. WILSON, W. F. HEAL,
City Engineer. City Clerk.
Moose Jaw, Sask., July 21, 1911. 31-32

Tenders

Tenders will be received by the undersigned until August 19th, 1911, for supplying and installing a six-million gallon Centrifugal Pump and Steam Engine. Specifications may be obtained from the City Engineer. Tenders must be plainly marked on the outside.

M. H. BAKER,
City Engineer.
31-33

St. Thomas, July 20, 1911.

Applications

Will be received by the undersigned for the position of City Engineer, or a competent Foreman, with municipal experience, to take charge of the public works of the City of Chatham, Ontario.

Applications to be in not later than 4 p.m. on Monday, August 7th.

W. G. MERRITT,
Clerk of Chatham.
31-31



To Contractors

Separate tenders endorsed "Tender for New Government House," addressed to the undersigned, will be received at this Department until noon of Tuesday, August 22nd, for the stone and brick work, fireproofing, steel work, roofing and carpenter work, for the new Government House in Chorley Park, Rosedale, Toronto. Plans and specifications may be seen at this department.

An accepted bank cheque payable to the order of the Hon. J. O. Reaume, Minister of Public Works, for five per cent. of the amount of the tender, and the bona fide signatures and addresses of two sureties, must accompany each tender. Cheque will be forfeited to the Crown in the event of the successful tenderer refusing to carry out the work within ten days after acceptance. The department will not be bound to accept the lowest or any tender.

By order,

H. F. McNAUGHTEN,
Secretary Public Works Department.
Department of Public Works, Ontario, Toronto, July 21st, 1911.

Newspapers publishing this advertisement without authority will not be paid for it.
30-31-32-33

Town of Battleford, Sask

Tenders

FOR THE ERECTION OF A New Town Hall

Sealed tenders, addressed to the Secretary-Treasurer, will be received by the Town Council of Battleford until 12 o'clock noon, August 14th, for supplying all materials and erecting a Town Hall.

Plans may be seen and specifications and form of tender obtained at the office of the Town Engineer, Battleford. Plans may also be seen at the office of the Canadian Engineer, Winnipeg, and at the office of Messrs. Gorman, Clancey & Grindley, Edmonton.

Separate tenders will be received for the heating plant.

Tenders must be accompanied by an accepted cheque for five per cent. (5 p.c.) of the amount of the tender.

WILLIAM KITSON,
Town Engineer.
H. C. ADAMS,
Secretary-Treasurer.
31-31

Positions Vacant

Advertisements under this heading two cents a word per insertion. Minimum charge 50 cents

AGENTS WANTED—United States firm manufacturing sawmill, well-drilling and prospecting machinery, desires to secure Canadian representatives. For particulars write E. J. McIntyre, 4059 Perry street, Chicago, Ill. 30-31

FOREMAN WANTED.—Wanted, a Construction Foreman on a large mill to be erected in Toronto, one who understands masonry, carpentry, and steel construction, also familiar with local conditions. Engagement September 1st. Apply Box 306, Contract Record, Toronto. 30-31

SUPERINTENDENT WANTED.—Superintendent of Construction; a man thoroughly familiar with all kinds of form work for reinforced concrete buildings, must be a first-class man. First class salary. State experience and give references. Box 306, Contract Record, Toronto. 30-31

Business Notes

Bathurst, N.B.

Sale reported of lumber mill. Owner, Nepisquit Lumber Co. The mill and property will be sold at auction at Bathurst on September 7.

Fredericton, N.B.

The T. S. Simms Company, of St. John, manufacturers of brooms and brushes, are contemplating the removal of their business to this city.

Nanaimo, B.C.

The Clay district in this vicinity is to be exploited, plant to be erected and operated by a company seeking incorporation as the Vancouver Island Clay Products Company.

Orillia, Ont.

The following merger has been formed—The Tudhope Knox Co., of Orillia, makers of steel trucks; the Perrin Plow & Stove Co., Smith's Falls, makers of plows, stoves, etc., and the Tudhope Anderson Co., of Winnipeg, selling agents, having agencies at Winnipeg, Regina, Calgary and other large centres in Western Ontario. They have also acquired the West Lorne Wagon Co. F. R. Oliver, of the Perrin Plow & Stove Co., will move to Orillia, where Perrin plows will be manufactured in future. The Smith's Falls plant will be enlarged and devoted wholly to the manufacture of stoves.

Powell River, B.C.

The Powell River Paper Company's general store and office were destroyed by fire on the 14th inst., also other buildings.

Fredericton, N.B.

Legal sale of lumber property. The lumber property of the Alexander Gibson Railway and Mfg. Co., Marysville, York County, this province, was sold at public auction under order of the equity court, at Fredericton, June 15, 1911, to Farnsworth & Jardine, the Liverpool (Eng.) lumber dealers, for \$1,000,000. It is believed that the property will be turned over to the Nashwaak Lumber Co., being organized with a capital of \$3,000,000. Incorporators are Lieut. Col. Hugh H. McLean, M.P., of St. John, Lawrence MacLaren, J. S. MacLaren, Alfred Rowley, and Fred R. Taylor.

chines, tumbling mill, girders, motors, etc., for hydro-electric power. Cost, about \$20,000.

Port Arthur, Ont.

Work in progress for hard coal shed, \$110,000. Owner, Canadian Northern Coal and Ore Dock Co., Ltd.; general contractor, Barnett & McQueen, Fort William, Ont.; roofing contractor, D. W. Holmes, Superior, Wis. Tar and gravel Carey roofing.

By-law to be submitted for factory, \$30,000, Queen street. Owner, J. L. McRae, Port Arthur. Purpose of factory, to manufacture school desks, office furniture, etc. The construction will likely be handled by Mr. McRae, as he is a building contractor. Vote taken on August 10th.

By-law to be submitted for storage plant, Waterfront. Owner, The General Storage Corporation, Ltd. John O'Gorman, Toronto, is asking certain assistance from ratepayers. By-law to be submitted August 10th. First building to be erected, eight storeys, 500 by 600 feet. Initial expenditure, \$400,000. The general opinion is that by-law will carry.

Quebec, Que.

Preparing to re-build laundry. MacMahon street. Owner, A. S. Pfeifer & Co. Preparing to re-build the building gutted by fire on July 20th; walls good; work to be done by day labor. Machinery badly damaged.

Saskatoon, Sask.

Site prepared for warehouse, Twenty-third street. Owner, McLaughlin Carriage and Automobile Co., Oshawa, Ont. Will start work at once on the erection of a new warehouse.

Sudbury, Ont.

The Dominion Turpentine Co., capital \$250,000, propose to establish a large factory here. Nothing definite has been decided.

Sault Ste. Marie, Ont.

The Superior Pulp and Paper Company will erect a \$4,000,000 paper mill and work has already commenced on clearing the property purchased from the Lake Superior Corporation.

Trochu, Alta.

Plans for the Royal Hotel are out, brick and stone, costing \$60,000.

Toronto, Ont.

Contemplated, office, Sheppard and Richmond streets. Owner, H. Gagnier, Ltd., 28 Adelaide street east, Toronto. Nine storeys, steel, concrete and brick, concrete foundation. Building on site being demolished.

Work in progress for store and residence, \$3,700, south side Bloor street west. Owner, Cooper & Son, Bloor st. and Symington avenue; architect, W. E. Cunningham, 84 Geoffrey street, Toronto. Two storeys, brick and stone, brick foundation, hot water heating, electric lighting, felt and gravel roof.

Contemplated, office, \$125,000, 85 Adelaide street west. Owner, S. Frank Wilson, 77 Adelaide street west, Toronto. Ten storeys, reinforced concrete. Owners are awaiting decision of the city council re by-law concerning reinforced concrete buildings.

Tenders called for additions and alterations to office building, northwest corner Adelaide and Victoria streets. Architects, Symons & Rae, 15 Toronto

street, Toronto. Seven storeys, 120 x 54, steel and brick, steam heating, electric lighting, cement work, cut stone, marble, terra cotta, tile, fireproofing, structural iron, fire escapes, vaults, sheet metal work, steel beams, plate glass, extension to elevators, electric fixtures, etc. Tenders close August 1.

Transcona, Man.

Tenders received for addition to car shop. Owner, National Transcontinental Railway, Ottawa; secretary, P. E. Ryan, Ottawa. The tender of Haney Quinlan & Robertson, Montreal, Que., \$2,500,000, was the lowest. This firm has been awarded the contract for protection work on the Soulages Canal, Ont.

Vancouver, B.C.

Preliminary plans prepared for warehouse, between Yukon and Alberta sts. The Vancouver Breweries Co., Ltd., 263 Seventh avenue east, are planning the erection of a 3-storey warehouse.

The British Columbia & Vancouver Island Tourist Hotel Company are contemplating the erection of an hotel at Shawingan Lake.

Work in progress for office building, Hastings street. Owner, J. K. Sutherland, 1901 Barclay street. Excavation contractor, Hawley & McMillan, \$5,000. Six storeys, reinforced concrete.

The Pacific Electric Heating Company will establish their Canadian plant in Vancouver. A building has been leased in the east end and operations will be started immediately.

Plans have been prepared for a warehouse to be built by the Campbell Storage Co., 857 Beaty street on the C. P. R. reserve near the Cambie street bridge. The building will be of corrugated iron and frame construction. J. W. Hooper, architect. W. McMillan, contractor.

Vernon, B.C.

Some of the buildings in course of construction are: Hudson Bay Company's 2-storey block, \$60,000; Post Office and Customs House; C. P. R. station, \$22,000; Union Bank Block.

Woodstock, Ont.

Contemplated, factory, \$25,000. Owner, Bain Wagon Co., Woodstock. Four storeys, 127 x 50, brick and cement, cement foundation, steam heating, electric lighting, tar and gravel roof, fire escapes, freight elevator, sprinkler system, iron columns. Contract not let yet.

Specifications in progress for knitting factory, \$30,000. Owner, Oxford Knitting Co., Woodstock; architects, Taylor & Taylor, Brantford. Two storeys and basement, brick, hot air heating, electric lighting, asphalt roofing, interior finish wood, brick, fire escapes, knitting machinery.

Windsor, Ont.

Tenders to be called for market shed, \$3,000. Owner, City of Windsor; architect, Jacques & Williamson, Windsor. One storey, 20 x 80, frame, metal and concrete, cement work, concrete foundation, metal work. Tenders received after August 3 until August 10.

CONTRACTS AWARDED

Brantford, Ont.

Carpenter shop, \$13,500, Mohawk st. Owner, Cockshutt Plow Co., Brantford; general contractor, A. E. Faulker, Brantford. Three storeys, 110 x 60,

brick, concrete foundation. Contract was let July 25th. Heating and plumbing contract not let yet.

Calgary, Alta.

Warehouse, \$40,000. Owner, John Deere Plow Co., Ltd. Successful contractor, Mackissock & Thomas, Limited, Winnipeg and Calgary.

Fort William, Ont.

Warehouse, \$100,000. Owner, International Harvester Co.; contractor, Elliot Construction Co., Minneapolis Minn. Supervisor of Construction, H. J. Powers, Empire Hotel, Fort William.

Guelph, Ont.

Factory. Owner, Independent Tire Company, Guelph; architect, W. A. Mahoney, Guelph; general contractor, P. H. Secord & Sons, \$47,000. Four storeys, 60 x 260, reinforced concrete, flat, tar and gravel roof, steel beams, iron columns, fire escapes, freight elevator, machinery.

Hamilton, Ont.

Factory, \$12,000, Garth street. Owner, Zimmerman Mfg. Co., Hamilton, Ont.; architect, P. M. Smith, Hamilton; contractor, W. A. Yates, Hamilton. Two and one-half storeys, stone and brick, 125 ft. x 60 ft. fi

Moose Jaw, Sask.

Warehouse, \$45,000. Owner, Tees & Persse, 315 William street, Winnipeg; general contractor, D. A. Girvin, Moose Jaw. Three storeys, 54 x 114, foundations for six storeys put in, brick, stone. Excavation will be commenced at once.

North Bay, Ont.

Business block, \$6,000. Owner, L. Bunyan, North Bay; general contractor, J. P. Quinlan, North Bay. Two storeys, 34 x 48, brick, stone foundation, hot water heating, electric lighting, cut stone, structural iron, sheet metal work, metal ceiling, cornice, iron columns, roofing, pipe covering, plate glass, vaults, skylights, interior finish pine. Heating and plumbing contracts not yet awarded.

Vancouver, B.C.

Business block, \$15,000, 538 Cordova street. Owner, David Spencer, 515 Hastings street west, Vancouver; architect, Thos. Hooper, Winch Building, Vancouver; general contractor, Purdy & Henderson, 543 Granville street, Vancouver. Four storeys, brick. Contract was awarded July 20.

Power Plants, Electricity and Telephones

Hamilton, Ont.

By-law carried for municipal power plant. Owner, City of Hamilton. By-law \$502,878 passed July 25. Specifications along lines of report received by city council and made by E. I. Sifton. London, Ont., will be ordered in a few weeks.

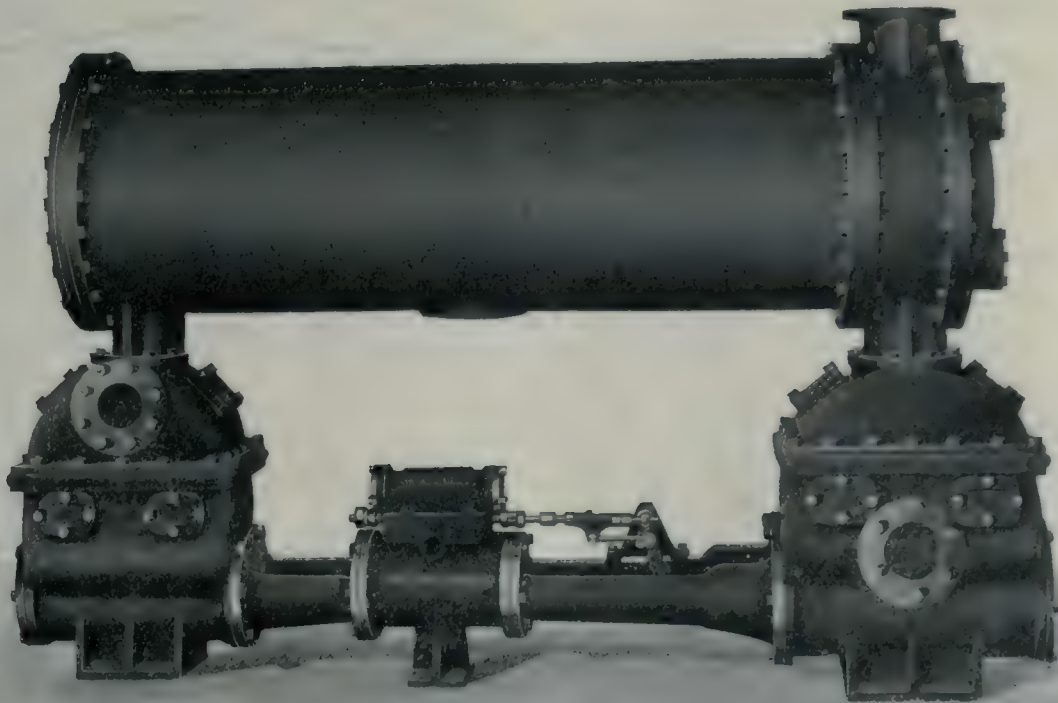
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220 King Street West

TORONTO

CONDENSORS



Condensor built by The John Inglis Co., Limited

BOILERS, ENGINES, PENSTOCKS,
Water Towers, Steel Tanks, Heavy Plate
Work, Condensers, Air Compressors, Pump-
ing Machinery, Special Machinery of all kinds

Let us Submit Prices.

The **John Inglis Company**

Engineers and Boilermakers

Limited

14 Strachan Ave., TORONTO, Canada

Medicine Hat, Alta.

Gas well, Johnson Park. Owner, City of Medicine Hat, Alta; engineer, A. K. Grimmer, Medicine Hat; contractor, Redcliffe Realty Co., \$12,000; \$8,800 for drilling and \$4,000 for casing; well 1,200 feet deep, 10-in. diameter at bottom. Contract awarded July 21. Contractor will want casing.

Toronto, Ont.

A new system of gas production, consisting of engine generator and purifiers, to be installed by the Pintsch Compressing Co., in their building at the foot of John street, which is being enlarged to accommodate the necessary plant.

Tenders called for one-storey addition to gas house, \$4,800, foot of John street. Owner, the Pentsch Compressing Company, Toronto. One storey, brick and steel, concrete foundation, galvanized iron roofing, cut stone, metal roofing, steel beams. Tenders closed July 29th.

Winnipeg, Man.

Tenders called for supplies. Owner, Winnipeg Electrical Distributing System; secretary board of control, M. Peterson. Manufacture and delivery f.o.b. Winnipeg, of the following: triple braid weatherproof wire and cable; cross arms; pins; insulators; lightning arresters; galvanized steel wire; miscellaneous hardware; paint, tapes and solder. Information obtained at office of City Light & Power Department, Main st. Tenders received by chairman, board of control, until July 31st.

Plans being prepared for telephone exchange, \$50,000, East Main street. Owner, Bell Telephone Co., Montreal;

architect, company's architect. Steel and brick, stone foundation.

Yale, B.C.

Burns Jordan and Welch have been awarded the contract for the construction of a tunnel near here, 2,075 feet.

New Companies

The Port Stanley Telephone Company, Limited, Port Stanley, incorporated, capital \$1,000; provisional directors, Neil Burlton, Edgar Earnshaw and Mason D. Hyndman, all of the Township of Southwold, Elgin County.

Russell Rural Telephone Co., Napan, Ont., incorporated, capital \$9,000. Provisional directors, Geo. J. Bonsfield and Marshall Rothwell, of Township of Cumberland, County of Russell.

Sovereign Construction Company, Limited, Toronto, incorporated, capital \$850,000. Provincial directors, Burnett Webster and John Irwin Grover, both of Toronto.

The Rudel Belnap Machinery Company, Limited, Montreal, Que., incorporated, with a capital of \$40,000, to carry on business as iron founders, mechanical engineers, manufacturers of machinery, etc. Incorporators, Louis Athanase David, Wm. H. Lunney, advocates, and John Holmes Brittle, accountant, all of Montreal.

Griffiths Electric Contractors, Ltd., Winnipeg, Man., incorporated with capital of \$500,000, to carry on business as manufacturers of electrical apparatus, machinery, etc. Incorporators include Jas. Kerr Brock, electrical engineer, Viscount Fielding and Lynn Gordon

Britsowe, all of City of London, England.

Lucas Patent Granitic Pipe and Cement Construction Co., Ltd., Victoria, B.C., incorporated, with a capital of \$100,000.

Bright, McDonald & Co., Ltd., Vancouver, B.C., incorporated, with a capital of \$20,000, to carry on business as contractors, engineers, etc.

Omineca Water and Power Company, Limited, Victoria, B.C., incorporated, with a capital of \$50,000.

United Lumber and Shingle Mills, Ltd., Vancouver, B.C., incorporated, with a capital of \$100,000.

Builders Investment Co., Ltd., Vancouver, B.C., incorporated, with a capital of \$50,000.

Halleran Construction Co., Limited, Vancouver, B.C., incorporated, with a capital of \$10,000.

The Clark, Green, Wade Logging Co., Ltd., 422 Richards street, Vancouver, B.C., incorporated, with a capital of \$10,000.

The Northern Telephone and Power Co., Ltd., South Fort George, B.C., incorporated, with a capital of \$250,000.

Business Notes**Toronto, Ont.**

Wells & Gray, Limited, 315 Confederation Life Bldg., have been awarded the contract for the construction of the Jane street subway at West Toronto for the C. P. R., and also for the large reinforced concrete factory for the Fort Motor Co., at Walkerville, Ont.

WIRE LATHING



factories and warehouses where the vibration of machinery or the movement of heavy weights is liable to shake the plaster off ordinary wood lathing.

Consider the advantages of Greening's Wire Lathing. It is fire proof, rat proof, shrink proof, warp proof. The key is perfect. The plaster cannot become detached from the lath as it clenches through mesh forming a double coat of plaster. Greening's Wire Lathing is particularly adapted for use in stores,

Every Builder and Architect should have our Lath and Wire Reinforcing Catalog.

WRITE FOR CATALOG NO. 6

The B. Greening Wire Company, Limited
HAMILTON, ONT. - MONTREAL, QUE.

Contract Record

ESTABLISHED 1886

A Weekly Journal of
Building, Contracting, Engineering, Public Works
Municipal Progress, Advance Information

PUBLISHED EACH WEDNESDAY BY

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SUBSCRIPTION RATES

Canada and Great Britain, \$2.00 U.S. and Foreign, \$2.50

Vol. 25

August 9, 1911

No. 32

City Council Indiscretion

An alarming condition of affairs that recently put in an appearance in the city of Carbondale, Penn., with reference to the City Council's advertising for sealed proposals for the services of a consulting engineer to prepare plans for what it terms a comprehensive system of sewerage and sewage disposal, has recently been commented upon in an editorial way by the Engineering News. Bidders were required to submit cash or certified check for \$50 with their bids, to be forfeited if they failed to enter into contract within 10 days from the award, and to complete the job within 60 days. Further, no money was to be paid the engineer for his plans unless and until they were approved by the Pennsylvania Commissioner of Health.

The bids that were received were opened on July 10 and were eight in number. According to this contemporary the list was as follows, the names of bidders being omitted:

(A) Complete design, including all necessary surveys, maps, plans, etc.; \$1,250 plus travelling expenses, or \$25 per day and \$10 for assistant.

(B) Complete design, plans and specifications; \$800. For surveys, maps, etc., \$20 per day.

(C) Complete design, plans and specifications, \$500.

(D) Complete design, including all necessary preliminary surveys, report, maps, plans, specifications, etc.; \$780.

(E) Complete design, plans and specifications, no surveys; \$539.

(F) Complete design, as per advertisement; \$972.

(G) Complete design, including surveys; \$1,175. If City Engineer makes surveys deduct \$225.

(H) Complete design, maps, plans, specifications, reports, surveys, etc.; \$900.

It is noted that the bidders, except (D) and (E), enclosed a certified check for \$50 with their bid. (E)

wrote a very dignified letter to the members of the council to the effect that their request for a certified check was unprofessional. The contract was awarded to (D).

In a letter concerning this scheme one of the bidders stated that the party to whom contract was let was a man whose engineering training was obtained for the most part in a rolling mill, and whose engineering practice has been the sale of vacuum sweepers, although recently given to the guaranteeing of odorless sewerage purification, without any attention to the apparatus on the part of the operator, however irregular the influent.

The laws of Pennsylvania require that such work shall be advertised and let by competition to the lowest responsible bidder.

This instance of selling engineering services by auction should be sufficient incentive to engineers to at once provide an effective remedy in order that their interests may be protected from the dictates of civic authorities who are elected into office with little or no knowledge as to what competent engineering advice is. In so doing engineers will not only do themselves a justified service but will prevent serious injury to municipalities in general.

An incompetent designer of a sewage disposal plant may make blunders which will cost the city many thousand dollars to remedy. We make this statement advisedly with knowledge of cities which have had to spend hundreds of thousands of dollars on their sewerage systems which would not have been necessary had the work been more intelligently and ably planned at the start. Much more than the ability to compute pipe capacities and outflow volumes is needed to fit an engineer to design a sewerage system wisely.

Why should not engineers associated together for mutual benefit do for themselves collectively what no one member of the profession, however influential, can do alone? It would require radical reorganization of our engineering societies and shaking of some dry bones, it is true; but is that a strong argument against it?

It would seem that an investigation would bring to light a number of ways in which the engineering profession could educate the average city council as to how to select a competent engineer for authoritative unbiased advice, without this disastrous punishment being reflected upon themselves.

Investigators of Civic Conduct

Bureaus of Municipal Efficiency have been tried in several cities of the United States and their reports would indicate that the experiments have in all cases been successful. They generally have for their purpose the promotion of efficiency and economy in the conduct of municipal business, and to this end they study methods by which the different departments of civic organization carry on their work, with a view to recommending such changes as may appear necessary. Such a bureau has been defined as "An institution designed to introduce into public administration the most economical methods of private business, to prevent waste and to provide an effective agency of citizens' enquiry, to ascertain exactly how the public business is being transacted, to bring this information to the public in a digestible form, and on the

basis of exact knowledge to assist city administration in increasing efficiency."

One bureau has outlined its objects and its methods of procedure to be as follows:

Specific Objects of the Efficiency Bureau

1. To ascertain the powers and limitations of each city official; to eliminate conflicts of power and administrative jurisdiction, and to suggest methods of preventing waste and inefficiency.
2. To aid public officials in securing the information necessary to effective administration; to preserve such evidence of transactions as is necessary to locate responsibility, and to inform the public of service performed and the cost thereof.
3. To scrutinize the general system of accounting and make constructive suggestions for improvement.
4. To examine the methods of purchasing materials and supplies and the letting of contracts.
5. To improve budgetary proceedings and assist those who make appropriations in securing that classified and exact knowledge which is necessary to prevent carelessness and waste in appropriating the public funds.
6. To furnish the public with exact knowledge regarding public revenues and expenditures and thereby promote efficiency and economy in public service.

Methods of Procedure

1. Confer with public officials and secure their cooperation and that of their subordinates in remedial work.
2. Prepare a digest of the powers and duties of the department or office by an examination of the statutes, ordinances and rules pertaining thereto.
3. Prepare a chart of each department or office showing lines of authority.
4. Examine the public records, analyze the information contained therein, and make collateral inquiry concerning matters in which the records may be defective.
5. Compare functions and expenditures with work accomplished and results obtained.
6. Hold frequent conferences between members of the Bureau's staff and also between the latter and public officials on methods used and facts disclosed.
7. Submit formal report to officials on organization, powers, duties and present methods of business procedure.
8. Submit critical report to officials and general public containing constructive suggestions and procedure incident thereto.
9. Continue educational work until something definite is done to remedy unbusinesslike methods disclosed. Assist officials in installing new systems recommended by the Bureau, or change in former systems.
10. Support publicity by verifiable data, illustrations, budget exhibits, etc.

A pamphlet recently published on the work of these bureaus comments lengthily upon the results obtained by the New York Bureau of Municipal Research which is credited with having saved the city several millions of dollars, some of the largest items of this being \$400,000 from the Dock Department budget and \$300,000 to \$500,000 from the Fire Department budget. This bureau has reorganized from top to bottom departments of Finance and Accounts, Division of Child Hygiene, Bureau of Licenses, Rev-

enue control in Water and Park departments, Bellevue Hospital clerical staff and the control of violations of the Tenement House department. It has revised the city's accounting system, budget making methods, the method of computing school repairs and the city's debt, and the real estate bureau's records. It refers to the fact that ex-Comptroller Metz has donated a fund of \$30,000 to encourage the introduction of accounting methods in other cities similar to those this bureau has introduced in New York.

There is no doubt that the efforts of these organizations may accomplish a great deal of good, especially where the criticism is of a constructive rather than of a destructive nature. Criticising the head of a department for inefficiency is a very much simpler matter than improving conditions that may be found to exist. Very often a department may be as efficient an organization as conditions will permit, but valuable results may be marred by influences beyond its control. Where incompetency is found, co-operation on the part of the department itself to secure greater efficiency will usually result in a speedy improvement. This of course is the ideal case, but the investigation committee should be prepared at times to meet opposition from the department that is being studied, and this is the condition which will necessitate the employment of considerable tact.

The costs of maintaining the bureaus in the several cities have been as follows: New York, \$91,470, \$87,660, \$100,000 in 1908, 1909 and 1910, respectively; Chicago, \$55,000 in 1910; Philadelphia, \$25,000 and \$30,000 in 1909 and 1910, respectively; Cincinnati, \$35,000 in 1910; Memphis, \$12,000 in each of the years 1909 and 1910; Milwaukee, \$25,000 in 1910. In New York the greater portion of the expenses is contributed by about one dozen citizens, although there are between 100 and 200 smaller contributors. In Chicago, fourteen men subscribed \$114,000 and an additional \$3,000 was sent unsolicited, this sum to carry the work through two years. The Philadelphia bureau is supported largely by the contributions of a small number of men as is the case in Cincinnati.

Milwaukee appears to be the only city which supports a Municipal Efficiency Bureau by public funds, \$25,000 being appropriated for this purpose. Professor J. R. Commons is in charge of this particular bureau and has every assistance that experts in engineering, accounting, and organizations of labor, business and municipalities can give. It is now carrying on two lines of investigation. The first is a social survey to determine the hygienic problems of the city, housing conditions, industrial accidents and other things to show how far the city government is utilizing its resources to promote the health, welfare and happiness of the people. The second line of investigation is an efficiency survey, to ascertain the character of the organization, administration, accounting, financial methods, business practice, construction and operation in the municipal departments. The purpose is two-fold, to improve the efficiency of the local government and to reveal the defects in the existing system. It is a far more difficult task than efficiency work for a private corporation because city affairs must be conducted in accordance with many laws and by methods which are not always direct and free from red tape. The compilation of the requirements in the charter, state laws and city ordinances has proved no easy task, and it has revealed many

contradictions; these requirements must be clearly defined, however, for they govern a part of the procedure of every city department. The remaining part of the procedure is being studied by organization charts, which also indicate the legal regulations, and in this way the existence of cases of inadequate supervision and indefinite responsibility are being studied. The city accounting methods are being investigated and improved at the same time. Every detail of organization, administration, operation, business methods and accounting of each city department is being studied, and improvements are being sought, but before these are finally introduced they are criticized by the advisory experts and discussed with the department concerned. Special attention is being paid to the introduction of methods of cost accounting which will be helpful in increasing the efficiency of the force.

Columbus Housing Code

A new housing code has been passed in Columbus, Ohio, that marks a new era in building in that city. Columbus has long been known as the best built city in the United States. Being the centre of the great brick producing districts, brick has long been very cheap and the most used of all building material in the city. Now, however, the housing code proposes to make the city more beautiful and more healthful and more sanitary.

The ordinance provides for regulation of the erection, construction, use, control, maintenance and repair of buildings used for human occupancy or habitation, the number of occupants and the mode and manner of occupancy, for the purpose of securing the healthful, safe and sanitary environments of the occupants thereof, and to compel the owners of such buildings to alter, construct or modify the same, or any part thereof, for the purpose aforesaid, and to prohibit the unlawful use or occupancy of such building or buildings.

In the code, a "tenement house" is defined as "a house or building, all, or any portion of which is rented, leased, let or hired out to be occupied or is occupied, or is intended, arranged or designed to be occupied as a home or residence of two or more families living independently of each other and doing their cooking upon the premises and having a common right in the halls, stairways, yard, cellar, water closets or privates, or some of them, and includes apartments houses."

One of the strict provisions in regard to which there was bitter fight is in regard to the percentage of the lot occupied. In case of corner lots, not more than 75 per cent. of the lot may be used for a building; in the case of corner lots with streets on three sides, not more than 80 per cent; of interior lots not more than 50 per cent. Outside stairs, fire escapes, porches and platforms shall be considered a part of the lot occupied.

No tenement house or dwelling house shall exceed in height the width of the widest street upon which it stands. Behind and immediately adjacent to every tenement house or dwelling there shall be a yard extending across the entire width of the lot and at every point open from the ground to sky unobstructed. In case of tenements, such yard shall never be less than 18 feet in depth. In case of dwellings not less than 10 feet.

The size of all courts shall be proportionate to

height of the building. The minimum width of a court for dwelling house shall be five feet for a two storey building and an increase of one foot for every additional storey. In every tenement house and dwelling house, except water closets and bath rooms, in each department there shall be at least one room containing not less than 150 square feet of floor space and each other room shall contain at least 100 square feet. Each room shall be not less than 8½ feet high. Every room shall have a window. No basement may be used for living purposes. Every house must be provided with running water and sewer connections.

No tenement house shall hereafter be erected exceeding three storeys in height, unless it be fire-proof. No closet may be constructed under any staircase. There must also be fire walls constructed where dwelling houses are built in the form of double houses or terraces.

The buildings must be maintained by the owners. Lights must be provided in the halls. No water closet shall be maintained in the cellar; hallways must be kept clean; receptacles provided for ashes and garbage and rubbish.

There are many provisions to safeguard the people and it will affect numerous old buildings in the city which will have to be torn down or remodeled.

The Woolworth Building

A new building, which will be higher than either the Singer or Metropolitan towers, and will be exceeded in height only by the Eiffel Tower, is to be erected in New York. It is to be known as the Woolworth Building, and will rise to 775 feet above the curb. It will have a frontage of about 155 feet on Broadway, and a depth of about 200 feet. The foundations will be carried down to solid rock, 110 feet below the curb. On the Broadway front a large tower, measuring 84 feet by 86 feet at the base, begins at the 31st floor, and is carried with vertical walls to the 42nd floor, where the dimensions are 69 feet by 71 feet. It is then continued to the 47th floor, where the measurements are 59 feet by 61 feet, which continue until the 50th floor. From the 31st to the 50th floors the tower is 270 feet in height, and at this elevation it is surrounded by a pyramid, 105 feet high and 54 feet square, containing the five highest floors, and an observation gallery situated 730 feet above the street level. There are only two storeys below the curb. The height of the individual storeys varies between 12½ feet and 20 feet, most of them being 12½ feet. The steel framework will contain about 20,000 tons of metal. The exterior walls will be of granite up to the fifth floor, and of terra-cotta above that height, and the partitions will be composed of hollow brickwork 8 in. thick. The building will be equipped with 26 elevators. It is designed in accordance with the New York building code, which allows 150 lbs. per sq. ft. on the first and basement floors, and 75 ft. on each of the others. A uniform wind pressure of 30 lbs. per sq. ft. over the entire surface of the building is provided for.

The Department of Marine and Fisheries have called for tenders for the construction of a reinforced concrete tower and fog alarm building to be built at Point Atkinson, B. C.

The New Windsor Station in Montreal

Canadian Pacific Railway Station and Head Office—The Highest in Montreal—A Description of the Building



A great deal has been said and written about the new station and head offices of the Canadian Pacific Railway Company at Montreal, but its vastness is better expressed by photograph than by word picture. The future home of the C. P. R. will have a frontage of 493 feet on Windsor street, 550 feet on Osborne street, and 175 feet on St. Antoine street. The rest of St. Antoine street, and Mountain street, between St. Antoine and Osborne streets, will be occupied with trackage and other plant. The ground floor area of the station will be 77,000 square feet, and the whole floor area of the building will be 450,000 square feet.

Montreal has several ten-storey buildings, but this will be the first real tendency towards sky-scraping. It will have three heights at different points. At the corner of Osborne and Windsor streets it is 69 feet; at the corner of St. Antoine and Windsor, 120 feet; while the tower, which is situated a short distance north of that corner, will rise to a height of sixteen storeys, or 214 feet above the pavement. While not all working under this roof, there are 12,000 people residing in Montreal who are in the employ of the C. P. R. The first C. P. R. station with offices in Montreal, was erected in 1889. The present undertaking is the fifth extension to the company's terminal accommodation in Montreal, and will make this the largest and most complete railway headquarters in Canada. The last rivet was driven on the steel work at the top of the new tower a few days ago. The steel frame was manufactured and erected by the Dominion Bridge Company. Over 5,300,000 pounds of steel have been put into the structure. The stone facings have been built up to the fifth floor, while the concrete flooring is being put in at a rapid rate.

The main entrance to the present station is on Osborne street, a little west of Windsor street. Alterations will be made at this point so as to have the

entrance at the corner of those two streets, as is shown in the foreground of the accompanying reproduction. There will also be a main entrance at the corner of St. Antoine and Windsor streets. Entering from the St. Antoine corner the main floor may be reached either by two large elevators or by marble stairways on either side of the doorway. These will give direct entrance to the "concourse" on the upper floor, which will be 350 feet long and 60 feet wide. The new general waiting room will be 130 feet by 60 feet, and 26 feet high. The ladies' waiting room and retiring rooms will be large and elaborate, with nursery, and both free and pay toilet parlors. The dining room accommodation and culinary facilities will be of most modern and approved plan and equipment. There will be a total of eleven elevators in the building, the power plant for which will be in the basement of the extension.

Mr. C. E. Deakin is the general contractor for the station extension; the foundations were put in by The Foundation Company, Limited; Messrs. Byers & Anglin are the contractors for the viaduct and power house between the station extension and Mountain street; The Duckworth-Boyer Engineering & Inspection Company, Limited, were the inspectors for the steel work. The designing and drawings were made in the offices of the C. P. R. architect, Mr. W. S. Painter, and the erection is proceeding under the supervision of Mr. F. L. Ellingwood. The building will be ready for occupation early next year.

Cost Keeping for Contractors

The importance of cost records on construction work has been pretty generally realized by contractors during recent years and most concerns engaged in work large enough to warrant it have adopted some system by which all expenses on any contract

may be determined and classified among a number of accounts, forming permanent records of considerable value. These are of use not alone as a basis for future bids, or as a means of determining the cost of each class of construction from day to day, but as accurate records in case of litigation, especially in the matter of extra work. The system of contractor's cost keeping and organization in use by Charles Cranford, a general contractor of Brooklyn, N. Y., was described at a recent meeting of the Brooklyn Engineers' Club by Richard L. Russell, who discussed its advantages and explained the use of a number of printed forms used both in the field and in the office in connection with the Brighton Beach improvement work, involving excavation and concrete.

Degrees of Fineness

The degree of fineness into which the work is to be subdivided is one of the important factors in any cost-keeping system; the records dealt with by Mr. Russell are intended solely for the use of the contractor who through constant oversight of the work is so familiar with the conditions that few explanatory notes are needed in connection with the costs. Each foreman, under this system, is furnished with $5\frac{1}{2} \times 8\frac{1}{2}$ -in. blank daily report, containing six ruled columns; the first is headed "Employee's Number," and four are headed "Hours and Amount," the sixth column being used for the total. The laborers' numbers and the hours at each class of work are entered and the total summed up in the last column at the end of each day. Space also is left for remarks. With such a form a man's time may be classified according to the different kinds of work he may have done during the day. The foremen also report the daily yardage of excavation and concrete and material received.

The reports are inspected by the superintendent and if they give the information and cost distribution desired, are sent to the storekeeper, who enters the cost and quantity on a "daily statement." This sheet measures $9\frac{1}{2} \times 12$ in. and contains after each foreman's name, under the heading "Excavation" or "Concrete," the total cost for the day, the daily yardage and the cost per cubic yard. Space also is left for entering up the value of materials received and the grand total under each classification is summed up at the bottom of the sheet.

Transfer of Quantities

The quantities from the daily statement are in turn transferred to monthly statement sheets which measure 17×14 in., and are ruled so that entries may be made upon them for 31 days' work. On these sheets there are a large number of classifications; for example, the classifications under "Excavation" include work done by buckets, by orange-peel buckets and by hand. There are columns under which charges may be made against moving and maintaining buckets, derricks, boilers and engines, and oil and fuel.

The second of the monthly statement sheets covers transportation charges, the third timber work, and the fourth concrete. Classifications on the latter are as follows: "Massive," "Concrete," "Reinforced Concrete," "Arch Concrete," "Foundations and Drains," "Facing Walls," "Forms," "Cement" and "Conduits." Under each of the first four main headings there are three subdivisions labeled "Mixing and Placing," "Cubic Yards Placed," and "Cost Per Cubic Yard."

In addition to the cost of the work in the field, administration charges are made under the following heads: "Engineering and superintendence, timekeeper and storekeeper, general office force, telephone and office supplies, liability insurance, surety bonds and legal expenses, rental of yards, office, etc., watchmen, interest, depreciation on general plant and miscellaneous small tools, interest and discount." The daily general expense, under this system is proportioned by the engineer among the various items and included by the storekeeper in making up the daily statements previously referred to.

Requisition of Materials

Requisitions for materials are made by the storekeeper and submitted to the engineer for approval. If approved, orders are made out in triplicate on forms of three colors for ready identification, the original going to the manufacturer or dealer, the duplicate to the storekeeper and the triplicate being retained in the main office. When the invoice is received it is forwarded to the storekeeper and checked against the original order and returned to the main office.

The voucher system is used in settling all bills and payrolls; the bills are enclosed in folded vouchers on the back of which are spaces for the name of the creditor, distribution of the amount, number, date of check, date of bank, and date on which the voucher was recorded and distributed. The regular cash book, ledger, journal and voucher book are kept. In the latter the horizontal lines across the double page are numbered exclusively; one line to each voucher and the vertical columns contain, first, the number of the voucher; second, the total amount, and, third, the number of the contract and the amount to be charged against it. By this system the total amount of each contract is shown.

Sanitary Plumbing and Death Rate

At a recent meeting of the local council for the registration of plumbers at the University of Birmingham, Dr. John Robertson, the medical officer of health, lectured on plumbing in relation to public health. Among other things he said one of the most remarkable achievements of the nineteenth century was the great advance in the health of the people. For instance, that part of Birmingham which in 1851 had, roughly, a population of a quarter of a million, in 1910 had 870,000 residents. The death rate in 1851 was 26 per thousand, in 1910 it was $12\frac{1}{2}$ per thousand; which meant that if the 1851 rate had continued there would have been 12,000 more deaths in Birmingham in 1910 than had actually occurred.

In addition to the great advance in the saving of life, there had been a great saving of sickness, and the unemployment and waste of expenditure that followed. Typhoid fever had almost been reduced to the vanishing point, and deaths from phthisis had uniformly decreased under improved housing conditions. He further stated that anything that plumbing could do to reduce dampness in houses should be done to further reduce the deaths from the white scourge.

Two tunnels and 24 bridges are required on the branch line of the Grand Trunk Pacific Railway, now under construction south of Edson to open up the Brazeau coal fields. The firm of Creelman & Verge, who have the contract for all bridges, will commence the work soon.

Building with Reinforced Concrete

Some Points That Govern Design—The Properties of Concrete Exemplified—Placing of Reinforcing

By M. C. Tuttle.

Failure to understand the general principles of reinforced concrete comes from the idea that the subject is technical and complicated; also from the scarcity of non-technical articles on the subject. A statement of the simplest theories may be of interest. Concrete buildings are becoming common enough, so that the use of the concrete column, the concrete beam floors, stairs and wall excites little comment. It is generally known that steel rods are used to impart strength and that these are generally used in tension, but just how and why are not always clear.

Take the case of a simple beam supported at each end and loaded in the middle. It will be seen that the bottom of the beam is being pulled and the top compressed; that if the beam fails, it will probably do so by tearing apart at the bottom, or if the bottom is tough enough and the load is increased sufficiently, the top of the beam will crush or crumple. In the case of a concrete beam the material is hard but not tough, and a sufficiently-loaded beam of this material will supposedly fail by tearing open at the bottom.

Designing a Concrete Beam

In designing a concrete beam the engineer finds how much tension a given load will cause on a beam of given length. Knowing this he has but to select the amount of steel necessary to resist this pull. It will be seen that the deeper the beam the less pull will be exerted at the bottom, and accordingly the engineer can increase the depth and use less steel, or decrease it and use more steel, to get a given carrying capacity. He must at the same time assure himself that the compression in the top of the beam is not greater than the concrete can bear.

With regard to concrete columns the problem in the simplest case is to determine how much load comes on a given column; to reckon on the number of inches of cross-section necessary to safely carry this load and to so arrange the steel in the sides of the column that the column shall not bend or bow under the load. It is clear enough that a long shaft—for example, a knitting needle standing vertically on a table—will carry more load when it is straight than when it once begins to bend; and in the case of a bending column, the side opposite the bend is stretched and the side toward the bend compressed. To prevent this stretch steel bars are generally placed on the outside of any concrete column. In the simplest case this is the sole function of the bars.

With these general principles in mind, one will understand that once a bar is imbedded in concrete it should become a part of a composite structure, of which structure the concrete should be in compression, and the steel in tension, under load. If, however, a round bar was thickly coated with grease, so the concrete could get no hold on it when enough load was applied to a beam to tear the concrete at the bottom instead of taking up the pull, the bar would simply slip through the hole in which it was embedded.

Grip of Concrete on Steel

It has been found that the grip of concrete on steel is very strong. To satisfy yourself of this, embed the ends of wires in cement mortar at varying depths and at the end of three weeks try to pull them out. It is generally accepted that a plain steel rod with one end embedded in good concrete forty times as deep as the diameter of the rod will pull apart outside the concrete rather than slip from the concrete. It will be seen that a number of small rods will offer more surface hold to the concrete than does one large rod of equal cross section.

The average concrete building has more than one span of beams in its width, and it is to be noticed that the beams are in one solid piece across the width of the building—not separate beams between columns like the wooden beams in a mill building. If you consider the case of a concrete beam carrying load and supported by a column, you will see the beam will tend to break apart over the column by tearing at the top, just as a stick breaks across your knee; that is, the tension at this point has changed from the bottom of the beam, where it was in the middle of the span, to the top of the beam at the column. You will see that for some distance each side of the column tends to project, like the arms of a cross, and that at some point beyond it tends to hang like a hammock from the point where the arm of the cross ends and the beam changes from tension to compression. It is to take up this top pull over bearings that the beam bars are bent so as to bring the last two or three feet of bar into the top of the beam. It will be seen that if these ends stop at the centre of the column it would have much the same effect as making the horizontal arms of the cross of two pieces instead of one; it would not be so strong, and if the steel were all at the bottom it might be compared to bringing the arm at the bottom when made of two pieces.

Support of the Slab

In a concrete beam and slab floor the slab is supported by the beams and would tend to crack under the load either by crushing at the top or by pulling apart at the bottom about midway between the beams. It would act much as a slab of slate would if it were loaded to breaking. The steel, accordingly, is put at the bottom of the slab to take up the tension, exactly as it is in the case of a beam. The slab, in fact, is nothing but a thin, flat, continuous beam, and the steel bars or mesh is arranged as nearly as may be like that of a beam or girder. There is a point a little distance away from the beam where the top of a slab is in tension exactly as the top of the beam is in tension over a column. Some engineers bend the slab steel so as to get it into the top of the slab at this point over the beam; others put in steel bars at right angles to the beam, extending beyond this point to take up the tension, and still others use small bars spaced a few inches apart, run-

ning both ways in the top of the slab for the purpose of taking up this tension, and also to tie the slab up to prevent cracking from internal strains in the material.

This leads to the consideration of the use of steel for preventing cracking. Concrete is cast wet and hardens into its place—in effect the same as cast iron hardens in its mold; and just as cast iron is full of internal strains caused by unequal cooling and unevenness in the metal, so the mass of the concrete is full of internal strains because of variation in time of setting, due to time of placing, the amount of moisture, the amount of heat and the rapidity with which it dries out, besides the unevenness which exists in the aggregate and in the cement. With cast iron it is possible to anneal this and so remove the internal strains. With concrete, however, it is only possible to tie the mass together with the tough steel so that under shock, under uneven loading, or in the racking of changes of temperature, the material will hold together and not show cracks.

Amount of Steel Necessary

The authorities disagree somewhat as to the amount of steel necessary to tie the mass of concrete together, some engineers claiming that with the use of enough steel a solid wall of concrete could be built of indefinite length without danger of cracking others believing that the length of concrete sections, however much steel there may be in them, should not continue indefinitely, but should be broken with contraction joints. It has been found that concrete and steel increase and decrease in length under the action of heat and cold to almost the same amount. Hence the two materials will work together and the steel holds the concrete rigidly, even under temperature changes. It would seem that steel would hold concrete against cracking under temperature changes. For this purpose, steel bars are commonly embedded near the faces of concrete walls horizontally to prevent vertical cracking. The danger of horizontal cracking is less both because the vertical dimension of a wall is commonly much less than the horizontal dimension and also because the weight of the material bears down on all parts of the wall and tends to compress the various particles of the concrete rather than to tear them apart. It is, however, common to use more or less vertical steel in walls as a precautionary measure.

In building brick or stone foundations for a building it is common to start with a layer of wide stones or a wide footing and to step this in like the sides of a pyramid so that the load from the walls will be spread over the entire bottom course. If a slab of concrete is placed on the earth and the weight of a wall brought upon the middle of this, it would be seen that if the ground gave a little under the load the concrete would tend to tear apart immediately under the edge of the wall and to allow settlement. If, however, steel rods are embedded in the bottom of such a broad footing at right angles to the wall, any tendency to tear the concrete apart at the bottom will simply bring the rods into tension. This principle is commonly used in concrete foundations. Where the columns come onto a footing the footing may be made square with the steel running two ways, or octagonal with the steel running four ways across the bottom in the concrete. Again, it will be seen that the concrete acts wholly in compression and the steel in tension.

Size of Concrete Columns

Objection is sometimes made to the size of the ordinary reinforced concrete column, and to overcome this objection vertical steel bars are sometimes used to carry part of the load. Builders are not altogether a unit on the advisability of using such vertical steel bars to carry part of the load, the argument against it carried to an extreme being something like the following: If you should support a weight on a long cork, the cork would undoubtedly compress under the load and at some point would allow the load to sink no further. If you ran two or three steel needles through the cork, cutting them off flush with the top and bottom and applied the weight again, the cork would take up very little of the load, the steel needles supporting it entirely, because the cork is more elastic than the steel.

Now, good concrete will carry 2000 lbs. to the sq. in. of cross section, while steel will carry 60,000 lbs. per sq. in. of cross section. Every material compresses somewhat under load, just as the cork used in the illustration does, the difference being that the compression in steel is very much less. Some experts claim that because the two materials under a given load do not share the compression equally, the concrete as a more elastic substance would have to be compressed beyond the point allowed by its physical structure before the steel would get anything like its full load. Others claim that as the concrete compresses much of the load is carried into the steel and that the two materials work evenly together. It can at least be said that practically all the tests on columns indicate that vertical steel bars do increase the carrying capacity of the columns. In considering column reinforcement, however, one must distinguish between the heavy vertical steel bars used to carry load and the smaller steel bars placed near the outside of columns to keep them from bending under their load, as explained in a former paragraph.

It will be seen that if the vertical steel bars used for carrying part of a load should be loaded heavily enough, they would tend to bow out, just as the knitting needles, previously used for illustration, under load tend to bow under their load. Accordingly, it is common to use bands of small steel just outside the bars to prevent this bowing under extreme load and also to hold the vertical steel bars in place during the pouring of the concrete.

Illustrating Effect of Reinforcement

If you stand an ordinary square-ended rubber eraser on end and press down hard on its top, you will see that the length of the eraser is shortened by the weight and also that the horizontal dimensions increase, that is, the eraser bulges in the middle. If the eraser were wound close with wire, this would hold all sizes of the eraser from bulging, and under the same amount of compression the length of the eraser would not decrease as much. Allowing for the difference in elasticity in the eraser and a concrete column, it is to be understood that the same general results occur in less degree in a concrete column that occur in a rubber eraser. Under sufficient load the particles which make up the concrete column would tend to slide by one another, so to speak, and to bulge the column, and as these particles are not as elastic as the particles of rubber, beyond a certain point they will not return to their relative positions, but will leave permanent cracks between

the particles. The slipping of the different particles on one another can be seen readily in the case of a pile of sand, where under a load applied over a small area the particles of sand simply slip by one another out from under the load, and there is very little supporting capacity. Confine the same sand in a metal tube; compact it will and it will carry a tremendous load, because the particles cannot slip by one another, but are held firmly by the metal tube.

Reinforcement for Columns

This principle is commonly applied to the concrete column, some builders using horizontal hoops made of small bars placed just within the surface of the concrete, others using a spiral hooping that runs round the perimeter of the column inside the concrete. Experiments show that hooping increases the strength of a column tremendously. On practically any job to-day where concrete beams are being used, one may see small bars bent practically into U-shape standing up at right angles to the tension bars in the beams and girders. These bars are generally referred to as "stirrup bars." It has been found that when a concrete beam is loaded to the point of failure, cracks are likely to develop in the beams, starting at the bottom and running roughly at an angle of 30 deg. away from the point of support. These are referred to as shear cracks or diagonal tension cracks.

There is considerable disagreement among builders as to the exact function of the stirrup, and there is probably more uncertainty about their actual value than of any other feature of modern concrete design. In general terms they are put in to prevent this cracking, and by so doing to add strength to the beam. Some claim that these shear bars act with the concrete and with the tension bars of the beam, like the tension members of a truss, with the concrete between the bottom of one and the top of the next stirrup bar acting as the compression member.

Use of Stirrup

After careful investigation one is led to the belief that builders look favorably upon the stirrup; on the basis that it probably does some good and certainly cannot do much harm. It is probably safe to say that very satisfactory beams can be built without stirrups, and it will probably be necessary to wait further development of the theory of reinforced concrete design before the last word will be said regarding the necessity of the stirrup.

A new type of floor has come into prominence in the last few years, largely through the invention of C. A. P. Turner, of Minneapolis, Minn. This is the so-called "mushroom" or "girdless" type of flat slab floor. In this construction the caps of the supporting columns are usually increased in bell-shaped form below the ceiling line of a given floor. Over this cap the steel bars of the flat plate of the floor are carried at right angles from one column to the next column, and also diagonally across the slab from the columns at the opposite corners. These steel bars rise to the top of the slab at the columns, are near the bottom of the slab in the middle of the bays and are embedded in a fairly thin slab of concrete. It has been found that an absolutely flat slab of only 8 in. to 10 in. thick will carry a proper working load over a square bay with a column spacing of 25 or 25 feet. The advantage of the flat ceiling and

thinner floor is obvious enough from the operating point of view.

New Floor Construction

Aside from the articles and book by Mr. Turner, of Minneapolis, the only technical treatment of this subject that we know of being yet published is the paper by A. B. MacMillan, of the Aberthaw Construction Company, Boston, Mass. The writer of the present article has no desire to attempt an explanation of the theory of this floor construction; about all that can be said is that experiment has shown it to be very strong and quite satisfactory.

It can be said in general that because the steel runs in the top of the slab over the column, and remains in this position for a considerable distance beyond the column, it is sure that a circle of concrete is supported by the column, much the same as the top of an umbrella is supported by the shaft; and that from the edge of this circle the piece of the slab is supported like a simple beam by the steel extending from the edges of this and the corresponding circle of concrete at the next column, and that if the whole concrete slab should fail, the steel bars clamped in position by the weights coming down the column above would hold like the strings of a hammock. It is also probable that the concrete between the different bands of steel acts like a flat arch, adding greatly to the theoretical strength of the construction.—The Building Age.

The Revision Was Impartial

A letter from another member of the Citizens' Committee, for the revision of the Toronto building code, is reproduced below. The committee is showing no laxity, despite the press of business interests in the middle of the building season, and numerous letters received by this office from interested builders bear this out. It is reported that the by-law is at present undergoing a revision, the thoroughness of which will in all probability be made evident in the early appearance of the revised edition.

A number of factory and office building in contemplation in the city are being held back, until a decision has been reached. These include a ten-storey office building of reinforced concrete to cost about \$125,000, to be erected on Adelaide street west, that will not go on until a revision has been affected.

The following letter presents a few points, which in the meantime those who are contesting for a better by-law would do well to keep in mind.

Editor, Contract Record:

I have noted with a great deal of interest reports in your publication regarding the application for the revision of the Toronto Building Code, and also the stand taken by the City Architect, Mr. Robert McCallum.

It is to be regretted that Mr. McCallum took so positive a stand before he had time to study this application carefully.

I am sure that this committee of which I happen to be a member, could not have undertaken a task of this kind and shown any greater fairness toward all building material. Mr. McCallum stated that building by-laws are usually favorable to some special kind of construction and yet that this report is especially favorable to reinforced concrete construction.

Until recently nearly all city ordinances discriminated against the use of reinforced concrete or concrete in any form. No other material has been, or is now, discrim-

nated against as much as concrete. Most building ordinances are more definite in this respect than any other, and for that reason it is but natural that a report of this kind should devote more space to the subject of concrete than that of any other building material.

If it had been the intention of this committee to especially favor reinforced concrete, there would have been no object in calling attention to the section of the present by-laws covering the safe loads per sq. ft., specified in the by-law for brick masonry. The present by-law calls for 3 tons per square ft., for kiln run bricks, laid in lime mortar; 5 ton per sq. ft., for ordinary brick laid in Portland cement mortar; and 6 tons per sq. ft. for hard brick laid in lime mortar.

In the application the following has been recommended:

Character of Masonry	safe load per sq. ft.
Kiln run bricks laid in lime mortar	4½ tons
Ordinary brick laid in Portland Cement mortar	7½ "
Hard brick laid in lime mortar	9 "
Hard brick laid in Portland Cement and lime mortar	13½ "
Lime brick laid in Portland Cement mortar..	18 "

Pressed brick laid in lime mortar 12 "
Pressed brick laid in Portland Cement mortar 21 "

In other words the maximum allowable load would be increased from 6 tons per sq. ft. to 18 tons per sq. ft. for hard brick.

In the very first pages of the printed application, attention is called to the fact that the attitude taken throughout by the committee was not one of antagonism to the architect, but rather to assist a department which, on account of the duties it has to perform, must always be subjected to much adverse criticism.

One feature of the present by-law which seems too conservative, is that covering the thicknesses of curtain walls. In buildings where curtain walls are used most of the load is carried by the columns and the curtain walls merely fill in the intervening spaces.

The present by-law also seems to place a premium on non-fireproof construction, not in actual wording, but certainly in effect, as it makes the cost of fireproof construction so high as to be almost prohibitive.

The above represent only a few of the points touched upon in the application, and anyone studying the code carefully will see that the revision asked for in these cases is very fair.

Comparison of Materials for Conduits

Clay, Fibre and Concrete—The Advantages and Disadvantages of Each for Encasing Signal Wires

By W. K. Sparrow.

Clay conduits consist of two types, the single and the multiple duct, either square or round bore. This class of conduit is formed and vitrified, and then glazed by the salt process. The single duct type is made in 18-in. lengths, and the multiple duct type in 36-in. lengths. This material weighs about 8 lbs. per duct foot for the 3½-in. size.

Advantages.—(1) This class of conduit is, perhaps, to-day, the lowest in price, f.o.b. factory, of any of the classes which are mentioned. (2) When properly vitrified and glazed and free from iron, burrs, holes, etc., it is a high insulating material. (3) It has the advantage of long life; in fact its life is indefinite.

Disadvantages.—(1) If not properly vitrified, glazed, etc., or if it contains iron to any extent, the insulation is lowered. If not properly glazed it will absorb moisture and as the weight per foot is high compared with other classes of conduit, the amount of moisture absorbed is higher per foot. (2) Short lengths increase the number of joints over other classes, and as the ends are squared a gap is left over 18 ins. or 36 ins. which must be closed with other material. This method of construction naturally removes the advantage of high insulation claimed for this material. (3) Multiple duct, in addition to the above disadvantages, allows communication between ducts at the joints every 36 ins., thereby decreasing the safety factor of the cables. The single duct, although costing more to lay than the multiple, provides a greater safety factor. (4) Owing to the weight of the conduit the freight per duct foot is higher than other classes. (5) The loss in leakage has to be considered, as generally a break causes a

total loss of the length, which, is a four-duct conduit means 12 ft. It is false economy to try to trim up the conduit, as the labor is generally more than the value of the material. (6) The cartage and hauling charges are comparatively high, owing to its weight. (7) A better and higher-paid class of labor is necessary for installing clay conduits than for other classes. (8) A large percentage of the conduit warps in vitrifying, and owing to its low selling price it cannot be furnished true to square ends, straightness, lack of blow holes, or burrs, and with thorough glazing. (9) The possibility of abrasion to cables, either at the joints or by sharp projections inside, gives clay conduit no advantage over iron pipe. (10) Although some manufacturers furnish bends they are not generally used in subway construction, it being considered advisable to install short radii curves or angles by means of manholes or hand holes, rather than run the risk of abrasion to the cables in pulling them under such conditions. The use of manholes naturally increases the cost of construction.

Fibre Conduit

The next step was the use of wood pulp in conduit manufacture. The first type, perhaps, was that of the pressed wood pulp formed cylindrically and treated with a bituminous compound. This process was abandoned by the originators, owing to the liability of disintegration when placed underground. Later wood pulp wrapped in a minutely thin film upon a forming mandrel, under pressure, was formed cylindrically and after drying was indurated with a bituminous compound. Joints of the screw, sleeve and mortise and tenon type were cut on the ends in order to connect the lengths. Another type is that

* From a Paper Read before the Railway Signal Association.

made by winding paper on a mandrel and indurating during the process of manufacture. The latest of this class is the return to the pressed type with a bell and spigot joint.

Advantages.—(1) The conduit is of light weight, varying from 1.2 lbs. per foot to 3.5 lbs. per foot for the 3-in. size, according to the thickness of wall and type of joint. The light weight naturally reduces the freight, cartage and handling charges. (2) This material has high insulating qualities, but no higher, perhaps, than the vitrified clay in itself. (3) It makes a continuous duct without the objectionable open joints of wood and clay conduits. (4) It can be made up in bends and other fittings to meet the requirements, and thereby reduce the number of manholes or hand holes of other systems. (5) If broken it can be recut, thereby reducing the breakage charges to a minimum. (6) It requires a less expensive class of labor than other classes of conduits, but requires the education of the men to the fact that the material is light and easily broken. (7) It can be installed at a total cost of construction as low or lower than other materials. (8) It will not injure the cables by abrasion. (9) It better protects the cables from stray currents. (10) It eliminates hysteresis losses when used in alternating current installations.

Disadvantages.—(1) Being a new class of material and liable to injury in handling, as well as possibility of injury by picks, etc., more care must be used than in any of the other classes. (2) Liable to unwind or disintegrate if not properly made. More easily affected by heat and climatic conditions than types previously mentioned. (3) It is affected to a certain extent by oils and is liable to destruction by fire from short circuits, although it is claimed that the combustion stops when the short circuit ceases. (4) This material has less mechanical strength than any other class. (5) The life of the material is in question. It has been in use for 15 or 18 years, and as a guess it might last 50 or 100 years.

Concrete Ducts

This class consists of two types. The first brought out was the duct formed and covered at the factory with sheet iron, which cover was later abandoned on account of its short life and the difficulty encountered in cutting the material on the work into short lengths. Later came the manufacture of this duct in the trench by the contracting company, and after this came the monolithic types, formed in the trench, using covers of concrete for the top and divisions; or, by means of rubber or paper tubing filled with water or air to act as the form while the concrete set. When the concrete had set these forms were removed, leaving a complete monolithic structure.

Advantages.—(1) It is claimed that the installation of this class reduces the cost of construction and gives a continuous duct without joints, and a flexibility not obtainable in the other classes of ducts. (2) The bore of the duct is smoother, reducing the liability of abrasion to the cables. (3) The cutting down of freight and cartage costs to a considerable extent. (4) Practically indefinite life.

Disadvantages.—(1) A higher cost of construction for the reason that a grout mixture has to be used, thereby making a more expensive composition than a mixture of concrete. (2) Great care must be used to get a smooth bore and a construction

which is not porous. (3) Some engineers claim that a chemical action takes place between the concrete and the lead cable, but my experience is that the action is so slight as not to be worthy of consideration.

This class of conduit has not been generally accepted by the larger companies and it is reasonable to assume that it has proved to have no special advantage over other classes. The monolithic type, where tubes were used, gave a better construction than that made by wooden forms for slides, or a moulded cement top. All subways of this class give more or less trouble, caused by the grout running through the joints, thereby obstructing the ducts.

Pipe Used on Large Civic Work

The work on the low level intercepting sewer for the city of Toronto is progressing rapidly, and the reinforced concrete pipe is now being laid in several of the sections into which the great work has been



Views of Pipe in Process of Manufacture. Placing the Concrete in the Forms.

divided. The accompanying illustrations show the pipe that is being laid throughout Section 5, which has a length of 3300 feet from the Don westward to Parliament street.

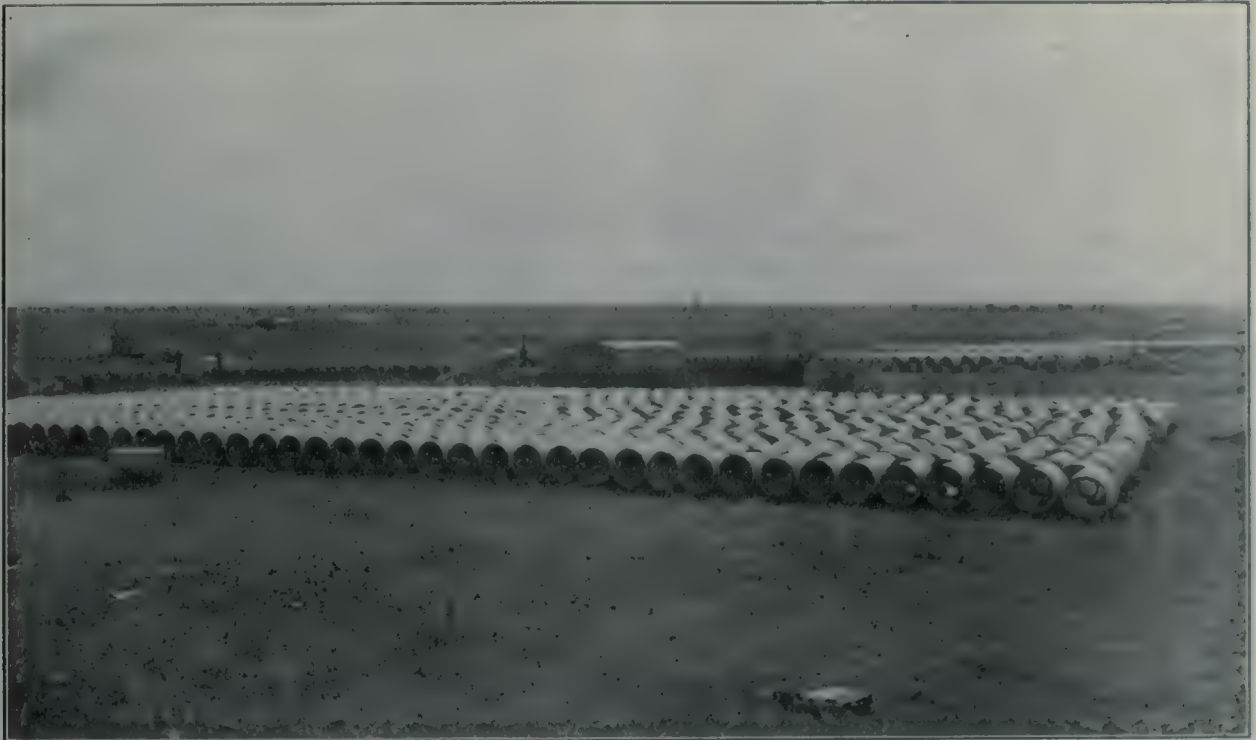
The pipe for this section was manufactured a short distance away from the work, local labor and material being employed, although the makers, the Lock Joint Pipe Company, have their headquarters in New York. They were awarded the contract for the construction of this pipe, and carried on operations in Sunlight Park. The work was commenced late in April and sections have since been made at the uniform rate of fifteen per day.

The Meriwether system of reinforcing, used exclusively in this pipe, provides for a continuous reinforcement. The pipe is laid in sections, and the joints between sections are so made as to insure freedom from leakage or obstacles to flow. By numerous tests under varying conditions the joints proved of even greater strength than the rest of the

pipe. It is due to this greater strength, and to increased economy as well, that reinforced construction in pipes has almost entirely superseded all plain, monolithic construction.

This system is one of the several that have suc-

constructed as to throw the least possible strain upon the pipe while the concrete is in a comparatively green state. After it has been cast it is lifted from the moulds and conveyed to a place where it can be rolled into the trench.



A Field of 30-inch Pipe at Regina, Saskatchewan.

ceeded in eliminating the serious objection to the use of concrete for sewer pipe. The fact that they are built outside the trench, giving facilities for proper inspection and manipulation and likewise for the

The standard design of this pipe is a circular section with the reinforcing material placed concentric with the circumference of the pipe and toward the interior of the section. Very unusual conditions, such



Manufacturing 60-inch Pipe for Low Level Intercepting Sewer, Toronto.

proper placing of the reinforcing material has everything in its favor, these obstacles being overcome by building the sewer in short sections properly reinforced, and uniting them together after they are placed in the trench. The handling devices are so

as an extraordinary heavy load, are met by a specially designed pipe with a flat base section. In a pipe of this design reinforcement is placed toward the interior of the crown and toward the exterior of the section of the spring line.

Various Practical Tests for Aggregates

Selection of Best Gravel and Sand—Testing for Silt and Voids and Grading of Grains—Alternate Method of Judging Sand

By Russell S. Greenman*

That almost all failures of concrete are caused by poor cement has been a popular opinion. After some failures the "post mortem" examinations have shown that poor workmanship, due to incompetent supervision, has sometimes been the responsible cause of the failures. Those experienced with concrete, however, found that, in addition to these two factors, the other constituent elements in concrete may be the causes for poor results or failures. These are truths which have almost become axiomatic.

The relation of intelligent workmanship to good concrete is solely a matter for consideration between the workman and the owner, it is not a question of general interest. If the owner of the proposed structure is content with poor work, that is simply his own business. The question of proper materials is, however, of general interest, for many structures are often constructed from the same group of concrete materials. The selection of those elements which with proper and intelligent workmanship shall produce good concrete is certainly important.

How to secure and select the best materials is often a problem. Apparently good sands or gravels have been selected, but not always have lasting results been secured. The method of securing for the consumer a good and safe cement has been provided for in many individual cases, but a campaign of education as to the need of careful selection of the aggregates and of construction in selecting them is still generally desirable. If it is true that the bulk of the cement now produced is used by the small consumer, then this applies especially to the smaller maker of concrete and not so much to those in charge of large public works. Even here, in many cases, surprising ignorance of the proper materials has been shown.

The selection of the materials for the concrete should be made only after careful examination and tests, either in the laboratory or on the site of the work or perhaps both. To aid this selection certain tests have been suggested and made. It will be found, however, that there are no standard tests or methods which can be used as a basis for comparable results. It is true that some of the laboratories of large public works and some departments of our state and national government make such tests, as for example the Structural Materials Testing Laboratory of the Department of the Interior, but almost all the tests made are individual in character and have not the endorsement such as the American Society of Civil Engineers has given to the method of testing cements.

We have before us, then, the question of tests and methods. These may be resolved into two classes, laboratory tests and practical field tests. The laboratory tests should be such that practical results and conclusions can be secured; the field tests should be made supplementary to the laboratory tests and confirmatory to them and not substitutes.

The selection of the coarse aggregates, crushed stone or gravel, is the more easily made, but sands and other fine aggregates do not so easily divide into good and poor materials. How such a division may be practically made is the topic we are to consider, and this paper is presented with the sole idea of starting a discussion as to the practical tests which should be made on materials proposed for use in concrete. When reference is made to sands it will include, of course, all materials for the fine aggregate, such as natural sands, screenings, iron ore tailings, etc. Gravels generally can be considered as sands, and facts concerning the one usually apply to the other.

Selection of Samples

It is, of course, generally conceded that any testing of the constituent materials is all wasted energy unless the samples submitted are thoroughly representative. It is certainly no easy proposition to take, for instance, a sample of sand directly from the sand bank or pit; but if the tests are to be of real value, provision must first be made for securing the best way, and from what place is it best to take the sample? Shall it be taken from the pit or after delivery upon the work? Sampling at the pit means that either the pit must be uniform or that extraordinary judgment must be used in selecting a sample typical of the sand, or gravel, generally in that pit. Undoubtedly the best sample from any pit is that taken from a blend made of samples taken at various places in the pit; but in some cases, even with the most conscientious sampling, the pit sample may not be thoroughly representative of the sand as it is delivered upon the work. Therefore, whenever possible, the sample should be drawn from the sand hopper or taken from the sand pile after delivery upon the work. This sample, if accepted, should be kept as the standard, and future samples, whether taken at the pit or after delivery, should be expected to equal in qualities the accepted standard.

Laboratory Tests

Having secured the sample, what are the most practical laboratory tests? The tests for strength of the mortar made with the sand and a "standard cement" is always a desirable test, but will not the tests for percentages of silt and of voids and for size and grading of the sand grains give results that form equally as good a basis for the acceptance or rejection of the sand?

In order to consider the tests more fully without entering into a detailed consideration of the methods used in determining each result, let us adopt, for the present, as our standard, the apparatus and the methods used by the Structural Materials Laboratory, to which reference has already been made. It is very probable that most of the larger laboratories follow the same general methods and will vary only in details. Now, having selected a definite plan of testing, do these results have a practical value in determining the relative merits of the different sands?

* Read before the American Society of Testing Materials.

To discuss this phase of our topic we shall use the results secured in the laboratory of the Department of the State Engineer and Surveyor of State of New York. From 34 sands selected practically at random, yet typical, from over 200 tested during the past two years, the interesting results in Tables 1, 2, 3, and 4 are noted:

Table 1.—Mortar Tests, Voids and Loam

No. of sands.	10	13	11
Class	A.	B.	C.
Tensile strength, natural:			
7-day	217	167	121
28-day	305	271	208
Tensile strength, washed:			
7-day	201	155	123
28-day	301	249	212
Voids, percentage	32.0	33.4	36.6
Loam, percentage	4.1	3.3	2.2

Table 2.—Granulometric Tests, Showing Percentages Passing Different Sieves

Sieve.	Class of Sands		
	A.	B.	C.
2	100	100	100
4	99	99	100
6	98	98	99
10	89	96	98
20	69	87	95
30	47	72	79
40	29	56	60
60	14	31	38
74	8	17	29
100	3.8	5.8	7.5
140	2.3	2.6	3.6
200	1.6	1.6	1.6

Table 3.—Effect of Voids

Percentage of voids	25-30	30-35	35-40
No. of sands	5	17	11
Average percentage	27.8	33	37.8
Tensile strength:*			
7 days	192	164	140
28 days	310	256	220
Percentage passing 100 sieve	2.8	6.4	6.7

*Results taken only of washed sample so that effect of loam would be nil.

Table 4.—Effect of Loam

Percentage of loam	0-2.0	2.5-3.5	5.0-6.0
No. of sands*	7	6	5
Average percentage	1.0	3.0	5.6
Tensile strength, natural:			
7 days	128	181	222
28 days	254	273	324
Tensile strength, washed:			
7 days	148	178	205
28 days	261	271	310

*Sands selected which had approximately the same percentage of voids.

A study of these results will show that a sand can be judged by its percentage of voids or of loam and by size and grading of its sand grains. As a general rule it would be impracticable to make long-time tests for tensile strength, so these tables give only the 7 and 28-day tests. Longer tests are, of course, desirable, but as we are now only considering practical tests we will endeavor to draw some conclusions from the tests at hand. We find that in Table 1 the highest tensile strength is with the lowest percentage of voids and the highest percentage

of loam; and that the natural samples containing more than 3 per cent. of loam are stronger than those with washed sand. From Table 2 we note that the smaller percentages of voids are secured by the sands having the best grading of the sand grains and that the sands with the largest percentages of fine grains are the poorer. Table 3 emphasizes the fact that sands are stronger when the percentage of voids is smaller, and that the less percentage of very fine grains the better the strength. Table 4 shows that loam to a certain amount is rather an aid to strength. This statement must not, however, be construed to mean that it would be advisable to permit large percentages of loam.

From this brief statement of the results secured and conclusions drawn can it not be seen that each test is a very important aid in determining the quality of the sand under inspection? There are, of course, other laboratory tests which are of great importance in the selection of a sand; among them is notably the careful examination of the character of the sand grains.

Foreknowledge of what qualifications are necessary and of what effect certain results may have is a vital point in interpreting the results; but with this foreknowledge we will then admit that results of tests like these do have a very practical value. With a better knowledge of the best methods of conducting tests and with a higher appreciation of the value of these tests among the general concrete contractors, and frequently among engineers themselves, then laboratory tests can be utilized to their full value. Scoffers at laboratory tests have only to examine results of the tests with concrete in which the sand has been used to see that the tests do forecast what does take place in the concrete.

Field Tests

While it may be most practical and best to have the sands first tested in the laboratory, the greatest ultimate good to concrete in general would be to convince the contractor, and often the engineer, that simple field tests will also be of material benefit to the work. For example, frequent tests for density and for proportioning would have a most beneficial result. The contractor would not necessarily have to use more cement, but on the other hand he might be able by proportioning to produce a more dense concrete simply by the addition of more either fine or coarse aggregates.

Such simple tests as that for percentage of loam by use of a graduated cylinder or that for the percentage of voids by means of the percolator should be frequently made. Neither of these, for example, requires elaborate apparatus and can be made in any field office, and yet how seldom in general work is any effort made to learn how much loam or how many voids a sand contains.

A report from London, England, states that dock laborers to the number of 60,000 are on strike. The seamen's strike, which was settled some time ago, convinced the dockers that they could also obtain their demands by similar action and as a result strikes have occurred in various shipping ports in England and Wales. London hitherto has not been seriously affected.

Hamilton's building statistics for the month of July show an increase of \$17,000 over the corresponding month last year.

Quick Construction

Remarkable progress has been made in the construction of a new Transportation building, in Montreal, as is evidenced by an inspection of the accompanying photographs. The work was started on the

ready for occupation by February, which will be some three months before the required time of completion. P. Lyall & Sons, Limited, are the contractors.

The Transportation building is a steel and concrete structure, designed to be the finest office building in



Buildings on Site May 3rd.



Site Ten Days after Contractors Got Possession.



Excavation Complete and Steel Being Erected Within Six Weeks.

site on May 3rd. Within ten days from this date the previous building had been entirely removed, and excavation work begun. By June 26th the foundations were in place, and one storey of steel work had been constructed. It is expected that the building will be

Canada, and to cost \$1,000,000. It will be faced with Bedford limestone, with oak trim and marble work in the interior. There will be six elevators in the building, leading to several hundred offices, the majority of which have already been taken up.

Victoria's Legislative Buildings

Detail plans have now been completed for the extension of the legislative buildings of Victoria and tenders have been invited for the erection of the side wings. Two complete blocks are to be devoted to office and departmental purposes, these being three storeys in height, absolutely fireproof, of granite similar to that employed in the existing structures on Parliament Square, and in architectural harmony therewith.

The new wings will contain 32,500 square feet of floor space exclusive of corridors, laboratories, stairways, etc., divided into intercommunicating rooms 20 by 26 feet each and ninety-six in number. The new library block tenders for which are now being invited, will be the central architectural feature of the addition, the total cost of which will run from \$600,000 to \$750,000.

Temperatures in Masonry Dams in Great Britain are stated by Mr. Edward Sandeman, engineer of the Derwent Valley Water Board, to vary about 5° at a distance of 30 ft. in from the face, while at a depth of only an inch or so a variation of 70° may be found.



The Transportation Building, Montreal, when completed.

Port Arthur to Sudbury Line

Work is being started on the construction of the Port Arthur to Sudbury division of the Canadian Northern Railway. This line will be over 550 miles in length.

The route of the line is a wide curve, penetrating the plateau of the height of land about hundred miles at its farthest from the shore of Lake Superior and descending again close to the water at Nipigon, whence the Canadian Pacific Railway's line is more or less closely paralleled into Port Arthur. The greatest part of the work to be done is through clay belt formations, and is described by Mr. Henry K. Wicksteed, chief survey engineer, a very ordinary railway construction. The most interesting section is in the last 120 miles into Port Arthur, which includes some heavy side hill work in rock and an 1,100-foot tunnel along the shore of Lake Nipigon. The Nipigon River is to be diverted

and a costly bridge is to cross it, and the Blende Valley will be crossed by a viaduct of 2,200 feet.

The location is said to afford the easiest gradients of any of the three transcontinental lines. Against west-bound trains the maximum grade is to be six feet in one thousand, and five feet against eastbound trains, but this will be reached in very few instances, much of the line being perfectly flat. The heaviest curvature with few exceptions, is six degrees; and four degrees is the rule for some hundreds of miles on the interior plateau.

The work will be done conjointly by the Foley Brothers, of St. Paul, and the Northern Construction Company, of Winnipeg, who will start operations at once, putting between four and five thousand men in the field.

The Cost of Making Brick

The figuring of cost in brick yards has not been practiced much, and while the figures which are obtainable vary greatly, it has been found that the best results are obtained over a long period of operations. The following table will give an idea of the operations of a large brick yard, well equipped, which made six million brick per year. In 1894 they had a strike and in 1909 the year was very bad for production on account of the weather condition. The power used was a steam engine of 80 h.p.:—

Production in Year	Millions	Labor	Kiln Coal	Engine Coal	Repairs	Expense	Supplies	Total
1901	3,250	6.86	2.90	2.15	2.02	0.75	0.48	15.16
1902	2,225	7.06	3.30	1.62	1.88	1.39	0.15	15.40
1903	2,500	7.00	3.24	2.28	2.48	0.88	0.14	16.02
1904	3,000	7.04	2.87	1.40	3.47	1.28	0.20	16.26
1905	3,500	6.91	2.92	1.28	5.00	0.68	0.20	16.79
1906	4,150	7.00	2.95	1.40	0.89	0.70	0.18	13.12
1907	3,634	8.00	4.40	1.19	1.25	0.73	0.17	15.47
1908	4,300	7.30	3.12	1.50	0.60	0.78	0.10	13.40
1909	2,674	10.35	2.73	1.60	1.60	1.20	0.17	17.65
1910	3,809	8.15	2.49	1.44	1.57	0.75	0.21	14.61
Av	3,304	7.57	3.09	1.59	2.07	0.91	0.20	15.42

These figures are all based on the thousand brick, and the values represent marks (1 mark, 24.8 cents). Most bricklayers make the mistake that they do not count the depreciation of the plant, and also do not bear in mind the interest. It can be safely stated that a brick yard is run down in twenty-five years, and a depreciation of four per cent. is, therefore, not too much—Deut. Topf. & Z. Z. No. 31, 1911.

Comparisons with previous annual returns of the earnings of the C. P. R. give cheerful testimony to the progress that the road is making. Since 1908, three years ago, the gross earnings of the road have increased by nearly thirty-three millions, or 31.4 per cent. In the same period the net increased \$14,907,463, or 46 per cent.

The following figures are for the month of June and twelve months ending June 30:—

	1911	1910	1909
June gross	\$ 9,479,650	\$ 8,807,817	\$ 6,550,153
Expenses	6,454,979	6,089,901	4,661,728
June net	3,024,671	2,717,916	1,888,426
Twelve months, gross	104,167,802	94,989,489	76,313,316
Expenses	67,467,973	61,149,533	53,357,743
Twelve months, net . .	36,699,827	33,839,956	22,955,571

Reinforced Concrete Floor Slab Design

Report on Investigation of Theories for Flat-Slab Designing —Application of Grashoff's Formula to Various Methods

By G. C. Stone, C.E.*

That the flat-slab or girderless type of floor construction in reinforced concrete, (commonly called the "mushroom system"), is to become the usual type in that class of building construction which involves intermediate columns, is now beyond doubt. The advantage of this mode of construction over the common "slab-beam-and-girder" are multiple. The design, construction and erection of the forms is with the flat slab reduced to a minimum of simplicity, thus saving both time and timber. The thickness of flooring, from floor-level to under surface of ceiling below is reduced to about a quarter of what it would be were girders used, thus reducing height of structure; and the slab itself used be no thicker than would be required with long slabs resting on deep beams. With buildings of the same height, more of the cubic feet of space covered by the roof are actually available when the flat slab is used. Lighting, heating, and ventilating are much simpler problems with the flat slab; and when once the nature of the internal stresses set up in a flat slab or reinforced concrete, supported on columns and subject to various and varying loads, is known, the design of the slab itself will become a very simple matter.

The idea of making this investigation was derived from a perusal of various theories, (some of them conflicting and contradictory), which have been advanced and put into practice for the design of flat slab floors. While thoroughly convinced of the advantage of the flat slab system, the writer was not a little puzzled by the wide range in the limits of fundamental assumptions as assumed by various authorities, by the conflict of opinions of those who have made a study of the subject of flat slab design, and by vast difference in results arrived at by these several designers. Of the methods examined, the variation in cost approaches 300 per cent. And these designs were made by engineers of recognition in the profession.

In the design of a flat-slab floor, we have to deal with a complex combination of elastic stresses. Evidently, the originally plane surface of the slab, when loaded uniformly over several panels or sets of four columns, tends to become a warped surface; that is, there is a tendency for the slab to sag downward around each column somewhat umbrella-fashion, thus compressing the slab at the bottom and stretching it at the top on lines radiating from the column; at the same time the slab is compressed at right angles to these lines by reason of the doming action about the column. Likewise, the part of the slab in the centre of the panel is dished or made concave upward, the tension being at the bottom and compression at the top, (compare above), in this case, but with a similar circumferential compression (about centre of panel now) due to the dishing. Evidently, too, since the slab tends to sag on a direct line between the columns in a row as well as within a panel, this dishing in the centre cannot be uniform around

but must be most marked on lines between diagonally opposite columns. Also, it is evident that we must have decidedly different elastic deformations about the column and within the panel; for the "umbrella" over the column is similar to that produced in a flat footing supporting a concentrated load at the centre; while the dishing is similar to that produced in a plate supported around its periphery and uniformly loaded. As to the shape of this representative plate, we are in doubt; nor are we quite assured that its peripheral support should have a plane surface; for does not the slab sag between columns in a row? Again, when the distribution of the loading is changed, may not these tensile and compressive stresses be modified, or even reversed? And if we are to consider the stiffening effect of the column-head in reducing the bending moment over the support as has been suggested, do we not necessarily then have to design the columns to resist flexure—eccentric loads—thus increasing the cost of the columns?

At first sight it would seem that the old Cantilever Method is the reasonable method of design. By this, a unit width of the slab is designed as a beam, both cross and diagonally; but to do this properly we must know fairly accurately the location of the line of inflection about the column-head, and the resulting size, shape, and deformation of the suspended plate. And since we must be able to adapt our design to resist reversed stresses due to "continuous girder" action and excessively concentrated loads, (which we cannot do by the cantilever method), evidently this design would be undesirable.

Tu neaure and Maurer, in Principles of Reinforced Concrete Construction, base their method and construct their diagrams on a modification of the cantilever method. Though their design does not give the same result as the cantilever, it is open to the same objections as given above, but somewhat modified by the use of heavier slabs and more steel. The result is expensive.

It has been attempted to justify the application of Grashof's formulas to slabs of reinforced concrete. Grashof's formulas were derived for plates of steel—a homogeneous material—supported on four points. As to just how a slab of a composite material like reinforced concrete can be assumed to behave under uncertain stresses like a slab of steel, and permit the application of Poisson's ratio, seems never to have been quite clearly understood.

Mensch, in his Pocket Book, has assumed a maximum possible bending moment of $M = wL^2/20$, which is intended to be a little toward the safe side as compared with its original form of $wL^2/26.5$ given by Grashof. In other words, the unknown difference between the behavior of reinforced concrete and steel presumably is assumed as being equivalent to the difference between these values.

In his book, Concrete Steel Construction, C. A. P. Turner gives his formulas: $M = wL^2/50$ for moment, and $\Delta = WL^3/7,000$ for deflection, and prescribes the width of column head, and of bands of steel, to

be from $7/16L$ to $1/2L$. Both of these formulas he derives from actual tests on single panels already erected. The method is ingenious and the equation daring; and, necessarily, the result is a very low cost. We fear it is too low.

MacMillan takes Grashof's analysis of stresses in a plate supported in various ways, and, by proportion, deduces a formula for bending moment of $M=wL^2/25$; this he uses in his design to get the maximum stress over the column-head, assuming that the moment at the centre of the slab will be one-half as much. This latter assumption, of course, is only partially true. He finds the bending moment, provides the necessary steel, and then makes the slab of such a thickness as will properly embed the bars—this thickness usually being greater than is actually required by the compressive strength of the concrete. MacMillan arranges his steel in much the same way as Turner, making the width of the bands equal to $7/16L$; and he, too, backs up his theory by citing numerous cases where it has been used successfully. He recommends from 16 to 24 feet as being ordinarily the most economical span, preferably square.

Brayton assumes $wL^2/24$ for the bending moment at the centre of the panel, and doubles this over the columns. He makes his bands $7/16L$ wide and uses the same method of distribution of the bars as Turner and MacMillan, letting the bars lap over the column-heads and so provide for the doubled bending moment of the slab.

Now taking up and discussing each of these methods in turn:

As we have already pointed out, the Cantilever Method presupposes a definite fixed load and loading, and the floor is accordingly designed to carry this. Since the load may vary almost indefinitely in amount and distribution, we would have to provide for any of these possible conditions, and such a provision, treating the slab as a cantilever, is impractical if not impracticable. So we are inclined to pass this method by as one that is very interesting but quite useless.

Turneure and Maurer, it would seem, undertake to provide for the uncertainties and shortcomings of the cantilever method by using an abnormally large factor of safety. While this undoubtedly answers the purpose so far as enabling the slab to carry the load is concerned, yet the construction is bulky and expensive. However, assuming as they do that the slab action is similar to that of a cantilever system, modified and complicated, we believe that they are approaching the correct basis of flat-slab design.

We have already stated our conclusion regarding the application of Grashof's equations, unmodified, to slabs of reinforced concrete. We should remember, too, that these equations were obtained by testing square plates, only. We see no reason for attempting to assume that, what has been found by test to take place in a plate of a composite substance like steel, will likewise occur in a continuous slab built up of two materials as unlike in every respect (except temperature effect), as concrete and steel. If slabs based on these formulas have given satisfaction, it should be considered not so much a proof of the applicability of the theory as a fortunate coincidence of circumstances. We do not know on just what grounds Mr. Mensch justifies his modification and subsequent application of Grashof's formula.

Mr. Turner tested single panels only, thus making the slab deflect somewhat as a plate fixed at four sides would deflect. There was no continuous action.

Now, the question is, would Turner's formulas be upheld by a test over a number of adjacent slabs or panels? That is, would a flat-slab designed for $M=wL^2/50$, when loaded over several panels, bear out the formula $4=WL^2/7,000$? Mr. Turner has the advantage of buildings designed by his method which are now in use and giving satisfaction. Also, his design is the cheapest yet proposed through the engineering press; no one else has dared to use a factor of $1/50$ for M . Evidently, then, so long as these two points are in his favor no one can dispute the fact that his methods are successful. As to whether their success is due to good theory, good guessing, or good luck, seems to be undetermined.

MacMillan's reasoning is good, as far as it goes. To quote from his paper read before the Sixth Annual Convention of the National Association of Cement Users, at Chicago, February, 1910:

"For a square plate supported on two edges, $f=3wL^2/4t^2$.

For a square plate fixed on two edges, $f=wL^2/2t^2$.

For a square plate fixed on four edges, $f=wL^2/4t^2$.

For a square plate fixed on four points, $f=wL^2/4.27t^2$."

(from Grashof)

Here, f =max. fibre stress; w =total load, lb. /'; L =length in ft.; B =breadth in ft.; t =total thickness in ft.

"It is interesting to note that a plate fixed at four points is stronger than one fixed on four sides, and is 3.2 times as strong as one supported on two edges. Now, in the first formula, the moment of resistance can be expressed by $M_r=wBL^2/8$. Therefore, for a plate fixed at four points and the same unit load, the bending moment will be $1/3.2$ times this amount, or $M=wBL^2/25.6$. Using 25, instead of 25.6, for a denominator the result will be $M=wBL^2/25$ —a formula that expresses the maximum stress over the head of the column." We quote this in full, not so much for the final result as for the method employed in obtaining it. Aside from the fact that the initial equations are more or less connected with homogeneous materials, and the fact that in the original tests only one plate was loaded, so that those equations should be applied with caution to reinforced concrete construction, it would seem that some such course of deduction as this is the proper one to pursue in treating the subject of flat-slab design. But on one point we must decidedly disagree with Mr. MacMillan. He says: "When panel is rectangular, L is greater than B and must be used in getting the bending moment." We cannot see this. If two beams of the same material, and same cross-section, and bearing the same load per unit length, are themselves of different lengths, evidently the longer of the two will deflect the more. If we fasten the two beams together cross-wise and again apply the same load to each as before, they will sink to a position intermediate between their several deflected positions when loaded the first time, because the shorter beam helps to hold up the longer. Then the shorter beam must carry its own load and also some of that on the other beam; so we should certainly design with regard to the short beam, or the short dimension of the floor slab.

In a paper of this sort we cannot go into the details of a typical slab by each of the methods enumerated. But we have taken the table given below from Mr. MacMillan's paper, in which he himself works out an example by each of the methods hereinbefore discussed except, of course, Brayton's; for Brayton set forth his method in a discussion of MacMillan's paper.

and differs from MacMillan only in that he assumes $1/12$ for his maximum moment coefficient. To MacMillan's table we have added Brayton's results, and also our own for a "slab-beam-and-girder" panel, with a column for costs assuming, for purposes of comparison, that the steel costs 4c. in place and not reckoning the cost of concrete. The panel taken in each case was 20 feet square; live load, 200 lbs.

Authority:	Slab thickness:	Steel stress:	Lbs. of steel used	Cost of steel:
		lbs./"		
Cantilever Type	8"	16,000	2,189	\$87.56
Turneure & Maurer	12"	16,000	1,931	77.24
Grashof	8"	16,000	784	31.36
Mensch	8"	16,000	2,120	84.80
C. A. P. Turner	8"	*16,000	549	21.96
Macmillan	8"	16,000	1,084	43.36
Brayton	8.5"	16,000	1,900	76.00
Average:	8.64"	16,000	1,508	60.33
Slab-beam-and-girder	12"	16,000	2,300	92.00

*Turner recommends 13,000 lbs./".

We note that the cost where the beams and girders are used is the highest; and for the flat-slab the cost ranges for a 20 ft. square panel from \$21.96 to \$87.56, with an average of \$60.33! Truly, a wide variation. As a matter of fact, we should not compare the Grashof result with the others which are continuous.

As to the conclusions to be derived, we should say that MacMillan's is nearest the mean of the results shown. Personally, too, we should be inclined to think that the value which he uses for moment coefficient is most nearly what the future will show to be correct. But it would seem that no method of design should be used without a liberal allowance for un-known influences of the "umbrella" and "dish" action in stressing the material until the nature and amount of such influence have been demonstrated by actual experiment.

The recent test of a flat-slab floor in Minneapolis, a description of which has been furnished the press by Mr. A. B. Lord, of the University of Illinois, seems to have been a thorough and well conducted test. The comparison of the results of this test with the design by which the building was erected has not yet been given out. But we note the sense, if not the exact words, in the following general conclusions by Mr. Lord:

"Analysis by the beam method errs on the side of safety, and probably represents the maximum possible stress; which, however, is actually reduced by slab-action.

Grashof's analyses were made for a homogeneous material and depend on Poisson's ratio; also, they apply to square panels only, and not to these unless the conditions are such that the maximum stress falls within the panel and not at the column. Grashof's analysis unchanged cannot be applied here safely or reasonably. The moment in the slab is shown by analysis and by test to be greatest at the support, and the critical section is found by test to be near the edge of the capital; so the size of the capital should depend on the size of the panel, not of the column. The side of the capital should be about 0.2 the side of the panel, if square—proportionate to the panel area, otherwise. At the support the part of the reinforcement band over the column must carry all the shear; but the entire width of the band may be considered to resist bending moment if not more than twice as wide as the capital.

The maximum moment should be computed about

the edge of the capital, and should be taken as double the moment at the centre of the panel; Turner's coefficient of $1/50$ should be used cautiously. No dependence should be placed in tests of single panels."

It is to be hoped that the Minneapolis test will furnish some definite results by which scientifically accurate designs may be made of this admirable type of reinforced concrete floor-construction. No doubt such results will be forthcoming.

Canadian Contractors and Their Work

Messrs. P. Lyall & Sons, Limited

It is no small matter to be regarded as the largest concern in one's special line of business in a country like Canada. This is the proud position held by Messrs P. Lyall & Sons, Limited, the well-known building contractors, in Montreal. It was in the early eighties that Mr. Peter Lyall, who came, as a young man, from Scotland, established himself in business as a contracting mason in the future commercial metropolis of the Dominion. He brought with him from the Old Land, and put into his new-world busi-



Mr. Peter Lyall, President of P. Lyall and Sons, Montreal

ness, those qualities of thoroughness, ambition, and determination that have so generally characterized his fellow countrymen.

Two of Mr. Lyall's sons are associated with him in the extensive business in which the firm is engaged. Mr. William Lyall has been associated with his father from an early age. He has practically grown up with the business, and developed accordingly. In the position of managing

director he has shown himself to be a capable administrator, while his foresight and capacity for detail have been largely responsible for the rapid expansion of business as well as the stability and popularity of the firm. Mr. T. O. Lyall, in the direction of the office work and care of the financial side of the enterprise, is equally alive to the responsibilities of the hour and the opportunities of the future. He also has been with the firm several years. They make a good team, the progress of the firm being the best evidence of the fact.

Mr. Peter Lyall, president and founder of the firm, is connected with a large number of commercial, financial and charitable enterprises, and is, among other things, president

roofing, is handled by this firm in their own shops, and by their own employees. Their stone-cutting plant occupies a building 300 by 150 feet, and their marble shop is 50 by 250 feet. The planing mill is a two-storey structure, 150 by 150 feet. They have three large tool yards that scarcely provide space enough to accommodate their rapidly increasing equipment. All these shops are provided with the very latest mechanical devices for the artistic and expeditious production of the materials required in their varied building operations. Their operating plant is estimated to be worth \$600,000. The building operations of this firm have always been carried on under the open shop principle, and



Mr. William Lyall, Managing Director of the firm of the Western General Hospital. In recent years he has been able to loosen his hold somewhat on the building business, and give more attention to questions affecting the best interests of good citizenship, where he is always on the right side, and his influence is highly regarded and appreciated.

Every department of building operations, with the exception of ornamental iron, sheet metal, structural steel and



The Kellert Building, Montreal, a Lyall contract

believing this to be the best in the interests of the men themselves, as well as proprietors and contractors, it is the intention to continue this system. Men are paid what they are worth, and not infrequently more than the union scale; but the firm hold themselves free to discharge any man at any time who cannot earn the wages he wants or is getting. Employees are engaged irrespective of race or religion, unionism or other affiliations, the only requirement being honesty, steady habits, and ability to do the work allotted to them.

Among the buildings at present in course of construction by this company are: The Transportation building, and the Dominion Express building, Montreal; the Central Union Station building at Ottawa; the Arena building, Toronto; the Grey Nuns' Hospital, Regina; the "Times" office building, Moose Jaw; the "Times" printing office, Moose Jaw;



Montreal Technical School, to cost \$1,000,000

a palatial residence for Lieutenant-Colonel C. A. Smart, Montreal; a conservatory for Lord Strathcona, Montreal; three buildings for James Strachan, baker; a power house and chocolate factory for Walter Baker & Company of Canada, Limited; development work consists of water mains and sewers, street and sidewalk construction about a mile in extent for the Montreal City Land Company at Longue Pointe.

In the course of their long and busy career this firm has erected many of the largest and most expensive buildings, both public and private, in Montreal, and we might say in Canada. This is the case to such an extent in their home city that the growth of Montreal and the progress of the company seem to have proceeded along parallel lines, and the city owes much of its appearance of beauty and stability to the firm of P. Lyall & Sons, Limited. It is interesting to enumerate a few of the principal structures which have been erected by this firm and which attract universal attention from visitors to this city. First might be mentioned the Board of Trade building, erected at a cost of \$400,000; then the G. T. R. general offices, costing

some 600 feet. In the million dollar class must be mentioned the Union Railway station at Ottawa of similar construction to those just mentioned but possibly with finer finish in some details. There are four departments in this building—one containing the head offices of the Railway Commission, another the ticket office and lunch room, another divisional offices of the G. T. R.; the waiting room is a beautiful apartment whose ceiling is 70 feet high and finished in ornamental plaster and "Travertine" marble. The concourse or main hallway is also beautifully designed.

The Kellert building is a beautiful steel and concrete structure, faced with ornamental terra cotta and costing \$250,000. The Eastern Townships Bank's head offices on Victoria Square cost \$150,000 and is a good example of the solid, substantial construction which characterizes Lyall contracts. The National Bridge Company's works is another structure put up on June 13, 1910. It is of steel and concrete and brick. The plans for the work were prepared while construction was under way. The cost of the suite of buildings was \$300,000.



Saskatchewan Parliament Buildings, Regina, P. Lyall & Sons, Limited, Contractors

\$800,000; the Royal Victoria Hospital, costing \$1,000,000; Canada Life Assurance offices, \$675,000; the New York Life Insurance Company's office, \$600,000; the Montreal Stock Exchange; the Sun Life Assurance Company's head offices; the Coristine building; the Imperial building; the Macdonald Engineering building of McGill University, \$150,000; the Royal Victoria College for ladies, \$250,000; Proctor's theatre; the Yorkshire building; the McGill Museum and old Medical building; the Montreal Light, Heat & Power Company's Wellington Street sub-station; the Merchants' Cotton Company's factory; the Belding Paul & Company's factory; the residences of Mr. E. S. Clouston, Mr. James R. Wilson, Mr. George L. Cains, Mr. Lansing Lewis, Mr. James Robinson, Mr. James Crathern and others. Among other outside contracts of importance may be mentioned the Montreal Cotton Company's extensive works at Valleyfield costing over \$500,000; the Royal Alexandra Hotel, Winnipeg; the C. P. R. Railway Station and offices at Winnipeg.

The Montreal Technical School, not previously mentioned, is a million dollar structure. It also is of steel and concrete and white pressed brick facing.

A still larger contract was the Regina Parliament buildings costing a million and a half. This is a reinforced concrete and steel structure, having a frontage of

Montreal Notes

The Montreal City Controllers have appointed Mr. Emile Pépin, architect, as an assistant building inspector on Mr. Chausse's staff. The salary is a thousand dollars a year. He will be responsible for the inspection of a section covering about one-third of the city.

The strike among the carpenters has not been settled at the time of writing. Several employers have agreed to give the minimum wage of 35 cents an hour for a nine hour day and a large number of men have returned to work. The Harbor Commissioners and Messrs. P. Lyall & Sons, Limited, were among those who refused to recognize the Union or its scale and some of their men remained out.

An ambitious scheme is being entertained by the civic authorities of Montreal for the erection of a ten million dollar city hall—sometime. The proposed location is in the district bounded by St. Lawrence, Rachel and St. Denis streets and Mount Royal avenue. The property would have to be expropriated, being now covered with residences and a few stores. It is thought it will take from twelve to twenty years to carry out the project and by that time this locality will be in the centre of the city.

Trade Notes and Items of Interest

The St. Lawrence Pulp and Paper Mills at Ottawa were damaged by fire to the extent of \$30,000.

The Provincial Government will rebuild at once the Hamilton Asylum destroyed last week by fire.

The ratepayers of Guelph have decided to continue construction work on the Huskisson Street sub-way.

The Canadian Pacific Railway Company are building a new dock at Port Arthur, Ont., at a cost of \$230,000.

The City of Moose Jaw proposes installing approximately 17,000 linear feet of sewer and water main extensions.

The C. P. R. are contemplating the construction of a new spur line from Three Forks to Bear Lake, in British Columbia.

Winnipeg reports a total of \$11,500,000 worth of building permits that have been issued during the first seven months of the year.

The Canadian Northern Railway announces that it will require 20,000 men to construct the Port Arthur to Sudbury branch of the line.

The City of London reports an issue of building permits for July to the value of \$93,726, making a total of \$552,149 for the year 1911 to date.

The plants of the Union Construction Company, Ottawa, and of the Ottawa Stone and Brick Company, were recently damaged by fire to the extent of \$10,000.

Calgary's municipally-owned street railway earned during July about \$40,000. This makes the month just ended the best in the history of the municipal railway.

An estimate of Canada's fire losses during July amounted to \$5,384,300, compared with \$1,151,150 for June, and \$6,386,674 for the corresponding period last year.

The ratepayers of Nanaimo, B. C., have granted a franchise to Messrs. Haffner & Smith, Montreal, to provide hydraulic power for all purposes within city limits.

The value of building permits issued by City Architect McCallum during July amounts to \$2,789,520. Toronto is experiencing nothing short of amazing activities in this branch.

The building permits issued in the City of Guelph during the month of July amounted to \$26,025, making a total for the first 7 months of the year of approximately \$380,000.

Calgary building permits show an increase of 57.2 per cent. over the building returns of July, 1910. During the past month 214 permits were issued, representing a value of \$817,980.

Additions will be made to the Parliament Buildings, Victoria, to the extent of some \$75,000. Two wings will be built to the present structure, to be of fireproof construction, and granite facing.

Negotiations as to the appropriation of property for approaches to a new steel bridge at St. Andrews Locks, about fifteen miles from Winnipeg, have been started, and surveying will begin at once.

The Department of Railways and Canals, Ottawa, is at present considering the tenders that have been received for the job of constructing the section of the Hudson Bay Railroad from Pas Mission to Thicket Portage, a distance of 185 miles.

The firm of J. S. Metcalfe & Company, Montreal, have been awarded the contract for the Grand Trunk station

improvement at Ottawa. This is to consist of a cement platform and canopy over track terminals, and will cost in the neighborhood of \$100,000.

After considerable delay, caused by the city council debating upon the question of beginning to widen Yonge street, at the congested business corner, the C. P. R. were granted a permit to erect a 15-storey office building to cost \$900,000, at the southeast corner of King and Yonge streets, Toronto.

The Union Trust Company are erecting a splendid 12-storey structure in Winnipeg. Tenders will be called for shortly and the buildings are at present to be demolished, in the preparation for excavating. The new building will be of steel structure, and absolutely fireproof. Mr. J. D. Atcheson is the architect.

Building reports from Montreal, for the past month show an issue of 329 permits, to the value of \$1,057,761. During July, 1910, over three times this amount was recorded. The carpenters' strike, which is now of some weeks' duration is probably accountable for much of the decrease.

Various railway contractors in British Columbia state that the scarcity of labor is becoming exceedingly grave, and that scores of the camps are experiencing difficulty in carrying on their work owing to this cause. It is understood that the Vancouver Board of Trade will be requested to ask the Dominion Government to modify the immigration regulations, in order to make up the deficiency.

The Brandon Construction Company has been awarded the contract for the erection of the new power house in connection with the Brandon Asylum for the insane. This structure will be brick and concrete on a concrete foundation, which must be completed by Feb. 15, 1912, will be 60 by 115 feet and about 30 feet in height, one end being of two storeys to provide accommodation for the caretaker. The work includes a solid masonry chimney 150 feet in height.

Personal Notes

Mr. Peter Van Westrum, a member of the Westrumite Paving Company, and a native of Brantford, Ont., died suddenly in Victoria, B. C.

Mr. J. R. Frames, consulting engineer to the Dominion Government, is in Vancouver to inspect the work at the Coquitlam Lake where it is proposed to erect an 85 foot dam.

Mr. E. S. Estlin, Chief Engineer of the Manitoba Elevator Commission, has resigned his position to become supervisor of construction, for the Saskatchewan Elevator Company.

Mr. George Hutchinson, Ex-Provincial Architect for Saskatchewan, and a member of the firm of Messrs. Fraser & Hutchinson, of Regina, is re-engaged in his profession in Victoria.

The death is reported of Mr. H. E. Lawson, Mining Engineer, late of Toronto, in West Africa. Mr. Lawson graduated from Cambourne College, Cornwall, as a silver medalist, and practised his profession in India, Borneo, New Zealand, and West Africa, as well as in Canada.

Mr. Joseph Perrault, Architect, "Fairmount Court," 2106 Park Avenue, is completing the plans and specifications of the proposed enlargement of the Campbell Manufacturing Company, on Elmire, Cadieux and Colonia! streets. The excavations were begun last week by Messrs. Shearer, Brown and Wills, general contractors.

Contracts Department

News of Special Interest to Contractors, Engineers, Manufacturers and Dealers in Building Supplies.

Information for insertion in these columns is invited from Architects, Contractors, Engineers, etc.

Waterworks, Sewerage and Roadways

Calgary, Alta.

It is recommended that the contract of the Crown Paving Company for laying 25,000 yards of asphalt be accepted.

Cannington, Ont.

Tenders called for drainage, \$3,000. Owner, Village of Cannington; Clerk, W. A. Robinson; Engineer in Charge, Cavana & Watson, Orillia, Ont. 1-3 excavation trenches for 15 in. 12 in. 8 in. sewer pipes; (4) to make and put in brick and cement silt basins, 2 ft. 6 in. inside dia. and about 6 ft. in depth; (5) to supply cement or salt glazed vitrified tile. Plans, etc., at office of clerk. Tenders received by clerk until Aug. 3.

Cornwall, Ont.

By-laws carried for waterworks. Owner, Corporation of Cornwall. Town Clerk, Geo. S. Jarvis, Cornwall. By-law to raise \$30,000 for water mains carried.

Fort Erie, Ont.

Contemplated sewerage. Owner, Village of Fort Erie. Consulting Engineers, Witmer & Brown, Chaplin Block, Bukalo, N.Y. A sewer and septic tank will be constructed.

Gleichen, Alta.

Tenders called for waterworks. Owner, Town of Gleichen. Sec.-treas., W. J. Burr; engineers, The John Galt Engineering Co., 317 Portage ave., Winnipeg. 1 54-in. x 14 ft. Return Tubular Boiler and Slack. 1 500-gal. per minute Duplex Steam Pump. 1 Air Compressor and Air-Lift Pump. Specifications, etc., at the offices of the engineers. Tenders received by the sec.-treas. until 18 o'clock August 11th.

Hamilton, Ont.

Tenders called for sewers. Owner, City of Hamilton; S. H. Kent, city clerk; city engineer, A. F. McCallum. Construction of sewers on the following: Beach road, 350 feet; Campbell avenue, Greenaway, Wentworth streets, Sherman, Rosemount, Scott and Beechwood avenues. Tenders addressed to C. H. Lees, Mayor, chairman board of control, care city clerk, received until August 9.

Hastings, Ont.

Tenders called for pavement. Owner, Village of Hastings. Clerk, Alex. Wilson. Construction of 50,000 sq. ft. of cement pavement. Tenders received until August 10th.

Moncton, N. B.

Extension of time for reservoir dam, \$50,000. Owner, City of Moncton. Engineer, John Edington, Moncton. Dam

50 ft. high, 800 ft. long. Three tenders received but not opened. Time for receiving tenders extended until August 9th.

Tenders called for pipe line. Owner, City of Moncton. Engineer, John Edington; excavating and refilling trenches, laying and joining pipes from the City of Moncton to the new reservoir. Plans, specifications at office of City engineer. Tenders received by city engineer until 5 p.m. August 15th, 1911.

Tenders to be called for sewerage. Owner, City of Moncton, N. B. City Engineer, John Edington. Extension of sewer on High street North, 800 ft. Victoria Square, 700 ft. Extension of sewer on St. George street 375 ft. N. B. The tender of LeBlanc & Govang for sewer on Cornhill street, \$777.61 was accepted.

North Toronto, Ont.

Tenders called for main sewerage, No. 4 (east of Bayview ave.) Mayor, A. J. Brown. Consulting Engineer, T. Aird Murray, 303 Lumsden Building, Toronto. Providing and laying about 2,000 lin. ft. of 24-in. vitrified sewer pipe, with all necessary manholes and junctions. Plans, etc., at office of engineer. Work to be completed Sept. 30th. Tenders received until August 14th by F. Howe, chairman Works Committee, Eglinton Town Hall.

Port Atkinson, B. C.

Tenders called for reinforced concrete tower. Owner, Dept. of Marine and Fisheries, Ottawa. Deputy Minister, A. Johnston. Construction of a reinforced concrete tower, double dwelling and a fog alarm building. Plans, etc., at Dept. of Marine and Fisheries, Ottawa, at the agency of Dept., Victoria and at Post Office, Vancouver. Tenders received by Deputy Minister until noon Aug. 31st.

Point Grey, B. C.

By-laws carried for engineering. Sec.-treasurer, H. Floyd Kerrisdale. To borrow the sum of \$349,908.50 for extending improving and opening roads; to borrow \$501,259.80 to provide extensions and additional equipment for water service. Tenders to be received within 3 weeks for two road rollers 12 ton and 15 ton.

Quebec, Que.

Tenders called for steam boiler. Owner, Corporation of Quebec; city engineer, W. D. Baillarge. Each tender to be accompanied by a deposit of \$400. Tenders received by engineer until 4 p.m., August 9th.

Regina, Sask.

The city will construct two and one-half miles of 72-in. sewer pipe.

Saskatoon, Sask.

By-laws to be submitted for engineering. City clerk, T. H. Truesdale. On August 24th the following by-laws will be submitted to ratepayers: \$10,000 for improvement of Saskatchewan Drive, etc., \$45,000 for house sewer and water connections; \$60,000 for construction of subway at 19th street; \$73,000 for extension to waterworks system; \$75,000 for extensions to light and power system; \$75,000 for construction of water filtration plant and improvement of sedimentation basin; \$10,000 for concrete street crossings; \$225,000 for construction of intercepting sewer and sewage disposal plant.

Stettler, Alta.

Contemplated sewerage system. Owner, Town of Stettler, Alta. Secretary-treasurer, D. Mitchell. The sewerage system here will be undertaken by town in 1912. For further information write sec.-treas.

St. Thomas, Ont.

Tenders called for waterworks. Owner, City of St. Thomas. City Engineer, M. H. Baker. Supply and installation of a 6,000,000-gal. centrifugal pump and steam engine. Specifications obtained from City Engineer. Advertisement in "Tenders and For Sale Department" of this issue. Tenders received until Aug. 19th.

St. Vital, Man.

Tenders called for pavement. Owner, Rural Municipality of St. Vital. Secy., E. A. Poulain; engineer, G. Mullen, 372 St. Jean Baptiste street, St. Boniface. St. Mary's road 18 ft. in width with one curb, approximate length one mile. Specifications, etc., at office of municipal engineer. All tenders to be accompanied by a marked cheque for 1 per cent. of the amount of tender. Tenders received by sec.-treas. until 8 p.m. August 14th.

Thorold, Ont.

Work delayed for road paving. Owner, Stamford township, etc. Parties concerned, Stamford Township and rest of Welland Cny. Engineer, J. C. Gardner, Niagara Falls, Ont. Engineer's report unfavorable; matter tied up indefinitely.

Toronto, Ont.

Tenders called for sewer. Owner, City of Toronto. G. R. Geary, Mayor, City Engineer, C. H. Rust; laying and jointing 36 in. reinforced pipe for the Toronto Junction Main Sewer. Specifications, etc., at office of engineer. Tenders received by Chairman Board of Control, until noon Aug. 8th.

Tenders called for lighting fixtures. Owner, City of Toronto; G. R. Geary, Chairman Board of Control. Supply

and connection of electric lighting fixtures for filtration plant. Plans, etc., at office of City Engineer or at Water Works Department. Tenders received until noon August 15th by G. R. Geary.

Tenders called for pavement and sewers. Owner, City of Toronto, Chairman Board of Control, G. R. Geary. Construction of the following: asphalt pavements on seven streets; bitulithic pavement on two; brick block pavement on two; grading on two; concrete curbing on four; concrete walks on several; sewers on four. Tenders received until noon, August 15th, by G. R. Geary.

Vancouver, B. C.

Recommendations of Engineer for sewerage scheme. City Engineer, F. Fellowes, Vancouver. Proposal to construct a 4½ ft. dia. brick and concrete sewer from Clark Drive with temporary connection, with False Creek easterly into Hastings Townsite. Estimates on whole submitted later.

Winnipeg, Man.

Tenders called for sewer pipe. Owner, City of Winnipeg, Man.; secretary, Board of Control, M. Peterson. Supply of quantity of sewer pipe and specials. Specifications, etc., at office of City Engineer. Tenders received by Chairman, Board of Control, until 11 a.m., August 10.

Tenders called for pumping and compressor plant. Owner, Public Parks Board, 229 Chamber of Commerce, Winnipeg; chairman, C. W. Sharp; secretary, T. H. Blackwood. Installation of pumping and compressor plant. Plans, etc., at office of board. Tenders received until noon, August 12th, by C. W. Sharp.

Tenders called for grading. Owner, Public Park Board, Winnipeg, Man.; chairman, H. C. Stovel, 229 Chambers of Commerce, Winnipeg; secretary, J. H. Blackwood. Grading a double roadway on Inkster avenue, from Main street to Keewatin street. Plans, etc., upon application to Public Parks Board office. Tenders received by chairman until noon August 12th.

CONTRACTS AWARDED

Dresden, Ont.

Waterworks. Owner, Corporation of Dresden; town clerk, J. T. Bridgewater; consulting engineer, F. W. Farncomb, G.E., 64 Bank of Toronto Chambers, London. Successful contractors, Canadian Fairbanks Co., Toronto, two pumps, \$1,200; Kerr Engine Co., Walkerville, hydrants, \$1,202; Cryderman & Farrell, Thamesville, laying pipe, about \$1,254. Tenders for pipe not let yet.

Elora, Ont.

The contract for constructing the Drain No. 1, Maryborough, from lot 2, con. 14 to lot 9, con. 10, was awarded to D. B. Campbell, of Strathroy, \$8,375.

Greenwood, Ont.

Tenders have been called for the erection of two cement abutments and cement floor for Greenwood Bridge, also cement abutments and cement floor for Gibb's bridge over Beaver river.

Nanaimo, B.C.

Paving. Owner, Corporation of Nanaimo; city engineer, Allan Waters; contractor, Worswick Paving Co., May and Linden streets, Victoria. Paving Com-

mmercial street, and part of Bastion, at \$1.60 a superficial yard.

Southampton, Ont.

Filter Basin, \$2,375. Owner, Town of Southampton; town clerk, J. C. Eckford; engineers, Bowman & Connor, Toronto; contractor, Andrew Gray, Southampton. Owing to lateness of season the intake pipe and crib were not included.

Vancouver, B.C.

The contract for roadways, curbs, etc., at the new court house, has been awarded to Robert McLean & Co., 744 Hastings street west, for about \$16,500. Work will be commenced at once.

Winnipeg, Man.

City contracts have been awarded to Engineer of Construction for the following: Asphalt No. 1 pavements—Morley avenue, Yale avenue, Harvard avenue, Dromore avenue and Harrow street. Water mains—Westminster avenue, Machray avenue and Spruce street. Granolithic walks—South side of Martin avenue, north side of Castle avenue. Sewer—Rosedale avenue.

Railroads, Bridges and Wharves

Calgary, Alta.

The council have been asked to have plans prepared for a high level bridge across the Bow river at Centre street, in order that a by-law may be submitted to the people early in the year 1912.

Fort William, Ont.

Work in progress for freight shed, \$50,000. Owner, G. T. R., Fort William. 300 x 100, frame, corrugated iron, pile foundation. Company doing its own work.

Work in progress for coal dock, \$50,000. Owner, James Murphy, Fort William. 50 ft. high, concrete and frame 250 x 87. Work to be under supervision of owner by day labor. Up-to-date handling plant to be erected in connection. N. B. Nothing settled with regard to Canadian Swift Co. to date.

Halifax, N.S.

The Halifax Electric Tramway Co. will construct half a mile of car line on Pleasant street, estimated cost, \$5,000.

Montreal, Que.

Tenders called for harbor buildings. Owner, Harbor Commissioners; secretary, David Sneath. Chief engineer, F. W. Cowie. Construction of Harbor Yard Building and Locomotive House. Plans, etc., upon application to F. W. Cowie. Tenders received by secretary until noon Aug. 5th.

The Intercolonial Ry. propose carrying out extensive improvements, including the double tracking of the line from Chaudier Junction to Levis, and other principal sections, also the construction of subways in Quebec Province and East. A. W. Campbell, chairman of the Railway Commission.

Ottawa, Ont.

Tenders called for trainmen's houses. Owner, Commissioners of Transcontinental Railway, Ottawa. Secretary, P. E. Ryan. Erection of trainmen's houses at the following points: District A—Napaogan and Edmundston, prov. of New Brunswick. B—Laurier St. Foye and Fitzpatrick, prov. of Quebec. D—Cochrane, province of Ontario. F—Graham & Redditt, prov. of

Ontario and Transcona, in the province of Manitoba. Plans, etc at office of Gordon Grant, chief engineer, Ottawa, and the District offices at St. John, Quebec, Cochrane and St. Boniface, Man. Tenders received by secretary until August 21st.

Papineauville, Que.

Tenders called for wharf. (Labelle County). Owner, Department of Public Works, Ottawa. Secretary, R. C. Desrochers. Construction of wharf. Plans, etc., at Department and at office of the District Engineer, Merchants Bank Building, St. James street, Montreal, and on application to local postmaster. Tenders received by secretary until 4 p.m. Aug. 23rd.

Pincher Creek, Alta.

Contemplated bridge north of Brockelt. Owner, Dept. Public Works, Edmonton. Deputy Commissioner, John Stocks. Bridge in Summerview section over old Man. River. The west end bridge and the South Fork will not be erected this year.

Port Arthur, Ont.

Agreement signed for dock, \$230,000. Parties concerned, City of Pt. Arthur, and Can. Pacific Railway. City Clerk, J. McTeigue. Secy. C. P. R., W. H. Baker. Company will build new dock—site to be provided for Union Depot for 3 railway companies if action is taken within 3 years time.

Regina, Sask.

Contracts to be let for street railway (9 miles). Owner, City of Regina. Commissioner, McPherson. City engineer, L. A. Thornton, City Hall Survey made. Contract let for 7 miles, remainder to be received about September. About 7 miles additional lines to be constructed next year.

Stellarton, N. S.

Work in progress for addition to engine house, 288 ft. long. Owner, Dept. of Railways and Canals, Ottawa. A new h.p. boiler and other equipment to be added to the machine shop.

Toronto, Ont.

Equipment required for municipal railway system. Owner, City of Toronto; W. A. Littlejohn, city clerk; city engineer, C. H. Rust. Trolley poles, trolley wire, nuts, spikes, bolts and angle bars in connection with municipal railway system. Tenders called in about ten days.

Township of Zone, Ont.

Tenders called for two bridges. (Thamesville). Commissioners, J. Buchanan & A. Dowswell. Concrete and steel. Plans, etc., of No. 1 at residence of John Buchanan, Lot 10, Con. 1, Zone; No. 2 at residence of A. Dowswell, Lot 8, Con. 3. Tenders received until Aug. 21st.

Victoria, B.C.

The C. P. R. are contemplating the construction of a new spur line from Three Forks to Bear Lake, providing transportation for the Lucky Jim Mining Property.

Winnipeg, Man.

Surveys to be made for approaches to bridge, St. Andrews Locks, 15 miles from Winnipeg. Owner, Dominion Government. Resident engineer, W. Z. Earle, 501 Ashdown Building, Main st., Winnipeg. Negotiations as to appropri-

ation of property for approaches to steel bridge started; surveys are ordered.

CONTRACTS AWARDED

Ottawa, Ont.

Cement platform, etc. Owner, Grand Trunk Railway Company; contractor, A. S. Metcalfe Co., Montreal. Cement platform and canopy over track terminals at about \$100,000.

Port Arthur, Ont.

Storage dam, Current River Park. Owner, City of Port Arthur; city clerk, J. McTeigue; contractor, Seaman & Penniman. Completion of the service reservoir dam.

Public Buildings, Churches, Schools, etc.

Battleford, Sask.

Tenders called for hospital for insane. Owner, Dept. of Public Works, Regina. Architects, Story & Van Egmond, Regina. Erection of hospital. Plans, etc., on application to F. T. Robinson, Dept. Regina; or to Messrs. Story & Van Egmond. Tenders received until noon Aug. 5th.

Tenders called for town hall. Owner, Town of Battleford; H. C. Adams, secy.-treasurer. Town Engineer, W. Kitson, Battleford. Supply of materials and labor for erection of town hall. Plans at office of town engineer; at office of Canadian Engineer, Winnipeg; and at office of Messrs. Gorman, Clancey & Grindley, Edmonton. Tenders received until August 14th. Separate tenders will be received for the heating plant. Advertisement in "Tenders and For Sale Department" of this issue.

Brandon, Man.

Electrical supplies required for hospital for insane. Owner, Department of Public Works, Winnipeg; Minister of Public Works, R. Rogers. Wiring and electrical supplies. Plans, etc., at office of Provincial Architect, Fort Garry Court, Winnipeg, or on application to Mr. A. Pue, Clerk of Works, Brandon. Tenders received until noon, August 8, by R. Rogers.

Calgary, Alta.

The congregation of St. Mary's Church have purchased the property at the corner of 13th avenue and 6th st. west, on which property they propose to erect a fine cathedral.

Dartmouth, N. S.

Tenders called for hospital building. Owner, Public Works and Mines Dept., Halifax; Commr., E. H. Armstrong. Architect, H. Gates, 90 Hollis street, Halifax, N. S. Erection of brick building at the Nova Scotia Hospital. Plans, etc., at office of architect. Tenders received by commissioner until Aug. 7th.

Edmonton, Alta.

Plans being prepared for exhibition buildings. Owner, Exhibition Association. (A) Horse barn, (B) store building, (C) concentrated shop, (B) 3 storey addition, frame with concrete foundation, (c) 2 storey. Tenders called as soon as specifications are ready.

Guelph, Ont.

Tenders called for winter fair building. Owner, Winter Fair Board; president, J. Bright, London. Sec., A. P.

Westervelt. Architect, W. A. Mahoney, Guelph. Brick, 1-storey, 263 x 40, concrete foundation, cement work, sheet metal work, metal ceiling, hot air No. 25 Guelph Stove Co. or equal; metal ceiling, interlocking shingle, Oshawa; hardware necessary for live stock. Tenders closed August 4th.

Plans being prepared for Y. M. C. A. Building. Architects, W. A. Mahoney, Guelph, and Mills Hutton, Hamilton. Chairman Building Committee, H. G. Cockburn, Guelph; 4-storeys, 75 x 95, stone and brick, stone foundation, hot water heating, electric lighting, interior finish, quarter oak and georgia pine, cement work, cut stone, brick, terracotta, tile, fireproofing, structural and ornamental iron columns, plate, art and prismatic glass. Tenders called in about two weeks, close about Aug. 20.

Hamilton, Ont.

Specifications in progress for re-building asylum. Owner, Provincial Government. Architect, F. R. Heaks, Parliament Buildings, Toronto. 1st storey brick, hot water heating, electric lighting. Estimated expenditure, \$15,000. Part of building destroyed by fire.

Work in progress for church, \$10,000. (Ruth and Clinton). Owner, Roman Catholic Diocese, Mgr., Mahoney, Dean. Architect, M. White, 119 Wellington street N., Hamilton. 1-storey and basement, 90 x 40, brick and stone, stone foundation, hot air heating, electric lighting, shingle roofing, interior finish Georgia pine, cement work, cut stone, brick, electrical work, art glass. Bulk contract with architect.

Havelock, Ont.

Tenders called for public school. Owner, Board of Trustees, Havelock. Chairman, H. C. Kindred. Steam heating system. Plans, etc., at Mr. J. E. Belcher's, Peterboro.

Justice, Man.

Tenders called for school, \$5,000. Architect, W. W. Blair, Winnipeg. One storey, two rooms, stone foundation, brick veneer, hot air heating, roofing and sheathing paper, shingle stain. Plans with architect, also Barclay & O'Hara, Brandon. McDiarmid & Clarke, Brandon; T. J. Pentland, Justice. Tenders addressed to A. M. Robertson, Chairman School Board, Justice, until August 14th.

Medicine Hat, Alta.

Plans being prepared for church, \$75,000. (Fifth avenue). Owner, Methodist Church, H. F. Forester, secretary. Architect, W. T. Williams, Medicine Hat. 70 x 110, brick and cut stone, concrete foundation, shingle roof. Detailed plans not complete. Excavation tenders to be in by Aug. 1st. Tenders called shortly for building.

Michel, B. C.

Tenders required for heating system. Owner, Public School Board. Secretary, J. A. Murray. Installation of hot air heating system. Tenders to include necessary excavating for same. Work to be completed before Sept. 1st.

Milestone, Sask.

Plans being prepared for church, \$6,000. Owner, Roman Catholic Church. Architect, W. W. Hilton, Regina, Sask. 1-storey, 38 x 60, 20 ft. ceiling, cement block, foundation of cement block, artificial stone, shingle stain, in-

terior finish, plaster. Tenders to be called probably within a month.

Montreal, Que.

Contemplated city hall, \$10,000,000. Owner, City of Montreal. City Clerk, L. O. David. It is proposed to build in the square bounded by Mount Royal avenue, Rachel street, St. Denis and St. Lawrence boulevards.

Equipment required for fire hall. City clerk, L. O. David; owner, Board of Control, City Hall. Automobile trucks, one for engine and one for aerial ladder, one combination engine, 1,000 gals., one auto hose wagon, two steam pumps.

Tenders to be called for hippodrome, St. Catherine street east. Owner, F. Lapointe, 625 St. Catherine street east, Montreal; architect, Mr. Theo. Daoust, 90 St. James street, Montreal. Six storeys, 150 x 100, fireproof construction, concrete foundation, electric lighting, flat roof, interior finish, marble, cut stone, New York brick, tile, fireproofing, armored and reinforced concrete, artificial stone, structural iron, fire escapes, freight elevator, sheet metal work, cornice, skylights, iron columns, ornamental machinery. Building to seat 7,500. Tenders received about end of August.

Mount Hamilton, Ont.

Contemplated, church. Owner, Methodist Church of Canada; pastor, Rev. S. W. Holden. Building occupied by Daniel Cotter purchased, possession obtained by end of year.

New Westminster, B.C.

The decorating and interior work on the new Y. M. C. A. will shortly be commenced.

Peterborough, Ont.

Tenders called for school, school section No. 16, Otonabee. Owner, School Board, S. S. No. 16; secretary, C. F. Kitney, Box 838, Peterborough, Ont. Erection of school, tenders to be based on using material in old school house as far as possible. Plans, etc., with David Spears. Tenders received by David Spears, Box 725, Peterborough, until August 10th.

Port Pitt, Sask.

A new school house will be erected here. J. B. Sim, chairman.

Stettler, Alta.

Contemplated buildings. Opera house (Block 7). Plans immature as yet. Estimated cost, \$5,000. Bottling plant being installed in block 2, Main street.

Strathmore, Alta.

A market building will be erected in the near future. Geo. Wells, and D. F. Boissevan are on the committee in charge.

Toronto, Ont.

Work in progress for re-building tower, Queen's Park. Owner, Victoria University, Queen's Park; architect, Sproat & Rolph, 90 Yonge street, Toronto. 54 feet copper flashing, wood and tile.

Plans being changed for Y. M. C. A. building, College street. Owner, Y. M. C. A.; secretary, G. A. Warburton; architects, Burke, Horwood & White, 28

Toronto street, Toronto. Plans changed to admit of dormitory on Grenville street, connected with College street building.

Tenders called for new isolation hospital. Owner, City of Toronto; G. R. Geary, Mayor. Supply of hardware, light fixtures, and weather strips. Plans specifications, etc., at office of the City Architect, City Hall, Toronto. Tenders received by Chairman Board of Control until noon, August 8, 1911.

Tenders called for heating system. (Police Station No. 4, Wilton avenue). Owner, City of Toronto. Mayor, G. R. Geary. Complete supply and installation of hot water heating system. Plans, etc., at office of the Property Department, City Hall. Tenders received by Chairman Board of Control until noon Aug. 8th.

Work in progress for 5 buildings, \$9,000. (Hamilton street). Owner, John Stacy, Oshawa. Architect, G. B. Hoole 79 Adelaide street east, Toronto. 2½ storeys, 40 x 80, brick, stone foundation, hot air heating, combination lighting, open plumbing, shingle roofing, cement work, shingle roofing, cement work, brick, cornice, electrical work, plate glass. Owner will build by day labor.

Tenders to be called for lodge, \$25,000, east side Dovercourt road. Owner, I. O. O. F., Sovereign Lodge; architect, W. G. Hunt, 679 Dovercourt road, Toronto. 4 storeys, brick and stone, stone foundation, electric lighting, felt and gravel roofing, cement work, cut stone, brick, fireproofing, artificial stone, metallic lath, structural iron, sheet metal work, cornice, electric work, plate glass. Tenders to be called in about three weeks.

Tenders to be called for obstetrics building. Owner, Toronto General Hospital, Toronto. Architect, Darling & Pearson, 2 Leader Lane, Toronto. 4-storeys, brick and stone, stone foundation, forced hot water heating, electric lighting, asphalt roofing, cement work, cut stone, brick, terra cotta, concrete fireproofing, structural and ornamental iron, passenger elevator, sheet metal work, fireproof doors and windows, asbestos materials, electrical work, steel beams, plate and art glass. Tenders called shortly.

Tenders to be called for chapel, \$4,500, Shaw and Irene streets. Owner, St. John Evangelical Lutheran Church. Chairman Building Committee, W. Shewee, 58 Emerson avenue, Toronto; architect, W. E. Noffke, 26 Central Chambers, Ottawa. 48 x 30, brick and concrete and stucco, concrete foundation, cement work, artificial stone, sheet metal work, cornice, hot air heating, electric lighting, shingle roof, plate and art glass. Walls to be covered with Beaver board. Tenders to be called about August 8th.

Tenders called for club-house. (16-22 Gerrard East). Owner, Burke, Horwood & White, Toronto street, Toronto. 3-storeys and basement, brick, brick foundation, hot water heating, electric lighting, open plumbing, asphalt, felt and gravel roofing, interior finish, hardwood finish, cement work, cut stone, marble, brick, tile, fireproofing, reinforced concrete, artificial stone, metallic lath, structural and ornamental iron, sheet metal work, metal roofing,

cornice, skylights, electrical work, iron columns, plate, art and prismatic glass, iron crane. Tenders close Aug. 4th.

Uxbridge, Ont.

New tenders called for post office. Owner, Dept. of Public Works; R. C. Desrochers, secretary. Two tenders received, lowest tenders being considered excessive, new bids will be called for.

Tenders called for public building. Owner, Department of Public Works, Ottawa. Secretary, R. C. Desrochers. Erection of public building. Plans, etc. at Dept. and on application to clerk of Wks. Postal Station F., Toronto. Tenders received by secretary until Aug. 21st.

Whitby, Ont.

Tenders to be called for Collegiate Institute, \$25,000. Owner, Whitby Board of Education; architect, Munro & Mead, Chancey Chambers, Hamilton. Two and one-half storeys, 110 x 40, brick, stone foundation, cut stone, reinforced concrete, artificial stone, structural iron, iron columns, steel beams, metallic lath, fire escapes, electric bells, cornice, hot water heating, slate roof, interior finish ash. Tenders received in about two weeks by Board of Education.

CONTRACTS AWARDED

Brockville, Ont.

The contracts for a \$14,000 Maternity Ward to the General Hospital has been awarded as follows: Masonry and cement, W. Patterson; carpentry, H. Dunham; plastering, McKee Bros; heating and plumbing, Brown & Semple; sheet metal and iron work, B. Dillon; stone work, W. Patterson, all of Brockville.

North Vancouver, B.C.

The contract for the erection of the Ridgeway school has been awarded to Smith Bros., North Vancouver, for \$47,326.

Ottawa, Ont.

Tenders have been opened for the new heating plant of the Carnegie Library, and contract awarded to Chandler & Co., cost \$1,660.

Regina, Sask.

The contract for the Regina College buildings has been awarded to R. J. Leckie, Regina.

Toronto, Ont.

The following tenders for additions to schools have been accepted: Harbord Collegiate Institute, mason work, \$915, S. Pollock; Hillcrest school, mason work, \$715, Hamm & Reid; carpenter work, \$242, Frank Armstrong; plumbing, \$935, Keith & Fitzsimmons, Lansdowne school — carpenter work, \$310, Oliver C. Pook; plumbing, \$450, Keith & Fitzsimmons. Earl Grey school—Plumbing, \$56, Lewis Le Graw; Norway school—Carpenter work, \$185, Wm. Williamson. Perth avenue school —Carpenter work, \$781, Frank Armstrong. Roden school — Carpenter work, \$421, Wm. Williamson. Palmerston avenue school—Concrete work, \$353, Orr Bros. Stratheona school—Mason work, \$325, Orr Bros. George street school—Painting, \$445, James

Taylor. Brown school—Sodding, \$350, Orr Bros.

Vancouver, B.C.

Church, \$72,000, Thurlow and Pendrill streets. Owner, First Congregational Church, Pastor, Rev. J. K. Unsworth; architect, Sharpe & Thompson, 536 Hastings west, Vancouver; superintendent of construction, William Neve, 1090 Thurlow street, Vancouver; contractor, Adams Construction Co., 44 Seymour st., \$23,000. Brick work and foundation will be done by this company. Besides the face brick, over 200,000 common brick will be needed.

Residences

Saskatoon, Sask.

Work in progress for apartment house, \$12,000, Fourth avenue and 22nd street. Owner, P. M. Ayers, Saskatoon. Architect, G. H. Gugenhausen. Forty or fifty rooms, brick. Permit has been granted.

Toronto, Ont.

E. Prine, 15 Garnet avenue, pair dwellings, west side Gladstone avenue, 2-storey, 40 x 24, brick, brick foundation shingle roofing, \$4,000.

James H. Dodd & Sons, 962 Gerrard street east, pair dwellings, \$4,400, 6-8 Marjory avenue, 2 storeys, 28 x 32, brick front and roughcast, concrete foundation, shingle roofing.

A. D. Petrie, 356 Dupont street, pair dwellings, \$5,000, 2 storeys, 32 ft. 8 in. x 44 ft., brick and stone, stone foundation, shingle, felt and gravel roofing.

Thos. Royle, 75 Symington avenue, pair dwellings, \$3,200, 2 storeys, 30 x 36, brick and stone, stone foundation, felt and gravel roofing.

Work in progress for four dwellings, \$2,500, west side Seymour avenue. Owner, W. Gladman, 659 Pape avenue, Toronto. Two storeys, 55 x 22, brick front and roughcast, brick foundation, stove heating, shingle roofing. Work will be done by day labor.

Work in progress for apartments, \$13,000. (St. Charles and St. Nicholas). Owner, Thos. McLaughlin, Toronto. Architects, Davis & Moore, 176 St. Clarendon avenue. 2 storey, 104 x 30, brick, stone foundation, cement work, plate glass, tile, mantels. Work will be done by day labor.

Tenders called for residence, \$2,500. (E. S. Logan avenue). Owner, A. & A. Grant, 318 Dupont street, Toronto. 2½ storeys, 22 ft. 6 in. x 34, brick, stone foundation, electric lighting, shingle roofing, cement work, cut stone, brick, tile, mantels, electrical work, shingle stain, plate glass. Tenders will be open for a week on all trades but carpentry.

Work in progress for 3 dwellings, \$6,000. (Sunnyside and Constance). Owner, A. T. Stewart, High Park Gardens and Indian Road, Toronto. 2½ storeys, 47 x 44, brick, stone foundation, hot water heating, open plumbing, slate and felt roofing, cement work, brick, tile, mantels, cornice, electric work, electric bells. Work will be done by day labor.

Tenders called for pair of dwellings, \$4,000, west side Ridley Gardens. Owner, R. J. Roger, 31 Beverley street, Toronto. Two and one-half storeys, 44 ft. x 49 ft. 6 in., brick and stone, stone foundation, hot air heating, combination lighting, open plumbing, shingle roof-

ing, hardwood floors. Tenders will be received for heating, lighting and plumbing.

Tenders called for pair dwellings, \$4,000. (Perth avenue). Owner, James Sargeant, 480 Ontario street, Toronto. Architect, J. M. Cowan, 65 Adelaide street east, Toronto. 2-storeys, 40 x 32 ft. 6 in., brick, stone foundation, hot air heating, electric lighting, open plumbing, shingle, felt and gravel roofing, cement work, plate glass. Tenders will be open for a week.

Work in progress for residence, \$6,100. (Crescent road). Owner, A. Foulds, Toronto. Architect, Eden Smith & Son, 199 Yonge street, Toronto. General contractors, Woodley Bros., 183 Avenue road, Toronto. 2½ storeys, 41 x 50, brick, brick foundation, hot water heating, electric lighting, interior finish hardwood floors, cement work, brick, tile. sheet metal work, plate glass, etc.

Tenders called for apartment house, \$40,000, Dundas street near Queen. Owner, S. Hager, Dundas street; architect, W. G. Hunt, 679 Dovercourt road. Four storeys, 117 x 88, stone foundation, brick and stone, cement work, cut stone, sheet metal work, felt and gravel roof, artificial stone, steel beams, structural iron, steam heating, telephone system, electric lighting. Tenders closed in two weeks.

Work in progress for dwelling, \$4,500, 66 Ben Lomond avenue. Owner, Mrs. A. L. Davis, 66 Ben Lomond avenue, Toronto; architect, Sproat & Rolph, 90 Yonge street, Toronto; general contractor, Alex. MacLeod, 57 Ben Lomond avenue. Two storeys, 32 x 40, concrete foundation, frame and stucco, hot water heating, combination lighting, shingle roofing, cement work, tile, mantels, electrical work.

Work in progress for apartment house, \$6,000. (Harbord street). Owner, Thompson & Mitchell, 446 Markham street, Toronto. Architect, J. M. Cowan, 66 Adelaide street east, Toronto. 2-storey, 40 x 77, brick, stone foundation, hot water heating, electric lighting, open plumbing, felt and gravel roofing, cement work, cut stone, brick, tile, mantels, metallic lath, electrical work, electric bells, plate glass. Work will be done by day labor.

Work in progress for pair of dwellings, \$4,200, Conduit and Utley streets. Owner, Fisher Bros., 20 Rowland avenue, Toronto; architect, A. S. Fisher, 158 Cowan avenue, Toronto. Two stys. 41 ft. 9 in. x 23 ft., brick, brick foundation, hot air heating, electric lighting, open plumbing, shingle roofing, oak floors, cement work, brick, tile mantels, cornice, electrical work, electric bells, shingle stain, plate glass. Work will be done by day labor.

Tenders called for seven dwellings, \$21,000, Beverley and Baldwin streets. Owner, D. Lavine, 182 Beverley street, Toronto; architect, S. A. Waggett, 61 Bleeker street, Toronto. Two and one-half storeys, 37 ft. x 52 ft. 6 in., brick, stone foundation, hot water heating, electric lighting, open plumbing, cement work, cut stone, brick, tile, mantels, electrical work, electric bells. Owner will receive tenders for a week for all trades but masonry and carpentry.

Work in progress for residence,

Castle Frank Road. Owner, D. A. Burns, 1 Hawthorne, Toronto; architect, J. A. MacKenzie, 208 Lumsden Building, Toronto. Two and one-half storeys, 44 ft. 9 in. x 36 ft., brick, brick foundation, hot water heating, slate roofing, interior finish hardwood, cement work, cut stone, brick, tile, mantels, artificial stone, metallic lath, structural iron, electric work, steel beams, plate glass. Specifications call for papering and decorating, bathroom fittings, electrical fixtures.

Work in progress on alterations to residence, \$12,000. (73 St. George street. Owner, W. H. Brouse, 19 Colborne street, Toronto. Architect, F. S. Baker, Traders Bank Building, Toronto. Carpenter contractor, T. W. Hall, 64 Glencairn avenue, Eglinton. 2½ storeys, stone, brick, steel and wood, concrete foundation, hot water heating, electric lighting, slate, felt and gravel roofing, interior finish hardwood floors, cement work, cut stone, brick, tile, mantels, structural iron, sheet metal work, cornice, electrical work, plate and art glass, etc.

Vancouver, B.C.

Campbell & Dawson are the architects for two bungalows, \$3,000 each.

Apartment house, \$34,000. (Salisbury Dr. and Parker street). Owner, Caledonian Investment Co., 417 Cordova, Vancouver. General contractor, Robt. McLean & Co., Pacific Building, Vancouver. 3-storeys, 122 x 61, brick.

Winnipeg, Man.

Tenders are wanted by the owner, 1632 Ross avenue, for the erection of four cottages.

The central Garage Co. will erect a larger and better building on Water st. in place of the one destroyed by fire on May 21. The building will be fireproof throughout.

Plans being prepared for residence, \$7,000, Walnut street. Owner, Edgar Prain; architect, Edgar Prain, 313 Fort street, Winnipeg. Two storeys, solid brick, stone foundation, shingle roof, hot water heating, electric lighting, oak interior finish.

Work in progress for residence, \$12,000, Greenwood Place. Owner, J. Farquhar, Winnipeg; architect, Edgar Prain, 313 Fort street, Winnipeg. Two and one-half storeys, stone foundation, frame construction, hot water heating, electric lighting, shingle roofing.

Work in progress for residence, \$6,000. (Grosvenor avenue). Owner, Samuel Tait, Winnipeg, Man. Architect, H. B. Rugh, Union Bank Building, Winnipeg. 2 storeys, stone foundation, steam heating, electric lighting, shingle roofing. Owner is building, material supplied as needed.

CONTRACTS AWARDED

Brantford, Ont.

Heating and plumbing contract not yet let for residence, \$3,000. (Dufferin avenue). Owner, J. C. Walker, 129 Chatham street, Brantford. General contractor, J. C. Walker. Masonry, cement and plastering, Alex. Reynolds, 40 McMurray street, Brantford. 1½ storeys, 30 x 30, brick, concrete foundation. General contract awarded July 29th. Building to be completed December 1st.

Apartment house, \$5,500. Owner, W.

K. Halloran, Brantford, Ont.; architect, Taylor & Taylor, Brantford; general contractor, Ingleby & Fitness, Brantford. Two storeys and basement, brick, stone facings, concrete foundation, steam heating, electric lighting, slate roofing, mantels, artificial stone, electrical work, telephone system, interior finish hardwood and pine. Heating and plumbing contract not yet.

Fort William, Ont.

Residence, \$5,000. Owner, Jas. A. Davidson, Fort William; architect, R. E. Mason, Fort William; general contractor, R. MacLeod, Fort William. Three storeys, 30 x 36, brick veneer, concrete foundation.

Port Arthur, Ont.

The contract for a 2½-storey brick veneer and concrete residence for W. F. Fortune, has been awarded to Geo. Otto, Port Arthur. H. Halton, architect.

Toronto, Ont.

Williams & Noxen, 31 Globe avenue, pair dwellings, north side Dixon avenue, \$4,200, 2 storeys, 33 x 28, brick, brick, foundation, electric lighting, felt and gravel roofing, H. Elliott, 40 Globe avenue, architect.

Victoria, B.C.

The contract for the metal work in connection with the new suspension bridge to be erected by the Provincial Government over Churn Creek has been awarded to Messrs. A. G. Langley & Co., of Vancouver.

Business Buildings and Industrial Plants

Alliston, Ont.

Equipment required for factory. Dynamo to generate 100 h.p.; a second-hand one, if in good condition, would do; water power at Nicolston. Specifications with Mr. Wm. McBride, president Board of Trade. Equipment installed as soon as factory is erected.

Calgary, Alta.

David McDougall, Ninth avenue, will build a six-storey block, costing \$90,000.

Plans are completed for the new immigration hall, and construction will commence at once.

It is planned by a syndicate from Pittsburg to build a \$40,000 hotel at the cor. of Third street west and Fifteenth avenue.

Plans prepared for business block, (Eight avenue). Owner, B. Stringer, Real Estate Brokers. 130 x 50, 10 storeys, fireproof. Building to be fitted up for a bank on ground floor. Excavation will be done this fall. Superstructure commenced this spring.

It is announced by Industrial Commissioner Miller, of Calgary, that Morris & Co., of Chicago, Ill., will establish a packing plant here, to be a duplicate of their Oklahoma City plant, costing \$3,000,000, the building will cover twenty acres of ground.

Tenders called for equipment for department store. Owner, Hudson's Bay Company. Architects, Burke, Horwood & White, 28 Toronto street, Toronto. Boilers, engines, dynamos, switchboard, storage battery, electric wiring, vacuum cleaning, pneumatic tubes, sprinklers, steam fitting, plumb-

ing, refrigeration, steel smokestack. Tenders received by architects until noon, Aug. 12th.

Tenders called for customs fittings. Owner, Department of Public Works, Ottawa; secretary, R. C. Desrochers. Alterations and addition to Customs fittings. Plans, etc., on application to J. J. O'Gara, Res. Arch., Calgary, and at above department. Tenders received until 4 p.m., August 9th, by secretary.

Coalmont, B. C.

Tenders closed for hotel, \$20,000. Owner, G. Marcotte, Coalmont. Architect, D. R. Boucher. 3-storeys 55 x 76, frame, concrete foundation, steam or hot water heating, gasoline lighting, iron roofing, interior finish fir, cement work, brick, metal roofing, sheathing, plate glass. Tenders closed on July 29, 1911.

Daysland, Alta.

Contemplated installation of machinery. Owner, The Burrard Grain Co., Ltd., Daysland. Company are planning to install flour mill machinery in connection with their elevator.

Edmonton, Alta.

Specifications in progress for Abba-voir. Owner, P. Burns & Co., Calgary. Brick, cement work, terra cotta, electric work, pipe covering, fireproof doors, steel beams, machinery. Nothing definite as to when work will go ahead; foundation likely to be put in this fall.

Hamilton, Ont.

Machinery required for factory. (Sherman avenue north). Owner, Standard Underground Cable Co. Architects, Prack & Perrine, Hamilton. General contractor, H. G. Christmas, Sherman avenue, North. 1-storey 58 x 25, steel, brick, stone foundation, cement work, structural iron, steam beams, reinforced concrete roof, fireproof doors, cornice, skylights. Building to be used for carpenter's shop. Wood-working machinery required.

Kentville, N. S.

Work in progress for carriage and auto building. Owner, Nova Scotia Carriage and Motor Co. 3-storey 100 x 100, frame construction. Extension to present factory to be started at once.

Lethbridge, Alta.

The Canadian Rand Drill Co., Ltd., are contemplating the building of a warehouse. S. A. Williams, manager. The P. Burns Co. will erect a business block on the 25-foot lot between the Acadia block and the store recently occupied by Bawden Bros.

Work in progress for store. (Broad avenue south). Owner, P. Burns & Co., Calgary. Architect, E. E. Carver, Lethbridge; 1 basement, 25 x 100, brick, concrete foundation, steam heating, electric lighting, tile, refrigerator, plate glass. Temporary structure, refrigeratory machinery may be removed from present quarters.

London, Ont.

The contract for the new Masonic Temple has been awarded to W. S. Davidson, \$46,000. The contract includes all excavating, brick work, stone work and interior construction.

Lulu Island, B. C.

Work in progress for mill, \$400,000. Owner, British Canadian Lumber Co., 1605 Georgia street, Vancouver. Archi-

tect, A. B. Pracna, 821 Pender street, W., Vancouver. Frame construction. Company will build themselves but will take tenders on separate contract and machinery. Estimated output, 250,000 ft.

Lytton, B.C.

Plans prepared for hotel, Block 8. Architect, Wright & McIntyre, 1410 Dominion Trust Building, Vancouver. Three storeys, 100 x 50, frame. Work done by day labor; work to commence immediately.

Niagara Falls, Ont.

Equipment required for factory. Owners, McGlashan Clark Co., Niagara Falls, Ont. Required: punch press, rolls etc., suitable machinery for spoons and cutlery. The addition to factory will be ready for installation of machinery in about 10 days.

North Vancouver, B. C.

Tenders called for livery, \$3,000. (4th street). Owner, Mr. Dumas, N. Vancouver. Architect, A. J. Henderson, N. Vancouver. 46 x 80, frame construction.

Ottawa, Ont.

The Ottawa Rowing Club and the Ottawa Canoe Club plan the erection of a joint club house half a mile below the present site of the canoe club.

Purchase of property for factory. (Aylmer road). Owner, Beaver Board Co., Head street, Buffalo. President, William McGlashen. A model village in connection with the factory is contemplated.

Parry Sound, Ont.

New industry, factory. Owner, Brown Smith Turning Co., Broadbent, Ont. The company has rented the premises formerly used as a planing mill on River street. Machinery being installed.

Port Arthur, Ont.

On July 8 the ratepayers passed a by-law granting assistance to J. B. McArthur for the purpose of establishing a match factory.

Preston, Ont.

Plans to be prepared for business block, \$25,000. (King street). Owners, Messrs. Geo. Bernhardt & Co., Preston. Architect, H. Gale Legg, Preston. 3-storey 66 x 80, red pressed brick, and red stone. Building to be used for stores.

Regina, Sask.

Plans being prepared for automobile garage, \$50,000. (Broad street). Owner, The Garage Ltd., capital \$100,000. Architect, W. W. Hilton. 2-storey and basement, 100 x 125 solid brick and steel, fireproofing, structural iron, cement foundation. (footings deep enough to allow 3 additional storeys later) cement floor; metal ceilings, 2 elevators.

Saskatoon, Sask.

Equipment required for departmental store, \$250,000. Owner, J. F. Cairns, Saskatoon. Architects, Brown & Vallance, Winnipeg; C. E. Sheppard, manager. 4-storey, fireproof, reinforced construction, terra-cotta front. Plans with architect. Interior fittings to the amount of \$50,000 have yet to be purchased. Contracts awarded for construction.

Sault Ste. Marie, Ont.

Plans are prepared and tenders called

for the new Algoma Central depot, which will cost upwards of one hundred thousand dollars.

Shawingan Lake, Vancouver Island, B. C.

Contemplated hotel, \$30,000. Owner, British Columbia & Vancouver Island Hotel Co., Victoria. Architect, Not chosen.

Strathcona, Alta.

Plans prepared for factory. Parties interested, J. S. Dennis, Canada Irrigation Co.; L. P. Strong, Alberta Pacific Grain Co., and J. M. Davidson, Crown Lumber Co., all of Calgary. According to present plans building will be completed this fall.

St. John, N.B.

There has been a conference of civic and provincial representatives to consider the advisability of making a bid for the shipbuilding plant that is to construct the Canadian naval vessels, and in view of the fact that Halifax and the Nova Scotia government are willing to contribute \$400,000, and Sydney has \$300,000 available, it is considered certain that \$500,000 will be offered by St. John and the provincial government.

Toronto, Ont.

Excavation tenders called for factory, Liberty street, Fraser avenue, etc. Owner, Gillett Company, King street, Toronto; architect, A. R. Denison & Stephenson, 20 King street west, Toronto. Excavation of foundations and basement. Plans, etc., at offices of architects. Tenders received until noon, August 8th.

Work in progress for reconstruction of warehouse, \$8,000, Scott and Esplanade streets. Owner, H. P. Eckhardt & Co., Front and Scott streets, Toronto; architect, J. Francis Brown, Board of Trade Building, Toronto. Brick, felt and gravel roofing, cement work, brick, fireproofing, sheet metal work, metal siding, cornice, fireproof doors and windows, plate glass.

Work in progress for stores and dwellings, \$10,000. (E. S. Bathurst and Dupont). Owner, Freehold Realty Co., 521 Front street East, Toronto. General contractor, Wm. Clark & Son, 224 Augusta avenue, Toronto. 2 storeys, 96 x 20, brick, brick foundation, hot water heating, electric lighting, open plumbing, felt and gravel roofing, interior finish maple floors, cement work, marble, tile, electrical work, cornice, plate glass, refrigerator, store fittings.

Work in progress for addition to building. (108 Adelaide street East). Owner, E. S. Boone, 108-110 Adelaide street East, Toronto. Architect, Chadwick & Beckett, Toronto street, Toronto. 1-storey 64 x 52, brick, hot water heating, electric lighting, felt and gravel roofing, cement work, brick, artificial stone, structural iron, freight elevator, fireproof doors, steel beams, prismatic glass, concrete flooring.

Work in progress for warehouse. Owner, G. J. Foy, Ltd., 3 Front street E., Toronto. Owner has purchased Nos. 32 and 34 Front street west and intends erecting a modern warehouse thereon.

Work in progress for warehouse, \$35,000, Osler and Pelham avenues. Owner, Dodge Manufacturing Company, 138 Bay street, Toronto; architects, Stand-

(Continued on page 68)

Tenders and For Sale Department

CITY OF GUELPH

Tenders

EXTENSION OF TIME

Tenders will be received by T. J. Moore, city Clerk, Guelph, Ontario, for the construction of a reinforced concrete arch bridge and viaduct over the Canadian Pacific Railway and the River Speed, Guelph, up till twelve o'clock, noon, Wednesday, August 16th, 1911.

Approximate amount of concrete 572 yards.
A marked cheque for \$400 is to accompany the tender.

Forms of tender may be obtained from, and plans and specifications seen at the office of the City Engineer, Guelph, or at the offices of the Contract Record and Canadian Engineer, Toronto, Ont.

Plans and specifications may also be obtained for the sum of \$5.00 per set, which will be returned upon return of plans.

Lowest or any tender not necessarily accepted.

L. MALCOLM,
Acting City Engineer.

Guelph, August 5th, 1911. 30-31-32

TOWN OF WILKIE

Sealed tenders will be received by T. A. Dinsley, Secretary-Treasurer of the Town of Wilkie, until noon, Monday, August 21, 1911, for supply and delivery of the following machinery, materials, and performance of certain works:

Tender A.—Electrical Machinery—

- (1) One 60 kw. 3-phase, 60 cycle, 2,200 volt a.c. Generator.
- (2) One Exciter for above.
- (3) One marble switchboard, instruments and switches.
- (4) Three 2,200 voltmeters, back-g geared to pumps.
- (5) Five transformers for lighting system.
- (6) Series Tungsten street lighting system.
- (7) Approximately 25 cwt. of weather-proof copper wire (line material, guy wire, arms, pins, insulators, etc.)
- (8) Cedar poles.

Tender B.—One 100 1 H.P. Internal Combustion Engine—

Tender C.—Pumping Machinery—

- (1) One working head and deep well cylinder.
- (2) One-half million gallon pump.
- (3) One air compressor.
- (4) Necessary shaftings and belting.

Tender D.—

One Pneumatic Storage Tank.

Tender E.—

Approximately 1,100 ft. 8-inch. c.i. water pipe.
Approximately 4,800 ft. 6-inch c.i. water pipe.
Approximately 2,000 ft. 4-inch c.i. water pipe.
Approximately 15 hydrants and 22 valves.

Tender F.—

Trenching, laying cast iron water pipes, hydrants, valves, etc., and back filling.

Tender G.—

Erection of power house and construction of reservoir.

Plans and specifications may be seen at the office of the secretary-treasurer of the Town of Wilkie, or on application to the Engineers, McArthur & Murphy, Room 8, Bottomly Block, Saskatoon, Sask.

A marked cheque for five per cent. of amount of the tender must accompany each bid.
The lowest or any tender not necessarily accepted.

McARTHUR & MURPHY, Engineers
Bottomly Block, Saskatoon, Sask.

T. A. DINSLEY, Secretary-Treasurer,
Wilkie, Sask. 30-31

Trench Machines

Parsons—Cuts trench 27 in. to 60 in., to 20 ft. deep, fine order.

Parsons—With Mattes Back Filler, cuts trench 28 in. to 78 in. to 20 ft. deep. Overhauled and first class. Write us if you have anything to sell, or if in want of anything.

THE MALES CO.

No. 82 Perin Building, Cincinnati, O.

Tenders

Tenders will be received by the undersigned until August 19th, 1911, for supplying and installing a six-million gallon Centrifugal Pump and Steam Engine. Specifications may be obtained from the City Engineer. Tenders must be plainly marked on the outside.

M. H. BAKER,

City Engineer.

St. Thomas, July 29, 1911.

31-33

FOR SALE

Complete Electric Generating Set, consisting of Leonard Peerless steam engine direct connected to 150 k.w. Canadian General Electric generator, 2,300 volts, 60 cycles; also condenser, switchboard, steam and exhaust piping, spare parts for engine and generator, and everything constituting the complete set as at present installed in the Thomas street lighting station of the Town of Brockville. This machine is in first-class order, having only been used on peak loads. It is now being replaced by a larger Belliss & Morcom engine with Swedish G. E. generator. Full particulars and price can be obtained from Laurie & Lamb, Consulting Engineers, Board of Trade Building, Montreal.

23-31



To Contractors

Separate tenders endorsed "Tender for New Government House," addressed to the undersigned, will be received at this Department until noon of Tuesday, August 22nd, for the stone and brick work, fireproofing, steel work, roofing and carpenter work, for the new Government House in Chorley Park, Rosedale, Toronto. Plans and specifications may be seen at this department.

An accepted bank cheque payable to the order of the Hon. J. O. Reaume, Minister of Public Works, for five per cent. of the amount of the tender, and the bona fide signatures and addresses of two sureties, must accompany each tender. Cheque will be forfeited to the Crown in the event of the successful tenderer refusing to carry out the work within ten days after acceptance. The department will not be bound to accept the lowest or any tender.

By order,

H. F. McNAUGHTEN,

Secretary Public Works Department.

Department of Public Works, Ontario, Toronto, July 21st, 1911.

Newspapers publishing this advertisement without authority will not be paid for it.

30-31-32-33

CITY OF MOOSE JAW Saskatchewan

Sewer and Water Extensions

Sealed tenders will be received by the City of Moose Jaw, addressed to the undersigned City Clerk, until 8.30 p.m., on Monday, August 14th, 1911, for the laying of approximately 16,885 lin. feet of sewer and water extensions, as well as for the supply of all cast iron and vitrified tile pipe and specials, etc.

Any tender received after the above stated time will be declared informal.

Plans and specifications for the construction work may be seen at the office of the City Engineer, and specifications for the supply of materials may be obtained from the City Engineer's office upon application.

The lowest or any tender not necessarily accepted.

J. M. WILSON,

City Engineer.

Moose Jaw, Sask., July 21, 1911.

W. F. HEAL,

City Clerk.

31-32



Department of Railways and Canals

Intercolonial Railway

Passenger Station, Truro, Nova Scotia

Sealed tenders addressed to the undersigned and endorsed "Tender for Truro Station," will be received at this office until 12 o'clock noon, on Friday, the 25th of August, 1911, for the construction of a stone Passenger station at Truro, Nova Scotia.

Plans, specifications and form of contract to be entered into may be seen and full information obtained on and after 10th of August, 1911, at the office of the Chief Engineer of the Department of Railways and Canals, Ottawa, and at the office of the Chief Engineer of the Intercolonial Railway at Moncton, N.B., or at the office of the Board of Trade, Halifax.

Parties tendering will be required to accept the fair wages schedule prepared or to be prepared by the Department of Labor, which schedule will form part of the contract.

Contractors are requested to bear in mind that tenders will not be considered, unless made strictly in accordance with the printed forms, and in the case of firms, unless there are attached the actual signature, the nature of the occupation, and place of residence of each member of the firm.

An accepted bank cheque for the sum of \$10,000 made payable to the order of the Minister of Railways and Canals must accompany each tender, which sum tender, which sum will be forfeited if the party tendering declines entering into the offer submitted.

The cheque thus sent in will be returned to the respective contractors whose tenders are not accepted.

The cheque of the successful tenderer will be held as security, or part security, for the due fulfilment of the contract to be entered into.

The lowest or any tender not necessarily accepted.

By order,

L. K. JONES,

Secretary.

Department of Railways and Canals,

Ottawa, August 4th, 1911.

Newspapers inserting this advertisement without authority from the Department will not be paid for it.

32-33

Crushers for Sale

No. 8 Austin Gyratory, complete with 75 ft. elevator and revolving screen.

No. 7½ Gates Gyratory Crusher, style "D."

No. 6 Gates Gyratory Crusher, style "D."

Also smaller sizes at attractive prices, all absolutely in OK condition and guaranteed by us.

WILLIS SHAW MACHINERY CO.,

330 South LaSalle Street,

Chicago, Ill.

Town of Battleford, Sask

Tenders

FOR THE ERECTION OF

A New Town Hall

Sealed tenders, addressed to the Secretary-Treasurer, will be received by the Town Council of Battleford until 12 o'clock noon, August 14th, for supplying all materials and erecting a Town Hall.

Plans may be seen and specifications and form of tender obtained at the office of the Town Engineer, Battleford. Plans may also be seen at the office of the Canadian Engineer, Winnipeg, and at the office of Messrs. Gorman, Clancey & Grindley, Edmonton.

Separate tenders will be received for the heating plant.

Tenders must be accompanied by an accepted cheque for five per cent. (5 p.c.) of the amount of the tender.

WILLIAM KITSON,

Town Engineer.

H. C. ADAMS,

Secretary-Treasurer.

31-31



Department of Railways & Canals, Canada

WELLAND CANAL

NOTICE TO CONTRACTORS

Sealed tenders addressed to the undersigned and endorsed "Tenders for Turning Basin, Thorold, will be received at this office until 16 o'clock on Monday, the 21st day of August, 1911.

Plans, specifications and form of contract to be entered into, can be seen on and after this date at the office of the Chief Engineer of the Department of Railways and Canals, Ottawa, and at the office of the Superintending Engineer, St. Catharines, Ont., at which places forms of tender may be obtained.

Parties tendering will be required to accept the fair wages schedule prepared or to be prepared by the Department of Labor, which schedule will form part of the contract.

Contractors are requested to bear in mind that tenders will not be considered, unless made strictly in accordance with the printed forms, and in the case of firms, unless there are attached the actual signature, the nature of the occupation, and place of residence of each member of the firm.

An accepted bank cheque for the sum of \$1,500 made payable to the order of the Minister of Railways and Canals must accompany each tender, which sum tender, which sum will be forfeited if the party tendering declines entering into the other submitted.

The cheque thus sent in will be returned to the respective contractors whose tenders are not accepted.

The cheque of the successful tenderer will be held as security, or part security, for the due fulfilment of the contract to be entered into.

The lowest of any tender not necessarily accepted.

By order,

L. K. JONES,

Secretary.

Department of Railways and Canals,
Ottawa, 5th August, 1911.

Newspapers inserting this advertisement without authority from the Department will not be paid for it.

32-33

For Sale

One second hand No. 1 Smith concrete mixer, with engine and boiler complete. Apply to A. J. Croan, Brantford, Ont.

32-33

Tenders

Tenders will be received by the undersigned until noon, Monday, August 14th, for the completion of the clear water reservoir at St. Thomas waterworks. Plans and specifications may be seen and form of tender obtained at the office of the City Engineer.

GEO. K. CROCKER,

Chairman of Board of Water Commissioners.

32-33

Corporation of the City of Three Rivers

Public Notice

Sealed tenders addressed to the undersigned and marked "Tender for Steel Bridge," will be received at the City Hall, Three Rivers, up to the 25th instant at 4 o'clock p.m., for the erection of a steel bridge with two concrete abutments on the River St. Maurice, the span to be of 200 feet in length.

Plans and specifications may be seen at the office of Mr. Benj. Bourgeois, city engineer, No. 174 Notre Dame street.

An accepted cheque for 10 per cent. of the amount of tender must accompany each tender.

The lowest of any tender not necessarily accepted.

L. T. DESAULNIERS,

Sec.-Treasurer.

City Hall, Three Rivers,
August 4th, 1911.

32-34



Department of Railways and Canals, Canada

QUEBEC BRIDGE

NOTICE TO CONTRACTORS

Sealed tenders addressed to the undersigned and endorsed "Tender for Removal of old Bridge Material," will be received at this office until 16 o'clock, on Monday, the 21st August, 1911, for the removal of unused material delivered on the ground intended for use in connection with the construction of the old Quebec Bridge.

Specifications, forms of tender and full information can be obtained on and after this date, at the office of the secretary of the Department of Railways and Canals, Ottawa, at the office of the Chairman and Chief Engineer of the Board of Engineers of the Quebec Bridge, Canadian Express Building, Montreal, and at their office, Board of Trade Building, Quebec.

An accepted bank cheque for the sum of \$13,000, made payable to the order of the Minister of Railways and Canals must accompany each tender, which sum will be forfeited if the party tendering declines entering into contract for the work, at the rates stated in the other submitted.

The cheque thus sent in will be returned to the respective contractors whose tenders are not accepted.

The cheque of the successful tenderer will be held as security, or part security, for the due fulfilment of the contract to be entered into.

The lowest of any tender not necessarily accepted.

By order,

L. K. JONES,

Secretary.

Department of Railways and Canals,
Ottawa, 5th August, 1911

Newspapers inserting this advertisement without authority from the Department will not be paid for it.

32-33

TOWN OF BERLIN

Sealed tenders addressed to A. H. Miller, town clerk, will be received up to 6 p.m., August 17th, for the construction of a water and sewerage bridge on Albert street, Berlin. Plans and specifications may be seen at the office of Herbert Johnston, Town Engineer.

The lowest of any tender not necessarily accepted.

H. A. DIETRICH,

Chairman, Board of Works.

Berlin, August 5th, 1911

32-33

To Contractors

Sealed bids will be received by the undersigned up to noon of Monday, August 21st, for all trades required in the erection of a nine-storey, stone, brick, and steel workshop building in Richmond street west, Toronto.

The lowest of any tender not necessarily accepted.

F. S. BAKER, Architect,

Traders Bank Building,

Toronto

32-33

CITY OF SASKATOON

Storm Sewers and Paving

TENDERS WANTED

Sealed tenders, addressed to the City Commissioners, Saskatoon, and marked as to contents, will be received up to 12 o'clock noon on Friday, August 18th, 1911, for the following work and materials, viz.:

Contract No. 97. All labor necessary for laying pipes, and furnishing certain materials, according to the following quantities:—

1,980 lin. ft. 15 in. vitrified tile pipe.

2,150 lin. ft. 12 in. vitrified tile pipe.

1,790 lin. ft. 10 in. vitrified tile pipe.

6,840 lin. ft. 8 in. vitrified tile pipe.

2,845 lin. ft. 8 in. vitrified tile pipe.

(catch basin branches)

2,265 lin. ft. 42 in. reinforced concrete pipe

Contract No. 98. Furnishing 2,265 lineal feet reinforced concrete sewer pipe; and 6 reinforced concrete manholes, 42-in. in diameter.

Contract No. 99. Furnishing 40 manhole frames and covers, and 92 catch basin gullies.

Contract No. 100. Laying approximately 21,000 square yards of pavement, and grading incident thereto.

Plans, specifications, instructions to bidders, general conditions, and forms of tender may be seen at the offices of George F. Clark, City Engineer, Saskatoon. Copies of instructions to bidders, and forms of tender will be furnished on application to the City Engineer, but copies of plans and specifications will not be furnished.

The lowest of any tender not necessarily accepted.

JAS. CLINSKILL,

W. B. NEIL,

City Commissioners.

E. M. SNELL,

Saskatoon, Sask., August 2nd, 1911.

32-33

Mixer Wanted

Wanted a Second Hand Ransom Concrete Mixer, with or without power. Ed. Conroy, 435 Mark street, Peterborough, Ont.

32-33

Positions Vacant

Advertisements under this heading two cents a word per insertion. Minimum charge 50 cents

WANTED. Structural steel draughtsman, accustomed to drafting simple trusses and general work. Apply Reid and Brown, 633 Esplanade East, Toronto.

Business Buildings and Industrial Plants

(Continued from page 61)

ard Structural Co., 111 Manning Chambers. Three storeys, 175 x 47, semi-fireproof, concrete foundation, cement work, brick, structural iron, fireproof doors or windows, steel beams, asphalt roof, hot water or steam heating, electrical work.

Work in progress for pair of stores and dwellings, \$7,000, north side Bloor street west. Owner, Hambly & Chaplan, Toronto; architect, W. G. Hunt, 679 Dovercourt road, Toronto; general contractor, E. White, 35 D'Arcy street, Toronto. Two storeys, 84 ft. x 34 ft. 6 in., stone foundation, brick, electric lighting, hot water heating, felt and gravel roofing, interior maple flooring, steel beams, cut stone, artificial stone, plate glass.

Work in progress for factory, \$18,000, Royce and Lansdowne. Owner, Standard Sanitary Manufacturing Co., Royce avenue, Toronto; contractor, Standard Structural Co., 111 Manning Arcade. One storey, 146 ft. 8 in. x 47 ft. 2 in., steel, brick and concrete, concrete foundation, hot water or steam heating, concrete and felt roofing, reinforced concrete, metallic lath, structural iron, fireproof doors and windows, steel beams, Work will be done by day labor.

Vancouver, B. C.

The British Columbia Electric Railway Co. has awarded the contract for the construction of a new freight shed at the foot of Carrall street near False Creek, to D. Mathewson, of this city.

Tenders called for business buildings. Owner, Crane Co. & Dominic Burns, Vancouver. General contractors, Norton, Griffiths Steel Construction Company, Labor Temple, Vancouver. Crane building ornamental iron work, marble tile, cut stone, plastering, and heating. Burns building plumbing, heating, electric wiring, mill work, marble and tiling. Tenders on sub-contracts received until Aug. 11th. Work held up owing to strike.

Tenders called for store. (Park Drive and Venables street). Owner, J. A. Malkin, 1400 Bute street. Architect, S. B. Birds, Loo Building, Vancouver. 2-storey, 44 x 120, frame, concrete foundation. Tenders called after July 26th.

Tenders to be called for store and rooming house, \$20,000. (Cedar Cottage and Westminster road). Owner, Clem Mills & Co. Architect, Townsend & Townsend, 812 Robson street, Vancouver. 3-storey, frame, 8 stores on ground floor and 8 suites of rooms on other two floors. Tenders received after Aug. 15th.

Tenders called for store and rooming house, \$40,000. (579 Richmond street). Owner, Capt. H. Pybus. Architect, S. B. Birds, Loo Building, Vancouver. 4-storey, 25 x 120, reinforced concrete. Tenders closed Aug. 4.

Victoria, B.C.

Hoult Horton, architect, has prepared plans for Norton Griffiths Steel Construction Co. for erection of an eight-storey building on Government, Humboldt and Gordon streets.

Winnipeg, Man.

Frank Lindsay will erect a modern seven-storey office building on the triangle formed by the intersection of Garry with Notre Dame and Ellice avenues, cost, \$175,000.

Specifications prepared for office building. (West Yard Ft. Rouge). Owner, Canadian Northern Railroad. Architects, R. B. Pratt, Winnipeg. 2-storey and basement, 68 x 31, concrete and frame, concrete foundation and steam heating, electric lighting, Ready roofing. Tenders closed on July 29th.

The Canadian Pacific plan to add two storeys to their depot next year. They also propose to erect a large four-storey building north of the train sheds and a first-class waiting room for travellers will be provided on the ground floor of the Royal Alexandra annex.

Tenders called for fans and engine for incinerator plant. Owner, City of Winnipeg. Secy. Board of Control, M. Peterson. Supply of steel plate forced and induced draft fans, together with engines for operation of same. Specifications at office of city engineer, 233 James avenue. Tenders received by Chairman Board of Control until 11 a. m., Aug. 8, 1911.

Tenders to be called for office building. (Lombard street). Owner, Union Trust Co., Winnipeg. Architect, John Atchison, Bank of Toronto Building, Winnipeg. 12-storeys, 101 x 27½, steel frame, fireproof, tile, pile and concrete foundation, two storeys granite, concrete balance, steam heating, electric lighting, 3 elevators. Tenders to be called shortly.

Tenders to be called for bank. Owner, Sterling Bank, Portage avenue, Winnipeg; architect, James Chisholm & Son. General contractor, Carter-Halls-Aldinger Co., Winnipeg. Steel and fireproof construction, interior finish, marble and oak. Tenders to be called for interior fittings; 2 high speed electric elevators; steam heat, electric lighting, marble and terrazo floor.

Work in progress for warehouse, \$100,000. Owner, Canadian Fairbanks, Ltd., Winnipeg. Architect, Browne & Vallance, Winnipeg. General Contractor, Geo. H. Archibald, Winnipeg. Reinforced concrete, terra cotta trimmed front.

Materials required for ink factory, \$9,000. (McGee street). Owner, W. Peacock. Architect, D. W. Bellhouse, Canada Building, Winnipeg. 2-storey, brick and stone, concrete foundation, electric lighting, steam heating, tar and gravel roof, cement work, cut stone, brick concrete blocks, electrical work, telephone, electric bells.

Extension of plant, cold storage, Mead, Tonseca and Higgins avenue. Owner, Manitoba Cold Storage Company, Winnipeg; manager, S. H. MacCall; architect, not yet appointed. 8 storeys and basement, 367 x 70, concrete and steel construction; chambers lined with 6-in. cork insulators.

Yorkton, Sask.

The Board of Trade is negotiating with a company who contemplate the establishment of a factory here for the manufacture of stoves, ranges, etc.

CONTRACTS AWARDED

Brockville, Ont.

Manufacturing Building. Owner, Canada Carriage Co., Brockville; general contractor, Byers & Anglin, Montreal. Two storeys, 100 x 50, brick. Contract was awarded July 27.

Chatham, Ont.

Alterations to store, \$2,500, King st. Owner, W. Gordon, Chatham; architect, J. L. Wilson & Son, Chatham; general contractor, Chatham Building Company; masonry, W. Draper; carpentry, H. Payment; sheet metal, M. Clements; iron work, A. E. Drew; stone work, J. & J. Oldershaw. Contract let July 31st. Building to be completed September 15th, 1911.

Edmonton, Alta.

Warehouse. Owner, Ames Holden McCready; architect, Jas. Henderson; general contractor, Foot & Purcell, Edmonton. Three storeys and basement, brick, steam heating, electric lighting, vaults, freight elevator, plate glass. Contract signed July 20th.

Fort William, Ont.

Store, \$3,000, Simpson street. Owner, Mr. Kaslar, Simpson street, Fort William; architect, Hood & Scott, Fort William; general contractor, C. Mathieu, Fort William. Two storeys, solid brick, concrete foundation, 25 x 65.

North Battleford, Sask.

The contract for the Imperial Bank of Commerce has been awarded to J. Broley.

N. Vancouver, B.C.

Stores, \$2,260; architect, A. J. Henderson, N. Vancouver; general contractor, J. J. Young, Collingwood, E. Vancouver. One storey, 26 x 80. Contract awarded July 22.

Revelstoke, B.C.

Geo. D. Shaw, of Revelstoke, has been awarded general contract for the erection of H. F. McKinnon's new 3-storey brick and concrete building, 40 x 95 feet. Cost, \$20,000.

Saskatoon, Sask.

Warehouse, \$56,000. Owner, Canadian Fairbanks Co., Winnipeg; architect, Brown & Vallance, Winnipeg; C. E. Sheppard, manager; general contractor, James McDiarmid, Winnipeg. Brick and stone frontage, reinforced concrete.

Vancouver, B.C.

The contract for the \$10,000 office building on Granville and Georgia sts. has been awarded to J. J. Dissette, 570 Granville street.

The contract for the new five-storey hotel to be erected in North Vancouver has been awarded to Alexander Craig, North Vancouver. Work will be commenced at once.

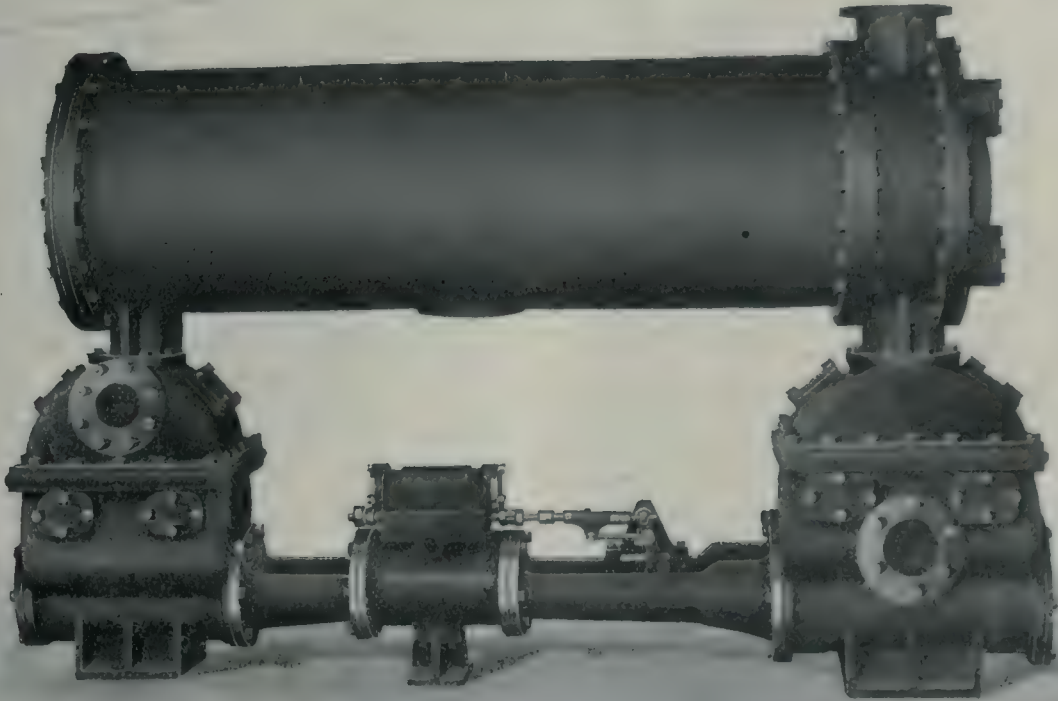
Hotel, \$8,000, Cordova street; architect, Henry B. Watson, Holden Building, Vancouver; general contractor, Matthew Hall, Vancouver. Contract awarded July 22.

Power Plants, Electricity and Telephones

Edmonton, Alta.

New negotiations opened for power development. Owner, City of Edmonton. City Engineer, A. T. Latonnell. Another company backed by English syndicate after water rights at Grand

CONDENSORS



Condensor built by The John Inglis Co., Limited

BOILERS, ENGINES, PENSTOCKS,
Water Towers, Steel Tanks, Heavy Plate
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ing Machinery, Special Machinery of all kinds

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Engineers and Boilermakers

Limited

14 Strachan Ave., TORONTO, Canada

Rapids. Plans have been prepared by Mr. Neville, C. E., Edmonton.

Middleton, N. S.

Equipment required for electric lighting system. Owner, Town of Middleton, N. S. James A. Gates, town clerk. Expenditure of about \$15,000 to \$20,000 to be made. Ratepayers have voted appropriation.

Niagara Falls, Ont.

Electric equipment required. Owner, J. Robinson & Sons, Niagara Falls, Ont. Equipment wanted, lathe drill press, sharper electric rectifier; also motor shafting, pulleys, etc. None purchased as yet.

Work in progress for power plant, \$66,000. Owner, American Cyanide Co., Niagara Falls. Extension of factory. D. Dick & Sons Ltd., Welland, Ont., have taken contract for roofing, \$10,000. Advertisement in "Tenders and For Sale Department" of this issue.

Port Arthur, Ont.

The Port Arthur & Fort William Electric Street Railway will extend the Arthur street branch one-half mile.

Portage la Prairie, Man.

Purchase of plant of Central Electric Co. Owner, City of Portage la Prairie; clerk, D. McGowan. The offer of \$110,000 has been accepted by the company. A by-law will probably come before the people in September.

Saskatoon, Sask.

By-laws to be submitted for building and machinery. City clerk, T. H. Truesdale. On August 24th the following by-laws will be submitted to raise \$25,000 for city stable and storehouse;

\$80,000 for erection of power house and purchase of site; \$135,000 for purchase of machinery for new electric light and power plant; \$35,000 for erection of Nurses' Home.

Victoria, B.C.

The contract for wiring the new B. C. Electric Railway station, which is to be built at the corner of Carroll and Hastings, by McDonald & Wilson, has been awarded to Mather, Yuill & Co., Ltd., 429 Pender street west

Miscellaneous

Hamilton, Ont.

Mr. Byrnes, 355 Main street, will erect a garage, 24 x 20 feet, \$2,000. James Markle, architect, 179 Market street.

Buildings contemplated or in progress in Hamilton, July 31, 1911:—H. Thombs, 56 Stinton street, brick dwelling on Argue street, for H. Catchpole, \$2,000; Mr. Chertkoff, 172 Barton street east, four frame dwellings on Douglas street, \$4,000; Mr. Chertkoff, 172 Barton street east, for the erection of eleven frame dwellings on Mars avenue, \$12,000; A. Bauer, 88 Campbell avenue, frame dwelling, \$300; P. M. Cook, 806 Bank of Hamilton Building, frame dwelling on King street, for Fred Hill, 4 William, \$1,800; O. Beecraft, 17 Kinrade avenue, frame dwelling on Bristol street, for F. Tansley, 215 West avenue north, \$1,000; Wm. Walker, 433 King st. west, frame dwelling on Argyle avenue, \$300; O. Gilvear, 87 Kinrade avenue, frame dwelling, Graham avenue, \$500; Chas. Cordell, 497 Cameron east, frame dwelling, Harvey street, \$1,000; E. B. Patterson, 167½ King street east, brick

dwelling, Catharine street, for T. Jackson, \$2,000; F. Bower, 37 Barton west, frame dwelling, Fairview avenue, \$800.

Ottawa, Ont.

Tenders called for fire hose. Owner, City of Ottawa; city clerk, John Henderson. Supply of 2,000 feet of 2½-inch double jacket rubber lined fire hose, complete with couplings (Higbee thread) made to Ottawa standard and guaranteed to test pressure of 400 pounds. Hose to be guaranteed against defective manufacture, mildew or rot for three years. Accepted cheque for ten per cent. of amount of tender to accompany each tender. For further information apply to chief of fire department. Tenders received by city clerk until 12 o'clock, August 15th.

Vancouver, B. C.

Buildings contemplated or in progress in the City of Vancouver, August 4, 1911: C. H. Cottrell, Water street, two stores, \$12,000, contractor, Sinclair & Pearson, 998 12th street west; L. W. Parren, 1030 Harwood street, two stores, \$1,800, 2728 18th avenue west; C. Phillips, 1905 8th street west, two stores, \$3,000; B. C. Sugar Refining Co., E. Hastings, one store, \$1,000.

Winnipeg, Man.

Buildings contemplated or in progress in Winnipeg, August 4, 1911: J. E. Sparrow, 277 Mountain avenue, dwelling, \$3,000, Bannerman avenue; J. T. Watson, 58 Sherbrooke, dwelling, \$2,900, Alverstone street. Greenwood & Thompson, dwelling, \$2,700, Ross avenue; J. T. Watson, builder; Robinson & Zelbowitz, 539 Pritchard avenue, double dwelling, \$1,800, west side Burnell street.

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Contract Record

ESTABLISHED 1886

A Weekly Journal of
Building, Contracting, Engineering, Public Works
Municipal Progress, Advance Information

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SUBSCRIPTION RATES

Canada and Great Britain, \$2.00 U.S. and Foreign, \$2.50

Vol. 25 August 16, 1911 No. 33

A Result of Revision

With the proposed readjustment of the Toronto building by-law the question has arisen as to whether the local brick makers will experience any material decrease in the demand for their products. For some time there has been an unprecedented call for all classes of brick in the city for residence, factory, mill and office buildings, and the supply has been taxed to the limit.

It will be some time, of course, after the revision occurs before reinforced concrete asserts itself to molest the present prices of brick, so great has it been retarded during recent years by the stringent conditions that are still applied to this class of building in the city. American cities with their well utilized application of reinforced concrete, are already years in advance of Toronto in modern fireproof structural work. However, when the time arrives in which these buildings commence to increase in size and number, the advance will be sane and safe, as they will be featured with a knowledge of the mistakes and difficulties of their earlier kin.

The city of New York has adopted the use of reinforced concrete in the erection of its city buildings to such an extent as to meet with a formal protest from the Greater New York Builders' Association a few weeks ago. The issue arose from the city's contemplating the erection of 48 fire company houses, all to be built of concrete. The association meeting was attended by a large number, representing over seventy concerns manufacturing brick and tile. The discussion brought out the fact that most of the buildings being erected in the city were of concrete, and that the brick industry was suffering by the more general use of cement product.

In Toronto there is ample field for the steady use of both materials and there is no occasion to attempt to force either of them into every conceivable application. When the unusual severity of the Toronto by-law towards reinforced concrete construction has been moderated there will be an influx of concrete

structures, the building of which has been withheld until the allotted time. This branch of building material will receive the attention it deserves, but in its own field, and it is altogether likely that the field of the brick industry will suffer no material infringement or limitation. Such a state of affairs would be in the best interests of Toronto building, as the builder will then be able to choose with lessened restriction, and increased freedom, between materials.

The Necessity of Skilled Labor

The fallacy that concrete can be properly mixed and placed by any kind of labor under any kind of supervision is fast disappearing, and every specification for concrete work should contain a clause after the manner of the following: All reinforced concrete must be constructed by laborers skilled in this special field and under the supervision of an expert in reinforced concrete construction.

The loads and stresses in the proposed construction are usually high, and while the design may have been carefully prepared with due consideration of safety factors and accurate locations for steel, much depends on the manner in which the work is executed, and the engineer will not jeopardize the construction by permitting incompetent workmanship.

The factor of safety that is required for building materials is accompanied by an additional factor of safety for labor. In case of both concrete and reinforced concrete the former item has become very fairly defined as to strength by experiment and experience. It is the workmanship factor that here demands the most serious and strict inspection and no matter how careful the inspector may be some defects are almost sure to be overlooked unless the workmen themselves are competent to judge in cases of poor ingredients, too rapid setting, removal of forms or improper mixing.

In the interests of concrete construction the report of the commission that was appointed to thoroughly investigate the failure of the Heinke Building in Cleveland is of great value, since nothing developed to cast doubt in any way upon the efficiency of reinforced concrete as a building material. The city building department, the architect, the owner and the contractor are all indicated as contributing to the failure by acts of either commission or omission. The report of the commission is given below.

It is the belief of the commission that the architects were negligent in the following respects:—

1. Although the evidence shows that the architects advised and requested the owner to place a special reinforced concrete inspector on the work during the progress of construction, they did not specifically call the owner's attention to section 473 of the building code, which, by "mandatory requirements," provides that the owner shall place such an inspector on the work.

2. The architects did not name in the application for the building permit a special inspector, as required by section 473, who was to be continually on the work during the placing of concrete and steel.

3. The architects did not give adequate consideration to the removal of the forms of the concrete work. They evidently gave little attention to weather conditions from October 22 to November 22, inclusive, when, according to the United States weather reports, there were 16 days of which the temperature was at or below 35, on 9 of which the temperature was 32

or below with a minimum of 25; and during which time there were only 4 clear days with 15 days of rain or snow. Under these weather conditions more than ordinary precaution should have been taken in the removal of forms.

4. The architects did not give adequate consideration to the sand used in the building. The specification called for washed sand, while unwashed sand, not of uniform quality, was used.

5. The architects did not exercise proper judgment in advising the owner in regard to the rapidity with which the work could be safely prosecuted.

It is the opinion of your commission that the contractor upon signing the contract, assumed the responsibility of executing the work in accordance with the plans and specifications. The contractor was negligent in the following particulars:

1. The foremen employed on the building were ignorant of the requirements of the drawings and specifications; did not exercise proper care in the measurement and mixing of concrete aggregate and the placing of reinforcing steel; allowed brick work and erection of forms to proceed upon green concrete; and conducted the work generally in a loose, slipshod and hurried manner.

2. The reinforcing steel was carelessly placed in ribs, girders and columns, and "no provision was made to insure steel being in its proper position after concrete had been poured."

3. The structural members of concrete were not of proper sizes, concrete was of poor quality and not properly placed.

4. The sand used was, in many cases, of inferior quality, contained loam and clay and did not meet the specification requirements for washed sand.

5. The cement delivered at the building was apparently 20 per cent. less in amount than the amount necessary to properly construct the work in accordance with the specifications.

6. The forms were usually removed without the consent of the architects in violation of the specification requirements.

In the east side of the third storey, forms, supporting the fourth floor, were removed in 16 days after the pouring of concrete, and the floor re-shored. The removal of these forms, in this short time, was, considering the weather conditions during the month of November, extremely dangerous. This time would hardly have been sufficient under favorable weather conditions.

These forms were removed without the consent of and contrary to the instructions of the architects.

It is the opinion of your commission that the removal or changing of these forms and shores was the one primary cause of the collapse.

In the opinion of your commission the owner was negligent in that he did not employ a special reinforced concrete inspector on the building as advised by the architects.

The report proceeds as follows:

The evidence shows that the inspector of buildings, engineer of construction and the masonry inspector in that district were at the building enough times to have ascertained whether such special inspector was on the work or not; to say nothing of the fact that daily reports were not being made to the inspector of buildings by such special inspector.

On the subject of concrete construction the commission says:

Your commission finds, from its investigation, no

reason to condemn the use of concrete in combination with steel for the structural parts of buildings; provided, the concrete is composed of proper materials, accurately measured and thoroughly mixed; the steel of sufficient strength and properly placed; the work installed by competent contractors and workmen, and the specifications, drawings and construction prepared and executed under the direction of competent designers and inspectors.

The commission was composed of able and unbiased engineers and architects and the report merits study and consideration. The failure was one of workmanship and not of material.

Preservative Treatment for Poles

In compiling statistics of the use of poles in recent years the forestry branch of the Department of the Interior reveals the extent of a rapidly growing demand for one important line of forest wealth. The total number purchased was 782,841, an increase of 118 per cent. over 1909. The total value of these poles at the point of purchase was \$1,043,874, and the average price was \$1.33, or less by six cents than the price per pole in 1909. Steam railways, telephone, and telegraph companies used 95 per cent. of these poles, the remaining 5 per cent. being used by electric railways and power and light companies. Of the total consumption 97 per cent. were cedar poles, which for their cost give better service than any other wood. At present none of these poles are treated or preserved by any method, in which respect Canada is not abreast of the times.

The Railway and Marine World, in commenting on this growing demand, strongly urged the adoption of preservative treatment. In the United States, where 3,738,740 poles were used in 1909 at a cost of \$1.98 each, it has been found profitable to adopt preservative methods. During the last three years the treatment of poles has advanced so rapidly that in 1909 15 per cent. of the total number were treated by creosote or other methods. This is an increase of 67 per cent. over the number treated in 1908. At present the United States has 87 pole-treating plants, while Canada has none. Pole users in Canada should take up this cheap and rational method of securing greater service from the poles used, thus lessening the drain on our forest. The conservation of resources is a growing necessity.

Regarding the advisability of limiting the height of buildings in Edmonton to six storeys, Mr. H. M. Martin states the following:

"At the convention of building owners and managers in Cleveland there were men who represented an investment of three billion dollars in large buildings," said Mr. Martin. "The consensus of opinion among these men seemed to be that buildings twenty storeys or more in height were as satisfactory from the point of view both of the owners and the occupants, as lower buildings. The presidents of the building owners' associations from Cleveland, Detroit, Seattle and Chicago all favored 20-storey buildings as being the most satisfactory from every point of view. Some were of the opinion that it would be a good thing to limit the height of buildings to 160 feet, but none would have the limit placed at anything less than that height."

Methods of Ordinary Building Operation

The Design and the Erection in Relation to the Owner, Architect and Contractor—The Success that One May Expect in the Capacity of the Other

By W. B. Bamford*

All building or engineering operations are divisible into two parts.

- (1) The planning and designing of the structures, and
- (2) Their constructing and erecting.

Each of these divisions is separate and distinct from the other, and is governed by different conditions. The fact that, in the majority of modern work, the planning and erecting are so inseparably merged has caused the guide marks of proper procedure to be almost lost and obliterated. This has resulted in mistakes or inconsistencies which have caused needless trouble.

The methods followed in the planning and erecting of buildings are now going through a transition period. It seems, therefore, unwise and inexpedient to attempt to treat the erecting entirely independent of the planning, because, by such a limitation, it would be impossible to forcibly bring out many of the defects of the present practice which are due to lack of a correct understanding of the possible lines of cleavage between planning and erecting.

There are many possible business relationships which can be made for the planning of work and also for its erecting. Each variation is subject to certain restrictions and limitations. There is no one of these possible relations that will be satisfactory for all kinds of construction work; nor is there any particular kind of work which can be undertaken under all the different relationships. It is necessary, therefore, to understand the advantages and limitations of all the possible methods for planning and erecting buildings, and then select the one which should be the most satisfactory for the particular work in hand.

Dependent on Circumstances and Efficiency

The selection of any method for the planning or erecting of a particular piece of work should be controlled by the relative efficiency of the method in the light of the circumstances surrounding the particular work. There are, of course, certain theoretically desirable situations, and the mistake is often made in devising hypothetical assumptions in order to substantiate the advocacy of any particular method. The acid test of time and experience ignores everything but facts, and views efficiency in the light of results under the conditions as they actually existed.

It has already been pointed out that, in nearly all walks of life and in all countries, radical changes are in progress at the present time. The new spirit of practical efficiency will more certainly judge the actual results obtained, and methods must undoubtedly give way or be modified where they do not conform to the correct standard of true efficiency.

In order to concisely present a general view of the various possible methods for the planning and erecting of buildings, the following outline is given.

These are divisible into five general methods:

D planned by	A Owner	1 Personally
		2 By organization
	B Professional Adviser	3 Engineer-Contractor or building corporation
		4 Professional adviser employed contractor

D A1—Where owner personally plans his building

D A2—Where building is planned by owner through his organization.

D B —Where building is planned by a professional adviser for the owner.

D C3—Where building is planned by an "engineer-contractor" or by a "building corporation."

D C4—Where building is planned by a professional adviser who is employed by the contractor and not by the owner.

Planning and Designing of Buildings

All work must be conceived and planned before it can be erected. The planning of work is an entirely separate and distinct operation from the erecting, but this fact is often forgotten because, in many cases, they are almost imperceptibly merged into a continuous operation. The planning of buildings may be done (a) by the owner, (b) by the contractor, or (c) by a person employed by an owner or contractor because of his special qualifications, and hereafter called a professional adviser. The professional adviser may be called an "architect," "engineer," "consulting engineer," "chief engineer," etc.

Owner as Planner of Buildings

(D A1) An owner may personally plan his own building. This is done in the case of architects who plan and design their own residences, etc. How many architects will testify to their entire satisfaction with such method? If an architect cannot satisfy himself in the plan and design of his own residence, what can a mere owner, who is presumably less able, do? Much personal mortification and many family jars would surely be eliminated if a law were enacted by the Congress absolutely prohibiting, under pain of death or banishment, any architect from planning and designing his own buildings.

(D A2) Many states and municipalities, public bodies, and corporations have a permanent staff and organization for planning and designing their architectural and engineering work. This is one of the most usual conditions met with at the present time.

Where the volume of work handled is of sufficient amount to keep at least the skeleton of such an organization busy at all times, this method can be made efficient by a proper executive staff and organization. If the amount of work handled is not constant enough to keep the skeleton organization busy at all times,

*Condensed from a paper published in the Journal of the American Society of Engineering Contractors, June, 1911.

then it may become less efficient than an independent professional adviser who is employed only when required.

In states, municipalities, and corporate bodies, practical politics play such a demoralizing part that the true efficiency of any method has been a difficult matter to determine. The modern spirit of efficiency is, however, fast overthrowing the old barriers of party politics and a new era is dawning in even our political life.

Professional Adviser as Planner of Buildings

(D B) The independent professional adviser is (together with D A2) one of the most common means employed for the planning of buildings. The reasons for his existence is due solely to the fact that much work is done for parties who do not have sufficient work to justify their employing a permanent staff or organization to handle their work; and they, therefore, employ the independent professional adviser when occasion requires.

Ability is the same under whatever name the possessor may operate. If men with the proper ability are members of an executive staff of a public body or corporation; if they are in the service of a contracting organization as hereafter outlined; or if they are in independent practice, they can still exercise their ability. The question, therefore, becomes—by what method can the most efficient results be achieved?

The speaker believes that, where possible, the independent professional advisers should be the most efficient, but, if they would hold their places, they must prove their efficiency. It is hoped that this summary may prove of some assistance in directing investigation along the proper lines.

Hereafter some of the shortcomings of professional advisers will be pointed out.

Contractor as Planner of Buildings

(D C3) The "engineer-contractor" and the "building corporation" have made rapid strides recently in abrogating to themselves the functions of the professional advisers. They have made such successful progress that the American Institute of Architects in 1907 felt compelled to set its seal of disapproval upon such practice. In 1908, however, a new committee took a little broader view of the situation and recognized that architects themselves were not blameless for existing conditions, that condemnation alone was inadequate to stay the movement, that the only sure way of combating such tendency was by showing that the innovation offers no greater efficiency than can be obtained from professional advisers and has inherent disadvantages.

It is, of course, understood that the "engineer-contractor" and the "building corporation," to be successful, must have within their organization men who are capable of performing the work which can be done by professional advisers.

(D C4) The practice is not new of a contractor dealing directly with an owner, and then the contractor, and not the owner, employing a professional adviser to plan and design the work the same as he employs mechanics to execute such work. Several firms in New York City have been successfully doing this very thing for a number of years, and a number of prominent firms of architects have been kept busy working for these contractors.

Both D C3 and D C4 are seriously threatening the independent professional adviser. These methods have already done inestimable good in awakening professional advisers to their shortcomings, and causing them to begin to repair their defective fences. This alone is a most encouraging sign and much good should come of it.

There is another important situation which occurs when the contractor is also the owner and plans the work. This will be reviewed later.

Methods for Erecting Buildings

Buildings may be erected (a) by an owner, (b) by a contractor, or (c) by a combination of owner and contractor. The contractor may furnish the labor and materials or only the labor; the material being supplied by the owner. The following are the possible variations:

E Erected by	A Owner	1 With own organization	a Unsecured cost contract
	B With assistance of professional adviser	2 By day labor	
		3 By employing trade contractors	
	C Contractor	4 General contractors	b Secured-cost contract
	D Constructor who is also owner	5 Engineer-contractor or building corporation	

This gives thirteen methods which may be followed:

E A1—Where erecting is done by owner with his own organization.

E A2—Where erecting is done by owner by day labor.

E A3a—Where erecting is done by owner with trade contractors under an "unsecured-cost" contract.

E A3b—Where erecting is done by owner with trade contractors under a "secured-cost" contract.

E B3a—Where erecting is done by owner, with assistance of professional adviser, with trade contractors under an "unsecured-cost" contract.

E B3b—Where erecting is done by owner with assistance of professional adviser, with trade contractors under a "secured-cost" contract.

E B4a—Where erecting is done by general contractor, under supervision of professional adviser, under an "unsecured-cost" contract.

E B4b—Where erecting is done by general contractor, under supervision of professional adviser, under a "secured-cost" contract.

E C4a—Where erecting is done by general contractor, without supervision, under an "unsecured-cost" contract.

E C4b—Where erecting is done by general contractor, without supervision, under a "secured-cost" contract.

E C5a—Where erecting is done by "engineer-contractor" or "building corporation," without supervision, under an "unsecured-cost" contract.

E C5b—Where erecting is done by "engineer-contractor" or "building corporation," without supervision, under a "secured-cost" contract.

E D—Where erecting is done by contractor who is also owner.

Owner as Constructor of Buildings

(E A1) When an owner, like municipalities, private corporations, etc., has a permanent organization, skilled in the kind of work to be undertaken,

it is possible to consider the relative economy and efficiency of the owner erecting his own work instead of having it done by contract.

This is a very broad and interesting subject, and has been very extensively discussed. For public work this is the old question of public vs. private activity, so hotly contested in the discussion of municipal ownership and the trend of socialism.

In the case of building operations, at the present time, if the owner already has an organization competent to perform the proposed work, it may be more economical and efficient to utilize it than to employ a contractor. If no organization exists, a contractor should be more efficient and economical than assembling an organization for the work in hand unless the prospects of additional future work may make it advisable to organize a contracting department with the future as well as the present in view. Then again the work may be so large or novel that there is no contractor properly equipped to handle it, and a contractor would, therefore, have no immediate advantage, in assembling a proper organization, over an owner. This situation was one of the factors which finally determined the U. S. Government to construct the Panama Canal with an organization of its own rather than to undertake the work by contract as originally contemplated.

There is a different situation which occurs when the constructor is the owner.

(E A2) Whether an owner shall do his erecting with his own organization or by day labor is a question largely of whether there is an organization competent and free to handle such work. Whether the erecting should be done by day labor or by contract, presents a similar situation to D A1. An owner may have a permanent executive organization which could perform the required work by employing the mechanics needed. It then becomes a question of the efficiency and economy of day labor for erecting vs. contract work. This situation arises more frequently with municipal work than in building operations. Many municipalities have done work both by day labor and by contract, and the relative efficiency of the two methods is still a much debated subject.

E A3) Where work is planned by an owner or by his organization, as under D A1 and D A2, it may be economical for the erecting to be done by the employment of trade contractors rather than employing a general contractor. The owner would then be saving the profit of the general contractor and certain overhead charges which must be carried by general contractors. It may, however, be necessary or desirable for an owner to assume the same overhead charges as a general contractor. The owner's saving would then be only the profit of the contractor plus possible greater efficiency in erecting the work.

Owner as Constructor with Assistance of Professional Adviser

(E B) When an owner is not able or desirous of planning or directing the erection of work, either personally or through his organization, his alternative is to employ an independent professional adviser to supervise and direct the constructing, or to deal directly with a contractor.

When a professional adviser is employed, the work can be constructed either by a general contractor or by trade contractors.

(E B3) When trade contractors are employed, the situation is practically that of an owner erecting his own work by means of trade contractors, except that the professional adviser relieves him of the technical work of supervising and directing the erecting. Such a relationship presents some interesting practical problems.

Contractor as Constructor Under Supervision of Professional Adviser

(E C4) The usual method for erecting buildings is to have a general contractor as constructor. The alternate method of having trade contractors has just been set forth.

When an owner is unable or not desirous of erecting buildings himself, a contractor of some sort must be used. The question of this kind of contractor and form of contract must be matters for special consideration in conjunction with the particular work in question.

The usual practice in building operations, and the common popular understanding, is that the architect who plans a building will be the one who supervises its erecting. That this relation is not essential and is often modified for important work should be noted here.

It is possible, if architects confine their activities to the planning and designing of buildings and do not consider more carefully the economic side of the erecting, that some of the methods for erecting building may become popular where the architect is not an important factor during the erecting.

Contractor as Constructor Without Supervision

(E C5) There has recently loomed into view a horrible reality which is disturbing the peaceful sleep of many independent professional advisers. The "engineer-contractor" and the "building corporation" are the names at present given to these night-mares. They designate a contractor who is also qualified to perform the duties usually assumed to be the exclusive prerogative of the professional adviser. These contractors must, of course, have the training and experience of architects or engineers, or have such men in their organizations. They are, therefore, able to deal directly with an owner for work, and can arrange to plan as well as to erect buildings.

Under D C4 it has been shown that these contractors may and do employ professional advisers when required to plan and design buildings. As they deal directly with an owner for a finished product, they are in an excellent position to compete with the independent professional adviser, provided they can show a greater degree of efficiency in obtaining the finished result. In such a situation the architect is relegated to the subordinate position of a designer or draftsman for the work.

Architects have been too strenuously contending that their primary excuse for existing was to improve the artistic side of architecture! and, that contractors being commercially minded men, art must surely be damned in their hands without the guidance of the independent architect. The fallacy of this condition has been disproved by an analysis of the methods for erecting many of the ancient marvels of architecture or in observing the superior artistic excellence of many products made to-day by commercially minded concerns.

Under the following section an additional and most important position which contractors can occupy will be discussed.

Contractor as Owner

E D) There is a strong recent tendency for the building corporation to occupy the position of owner of the property until the building is finished, the ultimate owner being merely the purchaser or prospective purchaser of the finished product. This can be developed into a very satisfactory and business-like procedure, and conforms more correctly to the usual ideas of manufacture and sale.

The methods for obtaining prospective purchasers by a contractor-owner can be varied in several ways, some of which are clever innovations. Among them might be mentioned: where the constructor owns the land and arranges with a purchaser to erect a suitable building; where financing an operation and placing a mortgage is part of the transaction to induce a purchaser to deal with a constructor; where buildings are erected for sale with no definite purchaser before they are undertaken, etc.

These and various other alternatives place a constructor-owner in an important position to treat directly with purchasers who need not become actual owners until the building is completed.

Some will say that this method is not practical or that it can never seriously menace the present method for erecting buildings under the direct supervision of the professional advisers. That the method is practical is testified to by its successful use. Several New York firms have been doing a large amount of work for several years under what is virtually such a method, and the experiments and tendency of the large building corporations are in this direction.

Any method is dependent for its continuance on its efficiency. Of the old or new method, the most efficient will survive. The old method has not been satisfactory; it must be modified. Both the old and the new method have almost an equal chance; both may succeed and be used, or either one may ultimately supersede the other, depending on the practical efficiency of its operation.

The modern development of the constructor-owner is almost certain to bring about large building corporations who handle the entire work, and have an organization which is also competent to perform all the functions of the independent architect or engineer as well as to erect the work. Under such a constructor-owner an architect or engineer in independent practice might be employed, but he would usually be merely a designer and seldom have any connection with the erecting of the building.

The whole tendency of the constructor-owner movement is along the logical lines of economy and efficiency in the erecting of large buildings. The effect on architects will be to relieve them of any connection with the erecting of work and will confine their attention to the ministerial duties of the draughting room in the designing and planning of buildings.

The "speculative builder," "real estate operator," etc., are variations of the constructor-owner, and probably do 50 per cent. of the residential work throughout the country.

Architect as Contractor

Should the architect have a perverted idea of becoming a contractor, he should change his title and become a "contractor-owner," "engineer-contractor,"

common garden variety "contractor," etc., as already outlined. Therefore, we may omit consideration of an architect as constructor and not shock the sensibilities of those who contend that an architect is not a practical man, but an artiste; which would of course preclude the possibility of such architects becoming successful contractors.

Summary of Conclusions

The purpose of this paper is twofold. Firstly, to present a resume of methods for planning and erecting buildings; because, without a clear understanding of all the various possibilities it is impossible to compare the probable economy and efficiency of any method over its alternatives. Secondly, by outlining all possible methods for planning and erecting buildings, to offer a basis for more intelligent criticism of any method in the light of its relation to all other possible methods, and to facilitate suggestions for improvement in the details of procedure connected with such method.

Buildings must be planned and designed, and then constructed and erected. The properly planned and constructed building involves a proper knowledge and application of many various and varied subjects. This knowledge must be possessed and applied by men. A man is a man, whether he be called "owner," "architect," "engineer" or "contractor," and, if possessed of the necessary knowledge, fortified by homely honesty and common sense, it should matter as little to-day as it did in times past, by what title the planner or constructor is called, provided only, that the result is well and truly achieved to the best of his ability.

Vancouver's New Wharf

The C. P. R. wharf extension at Vancouver is the latest corporation work in progress in that city. Their two present wharves are at James Bay, nearly opposite the Parliament Buildings. The new dock is 250 feet in length, which, being an extension to the former dock, will furnish a length of 650 feet. The width of the earlier constructed portion is 90 feet, which will be increased to 120 feet.

The extension will be built upon piles, over a thousand of which are to be driven. Part of these, some 250 in number, are Australian turpentine hardwood and the remainder are the best British Columbia creosoted fir. These will be surmounted by a layer of 4-inch plank.

On top of the new wharf will be erected a freight shed with dimensions 500 feet by 40 feet, or an addition in length to the old shed of over 10,000 square feet floor space. Gangways, slips, etc., will be installed in the new sheds, which will be used for both freight and passenger effects in transit. This wharf will be the principal one used and the extension will cost some \$35,000. The contractor for the work is Mr. E. R. Doe.

The Grand Trunk Pacific Railway are preparing to extend their line into Minneapolis and St. Paul and several branches are being surveyed down to the United States border.

Canada has a continuous waterway from the Atlantic to the head of Lake Superior, along which vessels of 14-foot draught may pass. The length is 2,300 miles, measured from Belle Isle to Fort William.

Railway Development in Western Canada

Consular Report of Unprecedented Construction on the Three Great Canadian Lines—Four-fifths of the Canadian Northern Line is in the West

In a recent report from Consul General Jones, of Winnipeg, the railway improvement in Western Canada for this season is estimated to involve the expenditure of \$45,000,000, and the continuous employment of 30,000 men and 10,000 teams, and the accomplishment will be the construction of 2,800 miles of track.

At an early date two more railways will reach the Pacific coast in Canada—the Canadian Northern and Grand Trunk Pacific lines. The former, which is following a route said to have been the original proposed location of the Canadian Pacific Railway, will terminate at Vancouver; the latter will reach the Pacific at Prince Rupert, about 450 miles north of Vancouver. Besides these extensions westward the northward ramifications of the railway system include a line to Port Nelson, on Hudson Bay, two converging branches from North Battleford and Edmonton meeting at Athabasca Landing, and a line running up to within 40 miles of the fertile Peace River country. In Ontario there are to be constructed branches of important size entering the Thunder Bay Algoma district. Through southern Manitoba the Great Northern Railway will enter Winnipeg.

The three railways now traversing western Canada—the Canadian Northern, Canadian Pacific, and Grand Trunk Pacific—are vying with each other in extension work. The Canadian Pacific, the oldest of the three railroads, which already crosses Canada from coast to coast, is devoting its attention to double tracking its system. A review of the work of the three railroads underway and in contemplation follows:

The Canadian Northern

The Canadian Northern now operates a total mileage of 5,471 miles over the whole system, while 4,120 miles of this is laid in western Canada. The company announced that it would spend about \$14,000,000 in construction work this year, laying 1,000 miles of new track and employing about 12,000 men.

This company is credited with making a careful selection of its territory and exercising discretion in regard to new town sites and the encouragement of building towns without unnatural boom. The close of the summer will see about 130 miles of new track completed by the Canadian Northern in the Province of Manitoba, including a line running up into a new territory between Lake Winnipeg and Lake Manitoba, where it is said 1,000 homesteads will thus be made accessible.

In Saskatchewan, the Canadian Northern is building 300 miles of new railroad, employing 2,500 men and 500 teams. One of the most important of the new lines now under construction in that province is the Maryfield extension, to be carried through the coal fields to Lethbridge, Alberta. Another branch of considerable importance is the Jack Fish line, which is being constructed from North Battleford into the Peace River country, and has 18 miles of steel already laid and another 40 miles graded. Then, most notable of all, is the Hudson's Bay line of some

450 miles, running from Le Pas to Fort Nelson, which is being constructed by the Government and will be operated, it is thought, by the Canadian Northern. At present the contractors are busy on the bridge that is to span the Big Saskatchewan River.

In Alberta, the Canadian Northern will build 450 miles of line. On the Vegreville-Calgary line the track has been laid to a point about 14 miles beyond Red Deer River, while the grade has been completed to within sight of Calgary. This line, when finished, will make in all 200 miles of steel to be taken over by the company for operation this fall. Grading has been completed on the line to Athabasca Landing, and an outfit has gone out to commence laying the steel. The most important work being done in the province is that on the main line, which has been graded as far as the Pembina River. On the Canadian Northern line to Peace River, 100 miles is to be completed this fall.

In British Columbia the work is confined to the main line, which is being constructed from Vancouver eastward to the Rockies.

The work in Ontario includes many minor improvements in the Thunder Bay-Algoma district.

It is stated that the Canadian Northern route between Port Arthur and Nipigon is so close to the Canadian Pacific that it is probable an arrangement will be made by which the two companies will run their own trains over a double-track line.

The Grand Trunk Pacific

The Grand Trunk Pacific is spending \$17,000,000 this year in constructing some thousand miles of new track. It is stated that 10,000 men and 4,000 teams have been engaged. There is keen competition between the Grand Trunk Pacific and the Canadian Northern as to which will first reach the Pacific coast. Up to the present the grade on the main line has been carried almost to Tete Jaune Cache, a point about 1,100 miles west of Winnipeg, while steel has actually been laid as far as Fiddle Creek, about 80 miles east of Tete Jaune Cache.

One of the most important branch lines which the company has under construction is that running 50 miles from Biggar to Calgary, where steel will shortly be laid. This branch will probably intersect the Edmonton-Calgary line a few miles north of the latter point, and when completed will offer the most direct route between Winnipeg and Calgary. The richest territory tapped by the Grand Trunk Pacific is said to be that traversed by the branch running southwest from Dandurand, a point a few miles west of Edson and entering down in the Brazeau fields, so as to serve the Pacific Pass Coal Co. It is estimated that there are 400,000,000 tons of coal available in this district.

The Grand Trunk Pacific also contemplates a line into the Peace River country.

From Regina to the international boundary a 100-mile line is being constructed; and, as the grade work is almost completed, it is expected the steel will be laid this fall.

In the mountain section a regular service has been

inaugurated to Vanarsdol, 100 miles east of Prince Rupert. The grade is well advanced for 140 miles farther eastward, and the company hopes to operate trains as far east as Aldemere this fall. Tenders will be requested shortly for the building of the 410-mile gap between Aldemere and Tete Jaune Cache, the link which will make the road complete to the coast. It is expected that the line will be thus completed by the end of 1913. An agreement was approved by the Prince Rupert city council on June 8 last under which the company was to give the city 100 feet of water front and certain areas for park and cemetery purposes; build a dry dock to cost \$2,500,000; build a station and other terminal buildings to cost \$1,000,000, and a hotel to cost a similar amount, in return for a fixed payment of \$15,000 a year as to taxes, for 10 years. The board of railway commissioners has authorized the company to open for traffic its line from Prince Rupert easterly for 100 miles, the speed of the trains to be limited to 12 miles an hour. A contract has been let to a Seattle contractor for the construction of a concrete wharf and warehouse at Vancouver for the company's steamship business; and plans are under consideration for the building of a similar wharf and warehouse at Victoria.

The Canadian Pacific Railway

Recently it was officially stated that the Canadian Pacific Railway had 10,758.8 miles of tracks now, as against 10,270.6 in 1910. To this there is to be added in the present year 1,023 miles over the whole system, of which 897 miles are being built in single track. It is understood that the company intends to spend in the neighborhood of \$12,000,000 in improvements and the construction of new lines in western Canada this year. A contract has been let for the erection of the station building in Regina, which is to be used jointly by the Canadian Northern, under the terms of an agreement between the two railways. The building will be three storeys high, with two wings, and is to be completed by May 1, 1912. The contractors started clearing the site on June 12. The proposal to build a car and other repair shops at some point in Alberta is under consideration.

The new lines include: Another branch for Lethbridge, Alberta; a line from Bassano to Langdon, Alta., looping the irrigation block; and a branch from a point 40 miles north of Taber, into Calgary. It is proposed to build a new station at Calgary, a new wharf on the Fraser River at New Westminster, and a large station and railroad yard at Vancouver, containing 180 miles of side tracks.

New Fireproofing Methods

One of the interesting features of the new City Hall in Chicago is found in connection with the method adopted for fireproofing different parts of the structure. For example, instead of fireproofing the columns with wire lath and plaster, they are fireproofed with 2 in. of porous hollow terra cotta, built 2 in. away from the extreme projections of the steel work, each course being wired on with No. 10 copper wire. The intervening space between the tile and the steel is completely filled with a rich Portland cement concrete grouting, poured into place. All pipes are allowed to be set outside of the fireproof covering thus constructed, so as to make it impossible for these pipes to damage the fireproofing.

The pipes are again protected against fire by another covering of tile.

The floor construction consists of 6-in. hollow segmental side construction tile arches, spanning the distance of about 10 ft. from beam to beam. The bottom flanges of the beam are protected with 2-in. hollow soffit tiles. Below this fireproof construction an additional fire protection is offered in the shape of a suspended ceiling of incombustible material. In the corridors the space intervening between the tile arches and the suspended ceiling is used as space for pipes. In this manner a double protection is afforded at the place where the heat will be greatest in case of fire.

Above the tile arches the beams are surrounded with 2 in. of Portland cement concrete. Cinder concrete is filled in on top of the floor arches up to a height of 4 in. above the top of the steel beams, and this construction will make it impossible for a fire to damage the top flanges of the beams. By introducing the segmental tile arch the dead weight of the floor construction has been cut down to a minimum.

July Building in Edmonton

The demand for houses of residential type in the city of Edmonton shows no signs of abating and is unprecedented. Numerous permits are applied for each day for new ones, the builder knowing that he will be sure to sell the house long before completion. Numerous business blocks are going up and there is a pleasant tone of industry in all parts of the city. The big Tegler Block, the framework of which is up to the sixth storey, is to have an additional storey to the number originally planned, making seven in all. The first floor was let in a long lease prior to commencement of construction, showing the great opportunities the city offers in the way of building investment. Several large blocks are projected and we expect to have these applications in during the coming month. House rents are on the increase and cases are rare where a habitable house is vacant for even a week.

The total issue of building permits for the past month amounted to \$474,909, which is an increase of nearly \$15,000 over July, 1910. The total of permits issued this year to date amounts to \$2,095,340, showing that in the city of Edmonton the building industry is playing a very important part among the others.

A novel method of building up cement piles or supports in quicksand is the subject of a German patent. A pipe of suitable size has at its lower end an auger point and a helical screw blade, several holes being driven through the wall of the pipe just above the blade to permit the discharge of cement grout outward. By water pumped through the pipe, the apparatus is twisted into the sand, jets being used to aid the sinking if necessary. When the required depth has been reached, the grout is pumped into the pipe and the drill is turned backward to withdraw it. Flowing out along the face of the blade, the cement becomes mingled with the sand directly above, and the turning screw passes the mixture to the space below. A cylindrical pile is thus built up in the semi-liquid sand. Others may be produced in the same way alongside the first, and these may be readily consolidated into very strong and substantial piers.

Local Type of Concrete Building

The Hamilton Gear & Machinery Company, specializing in cut gears and high grade tool and machine work, are erecting a building of reinforced concrete at the corner of Concord and Van Horne streets, Toronto. This structure is indicative of the extensive use to which reinforced concrete may be put, and



After five weeks; first storey forms in place

although comparatively small in size, provides for extensions both in height and floor area in a very simple and convenient manner. The accompanying photographs are shown to give an idea of the work as it has developed week by week.

The main beams are shown to run lengthwise of the building, while secondary beams cross them making three panels to each spacing between columns. This gives a maximum head room for crane work. The floor to ceiling distance is $16\frac{1}{2}$ feet, while the crane just clears the secondary beams. The crane girders, which are 10 inch I-beams, are shown in the accompanying illustration to rest on heavily reinforced concrete brackets poured integrally with the columns. The reinforcement consists of $\frac{3}{4}$ in. smooth rolled steel rods bent as shown with a large arc contracting by 4-inch radius and projecting downwards for approximately 6 inches. These pieces are inserted in the concrete just inside the four vertical rods for column reinforcing, while more centrally located are two $\frac{3}{4}$ -inch steel rods supplied at the ends with $2\frac{3}{4}$ -inch washers as shown.

The crane girders themselves are bolted together

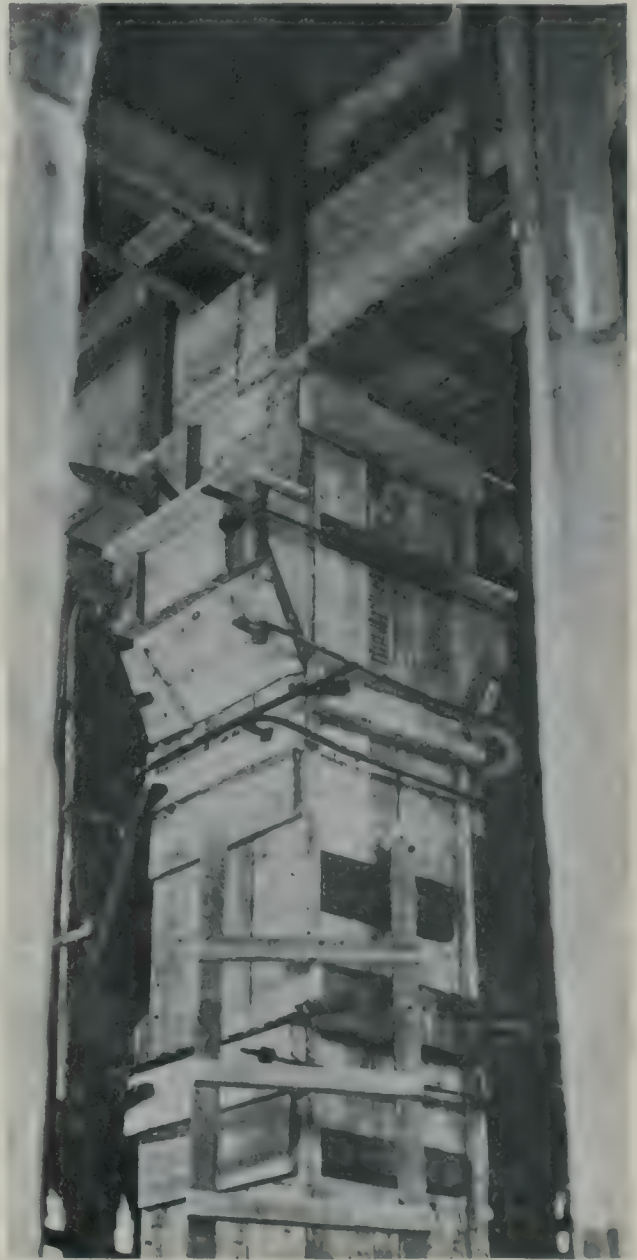


Building after removal of forms, showing window area

by two $\frac{3}{4}$ -inch tie rods on each side of the supporting column. The whole forms a very substantial support, of neat appearance and requiring but little space.

The line shaft for power transmission purposes is carried on post hangers bolted to the columns with

the pulleys just clearing the crane girder and having intermediate journals carried on brackets of angle iron forming a centre to centre distance between bearings of 9 feet 3 inches. The four slabs, which at the present time constitute the ceiling of the first storey, are of $4\frac{1}{2}$ -inch concrete with .29 square inches per foot reinforcing spanning 5 feet 4 inches in the clear, and .07 square inches per foot temperature rods running lengthwise of the panels. The secondary beams are



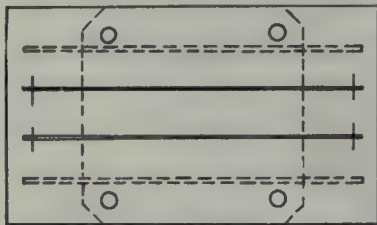
Pillar with crane brackets; note removability of all forms separately, including beam forms

10 inches by $18\frac{1}{2}$ inches, deriving half of their strength from the T action of the end beams. The inside main beams resting on the columns are 18 inches by 34 inches, the columns themselves being 18 inches by 18 inches. The outer long beams and the corresponding beam across the end of the building are 14 by 48 inches. Only a small part of this depth of outside beam is below the ceiling, giving ample opportunity for high and large window area, the remainder of the beam extending upwards to form a parapet wall and

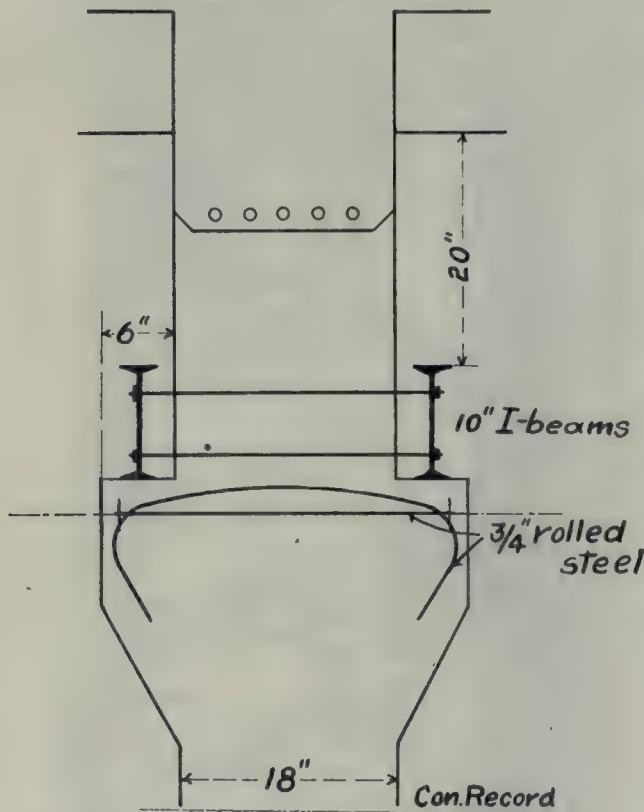
finished off with the window sills of the future second storey, which will also be of concrete of corresponding design.

The floor contains $4\frac{1}{2}$ inches of rock concrete, on top of which are laid 2 by 3 inch nailing strips with bevelled sides and 16-inch centres except 10-inch centres under the heavy machinery. The intervening space is filled with cinder concrete and an air space left to prevent future floor decay. The floor itself consists of $\frac{7}{8}$ -inch hemlock diagonally laid and covered with $\frac{7}{8}$ -inch maple. The windows on the sides of the building exposed to possible neighboring fires are all fenestra with wired glass. Approximately one

The temporary roof is surface graded with wet cinders rammed hard, and four inches of cinder concrete on the top, giving a surface pitch of three-eighths of an inch to one foot, with the lowest point in the proximity of one of the centre columns, where a cement funnel leads to a cast iron pipe inside the boiler room clear of all crane ways. At present ordinary 4-ply felt and gravel roofing is laid on the top of the cinder concrete surface, the top of the slab roof being unfinished as the second floor will be constructed in a manner similar to the lower floor already described. The plant is just commencing operations and the first orders are



Section A-B.



Diagrammatically showing peculiar reinforcement of crane bracket

quarter the window area in the building is of swing design for the purposes of ventilation.

The boiler room and blacksmith shop are in the same building, but are separated by a partition of 6-inch hollow tile and have cement floors, eliminating any danger of smoke and grit injuring the fine machinery in the other parts of the plant.

One of the photographs shows the arrangement of the joists and trimmer beams around the elevator shaft. Use is made of the same opening in the upper floor of both chimney and shaft, so as to eliminate unsupported portions of slab as much as possible.



Corner of ceiling, showing joists and trimmer beams

being put through. Mr. A. H. Harkness is the designing engineer and the Bishop Construction Company the contractors.

Users of reinforcing material will be pleased to learn that wire reinforcement has met with a progressive change of form which eliminates what has previously been a serious drawback. Owing to the fabric being shipped in rolls its tendency to curl during the process of laying has limited its general use. This has been regrettable owing to the fact that, for bonding, wire reinforcement is considered superior to any other material. It has been stated that the Page Wire Fence Company are now able by the use of special machinery to supply their wire reinforcing in flat sheets, thus getting rid of the curling tendency.

Building operations in Hamilton have this year exceeded anything previously reported. The industry has been very general throughout the city, and has included a large number of residences as well as factory buildings.

Proper Sizes of Culverts

At the present time practically all of the culverts are too small to carry the water that comes to them. The matter of the required area is one that has been given very little attention. When a new culvert is to be constructed, the township commissioners generally each make a guess as to the area required, and then agree by a majority vote as to what the size should be, which vote is largely determined by the amount of money that is available for a particular structure, or how many of the commissioners live in that neighborhood. There is no excuse whatever for this unbusinesslike guessing method, for the railroad companies have made accurate surveys of drainage areas and computed the run-off from the maximum rainfall per hour, and have designed their structures according to these scientific methods, and in most cases have had an opportunity to determine from practical use as to whether their computations were correct or not.

Drainage Areas and Approximate Areas of Waterways

Column D=Areas in square miles.

Column A=Areas of Waterway in square feet.

D	A	D	A	D	A
.01	2.0	4.8	443.0	60.0	1,650.0
.02	4.0	5.0	455.0	65.0	1,720.0
.04	7.5	5.5	483.0	70.0	1,780.0
.06	10.5	6.0	509.0	75.0	1,840.0
.08	13.5	6.5	533.0	80.0	1,900.0
.10	16.0	7.0	556.0	85.0	1,960.0
.15	25.0	7.5	579.0	90.0	2,015.0
.20	32.0	8.0	601.0	95.0	2,065.0
.25	38.0	8.5	622.0	100.0	2,120.0
.30	44.0	9.0	641.0	110.0	2,220.0
.40	56.0	9.5	660.0	120.0	2,315.0
.50	66.0	10.0	679.0	130.0	2,405.0
.60	74.0	11.0	710.0	140.0	2,500.0
.70	81.0	12.0	740.0	150.0	2,580.0
.80	88.0	13.0	775.0	160.0	2,665.0
.90	94.0	14.0	805.0	170.0	2,745.0
1.0	100.0	15.0	835.0	180.0	2,820.0
1.2	120.0	16.0	865.0	190.0	2,900.0
1.4	140.0	17.0	890.0	200.0	2,970.0
1.6	160.0	18.0	920.0	220.0	3,115.0
1.8	180.0	19.0	945.0	240.0	3,245.0
2.0	200.0	20.0	970.0	260.0	3,370.0
2.2	220.0	22.0	1,015.0	280.0	3,495.0
2.4	240.0	24.0	1,060.0	300.0	3,615.0
2.6	260.0	26.0	1,100.0	325.0	3,770.0
2.8	280.0	28.0	1,140.0	350.0	3,900.0
3.0	300.0	30.0	1,180.0	375.0	4,035.0
3.2	321.0	32.0	1,220.0	400.0	4,165.0
3.4	340.0	34.0	1,255.0	450.0	4,385.0
3.6	357.0	36.0	1,290.0	500.0	4,610.0
3.8	373.0	38.0	1,320.0	550.0	4,825.0
4.0	388.0	40.0	1,350.0	600.0	5,030.0
4.2	403.0	45.0	1,435.0	650.0	5,230.0
4.4	417.0	50.0	1,510.0	700.0	5,420.0
4.6	430.0	55.0	1,580.0	....	....

The factors entering into the problem of the probable run-off are the area of the drainage basin, the maximum rainfall per hour, the slope of the surface, the character of the soil, whether it is porous or compact, and whether it is cultivated or wooded. The accompanying table has been prepared by the Engineering Department of the Atchison, Topeka & Santa Fe Railway for the approximate areas of waterways for average drainage areas in eastern Kansas and Mis-

souri, where the rainfall is about 35 inches per year. (Estimates for other sections of the country would be based on proportionate rainfall and comparative similarity or dissimilarity of soil conditions and topography affecting run-off).

It will be noted that a normal drainage area containing one square mile, or 640 acres, requires 100 square feet of waterway area. These figures can be very easily kept in mind, and waterways for drainage areas up to four square miles readily determined, even though the table containing the tabulated data is not at hand, by multiplying the area in square miles by 100.

This table contains the most reliable information yet available. Since the drainage basins have been carefully surveyed, and records of the maximum rainfall kept, and the structures designed from this data have been in practical use for a number of years, such information is of inestimable value, and the areas of the waterways given here are as nearly correct as it is possible to learn at the present time.

In the construction of new culverts, this table should be carefully consulted after the drainage area and the character of the slopes and soil have been determined. It should be remembered, however, that these waterways are for average drainage areas.

A large riveted steel stack has been recently erected in Cleveland, Ohio, at the foot of East 70th street, for the new power house of the Cleveland Electric Illuminating Company, where it will serve 18 boilers of 600 h.p. each. The height of the stack alone is 216 feet, which is increased to 275 feet by the structural supports. The outside diameter is 22 ft. at the top and 40 ft. at the base where it flares out like a bell. The diameter inside the brick lining is 18 ft. 6 ins., the same from top to bottom. While it is not the highest in the world, it is claimed by the builders, the James McNeil & Bro. Co., of Pittsburgh, Pa., that this is probably the largest steel stack, considering both height and diameter. The weight of material in the stack proper, not including supports, is given as 400,000 lbs. A total of about 30,000 rivets was used in its construction.

Four different thicknesses of plates are used in the stack walls, decreasing by sixteenths from 7/16-in. thick at the base to 3/4-in. thick at the top. Each thickness of plate is used over a length of from about 35 to 55 ft. of the stack. The brick lining extends from top to bottom, varying in thickness from 26 1/2 ins. at the bottom to 4 ins. at the top. Its thickness is decreased by steps of several inches each at intervals of from about 30 to 55 ft. The breeching opens into the stack at two points directly opposite each other. The openings are 13 ft. square. The stack is held to its foundations by 14 anchor bolts each 10 ft. long by 2 ins. in diameter. At both ends of each bolt a length of 6 ins. is upset to 2 1/2 in. diameter for threading. Four similar additional bolts, each 6 1/2 ft. long, are used at the foot of the jamb posts of the breeching portals.

Since the first laying of bitulithic pavement in Toronto, about ten years ago, there have been upwards of 400,000 square yards put down in this city. Some of the good qualities that have made themselves evident are economy in cleaning and repair and a rough surface that is favorable to motorers and drivers.

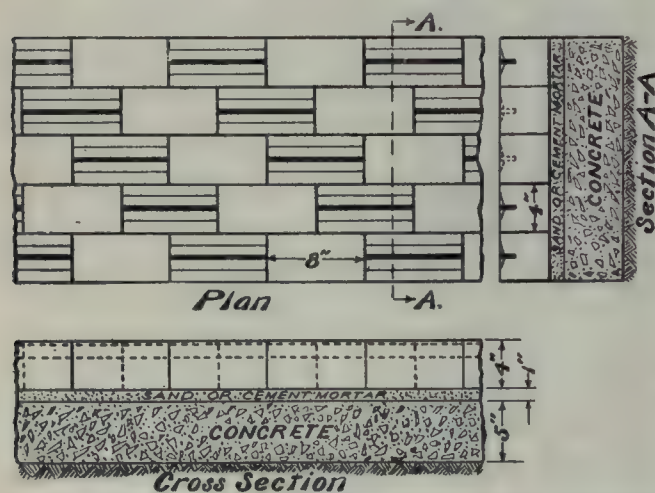
A New Wood Block Pavement

A wood block pavement of unusual construction, which is designed to overcome the slipperiness incident to ordinary pavements of this material, has recently been brought out.

Each of the materials used for paving has certain well defined advantages and disadvantages which make the selection of the kind to be used on any given street a matter of judgment as to what qualities are most essential in that particular case. Treated wood blocks have been used extensively in city pavements, in some cases, as in New York city, for example on thoroughfares carrying the heaviest commercial traffic. One of their greatest merits is noiselessness, while at the same time they have the disadvantage of being slippery when wet. Most of the adverse criticism to which wood block pavement has been subjected has been on this score. As a consequence, its use has, in the past, been limited to streets having comparatively light grades.

The new pavement is designed with the view of eliminating the slipperiness, and, therefore, making wood blocks available for the paving of streets with heavier grades than those on which wood is now used. It is intended, at the same time, to preserve the noiselessness and other advantages possessed by the material.

In order to secure the desired result a special block is used. This block, which is shown in one of the accompanying sketches, is 8 inches long, 4 inches wide and 4 inches deep. It may be made of any of the varieties of wood commonly employed for the manufacture of paving blocks, and treated by any of the usual methods. The top of the block is grooved as shown, and an iron grid inserted in the middle of the groove. This grid is $\frac{3}{8}$ in. in width and $1\frac{1}{4}$ ins. in depth, and extends the whole length of the block. Its top is flush with the top of the block. The groove begins one

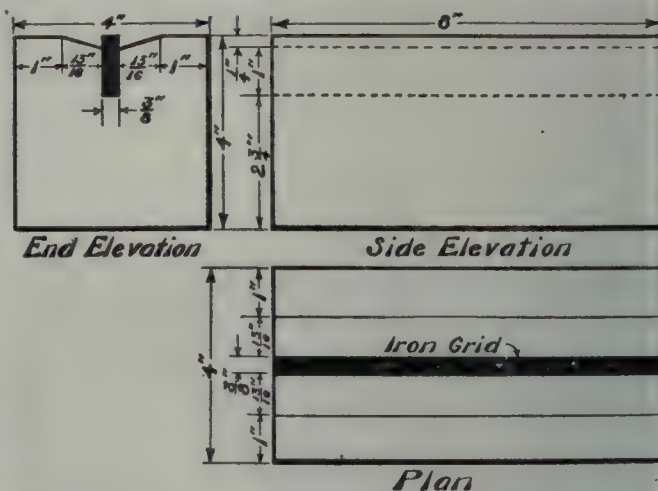


Showing Method of Laying Safety Wood Block Pavement.

inch from either side of the block and is $\frac{1}{4}$ in. deep at the grid.

In the construction of a pavement, the special blocks and ordinary blocks of the same size are laid as shown in the second sketch. The blocks are laid across the street at right angles to the curb lines, each alternate block being a special. As the blocks in adjacent rows break joints by half the length of a block, a longitudinal section (as A-A in the sketch) shows two specials alternating with two regular blocks.

In the sketch, the blocks are shown resting on a 1-inch sand or cement mortar bed on a 5-in. concrete foundation. This construction may, of course, be varied, and the pavement laid according to any specifica-



Showing Special Block Used in the Safety Wood Block Pavement.

tions for foundation and cushion. Any desired filler, also, may be used.

Work on the Guelph sewage plant is making excellent progress and it is expected that everything will be completed for operation in a few months. The six new beds, of which three are completed, are being constructed directly north of those now in operation. A layer of broken stone is first laid in the bottom. This is covered by a layer of crushed stone, which is followed by layers of three different grades of gravel, all being covered with a coating of sand. About 500 loads of gravel are required for each bed. The sewage is conveyed by pipes to wooden troughs which extend lengthwise across the centre of the beds, where it flows out spreading over sand and gravel through which it filters into a covered drain, from which it is run into the river. The sewage farm will be operated on the intermittent system.

Considerable difficulty is being experienced in the construction of the Strathcona intake pipe owing to the swift and deviating currents in the Saskatchewan river, especially during the spring and early summer months. The winter season was considerably advanced before the contract had been awarded, and owing to the necessity of removal of a large quantity of ice it was found impossible to instal a pipe before the spring break-up. The city engineer later undertook the work by day labor, but after laying about 90 feet of the pipe at great expense, the intake had to be abandoned until ice begins to form on the river next winter, when an attempt will be made to lay the additional 330 feet of pipe line. In the meantime the three sections of pipe already laid remain unused.

The Union Trust Company of Winnipeg are about to build at the corner of Lombard and Main streets, test foundations if rock is too deep to allow of making a sufficiently strong foundation, the builders will put a pedestal pile foundation and will consist of twelve stories, first two of granite and remainder of terra cotta.

The Extras and Omissions of Contracting

**Where Quantity Surveying Eliminates a Host of Difficulties—
Written Orders Should Feature every Alteration—Day Work Prices**

The term "variations" has a different significance according to the point of view from which they are looked at. From the one point "additions" are the characteristic features, and from the other, "omissions." The foreman generally does not beat about the bush, but designates them boldly "extras;" but in an article on the subject, *The Builder*, London, deals with the term literally, as there are few contracts where items to which both terms apply do not occur.

If all contracts were carried out strictly to the letter, as far as procedure is concerned, and given a good bill of quantities consistently priced, this should not be a troublesome matter, but this premises a good set of drawings and full details prepared at the outset, a full specification, every order for a variation given in writing—how often is this precaution omitted and with what unfortunate results—day-sheets, verified by the clerk of works, and sent in week by week, and a careful record of all work covered up, agreed to as correct by the contractor or his foreman and the architect or the clerk of works, or else measured by the surveyor during the progress of the work. Such would be the ideal condition of things; but we are afraid it is not the lot of many surveyors to find such an ideal condition when proceeding on to the works to take up the measurement of variations.

The Pricing of Quantities

Looked at from the surveyor's point of view, it is presumed that he prepared the original bill of quantities, so that there will be nothing to find fault with on this head. We must—if only as a matter of courtesy—reckon that the drawings and specification are all that can be desired, so that eliminates another element of trouble. We then come to the question of pricing—the question of ascertaining what are variations and the measurement of same we will leave till later. What a fruitful source of difficulty the inconsistency of pricing that occurs in so many bills of quantities occasions. The "slips" of pricing "feet" for "yards," "yards" for "squares," and vice versa, one is continually running across, and there are great possibilities in this direction. Then those misreadings—to name a few of which have come under our notice. "Half brick walls in cement," at $\frac{1}{2}$ d. per foot on the supposition that the item is an extra over the bulk brickwork for building $4\frac{1}{2}$ -in. walls, although nothing was said to this effect. Another striking instance was an item of stone facing which was priced as "extra over brickwork," although the note "labor and materials" was put at the end and also underlined. This worked out on the variations as an extra cost. The builder, however, content with his good fortune in having saved some of his loss, did not press for the extra, although under the contract we do not think there is any doubt that he could have done. Still another. A client decided to have corrugated iron roofs to some large sheds in lieu of slating and boarding, and, being in fear of prices being "faked" as he termed it, refused to have the matter gone into before deciding (the priced quantities being sealed). He

found at the end that he paid more for the corrugated iron than he would have done for the slating and boarding owing to the high price of the former and the low prices for the latter in the contract. These examples could be multiplied indefinitely, but those we have given are sufficient for our purpose. The question arises as to how far it is permissible to deal with the prices after the tender is accepted, but before the contract is signed. It is obviously unfair to other competitors to allow the contractor whose tender is accepted to make any addition to his price. On the other hand a contractor may reasonably object to reduce his price. The fairest method, therefore, is to examine the prices beforehand, rectify obvious errors, and, if they make any appreciable difference to the total, to treat this difference as a percentage on the prices (as an addition or omission, as the case may be) in the final settlement of the accounts. This method eliminates one element—that of inconsistent pricing—that is often a cause of trouble. Where this procedure has not been followed our experience has been that in a friendly settlement of accounts neither side holds to the strict letter of the contract, but brings into play a wise discretion. On the one hand the client does not insist upon the contractor executing extra work at what may be a ruinous price, and on the other the contractor does not ask to be paid an obviously excessive price for extra work, notwithstanding the fact that he could claim such under the contract. Of course, this could not apply generally, but only in such cases as we have given examples of. It may be considered that this is establishing a dangerous precedent, but we have found in practice that, so far from causing complication, the result is quite the reverse, and it is obvious that this course is only possible where there is mutual confidence such as ought to obtain—and we are happy to believe does obtain—with any extended business relationship. In those cases where either party approaches the business with the object of scoring off the other, the only course open is to stand strictly by the letter of the contract and each fight his own battle. It then becomes a case of "diamond cut diamond."

We have dealt somewhat fully with the question of inconsistent pricing, perhaps more fully than some may consider the importance of the question warrants, but we think that most contractors and surveyors have frequently been faced with the difficulty of arriving at a fair result when these discrepancies occur. We have, therefore, given the results of our experience extending over many years and under varying conditions, and we venture to hope with satisfactory results to all parties, to be considered for what they are worth.

How Variations Should be Dealt With

The question of ascertaining what are variations now claims our notice. If the architect is careful to have every variation ordered in writing, the procedure is simple, and contractors would be well advised to ask for this, or, at any rate, to confirm in writing

such orders if given verbally. Much trouble will be saved by this precaution, as such confirmation, in the absence of any protest from the architect, must necessarily be strong evidence for the surveyor to act upon. Some architects hand their surveyors all the correspondence relating to the work to be examined and notes made, so far as the letters relate to the question of variations, and we have found this works well. Where the architect keeps an order book for variations, the orders, of course, are unmistakable evidence, and unless he receives special instructions from the architect no surveyor would deal with any claim for a variation raised by the contractor, unless he could produce such an order. We would therefore strongly urge both parties to a contract to see that every order, whether for extras or omissions, should be in writing in some form or other.

We think it is generally agreed that the bills of quantities should form part of the contract in fairness to all parties. In practice we generally find this is accepted (although there are notable exceptions in the case of some public bodies), whether it is so stated or not. A good deal of discretion should, however, be exercised by both parties as to how far this should be carried, and it is, of course, obvious that it may cut both ways. The contractor who adopts a policy of "grab" by raising every little question may find himself met with items which far outweigh any claim he may make under this head. On the other hand the surveyor who either from incapacity or carelessness leaves many openings for such claims deserves all the trouble that falls upon his head, and the architect who finds himself involved in difficulties (because, after all, the architect is often the one to suffer) would do well to select another surveyor.

The Measurement and Pricing

When measuring variations it is most essential that the system adopted should be identical with that of the original dimensions. The pricing will then be found quite a simple matter. It is a good system to keep each item separate regardless of the form of the final account, as it is easy to afterwards group items together in the final summary of accounts.

The pricing, to those who are conversant with the subject, should not be the debatable matter that it often is, but "trying it on" on either side is reprehensible—waiting to see what the other side will say instead of naming a fair price and sticking to it. In the case of a well-priced bill of quantities there should be very few debatable points on this head, as it ought to be easy to make up new prices from those of the contract. We say should be, but we are afraid that there are more bones of contention over the question of pricing, owing to inconsistency and want of method, than over any other portion of the work.

The question of day works has been, and probably always will be, a vexed one. These should be kept carefully and signed for by the clerk of works as correct, but it should be distinctly understood that in no case should the signature of the clerk of works be construed into either an order or even an undertaking that the item should be treated as day work, but simply as a record of the correct time and materials, leaving it to the discretion of the surveyor as to whether the item should be measured or accepted as day work.

Theoretically in many cases there should be no discrepancy between the price for work on a day-

work basis and that on a measured basis, but we are afraid this state of things is the exception rather than the rule. It has always been our experience that where this theory has been accepted by the contractor, there have been fewer grumblings at losses than where there has been the attempt to get day work adopted at all costs, and we are speaking of contractors', not individual works. Where the contractors have accepted this theory we have found a perfect system of business in every department—good bookkeeping, good supervision, good feeling, consistent pricing even in competitive works, and evident prosperity. We emphasize these points so as to remove the possibility of a charge of slackness or generosity on the part of such contractors.

Although in most cities there is a general schedule of day-work prices arranged between the local institute of architects and the institute of builders, we do not think these should obtain in those cases where the price for materials are inconsistent with the prices for labor and materials in the bills of quantities, although some contractors contend that these schedules override the bills of quantities. It is, however, surprisingly rare to find it absolutely impossible to measure work if the surveyor is really competent. That, at least, has been our experience.

We have dealt with the subject, taking as a basis an ordinary competition on bills of quantities, that being the more common procedure in works of any size. In those cases where the contractor is paid a percentage on his cost there can be no question but it should be clear as to whether the cost is to include establishment charges or not, as doubt on this point often leads to trouble. We have emphasized the question of pricing as it is so often on this question that the settlement turns. If trouble arises from unbusinesslike action on the part of either the architect or contractor, or the before-mentioned policy of "grab," then we are afraid there is no system to satisfactorily meet the case, but we would again impress upon contractors the necessity of careful pricing and good bookkeeping and supervising. The latter would stop many wastages and leakages that so often occur, and which sometimes turn a profit into a loss, while the former enables the contractor to obtain all he is entitled to, and such being the case the work should show a profit.

So much has lately been said upon the subject of specialists, and the supply of special articles, that we do not propose to deal with this question beyond suggesting a sharp look-out as to the charges for carriage and packages, and also the credit of returned packages, which is often a much larger matter than at first appears.

In no other country in the world, it is asserted, are there such vast, varied, and valuable deposits of gypsum as in Nova Scotia. The exposures show beds of from a few feet to hundreds of feet in thickness, ranging in color from gray to snow white, and frequently of the best quality. Some of the deposits have been worked for nearly a century, but during all this time only two mills have been established for the manufacture of gypsum products. The production of gypsum rose from 300,000 tons in 1908 to 322,974 tons in 1910, practically all being sent to foreign countries.

Hot Country Methods

The placing of concrete work in countries with arid climates calls for very careful calculation of the proper amount of water to be used in both the mixing and curing operations. In many countries where cement is now being used the thermometer is known to register above 100 deg. F. for the greater part of the year and for several months of the time it ranges daily from 106 to 115 deg. F. Referring to the manufacture of cement pipe to illustrate the water requirements and rapidity of cement setting, a writer states that even where sufficient water is used in the concrete to bring the web-like water marks to the outside of the pipe during ramming, the pipe will require and takes in the water from 20 to 30 minutes time after it is made, and will withstand a hose pressure, full force, equal to 25 pounds per square inch in from three to four hours' time thereafter. As to gain in strength due to rapid setting with a 1:5 mix of well proportioned sand and gravel, it is possible to make three pipes upon the same ring within nine hours. This necessitates the removal of the ring from two of the pipes during one and the same day. At the end of two weeks' time, however, the cured pipe will withstand repeated severe blows delivered upon the side of the pipe wall and at right angles to the pipe access, from a $\frac{3}{4}$ -inch iron pipe sufficient to bend and flatten the same without any injury to the cement.

In the building of cement pavements general practice is to place the concrete base of a slushy mixture upon a well wet down sub-grade, using in the mixing all the water that the mixture will carry without reducing the specific gravity below the point where the gravel will still be held in suspension in the mortar, and without using sufficient water to produce the first appearance of white streaks which foretell a condition that will result in laitance if more water be added. The evaporation is so great that by the time some 50 square feet of this machine mixed base of 1:7 concrete has been placed 4 inches thick and rodded off, the first half of it will be in a proper condition to be rammed down to a thickness of $3\frac{1}{2}$ inches.

This base is followed as closely as possible by a half inch wearing surface composed of one and one-half parts sand and one part cement, mixed with sufficient water to render the mixture sloppy. A finisher and helper must be accurate to edge, mark off and finish the top coat in time to catch the moisture as it goes down and not resort to sprinkling. In the building of a cement walk as described above, the rapid evaporation takes out all excess moisture and the proper floating and troweling gives density and a lasting bond is secured. With forms already in place seven men will lay and finish 2,000 square feet of 4-inch walk in a working day of nine hours. After finishing, the practice is to cover the walk with moist earth as soon as possible and follow by a thorough sprinkling on the same day, together with a heavy covering of wet earth and a good water-soaking daily for the next week or more.

It is stated that under the conditions of the intense heat of some arid countries the strength of concrete attained in a fortnight will equal the strength of concrete attained in the damp and cool climates in a 30-day period of any time of the year.

New G. T. R. Hotel, Winnipeg

The accompanying illustration shows an architectural perspective of the new magnificent new Selkirk Hotel building that the Grand Trunk Pacific Railway Company propose erecting in Winnipeg. The construction will be fireproof and the interior is to be finished in marble, cane stone and mahogany, while



Proposed Hotel Selkirk.

the exterior will be buff brick, with facings of cut stone. When finished the Selkirk is expected to be the handsomest and most luxurious hotel in Canada. Messrs. Ross & McFarlane, of Montreal and Winnipeg, are the architects. They have recently opened an office in the latter city, having consolidated with Herbert B. Rugh, who will be in charge of the erection of the building. Tenders have been received, and ground will be broken for the excavation immediately after the letting of the contract.

Slate for Flat Roofs

The main uses of slate at present are for overlapping roofing, suitable for laying only on a sloping roof; and this immediately sets a limit on its use. In many classes of buildings, such as residences, churches, or public structures, sloping roofs are highly desirable, whether for ventilation, increased space under cover, or architectural effect. But in other buildings, such as factories and city structures in general, flat roofs are imperative. The application of slate to flat roofing manifestly opens up great possibilities. This has now been made in what is known as inlaid slate roofing, not by any means an experiment, but a roofing that has been laid on many buildings with a high degree of success.

Because of the peculiar climatic conditions prevailing in the Canal Zone on the Isthmus of Panama, resulting in rapid deterioration of rock-cut faces on exposure to the elements, the experiment will be tried of protecting rock cuts by coating them with cement.

The St. John, N.B. Builders' Exchange

The Builders' Exchange of St. John, N.B., is a live organization in the eastern province, and has been very heartily and largely responded to by the leading contractors and builders in and around the city. This year it has for its president the Hon. Robert Maxwell, M.P.P., while Mr.



Hon. Robert Maxwell, M. P. P., President, St. John Builders' Exchange.

Chas. F. Stevens is the secretary. The membership of the Exchange includes the contractors in almost all the many branches of work going on in the city, masons, carpenters, plumbers and heaters, painters and decorators, sheet metal workers, roofers, house raisers and movers, as well as general contractors, form a greater part of the list. The organization is rapidly getting into working order and is this year devoting considerable attention to unfair and profitless competition among builders, as well as innumerable other existing and short-lived evils that are constantly presenting themselves for ratification.

Bridge of Immense Single Span

A new bridge is being constructed across the Spokane River in Spokane. This will be the largest single span of reinforced concrete in America, at the time of its completion, which will be early in October. The central span is 281 feet, or 12 inches longer than the bridge over the Rocky River, in construction at Cleveland, and 58 feet longer than a similar structure at Philadelphia, which for some little time held the distinction of being the longest span of its kind. The cost of the Spokane bridge will be about \$550,000.

In connection with this it is to be noted that a span of 285 feet has been adopted to carry the New York Barge Canal over the gorge at Medina, N.Y., and the span of the proposed Hudson Memorial Bridge is to be 710 feet. With the exception of this bridge the largest single span yet proposed is one of 328 feet to be built over the Tiber, as described in the July issue of the Contract Record. A bridge under construction in New Zealand will have a 320 foot span.

Cement Production in Canada

The following table denotes the rapid advance in the Canadian manufacture of Portland cement, and the corresponding decline of natural rock cement. The figures are for the past ten years.

Year	Natural Rock Cement	Portland Cement
1901..	133,328	317,066
1902	127,931	549,594
1903	92,252	627,741
1904	56,714	910,358
1905	14,184	1,346,548
1906	8,610	2,139,164
1907	5,775	2,436,093
1908	1,044	2,665,289
1909 .. . . . .	.....	4,010,180
*1910 .. . . . .	.....	4,753,975

*Subject to revision.



Chas. F. Stevens, Secretary, St. John Builders' Exchange.

The Cement Products Exhibition Company, 72 West Adams Street, Chicago, has assured the prospective exhibitors at the New York Cement Show that the sale of Madison Square Garden will not affect the holding of the New York exhibition in this building. While most of the reports which have been circulated during the last three years that Madison Square Garden was to be demolished, seem to be untrue, it is a fact that a New York syndicate has recently arranged to purchase the building with the intention of erecting a big office building in its place. The contract for the purchase of the property, however, will not become operative until about March 1, 1912, which is several weeks after the dates set for the New York exhibition.

The coming show will be the last time the cement gathering will be held in the celebrated old structure on Madison avenue and Twenty-seventh street.

The Investigation of Water Impurities

Water for Industrial Purposes and for Household Use—Examination is Necessary for Both—Example of Inferences Drawn

By L. K. Russell, B. S.*

That pure water is one of the factors making for good health, few deny; but in a strict sense the mention of pure water is speaking of something that rarely exists, for even the distilled water of our laboratories is not pure in the chemist's sense; that is, it does not consist entirely of the elements, hydrogen and oxygen, chemically combined. Water is so readily a solvent of all kinds of matter, gaseous as well as solid, that unless extreme caution is taken, it is never chemically pure. When so prepared, as it may be occasionally, for experimental purposes it is to the scientist worth any price.

But what we intend to say, and what we desire is not a pure water but a safe water,—one not likely to injure health. Such water we can find quite readily; and it is with this object in view, to prove the safety and guard against its pollution, that examination of water is made. The examination of water is made generally for two purposes: to determine its fitness as a potable water, i. e., for use for household or domestic needs; and its use for industrial purposes.

The Examination of Water

The examination of water for the first class is called the sanitary water analysis; and of the second class, industrial water analysis.

The examination of these two classes is not distinct. The sanitary analysis includes the total amount of mineral matter held in solution, and the amount of that matter which causes "hardness," i. e., the precipitation of soap preventing formation of lather. Industrial analysis includes this, but it determines also the particular substances which cause scale or corrosion.

The specific mineral contents are often determined in so called mineral waters, but rarely with the exception of "hardness," in sanitary analysis.

The sanitary analysis of water includes the physical, chemical, and microscopical analysis, and the bacteriological examination. The object, as stated before, is to find out the quality of the water. Is the water at present receiving pollution of any kind? To what extent? Has the water at any time somewhat remote received pollution; if so, what is the origin of this pollution, animal or vegetable? Is the water hard or soft? Are there any vegetable organisms which by growth and decay are likely to cause nuisances due to odors? All these questions and others, the chemist has to answer from his sanitary examination.

In our laboratory work we shall devote the time to physical and chemical examination, and shall only learn of the methods of the microscopic and bacteriological.

Sources of Water

The sources of our water are the dew, rain and snow which fall upon the earth's surface. The process by which this takes place is exactly similar to that of distillation and condensation, as conducted in the laboratory. The evaporation takes place from the ocean and larger lakes aided by the sun's rays and the winds. This moisture carried into the atmosphere remains until, by a change of temperature, condensation occurs and the moisture is precipitated, as rain or snow, depending upon the temperature. This precipitation is at first practically distilled water, but even in its passage through the atmosphere it absorbs gases, as car-

bon dioxide, ammonia, oxygen, and in the neighborhood of towns and cities sulphur dioxide, soot, and dust particles, both mineral and organic. It is quite high in ammonia.

Rain water is a "soft" water, and contains little mineral matter in solution; but when it reaches the earth it begins at once to dissolve the mineral salts, carbon dioxide, and "albuminoid" ammonia, of which latter we shall have much to say. The water thus enriched is capable of greater solvent action on rocks and soils. The water collects and may form rivulets and brooks, enlarging later into ponds and rivers, or it may sink deeper into the ground and then emerge as springs or become our wells. The rivers and ponds,—so-called surface waters, pass through the fields and forests where they take up considerable vegetable matter, such as leaves and peaty material. The color of the water is changed by this; and from the colorless water of the rain (that away from towns, at least) as viewed by looking through a considerable layer upon a white surface, as in Nessler tubes, it changes to a yellow or a brown color. This depends upon the amount dissolved, the color deepening with increasing amounts, similar to the steeping of tea. This vegetable coloring is organic matter. It is a highly complex molecule containing the elements carbon, nitrogen, oxygen, hydrogen, and is called by the name of "albuminoid ammonia." The estimation of the amount of albuminoid ammonia is important, but we must take into consideration its origin. If this be leaf or peaty matter, it is harmless, but if it be household and city wastes, which we may designate by the term sewage, it is objectionable and likely to be highly injurious. Our analysis of albuminoid ammonia does not point out its source.

The water which sinks into the earth will take up a larger amount of mineral matter, but there is much less organic matter, peat or leaves. This water should be practically colorless. In distinction from the water which flows over the surface of the earth, surface waters, we designate wells and springs, as ground waters.

Water Pollution

Up to the present we have assumed that the rain fall which we have followed in its collecting together, either as a surface or ground water, has not come in contact with the "wastes of human life." Such a condition could not long be maintained except in the virgin forests far away from habitation of man. Far up on the hillside it may be, a lonely farm house has diverted a little stream for drinking purposes. It flows through a sunken trough, where it may be dipped up both for family and barnyard use. A little way below this trough the flow from the kitchen sinks finds its way into the brook. This it may do by directly flowing along the surface or sinking into the ground, emerging again into the brook, with less turbidity and other changes not so apparent to the eye. Again, the family cesspool, the barnyard with its manure heap, and the fertilized fields all have drainage outlets into the brook. This process of adding to the brook the "wastes of civilization" is repeated over and over again as the brook, increasing in size to the river, continues on its way. What the changes are which take place under the circum-

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stances described, we will relate further on, but what we must remember is that along with the "household wastes" there may be disease germs, or typhoid. Of course, there are chances of purification. Seeds of tiny plants sprout and grow in the water, feeding upon the products of organic decay which have entered the water.

A part of the water sinks into the sand, and by this filtration becomes freed from suspended matter and disease germs. By running over rocks and minute waterfalls oxidation by the oxygen of the air takes place. Another purifying process is its storage by which suspended matter settles, and oxidation goes on.

Organic Matter in Water

We have named the elements of organic matter as carbon, hydrogen, oxygen, and nitrogen, the latter being the essential element of animal life, and by its quantitative estimation we may judge the pollution of the water. This may be present in at least four combinations, and our sanitary examination includes these four determinations, viz: albuminoid ammonia, free ammonia, nitrates and nitrites.

The term albuminoid ammonia, includes all the highly organized complex forms in which the nitrogen may exist as organic matter, and is the form in which the latter enters into the water. As previously explained, we cannot distinguish by this fact alone, the source of the nitrogenous matter, whether harmless vegetable matter, or the extremely harmful animal refuse. But once in the water, decomposition sets in, aided if not caused by the minute organisms, known as bacteria; and organized nitrogen passes from the form of albuminoid ammonia to free ammonia, remaining in this form in solution. In passing, we may remark that the animal refuse will more quickly pass through the change noted than vegetable matter. Nitrogen as free ammonia next passes by bacterial action to form of nitrites, and finally into form of nitrates. Our surface waters are high in albuminoid and free ammonia, and the ground waters in nitrates and nitrites, especially the former. In fact, the forms of free ammonia and nitrites are transition forms, while the nitrates are a permanent form, and are not decomposed by bacteria, but only by chlorophyll or greengrowing plants. We judge of the nearness or of the remoteness of the pollution by the form in which we find the nitrogen present. A water high in albuminoid with some free ammonia, and nitrites, but low in nitrates, has received pollution within a short time. If these are low and nitrates high, pollution took place at a period somewhat remote. If all are present, the water has received pollution not only at a remote stage but is also receiving it at present.

Chlorine in Water

Another accompaniment of animal refuse pollution is chlorine which enters the water as sodium chloride, or common salt. We must, however, take into consideration that all water has present in it some chlorides which it dissolves from the soil or which has blown into it from ocean fogs. So in our final decision of the quality of the water we must take into consideration its source and locality. Distance from the ocean, the existence of mountains between the water and the sea will regulate the amount of sodium chloride carried along by the winds and deposited in the surface waters. One very important point must be noticed in regard to chlorine, once in the water it remains as it enters. There are no such transformations as is the case with nitrogen compounds. For this reason and the fact that it is present in sewage it is looked upon as helpful determination especially in surface waters, where any considerable amount over the normal for the region lends one to view the water with suspicion.

The "total solid residue on evaporation," or as it is more often called "total solids" is determined. This gives a measure of the solid matter held either in suspension or solution; and when this residue is gently ignited, (heating the outside of the dish containing the residue with the flame of the Bunsen lamp) by which means the organic matter is charred and oxidized, and thus removed, we get a measure of the carbonaceous matter present; for a second weighing will detect this removal. This is reported as "loss on ignition," or volatile matter. The difference between the weight of total residue and loss on ignition is considered to be the mineral matter.

Another method which gives a measure of the carbonaceous matter present is that of "oxygen consumed." The water is heated with a known amount of oxidizing agent, as potassium permanganate, this giving up its oxygen in proportion to the amount of carbonaceous or easily oxidizable matter present. By analytical methods we can determine the amount of our reagent so decomposed.

WATER FROM POTSDAM WELLS

In Parts Per Million

Total Hardness	I	249.0	II	533.8
Oxygen Consumed	I	0.0	II	33.17
Chlorine	I	7.0	II	24.12
Nitrates	I	1.5	II	36.0
Nitrites	I	0.0	II	.002
Free Ammonia	I	.008	II	.076
Albuminoid Ammonia	I	.012	II	.16
Total Solids	I	370.0	II	900.0

I—Does not indicate pollution. II—Indicates pollution.

Summary of Results To Be Obtained by Analyses

The "hardness" of water determines its fitness for domestic purposes, especially for washing, as very hard water increases soap bills and is rough on hands and clothes.

In addition to the chemical tests given, a physical examination is made to note odor, hot and cold, turbidity, sediment, and color.

Under the microscope an examination is made to detect such micro-organisms as would by their growth and decay cause unpleasantness to sight, smell or taste. In some cases special samples are taken to find out the number of bacteria per cubic centimeter.

In the ways mentioned by chemical, physical, microscopical, and bacteriological tests an accumulation of evidence is obtained, from which the water analyst passes judgment upon the desirability and safety of the water for potable purposes. This is not a simple task, as there is no hard and fast line up to which the amount of a substance may go and be safe, and above which the water is to be condemned.

The task before the water analyst is not like that of the assayer who reports definitely that the ore submitted to him contains a certain number of ounces of gold per ton, but rather it is that of the physician making his diagnosis from observed symptoms. The data we have collected tells us the past and present history of the water, and with a knowledge, if possible, of its surroundings we must advise whether or not it is best to use it.

According to reports from Edmonton the shortage of cement is still very grave. The Edmonton Builders Exchange appointed a committee to investigate the deficiency and ascertain what steps should be taken to relieve the highly unsatisfactory situation. The committee, however, have decided that they can do nothing, and the Board of Trade will be asked to make an investigation. At present the price of cement in Edmonton is \$3.25 to \$3.50 barrel.

General Notes on Placing Reinforcement

Pointers Relative to Cleanliness of Steel—Assembling, Centering, Spacing and Binding are Among the Many Points of Importance

By Jerome Cochran, C.E.

As soon as the steel reinforcement is delivered at the site it should be carefully checked, assorted and stored in such a manner that it can be readily inspected. The steel should not be permitted to lie on the ground, but be blocked up several inches. It should always be protected from rust, dirt, oil, paint, etc., and so stored that those portions needed first may be reached without disturbing the remainder.

Handling Reinforcement

All metal which has been bent or otherwise injured in handling or in transit should be carefully repaired before being used, it being insisted upon that all bars shall be straight and free from flaws in any degree calculated to impair their strength. Should any bar be broken it should be laid aside and another bar of the same length and cross-section procured without delay.

Cleanliness of Steel

The steel reinforcement, before being placed in forms, should be thoroughly cleaned from loose, scaly rust, dirt, oil, paint, or any coating that may be detrimental to the positive adhesion of the concrete to the steel. A slight film of red rust, which facilitates the forming of a hard film or coat of ferro-calcite and increases the adhesion of the concrete, should not be considered objectionable, but any bar on which rust scales have begun to form or have already formed, should be unconditionally rejected, unless such scales are thoroughly removed with wire brushes or by other means. Concrete which has lodged on the steel and hardened during previous work should be entirely removed before the reinforcement is finally concreted in, so as to insure a better adhesion of the fresh concrete to the steel.

No steel reinforcement should be painted or oiled, although some engineers have specified that the steel shall receive one coat of pure linseed oil before leaving the factory.

Methods of Cleaning Reinforcement

All heavy rust and mill scale should be removed from the reinforcing metal by hammering, steel scrapers or brushes, pickling in a weak solution of hydrochloric acid, or by some other equally efficient means of cleaning the metal, before being covered by the concrete.

Steel bars may be cleaned by pickling in a bath consisting of one part commercial sulphuric acid to six parts water, or other proportions depending upon the amount of rust on the bars. Bars must be washed thoroughly in clean water after the bath and before placing in the concrete.

Cleaning Forms

No steel should be permitted to be placed until the forms have been thoroughly cleaned and inspected. Forms must be cleaned of all dirt and shavings and care must be taken to prevent new dirt and shavings from coming into the forms. Provisions should be made in the bottom of all column forms for cleaning them out. It is also customary to require that the same provision be made in beam and girder forms. The failure of several buildings has been attributed partly to the fact that shavings had collected at the junction of beam and column forms.

Marking Centering

When the forms are ready for the steel the contractor should be required to go over the floors with the blue

prints and a piece of crayon or keel and letter the beams and girders to correspond with the plans, in large figures on the decking beside the beams, and should specify the bars required, thus:

Beam B1: Two 1-in. Rounds, Bent.

Two 1¼-in. Rounds, Straight.

Assembling of Reinforcement

The steel reinforcement should be so assembled that the exact number, size, form, spacing and location of bars, stirrups, ties, spacers, etc., called for by the engineer's plans, is adhered to in every member. Should any discrepancy be noted in regard to the reinforcement of similar members, or any reinforcement omitted, it should at once be brought to the attention of the engineer in charge of the work or other proper authority, and not allowed to pass unobserved, as is quite often the case.

Inspection of Reinforcement

All steel reinforcement should invariably conform to plans and details, and should be placed and inspected by the engineer in charge before any concrete is put in place, and to admit of this inspection steel for a day's work should be placed in advance of the concrete.

The engineer should insist upon the reinforcement being accurately placed, and any carelessness on the part of the contractor in this should be sufficient grounds for the engineer to require the removal of the work and the replacing of it correctly. There is a great temptation on the part of many contractors to neglect this work, trusting that everything will come out right, regardless of how the reinforcement is placed. The writer has heard of a case where the reinforcement for footings was placed directly on the ground.

Thickness of Concrete Covering

The minimum exposed concrete covering of all faces for steel reinforcement should be as follows: ¾ in. for slabs, 1¼ in. for beams and girders, 1½ in. for columns and walls, and 2 in. for foundations.

However, in case of direct permanent exposure to the elements, this minimum covering should be uniformly 2 in. Some engineers allow ¾ in. for slabs, while some have required 1 inch.

Distance Between Reinforcing Bars

The clear spacing between parallel reinforcement in beams and girders should not be less than 1¼ in. No reinforcing bars to be closer together than 24 diameters, centre to centre.

Placing Reinforcement in Proper Position

Reinforcement should under all circumstances be placed under the direction of the engineer or inspector in charge, and all such erection and placing should be in charge of competent foremen who shall be familiar with the drawings and preferably with at least two years' experience in reinforced concrete construction.

Before placing concrete, the steel reinforcement must be placed the proper distance from the bottom and sides of forms and in the position required in the finished structure, and each piece or member so firmly fixed as to posi-

tively prevent any subsequent displacement. Especial care should be taken in placing steel in its proper position, and it should be the duty of the inspector to insist that it be so fixed and held in place in the forms that it will not be displaced from its proper position and spacing during the placing and compacting of the concrete. Too much stress cannot be placed upon this important requirement, for the failure of many structures may be attributed to this fact.

Loose-Bar Method

Particular attention should be given to loose-bar reinforcement that it is accurately and properly supported in position, so that all parts shall remain in true relation and alignment until locked in the setting concrete. Such device or devices should be used as will absolutely prevent the bars from approaching the forms beyond the limits specified for protection, and at the same time maintaining a uniform and accurate spacing of the bars throughout the length of the members.

Assembled-Unit System

Care should be taken in handling unit systems that the lower units are not bent out of shape by the weight of those above.

Spacing Chairs

Spacing chairs and clips for separate bar reinforcement should be made of heavy weight and good quality of sheet-steel. They should have ample strength against crushing under such loads as are likely to come on the reinforcement. The bottom edges of the chair should be bent to form flat feet and prevent cutting into the form boards when used to support floor reinforcement. For wall and column reinforcement, the bending of the bottom edge of the chair to form feet may be omitted, and for spiral hooping the slots for the spiral rods must be cut to pitch so that the chairs be straight with the vertical bars.

All metal separators used to keep the reinforcement at the right distance from the forms should rest on a piece of galvanized iron, or else a rust spot will show on the under surface.

Notched concrete spacing blocks composed of the best concrete may be substituted for the metal spacers when used for the floors system. The notches should be properly spaced so as to separate the bars from each other and from the sides of the forms, and the blocks should be of the proper thickness to hold the bars at the required height above the bottoms of the beams, girders and slabs.

Ample supports should be furnished so as to prevent sagging of the reinforcement.

Wooden blocks should not be used unless absolutely unavoidable, for the reason that remaining in the concrete, as they are liable to do, a weak spot will be developed.

Bending of Bars

All reinforcing bars should be bent before they are placed in position and the bending done in such a manner that they will not break or crack at the bend, the bending force being applied gradually and not with a jerk. Bending should be done with absolute accuracy in accordance with the detail drawings for the various portions of the structure. The inspector should insist upon the bends being accurate in line and plane.

All ordinary bending should be done cold. It is very important, especially in bending large bars, that the force be applied gradually and evenly, and not with a jerk, as is customary with some contractors.

If the bars are heated and blacksmith work is done, care should be exercised that the steel is not burned in the operation, otherwise the engineer in charge is justified

in condemning it. Warming up to a low cherry red should under all circumstances be the highest heat permitted.

Bar Benders

All reinforcing bars for an entire job should be bent in a bending machine in accordance with the dimensions and forms shown on the drawings. Bending machines should be required to bend any kind of a steel bar up to 1¼ inches in diameter to any angle required.

Splicing of Bars

The splicing of bars should be done exactly according to the engineer's plans, no splices being permitted except at points shown on plans. Various forms of splices are in use, and if not definitely instructed by the plans and specifications the contractor should learn from the engineer just what sort of form or forms will be acceptable.

The length of lap required for splicing of reinforcing bars in tension should be determined on the basis of the safe bond stress and the stress in the bar at the point of splice; or a connection should be made between the bars of sufficient strength to carry the stress. Splices at points of maximum stress should be avoided. Joints in bar work should be lapped at least 18 inches.

No welding of reinforcement except in column hoops should be permitted without special permission from the engineer.

Protruding Ends of Bars

The bends of bars which are left protruding for splicing should be, if they are likely not to be connected up for some little time, painted with cement paint to diminish rusting, and guarded against being bent or loosened. Throughout the work care must be exercised to prevent disturbing bars, portions of which are embedded in fresh concrete.

Fastening Reinforcement

All reinforcement should be securely fastened to preserve spacing, location, alignment, etc. Braces, blocks, suspenders, spacers, ties, etc., should be used in ample number to make certain of this feature. All temporary fastenings should be removed when the concreting reaches them.

Whenever practicable, all reinforcing metal should be put in place in the form and securely fastened in correct positions by wiring or otherwise before the placing of the concrete is begun. The wiring of reinforcement at intersections should be done carefully and strongly, using No. 16 or No. 18 B. & S. gauge soft black wire.

All wiring, straps, braces and templates required for the proper holding of the reinforcement in place must be furnished by the contractor in a manner entirely satisfactory to the engineer.

Tagging Reinforcing Bars

When the bars are cut and bent to proper shape, each individual bar in every beam and girder, or group of bars in columns, slabs, walls, footings, etc., should be tagged with a cloth tag wired securely to the bars (for beams and girders), or each bundle of bars, and marked with the proper number of the structural member, and the tags should be left on after the bars are placed in proper position in the forms. The engineer or inspector should examine the bars after they have been placed, personally remove the tags, after which the concrete may be placed.

Placing Concrete

Concrete should not be deposited in any position of the work until all the reinforcement for that section of work is in position and has been checked over to see that it agrees with the drawings. The steel work must be kept sufficiently ahead of the concrete work to give ample time for inspection.

Protection of Reinforcement

After placing steel reinforcement in position, if concreting be interrupted for any considerable number of days, the steel should be protected with canvas or tarred paper or other satisfactory covering.

Additional Reinforcement

Should the contractor deem it necessary to increase the reinforcement over and above that called for on the schedules, in order to take the responsibility for the work, he should be required to increase the same without cost to the owner.—Engineering Record.

Canadian Consulting Engineers

L. B. Merriam, C. E.

Mr. Merriam is a native of Illinois, and graduated from the State University in 1879 at the early age of 19 years. The following sixteen years were those of experience in all branches of railway location and construction work



L. B. Merriam, C. E.

for the Chicago, Milwaukee and St. Paul; Chicago and Northwestern; Chicago, Burlington and Northern; Mexican Central, and other lines, approximately half of this time being spent in the employ of the C. & N. W. Railway, in charge of Construction and Maintenance of Way on the main line west of Chicago.

As consulting engineer with offices at Dekalb, Ill., Mr. Merriam designed and built waterworks, brick pavements, sewers and bridges until the fall of 1898, when he organized and directed considerable revision work on the Union Pacific Railway. In 1901 he engaged as engineer with the Colorado Fuel & Iron Company, and the Colorado & Wyoming Railway on mine development, town layout and construction, coke and washery plant, etc., and also as superintendent of construction for Reservoir No. 2 at Pueblo, Colo. In 1904 he undertook and successfully ac-

complished the construction of fifty miles of Union Pacific Railway line on the Topeka & Northwestern branch.

In November, 1906, Mr. Merriam engaged on the Grand Trunk Pacific Railway, being given charge of construction work from Winnipeg to Saskatoon and thence to Battle River bridge. Since then he has carried on a general engineering and contracting practice, with headquarters at Winnipeg.

Mr. Merriam has always been an advocate of day labor, and in his many successful enterprises in former railway work contract labor for grading was his only deviation from the rule.

He is a member of the Canadian Society of Civil Engineers, Western Society of Civil Engineers, and of the American Railway Engineering and Maintenance of Way Association, as well as being a member of the Winnipeg Builders' Exchange.

Sewage Disposal Works

The City Engineer of Calgary has recommended that the services of T. Aird Murray, consulting sanitary engineer of Toronto, be engaged to advise the city about the establishment of a sewage disposal plant. Up to the present the city has been running its sewerage into the rivers, but last year the provincial health department warned all municipalities in the province that this practice must be stopped. Calgary accordingly made preparation for the construction of a large trunk sewer and bought a site for a sewage disposal system in Bonnybrook, east of the city. The contract for the trunk sewer, which is to cost close upon \$200,000, has been awarded, and the engineer's department is now turning its attention to the question of the sewage disposal works.

Market for Portland Cement

There appears to be a large and increasing demand for cement in New Zealand. Extensive improvements are being carried on by the Harbor Boards. In Auckland, the works now being conducted consumes 6,000 tons of cement a year. The chairman of the Auckland Harbor Board has signified his willingness to entertain proposals from Canada for supplying 6,000 tons a year for three years, delivered the first year at the rate of 500 tons per month. The price quoted must be by the ton of 2,240 lbs., c.i.f., on the works at Auckland. The cartage from the oversea vessel to the works would be 2s. 6d. a ton.

Any offer to fill this contract should be accompanied by satisfactory evidence of ability to do so. The duty on cement is 2s. a barrel, the barrel to be taken at 380 lbs. weight; upon the foreign article there is an additional duty of 2s. a barrel, so that Canada enters the field (as against foreign competition) 2s. a barrel to the good. The market now extends to 100,000 tons a year, and is rapidly expanding.

Peril in Leaky Reservoir

One of the city's large reservoirs in Highland Park, having a capacity of 120,000,000 gallons a day, has been condemned following an inspection by the members of Pittsburg's new council, Mayor William A. Magee and Joseph T. Armstrong, director of public works. Each of the officials expressed surprise that a bad accident had not occurred, and Director Armstrong said: "Acceptance of such a piece of work by the city, to be paid for out of tax money to the people, was a crime." The reservoir was completed a number of years ago at a cost of \$500,000. Great holes and cracks line the entire basin, and close to \$200,000 will be necessary, experts say, to repair and make it safe. Meanwhile, the reservoir will be abandoned.

Trade Notes and Items of Interest

The Otis-Fensom Elevator Company, of Toronto, are contemplating an addition to their plant in Hamilton.

Tenders are called for the earth work, concreting, and appurtenances in connection with the proposed filtration plant for the city of Montreal. The date for completion has been set as Sept. 1, 1913.

Tenders have been called at the City of St. Thomas, for the supply and installation of a 6,000,000 gallon centrifugal pump, and steam engine.

There is a movement on foot in Hamilton to organize the cement workers of the city with the probability of affiliating with the Trades and Labor Council.

The Berlin Water Commission propose drilling a 10-inch well 300 feet deep in an effort to provide an additional supply for the citizens. The cost is expected to be about \$2,500.

The Department of Railways and Canals, Ottawa, have called for tenders for the removal of unused material intended for use in connection with the construction of the old Quebec bridge.

The Littlefield-Clark Company, of Buffalo, have a pamphlet descriptive of their Efficiency Woodworker, a portable combination machine of especial interest to contractors, builders and lumbermen.

An ordinance was recently passed by the city council of Seattle abolishing the fees for building permits and it is expected that plumbing, electrical and other inspection fees will also be abolished.

Operations are being started on the new plant for the Diamond Flint Glass Company at Hamilton. The new building will cover a ground space of 300 by 150 feet and will cost approximately \$50,000. Excavation work has begun and it is hoped the building will be finished before fall.

The York County Highway Commission are experiencing no slight difficulty in securing sufficient materials. Owing to a scarcity of granite only one outfit is at present in operation. The Good Roads Commission are carrying on operations themselves owing to the excessive figures submitted by contractors for the construction.

The Rhodes-Curry Company, of Amherst, N. S., have commenced operations on the new general office building for the International Railway at Moncton. The proposed addition, which will cost about \$100,000, is being erected at the western end of the present building. The dimensions of the new wing are 139 feet by 57 feet.

Municipal Ownership of Street Railways is to be put in force at Winnipeg, Man. Press dispatches state that Mayor Evans of Winnipeg announced on July 20 that the city authorities have decided to purchase the entire plant of the Winnipeg Electric Railway Company, including its hydraulic power plant and the gas and electric light plant which it owns.

A difficulty recently experienced by the Grand Trunk Pacific in attempting to cross the irrigation lands of the Canadian Pacific Railway near Calgary, Alta., has resulted in a dissolution of the impending injunction, and, after considerable delay, construction of the Calgary branch may again be resumed, according to the report of the attorneys of the road.

Messrs. G. Amyot & Co., of Quebec, who recently bought several acres of land, at Maisonneuve for the purpose of erecting a big corset factory, have been offered freedom from taxation for ten years if they will rebuild and remain in the Ancient Capitol. This they have decided to do. They have over \$100,000 worth of property in Montreal at present.

South Vancouver contains 70 miles of wooden mains with some 136 fire hydrants, and according to the engineer's report there is no indication of a leak throughout the entire system. The report speaks well for this type of water main and should tend to eliminate the undue amount of prejudice that prevails among those who have not studied the efficiency of wooden pipe for water mains.

The Montreal Harbor Commissioners are making extensive additions to their storage elevators, and one with a capacity of nearly 2,000,000 bushels is now in process of construction. It is interesting to note that, when complete this elevator will be capable of handling 40,000 bushels inward per hour, and at the same time 60,000 bushels outward. With this addition the capacity of the port will be over 5,000,000 bushels.

As a result of the recent fire in which a large portion of the Hamilton asylum for the insane was destroyed and a number of lives lost, the fire authorities began an investigation of the various other charitable institutions in the city, and discovered a number of them to be quite unsafe for the purposes for which they are used. General orders have been sent out necessitating that all buildings be properly equipped at once with suitable fire escapes and other protection devices.

The Lock Joint Pipe Company has completed its contract for the manufacturing of the pipe required for the trunk sewerwork of the City of Regina. 1½ miles of trunk sewer has been completed which is one-half of the work called for by the present plan. The engineers in charge of the work expect the whole work to be completed by the 1st of December. Excavation at some points on the line attains a depth of 30 feet, and it is expected that this will be necessarily exceeded to maintain proper grade.

The great amount of street paving now under contract in the city of Quebec, and the provincial government movement for the improvement and macadamizing of country roads has given an enormous impetus to the quarrying of stone in the district and to the trade in broken stone. A company has been formed with a capital of \$60,000, under the title of the Quebec Brick Company, which is operating quarries along the line of the Ste. Anne Railway, and delivering immense quantities of broken stone for concrete work to the contractors for the city street paving.

Plans are being prepared by a Vancouver firm of engineers for a new water power plant for Kamloops. The city is preparing to expend \$200,000 in developing 5,000 horse power on the Barrier River, a tributary of the North Thompson River. The power will be conveyed forty miles to the city, where it will be utilized in pumping water for the reservoir and waterworks systems, as well as for industrial purposes. It is also proposed to extend the waterworks system by building many additional miles of mains and sewers, owing to the rapid growth of the population. The surplus power not required by the city will be sold to private parties.

The Penobscot Chemical Fibre Company, Great Works, Maine, recently secured control of power rights on the Penobscot at Orono, just below their works, and the concrete dam for this development which will be ultimately about 65,000 h.p., has been designed by Hardy S. Ferguson, consulting engineer, 200 Fifth Avenue, New York. This year the company is building the abutment and a 100-ft. length of the dam. On June 1st the Aberthaw Construction Company started the construction of the eight new concrete flumes at the main works of this company, which were also designed by Hardy S. Ferguson, of New York. At the present time there are four flumes in operation and the eight new ones will furnish electric power for bleaching purposes.

Personals

Mr. Jas. Greer, a well known contractor of Edmonton, died on July 30th.

A party of American engineers recently inspected the plans and construction of Toronto's system of sewage disposal with a view to obtaining information for the new system that is being planned for the city of Rochester.

Mr. Fred Henning, chief engineer of the Island pumping station, Toronto, who perfected a device for the proper chlorinating of the water supply, which was described in the July 12 issue of the Contract Record, is to be rewarded for his ingenious invention by the city council.

Mr. S. B. Clement, Assoc. M. Can. Soc. C. E., Chief Engineer of the Temiskaming & Northern Ontario Railway, has been given jurisdiction over engineering, maintenance of way and motive power departments, succeeding to a part of the duties previously performed by the Superintendent, Mr. J. H. Black, who has resigned to accept a position with the Northern Ontario Light & Power Company.

Building Activities

Building continues fairly active in Ottawa and the month of July shows a great increase in the number of dwelling houses being erected.

The building industry in Saskatoon was recently temporarily handicapped on account of water and is also being held back in a number of instances owing to the scarcity of gravel.

The Dominion Sugar Company, of Wallaceburg, Ont., are having plans prepared for a new factory to cost some \$700,000, to be erected in Chatham. It is expected that the foundation will be put in this fall.

Plans have been accepted by the city of Windsor calling for 640 feet of 60-inch steel water pipe in the bed of the Detroit River with a cement well 46 ft. x 18 ft. x 20 ft. 9 in. at the shore. The intake will cost \$30,000.

The Board of Control has asked the Montreal City Council to approve of the appropriation of funds for preliminary work in connection with the plans for underground conduits in the city for the preparation of which a commission was recently appointed.

For the seven months ending July 31st the amount of building in Kingston was \$172,604, according to a report issued by City Engineer Craig, as against \$135,960 during the same period of 1910. It is estimated that the total number of permits in 1911 will be in the neighborhood of \$300,000.

Building Inspector Rodgers of Winnipeg states that the 1910 record of Winnipeg will be largely exceeded this year. The amount of building for July, 1911, was \$2,787,100, which was two and a half times the amount issued for the corresponding period of the record year. The total value of building permits issued this year in Winnipeg amounts to \$14,368,650.

A reinforced concrete ice house was recently erected in Philadelphia, with sheet cork as the insulation throughout, instead of wood and mill shavings, and the like, which have generally been used. The insulation of the ceiling consists of 3-in. cork boards, attached with cement to the under side of a reinforced concrete slab. The walls are insulated with two layers of 2-in. cork boards, with all joints broken, and the floors with two layers, laid in hot

asphalt on a concrete base. The finish on the sheet cork, and walls, and ceiling is Portland cement; for the floor finish a concrete and cement mixture is laid directly on the cork.

The contract for the construction of the first section of the Hudsons Bay Railway from Le Pas to Thicket Portage, a distance of 185 miles, was awarded on August 10th to J. D. McArthur, whose tender amounted to a little less than \$3,000,000, and was well within the estimate of probable cost based upon the Government's survey. Mr. McArthur is prepared to start active construction work at once, and considerable progress will be made this fall. He has practically completed his contract for the section "F" of the National Transcontinental from Superior Junction to Winnipeg, and has his equipment and men all ready to undertake the new contract. The balance of the road will be placed under contract next year.

Publications

The second edition of Reginald Pelham Bolton's "Building for Profit" is announced by the De Vinne Press, 395 Lafayette Street, New York. Its author has had unusual experience in the designing, construction, operation and ownership of metropolitan buildings, during a period of fifteen years, and he is widely regarded as one of the leading authorities in his line. He makes the bold assertion that any unsuccessful building can be made a money-maker by applying certain principles to its management. "Violate these principles," says Mr. Bolton, "and you incur a loss; observe them, and your building is an assured success. Test your real estate investments by these principles, and you can determine in advance if they will pay you dividends."

One of the most valuable publications of the year is the volume just issued on "Lands, Fisheries, Game and Minerals," by the Dominion Commission of Conservation. The book, representing as it does a great deal of exacting research work, makes available to the average man a mass of instructive and entertaining information otherwise unobtainable by him. As a reference work for the journalist, the student of public questions and the well-informed man on the street, it will be found of no small value. It is a large volume of some 525 pages, substantially bound in cloth and fully illustrated throughout with maps, diagrams and two-color engravings. The volume is perhaps the most thorough and complete record of investigation and research that has ever been issued by any government in Canada.

Trade Enquiries

The Dominion Government Trade and Commerce reports contain the following trade enquiries. Readers of the "Contract Record" may obtain the names of enquirers by writing us, enclosing stamped envelope, and stating number of enquiry.

734. **Mosaic, &c.**—A London company manufacturing mosaic and various kinds of tiles suitable for wall lining and paving purposes, would like to get into touch with Canadian firms handling such materials.

736. **Cement.**—Cuban firm inquires for cement.

738. **Roofing paper.**—Cuban firm inquires for roofing paper.

740. **Pipes (clay and cast iron).**—Havana firm can place large orders for clay and cast-iron pipes.

Contracts Department

News of Special Interest to Contractors, Engineers, Manufacturers and Dealers in Building Supplies.

Information for insertion in these columns is invited from Architects, Contractors, Engineers, etc.

Waterworks, Sewerage and Roadways

Aylmer, Ont.

Tenders called for pavement. Owner, Town of Aylmer; T. Clerk, D. C. Davis. Town engineer, F. Wooster. 2,400 sq. yds. Bermuda road asphalt or vitrified brick pavement—tenders to include grading drains, gutters, etc. Specifications at office of clerk. Work to be commenced at once. Tenders received until 6 p.m., August 20th, by town clerk.

Calgary, Alta.

A by-law will be submitted on August 17 to raise \$26,500 for sidewalks and another to raise \$12,000 for bridge purposes.

Contemplated sewage disposal plant. Owner, City of Calgary, W. D. Spence. City engineer, J. T. Child. Engineer recommends that T. Aird, Murray Lumsden Building, Toronto, be engaged as consulting engineer in regard to sewage plant for which a site has been bought in Bonnybrook, east of city.

Schedule of extensions to waterworks. Owner, City of Calgary; city clerk, W. D. Spence; city engineer, J. T. Child. City Commissioner Graves recommends water main extension of about 27 miles; 3 miles of main to be built from the reservoir to Manchester, then to Park Hill, etc. Estimates will be prepared for presentation to council with street railway items.

Chapleau, Ont.

The municipality expects to construct considerable cement sidewalks in 1912. Apply T. J. Godfrey, Township Clerk, Chapleau, Ont.

Gravenhurst, Ont.

Tenders to be called for cement walks, \$3,000. Town clerk, W. H. Cross. By-laws carried to raise \$3,000 by debentures for constructing cement walks carried on the 4th inst. Council anxious to have work completed this fall. Tenders will be called for at once.

Tenders to be called for waterworks, \$7,000. Town clerk, W. H. Cross. By-law carried to raise \$7,000 to extend waterworks system and erect a water tower. Council anxious to have work completed this fall. Tenders will be called at once.

London, Ont.

An asphalt pavement on King street, from Adelaide to Exhibition grounds, was recommended by city council to board of works.

Little Current, Ont.

By-laws carried for cement sidewalks, etc. Owner, Town of Little Current. Clerk, D. McGilvery. By-law carried on August 7th authorizing borrowing of \$5,000 for cement side

walks and grading. It is expected that work will commence as soon as finances are arranged.

Milton, Ont.

Tenders called for iron pipe. Owner, Town of Milton. Chairman Board of Works, H. A. Dietrich. 16,310 ft. 5 in. standard wrought iron pipe. Delivery f.o.b. Milton, by Sept. 1st, 1911. Tenders close on the 10th.

Montreal, Que.

Tenders called for cement sidewalks. Notre Dame street. Owner, Board of Commissioners; secretary, L. N. Senecal. Construction of cement sidewalks. Specifications at City Surveyor's office. Tenders received by Board of Commissioners until noon, August 18th.

Tenders called for filtration plant. Owner, Board of Commissioners. Secy., L. N. Senecal, City Hall. Engineer, Hering & Fuller, 170 Broadway, New (1) Profilters and appurtenances, filtered water reservoir, sub-structures of gate houses, conduits and connections with the existing aqueduct and suction well, pipe lines, etc., complete as shown and specified. (2) Additional earthwork. (3) Additional concrete. Plans, etc., at office of chief engineer, Public Works, Montreal, and in office of Hering & Fuller. Date for completion, Sept. 1st, 1913. Tenders received by Board of Commissioners until October 3rd.

Oakville, Ont.

By-law carried for sewers. Owner, Corporation of Oakville. Clerk, Chas. A. Bradbury. The by-law to construct sewers carried. Tenders will probably be called—Supplementary report later.

Point Grey, B. C.

Tenders called for steel pipe. (Dist. lots 540 and 139). Sec.-treas., H. Floyd. Engineer, Cleveland & Cameron, Winch Building, Vancouver. Excavation and refilling of trenches laying and jointing about $4\frac{1}{2}$ miles of steel pipe. Specifications may be seen at office of engineers. Deposit of \$10 required. Tenders received until Aug. 14th.

Saskatoon, Sask.

Tenders called for storm sewers and paving. Owner, City of Saskatoon. City engineer, George T. Clark. No. 97—all labor necessary for laying pipes and furnishing certain materials according to the following quantities. Vitrified tile pipe 1080 lin. ft. 15 in.; 2150 lin. ft. 12 in.; 1760 lin. ft. 10 in.; 6840 lin. ft. 8 in.; 2865 lin. ft. 8 in.; (catch basin branches) and 2205 lin. feet 42 inch, reinforced concrete pipe. Number 98—Furnishing 2205 lineal feet reinforced concrete sewer pipe and 6 reinforced concrete manholes 42 in. in diameter. No. 99—Furnishing 40 monhole frames and covers and 92 catch basin gullies. No. 100—Laying

approximately 21,600 sq. yds. of pavement, and grading incident thereto. Plans, etc., at office of city engineer. Tenders received by City Commissioners until noon August 18th.

Thorold, Ont.

Tenders called for turning basin, \$30,000. Owner, Department of Railways and Canals, Ottawa. Secretary, L. K. Jones. Plans, etc., at office of chief engineer of the Dept. of Railways and Canals, Ottawa, and at the office of the superintending engineer St. Catharines, Ont. Accepted cheque \$1,500 to accompany each tender. Tenders received until 16 o'clock, August 21st.

Woodstock, Ont.

Tenders called for waterworks. Owner, City of Woodstock. City clerk, John Morrison. City engineer, F. J. Ure. Construction of concrete settling tank, preparation of two additional filter beds. Plans, etc. at office of city clerk and engineer. Tenders received by city clerk until Aug. 19th.

Winnipeg, Man.

Tenders called for sewer pipe and specials. Owner, City of Winnipeg. Secy. Board of Control, M. Peterson, City Hall. City engineer, H. N. Rutan, 223 James street, Winnipeg. Specifications with city engineer. Tenders received by Chairman of Board of Control until 11 a.m. Aug. 10th.

Tenders called for water pipe. Owner, City of Winnipeg; secretary board of control, M. Peterson. Supply of quantity of cast iron water pipe. Specifications obtained at office of City Engineers, 223 James avenue. Tenders received by chairman board of control until September 5th.

Windsor, Ont.

Tenders called for outlet for sewer. Parent avenue. Owner, City of Windsor; city clerk, S. Lusteed; city engineer, M. E. Brian. Supply of labor, tools and machinery for constructing a concrete outlet for sewer under Grand Trunk Railway tracks. Plans at office of above and at office of Canadian Engineer, Toronto. Certified cheque for five per cent. to accompany each tender. Tenders received by city clerk until 4 o'clock, August 22nd.

CONTRACTS AWARDED

Burnaby, B. C.

Waterworks, \$160,000. (Edmonds). Owner, Corporation of Burnaby. City Clerk, W. Griffiths. Contractors, Evans, Coleman & Evans, Vancouver. Lap-welded steel pipes, \$154,379. Delivery to be completed by January, 1912. Pipes to be supplied by Stewart & Lloyd, England; valves, Robertson, Godson Co., Ltd., 572 Beatty street, Vancouver, \$2423; delivery of 3, 4, 6, 8, and 10-in. pipes by Sept. 4th and balance by October 24th. Special castings, Evans, Coleman & Evans.

North Bay, Ont.

Waterworks extension. Engineer in charge, J. H. Shaw, North Bay. Successful contractors for supply of materials: cast iron pipe, 2,550 ft. 10-in., 27,745 ft. 6-in., 11,004 in., Canada Foundry Co., Toronto; wood pipe, 15,500 feet 14-in., Pacific Coast Wood Pipe Co., 1551 Granville street, Vancouver; hydrants, valves, etc., 32 hydrants, 11 14-in. gate valves and valve boxes, 5 10-in. gate valves and boxes, 40 6-in. gate valves and boxes, 3 4-in. gate valves and boxes, Kerr Engine Co., Limited, North Bay.

New Westminster, B. C.

Sewers. Owner, City Council. Engineer, J. W. B. Blackman, C. E., New Westminster. Contractor, Sinclair Construction Co., Vancouver, \$79,379. Others tendered—Romano & Pinto, Vancouver, \$125,136; Lee & Blake, Vancouver, \$100,372; Kibler & Roseleaf, Burne, \$68,970; Kennedy, Vancouver, \$84,800; Power Construction Co., New Westminster, \$94,495; Municipal Construction Co., Vancouver, \$143,712. Contract signed July 31st.

Ottawa, Ont.

The contract for the supply of new pump gear to replace the auxiliary at pump house was awarded to the Victoria Foundry Co., Ottawa, \$373; other tenders were T. G. Brigham, \$1,120; T. Lanson and Sons, \$479; W. Hamilton & Sons, \$497.

Contracts were awarded as follows: For pavements on Pretoria street, Union Asphalt Company, \$8,346; other tenderers, Barber Asphalt Company, \$9,720; Ottawa Construction Company, \$8,960. Church street, Ottawa Construction Company, \$4,560; other tenderers, Union Asphalt Company, \$5,570; Barber Asphalt Company, \$5,900.

Railroads, Bridges and Wharves**Berlin, Ont.**

Tenders called for bridge. (Albert street). Owner, Town of Berlin, A. H. Millar, Town clerk. Chairman, Board of Works, H. A. Dietrich. Town Engineer, H. Johnston. Construction of reinforced concrete bridge. Plans, etc., at office of town engineer. Tenders received by town clerk until 6 p.m. August 17th.

Broadview, Sask.

Tenders called for depot. Owner, Canadian Pacific Railway. Brick and stone. Plans, etc., with divisional engineer, Brandon. Tenders closed August 16th.

Calgary, Alta.

Dominion charter granted for railway. (to Carbon, 60 miles distant). Charter granted to Alberta Electric Railway and Alberta Land & Traction Co. Line to Carbon to be built first; afterwards to Banff, Lethbridge, brooke Medicine Hat, etc. Electricity tae not motive power at first. Oil engines of a type similar to those in use in automobiles will be used, also auto trucks to bring farm produce to railway.

By-law to be submitted for purchase of bridge. (over Bow River). City Clerk, W. D. Spence. City Engineer, J. T. Child. By-law for \$12,000 for purchase of Centre street bridge from private company.

Recommendations for track laying, etc. Owner, City of Calgary. Street Railway Superintendent, Mr. McCauley. Supt. recommends double tracking at an estimated cost of \$142,140; also that 18 new cars be ordered at once.

Tenders called for addition to station. Owner, Canadian Pacific Railway, Montreal, Que.; assistant chief engineer, J. G. Sullivan, Winnipeg. Erection of west wing and addition to present east wing of station. Plans at office of engineer of station. Plans, etc., at office of engineer, Winnipeg, and division engineer's office, Calgary. Tenders received at above offices until 5 p.m., August 18.

Guelph, Ont.

Extension of time for bridge. (over River Speed, Neeve street). Owner, City of Guelph. T. J. Moore, clerk. Acting City Engineer, L. Malcolm. Construction of concrete arch bridge and viaduct over C. P. R. Approximate amount of concrete, 572 cu. yds. Plans, etc., at office of City Engineer or Contract Record, 220 King street West, Toronto. Tenders received until August 16th by T. J. Moore, City Clerk.

Montreal, Que.

The contract with the Canadian Vicker Co. for construction of floating dock here has been signed.

Naufrage Pond, P.E.I.

Tenders called for extension to breakwater. Owner, Department of Public Works, Ottawa; secretary, R. C. Desrochers. Extension to breakwater and deepening entrance. Plans, etc., at department and at office of J. B. Heggan, district engineer, Charlottetown, P.E.I., and on application to local postmaster. Tenders received by secretary until 4 p.m., August 28th.

Nanaimo, B.C.

Two bridges on the South Forks pipe line were destroyed by fire, length, f. om 100 to 120 feet.

Norway Bay, Pontiac Co., Que.

Tenders called for wharf. Owner, Department of Public Works, Ottawa. Secretary, R. C. Desrochers. Construction of wharf. Plans, etc., at Department and on application to postmasters at Pembroke, Ont. and Norway Bay. Tenders received by secretary until Aug. 28th.

Ottawa, Ont.

Tenders called for railway ties and switch ties. Owner, Department of Railways and Canals, Ottawa. A. W. Campbell, Chairman, Govt. Railways Managing Board. Purchasing Agent, Mr. Louis Lavoie, Ottawa. Supply of ties and switch ties for the Intercolonial Railway. Specifications, etc., at stations after August 9th. Tenders received by Purchasing Agent until August 31st.

Park Hill, Ont.

The town of Park Hill will call for tenders August 21, on a small cement bridge, value \$400. John A. Laughton, Town Clerk, Park Hill, Ont.

Quebec, Que.

Tenders called for removal of old bridge material. Owner, Department of Railways and Canals, Ottawa. Secretary, L. K. Jones. Removal of unused material intended for use in connection with construction of old bridge. Specifications at Department and at office of Board of Quebec Bridge Engineers,

Canada Express Building, Montreal and Quebec. Tenders received until Aug. 21st, by L. K. Jones.

St. John, N.B.

St. John Street Railway have called for a new set of tenders for car barns, the previous tenders for which closed July 31. New tenders close August 7. Tilbury, Ont.

Tenders to be called for bridges. (over 6 and 7 side row drain). Owner, Corporation of North Tilbury; J. A. Tremblay, Tp. clerk, Tilbury. Cement and steel; two highway bridges, 10 ft. x 16 ft. clear; one 12 ft. x 16 ft. clear; one 12 ft. x 64 ft.; 4 farm bridges 10 ft. x 14 ft. clear; 3 12 ft. x 14 ft. clear and a cement wall to protect the highway 366 ft. long. Gravel and sand near at hand. Town engineer's estimate, \$3,770.

Three Rivers, Que.

Tenders called for steel bridge. Owner, City of Three Rivers. City Engineer, Benj. Bourgeois, 174 Notre Dame street. Secy-treas., L. T. Desaulniers. Erection of a steel bridge with two concrete abutments on River St. Maurice. The span to be 200 ft. in length. Plans, etc., at office of city engineer. Accepted cheque for 10 per cent. of amount of tenders to accompany each tender. Tenders received until 4 p.m. Aug. 25th.

Vancouver, B.C.

The Canadian Northern Railway have altered their plans, which now provide for three new bridges, one across the Thompson river, two miles above Lytton, and two miles across teh Fraser.

West Advocate, Cumberland, Co., N.S.

Tenders called for breakwater. Owner, Department of Public Works, Ottawa. Secretary, R. C. Desrochers, Ottawa. Construction of breakwater. Plans, etc., at Department and at office of C. E. W. Dodwell, District Engineer, Halifax, N. S. E. G. Millidge, District engineer, Antigonish, N. S., on application to the postmaster at West Advocate, N. S. Tenders received until 4 p.m. August 30th by secretary.

CONTRACTS AWARDED**Montreal, Que.**

The contract has been awarded for freight shed on Morean street, \$6,000, being erected by the Canadian Northern Railway, to John MacDonald, Toronto.

Port Arthur, Ont.

Bridge. Owner, Canadian Northern Railroad. Contractor, J. A. Whalen, Port Arthur. Bridge 59 miles east from Port Arthur.

Port Arthur, Ont.

Grading. (Port Arthur to Sellwood) Owner, Canadian Northern Railroad, Toronto. General contractor, Foley Bros. Sub-contractors, Stewart & Hewitson, Port Arthur. 5 miles grading.

Port Arthur, Ont.

Breakwater, Bare Point, Rainy River district. Owner, Department of Public Works, Ottawa. Engineer, E. B. Temple, Port Arthur; general contractor, Thunder Bay Construction Company. Port Arthur; sub-contractor, M. J. Hogan, Port Colborne, Ont. Contract for 1,200 feet.

Public Buildings, Churches, Schools, etc.

Brantford, Ont.

Contemplated, school, Holmedale District. City clerk, H. F. Leonard. Plans are now being prepared and building will commence as soon as possible.

Burnaby, B. C.

Tenders called for prison farm building. Owner, Public Works Department, Victoria. Engineer, J. E. Griffith, Victoria. Erection of prison farm building. Plans, etc., at office of H. A. Hodgson, Cotton Building, Vancouver; Govt. Agent, New Westminster; and at Department, Victoria. Tenders received until 5 p.m. Aug. 23rd.

Chilliwack, B.C.

The plans for the new post office are in the hands of the postmaster. Building will be two storeys and basement, concrete, 65 x 50.

Copper Cliff, Ont.

Contemplated school. Town Clerk, Thomas Stoddart. Owner, Public School Board. The Board will take into consideration the erection of a 10 or 12 room public school at their next meeting.

Dunnville, Ont.

Work in progress for high school, \$35,000. Owner, Board of Education. Architect, Munro & Meade, Chancery Chambers, Hamilton. General contractor, R. Bennett, Dunnville. 2½ storeys, 100x90, brick, steel, stone foundation, slate roof, cut stone, reinforced concrete, artificial stone, metallic lath, structural iron, ornamental iron, fire escape, sheet metal work, cornice or skylights, interior finish ash, weather strips, electric work. Telephone system, electric bells, electric lighting, steel beams, iron columns, plate glass. Sub-contracts to be let.

Edmonton, Alta.

By-law to raise \$55,000 for nurses' home was approved, but that to raise \$30,000 for street paving was defeated.

Hamilton, Ont.

Equipment required for hospital building. Owner, Board of Governors, Hamilton. A decision was reached to purchase one feed and two vacuum pumps for boilers.

Justice, Man.

Tenders being called for school. Owner, Board of Trustees, of District No. 696. Secy.-treas., I. J. Pentland. 2 storey and basement, brick veneer school. Plans, etc., at office of Mr. W. W. Blair, architect, Winnipeg; Barclay & O'Hara & McDiarmid & Clark, Brandon, and with T. J. Pentland, Justice. Tenders received by sec.-treas. until Aug. 14th.

Montreal, Que.

The Calvary & Bethlehem Congregation of Montreal will erect a church and house on Dorchester street, Westmount, one storey, stone, concrete foundation, hot water heating, electric lighting, slate roofing, cement work, cut stone, brick, tile, reinforced concrete, structural and ornamental iron, electrical work, iron columns, plate glass.

Ottawa, Ont.

Tenders called for cloak room, Rideau Hall. Owner, Department of Public Works, Ottawa. Secretary, R. C.

Desrochers. Construction of a cloak-room, Rideau Hall, Ottawa. Plans, etc., at the Department. Tenders to be accompanied by accepted cheque for 10 per cent. of amount of tender. Tenders received by secretary until 4 p.m. Aug. 14th.

Oakwood, Ont.

A Methodist Church costing about \$12,000 will be built next year. Plans are well matured and \$9,000 has been subscribed.

The Township of Mariposa will build a public school in Oakwood next year. Apply J. B. Weldon, Township Clerk, Oakwood, Ont.

Strathroy, Ont.

Tenders called for re-construction of church. Owner, Baptist Church, Strathroy. Chairman Building Committee, David Evans, Strathroy. Recontruction of interior of Strathroy Baptist Church. Plans, etc., at office of the chairman. Tenders received by chairman until noon, Aug. 14th.

Saskatoon, Sask.

Competitive plans called for church, \$75,000. (Spadina Crescent). Owner, St. John's Parish. Architect, Not yet chosen. Competitive plans will be called for at once. A rectory costing \$13,000 is also under consideration.

Toronto, Ont.

H. Bryan Gilbert, architect, 47 Wellington street east, is preparing plans for alterations to St. Barnabas Episcopal Church, Halton street.

Newdale, Man.

Tenders called for heating for school. Owner, Municipality of Newdale; architect, W. A. Elliott, Brandon, Man. Secretary, treasurer Harrison School District, C. Johnson. Installation of hot air heating system. Tenders received by secretary-treasurer until August 12, 1911.

Victoria, B.C.

Permit applied for building of a rink, Caddboro road and Empress street. Owner, Patrick Bros., 615 Pender west, Vancouver; architect, Thos. Hooper, 1108 Government street, Victoria. Frame, 322 x 144. Plans approved by Reeve of Oak Bay.

Winnipeg, Man.

Tenders on site for new exhibition grounds. Owner, City of Winnipeg. City Clerk, C. T. Brown. 150 acres to be purchased as a site for exhibition grounds for city. Tenders received until Aug. 21st by city clerk. By-law on purchase to be submitted in December.

Westville, N. S.

Tenders called for Y. M. C. A. Owner, Y. M. C. A. Secretary, J. W. Sutherland. For further information apply to secretary. Tenders were received by secretary until August 12th, 1911.

Windsor, Ont.

Plans to be prepared for public school building, \$40,000. Owner, Windsor Board of Education; Alexander Black, secretary; architect, none employed yet. Competitive plans. Authority given by Board of Education Aug. 8th to property committee to secure competitive plans for 8-room school in east end of city. The building to be completed not later than Easter, 1912, and probably sooner.

CONTRACTS AWARDED

Belleville, Ont.

Two schools. Owner, Board of Education, Belleville. Architects, Ellis & Connery, Manning Chambers, Toronto. General contractor, G. A. Bennett, Belleville, Ont. Contract awarded Aug. 7th.

Chatham, Ont.

School, \$30,000. (Queen street). Owner, Board of Education, Chatham. Architect, Jas. L. Wilson, Chatham. General contractor, Geo. W. Rayment, Chatham. Carpentry contractor, Geo. W. Rayment, Chatham. Masonry and cement, W. H. Draper, Chatham; Plastering, A. Blonde, Chatham; sheet metal, Western Sheet Metal Co., Chatham; iron work, Park Bros., Chatham; stone work, Jas. A. Oldershaw, Chatham; heating and plumbing contract not yet awarded. Contract let Aug. 9th. Building to be completed July 1, 1912.

Guelph, Ont.

Winter Fair building. Architect, W. A. Mahoney, Guelph. General contractor, Cowan & Walker, Guelph; mason, Cowan & Walker, Guelph; carpentry, Cowan & Walker, Guelph; Cement contractor, Johnston & Williams, Guelph; heating contractor, Howard Bros, Guelph; plumbing contractor, Fred Smith, Guelph; sheet metal, Pedlar Co., Oshawa; iron work, Pedlar Co., Oshawa; stone work, Cowan & Walker, Guelph.

Hamilton, Ont.

The contract for installation of heating and plumbing in the Caroline street school has been awarded to Adam Clark, Main street west, Hamilton.

Kingston, Ont.

G. W. Lakins, Moscow, Ont., has been awarded the contract for erection of Sydenham High School, \$8,690. Architects, Power & Sons, Kingston.

Megantic, Que.

Church, \$90,000. Owner, Roman Catholic Church, Lake Megantic. Architect, L. N. Audet, Sherbrooke, Que and J. A. Godin, 229 St. Denis street, Montreal, Que. General contractor, D. Viallancourt, 197 First avenue, Ville Emard Montreal. Cut stone, brick and terra cotta, electric lighting, art glass, asbestos shingle. Building to be completed April, 1913.

Newboro, Ont.

John R. Kerr has been awarded the contract for erection of the new Holiness Movement Church, seating capacity, 200.

Ottawa, Ont.

Incinerator, \$34,650. Owner, City of Ottawa; city clerk, T. Henderson; city engineer, N. T. Ker. Successful contractor, Laurie & Lamb, Board of Trade Bldg., Montreal. Heenan-Froude type 75 ton per 24 hours, top feed type plant improved patent, six cell refuse destructor.

Saskatoon, Sask.

Y. W. C. A. building, \$30,000. (64th street). Owner, Y. W. C. A. Secy. Miss S. Little, Toronto. Architect, Thompson, Daniel & Colthurst. General contractor, McDiarmid & Co. Winnipeg. 3-storey and basement, reinforced concrete construction, ornamental iron, brick with terra cotta.

Stratford, Ont.

The contract for St. Andrew's Church has been awarded to J. L. Youngs; plumbing and heating to McDonald & Henry; architect, J. S. Russell.

St. John, N. B.

Mortuary Chapel, \$4,000. (Fernhill cemetery). Architect, G. Ernest Fairweather, St. John, N. B. Contractor, R. Maxwell, St. John. Chapel, 12 x 25 ft. brick with stone trimmings. Work to commence at once.

Trail, B. C.

School. Owner, School Board; Sec., F. E. Dockerill, Trail. Architect, A. Larrie, Nelson. General contractor, John Burns & Sons, Nelson, \$36,455. Heating, B. C. Plumbing Co., Nelson, \$4,908.

Vancouver, B. C.

Wing General Hospital. (10th to 12th street). Owner, General Hospital Building. Geo. Haddon, secy., Vancouver. Architect, Grant & Henderson, Williams Building, Vancouver. General contractor, McDonald & Wilson, Howe & Robson streets. 3 storeys and basement, stone and concrete wing. Heating and ventilating let separately. Excavation has been started.

Winnipeg, Man.

Fire hall, \$20,000. (Cor. Cathedral and Powers). Owner, City of Winnipeg. Architect, A. & W. L. Melville, 405 Builders Exchange. General contractor, Sutherland Construction Co., Winnipeg. 2-storeys, brick and stone, stone foundation, steam heating, electric lighting, shingle roofing.

Residences**Dartmouth, N. S.**

Tenders closed for residence. (Mount Hope). Owner, Public Works and Mines Department, Halifax, N. S. 3-storey, 336 x 103, brick, concrete foundation, electric lighting, slate, tar and gravel roofing, reinforced concrete, structural iron, dumb waiter, metal ceiling, pipe covering, telephone system, electric bells, sheathing and deafening paper, steel beams, iron columns, iron stair case, Kinnear steel doors.

Digby, N. S.

Contemplated residence, \$3,000. Owner, Mrs. L. H. Morse, Digby, N. S. Wood, stone and concrete foundation, wood roofing. No tenders to be called. J. F. Brent, Middleton, will probably be given the contract. Work to begin in two or three weeks.

Halifax, N.S.

J. Wright will erect a \$1,000 residence on Young street, 2 storeys, 18 x 22 x 20, wood, concrete foundation, tar and gravel roofing, cement work, fireproofing, weather strips, asbestos materials.

Hamilton, Ont.

Plans being prepared for residence, \$7,000. (Ravenscliffe avenue). Owner, W. E. Phin, Welland. Architect, Munro & Mead, Chancery Chambers, Hamilton. 2½ storeys 80 x 40, brick and stone, stone foundation, green slate roofing, steam heating, electric lighting, cut stone, electric bells, art glass.

Maisonneuve, Que.

Buildings contemplated or in progress: Joseph Corbeil, for three flats, \$5,000, brick, 24 x 100, three storeys,

cement foundation, gravel flat roof; C. Demontigny, for three flats, \$6,000, stone, 25 x 102, three storeys, cement, flat roof; L. Bourdon, for three flats, \$4,500, brick, 25 x 100, three storeys, cement, flat roof; the School Commission of Maisonneuve for extension, \$4,000, architect, Ch. A. Reeves, 85 St. Jacques street, contractor A. Marchersault, stone, 45 x 60; Andre Bernier, 244 Pie street, for six flats, \$7,999.99, 24 x 80, three storeys, cement, flat roof; H. Lareau, 360 Adam street, for three flats, \$5,000, 25 x 100, three storeys, cement, flat roof; A. Gendron, UY William David street, four flats, \$8,000, cement, flat roof.

Montreal, Que.

A. Paris will erect two residences on Hamilton street, three storeys, 40 x 38, brick, cement foundation, R. C. Harbonneau, 1845 Notre Dame west, architect.

Sherbrooke, Que.

Tenders called for residence, \$4,000. (Prospect street). Owner, M. B. Echenberg, Sherbrooke. Architect, T. W. Gregorie, Sherbrooke. 2 storeys, wood and brock, stone foundation, iron roof, interior finish, wood, electric lighting. Tenders were called until August 10th.

Saskatoon, Sask.

Specifications in progress for residence, \$15,000. Owner, Frank P. Martin, 21st street, Saskatoon. Three stys., terra cotta and stucco work. Date of calling for tenders not decided yet.

Toronto, Ont.

Dwelling, \$6,000, 89 Balmoral avenue. Owner, Edward Eyre, 87 Balmoral avenue, Toronto; architect, J. H. Galloway, Toronto street, Toronto. Two and one-half stys., 36 x 21, brick, stone foundation, hot water heating, shingle roofing. Work will be done by day labor.

Specifications prepared for residence, \$2,500. (Duggan avenue). Owner, R. T. Robinson, Toronto. Architects, F. Page, 207 Confederation Life Building, Toronto. Two stys., 22 x 44 ft. 9 in., brick, brick foundation, electric lighting,

shingle roofing. Tenders called by Owner.

Specifications prepared for residence, \$3,500, north side Westminster avenue. Owner, J. A. Egan, 343 Crawford street, Toronto. 2½ storeys, brick, brick foundation, hot water heating, electric lighting, slate and shingle roofing, cement work, brick, tile, mantels, electrical work, plate glass. Work will be done by day labor.

Specifications required for alterations to residence, \$3,500. Owner, F. A. Prime, 413 Markham street, Toronto; architect, Sproat & Rolph, 90 Yonge street, Toronto. General contractor, W. Hughes, Simcoe street, Toronto. 2 storeys, brick, stone foundation, hot water heating, felt and gravel roofing, cement work, cut stone, skylights.

Specifications prepared for residence, \$2,500. (Dundas street). Owner, Sam Slatski, Maria street, Toronto. 2 storeys, 22 x 34, stone and brick, stone foundation, hot air heating, electric lighting, shingle roofing, cement work, cut stone, brick, tile, mantels, electrical work. Work will be done by day labor.

Work in progress for alteration to residence, \$4,000. (W. S. Queen's Park, Toronto. Owner, E. R. Woods, Toronto. Architect, Sproat & Rolph, 90 Yonge street, Toronto. General contractor, W. Hughes, Simcoe st., Toronto. Two storeys, brick, brick foundation, hot water heating, slate roofing.

Tenders to be called for pair dwellings, \$4,000, south side Strathcona avenue. Owner, A. E. Furnston, 39 Grafton avenue, Toronto; architect, P. H. Finney, 43 Victoria street, Toronto. Two stys., 38 x 32 ft. 8 in., roughcast, brick foundation, hot air heating, shingle, felt and gravel roofing. Tenders to be called next week.

Tenders to be called for dwelling and warehouse, \$3,000, College and Dufferin. Owner in trust. Thos. Hancock, 836 Dovercourt road, Toronto. Two stys., 44 x 20, brick, stone foundation, hot water heating, electric light, open plumbing, felt and gravel roofing, cement work, brick, tile, mantels, structural iron. Tenders to be called shortly.

Tenders called for residence, \$8,000. (Law street). Owner, W. R. Sheppard, Toronto; architects, Ellis & Connery, Manning Chambers, Toronto. 50 x 38, brick, stone foundation, hot water heating, slate roofing, cement work, cut stone, brick, tile, mantels, artificial stone, metallic lath, electric work, plate and art glass. Tenders closed August 10th.

Tenders called for addition to residence. (74 St. George street). Owner, Mrs. Stevenson, 74 St. George street, Toronto. Architect, Allen George, 74 George street, Toronto. 2 storeys, 24 x 16, brick foundation, hot water heating, electric light, felt and gravel roofing, hardwood floor, cement work, brick, steel beams. Tenders will be open for about a week.

Specifications prepared for pair dwelling, \$3,800. (Dundas street). Owner, J. Casselman, Dundas street, Toronto. Architect, Thos. A. Fleming, 94 Law street, Toronto. 2 storeys, 30 x 43, stone and brick, stone foundation, hot air heating, electric lighting, shingle, felt and gravel roofing, cement work, cut stone, tile mantels. Work will be done by day labor.

Tenders to be called for apartments, \$15,000, 865 College street. Owner, J. W. Ellis, 21 Howard street, Toronto; architect, P. H. Finney, 43 Victoria st., Toronto. Three storeys, 28 x 80, brick, brick foundation, steam heating, electric lighting, felt and gravel roofing, cement work, brick, terra cotta, tile, fireproofing, reinforced concrete, fire escapes, steel beams. Tenders to be called next week.

Tenders to be called for apartments, \$50,000, near southwest corner Brunswick and Bernard. Owner, Edith F. Williams, 43 Kendall avenue, Toronto; architect, C. S. Williams, 43 Kendall avenue, Toronto. Two stys., basement and sub-cellar, 90 x 110, stone, concrete and brick, stone foundation, steam heating, electric lighting, felt and gravel roofing, interior finish hardwood floors, steel beams. Tenders to be called shortly.

Vancouver, B.C.

Tenders are called for a new apartment house to be erected for Mrs.

Snyder, on Keifer street. Building to be two storeys, frame, concrete foundation, tar and gravel roofing, electric lighting, sheet metal work. Campbell & Dawson, Exchange Building, architects.

Winnipeg, Man.

Tenders called for apartment block, Furby street. Owner, Mrs. C. Gerry; architect, Hooper & Hooper, 303 McIntyre Block, Winnipeg. Stone and brick. Tenders received by architect until August 17th for all trades except heating and plumbing.

CONTRACTS AWARDED

Moncton, N. B.

Parsonage (Queen street). Owner, Trustees of the Central Methodist Church. Architect, Neil Brodie, St. John. General contractor, Humphray & Donald, Moncton, N. B. 2-storey, 40 x 40.

Business Buildings and Industrial Plants

Berlin, Ont.

Excavation is started on the new factory on Victoria street in which soap polishes and German chemicals will be manufactured. Building, two storeys and basement, 36 x 64. Henry Dozenroth has the contract for excavation.

Chatham, Ont.

It is announced that a beet factory will be erected here by the Dominion Sugar Company, which has factories in Berlin and Wallaceburg. The city has given free site, etc. D. A. Gordon, managing director.

Dauphin, Man.

Tenders called for land titles office. Owner, Department of Public Works, Winnipeg; town clerk, J. W. Johnson; Minister of Public Works, H. Rogers, Winnipeg. Construction of land titles office. Plans, etc., at office of Provincial Architect, Fort Garry Court, Winnipeg, and at office of clerk. Tenders received by H. Rogers, until August 16.

Gull Lake, Sask.

Tenders called for bank building. Owner, Merchants Bank of Canada. Manager, W. J. Dromgole, Gull Lake. Plans, etc., at office of Bank at Gull Lake. Tenders received until noon, August 15th.

Hamilton, Ont.

Contemplated addition to plant. Owner, Otis-Fensom Elevator Co., Traders Bank Building, Toronto. An addition to machine shop in Hamilton, under consideration.

Equipment required for printing plants. Owner, Hamilton "Herald" and "Spectator." Additions being erected to both plants. Belting and linotype machines required.

Machinery required for auto manufactory. Owner, Schnacht Auto Co., Cincinnati, Ohio. Engineer, J. Innes, Poplar avenue, Hamilton. About \$100,000 will be spent in machinery for manufacturing autos. Tenders called privately, received by T. Innes. No date settled. Canadian branch established here.

Contemplated addition to factory. (Wellington street N.) Owner, Sawyer, Massey Co., Wellington street, Hamil-

ton. Architect, Stewart & Witton, 7 Hughson street, Hamilton. Two new additions to present buildings decided on. Architect will be instructed to draw up plans soon. Firm makes agricultural implements and will require wood and steel working machinery, belts, etc.

Tenders to be called for factory, \$50,000. (Victoria avenue, N.) Owner, Otis-Fensom Elevator Co., Toronto. Architect, Stewart & Witton, 7 Hughson street, Hamilton. 1 storey, 237 x 74, brick and steel, stone foundation, steam heating, electric lighting, tile roofing, cement work, brick tile, fireproofing, armored and reinforced concrete, structural iron, sheet metal, cornice, skylights, roofing, sheathing and deafening paper, steel beams, machinery. Tenders received after five days.

Kamloops, B. C.

Site purchased for telephone exchange. (Third street). Owner, The B. C. Telephone Co., Vancouver. 2-storey brick, mill construction. Dimension of site, 150 depth x 50 frontage. Modern equipment to be installed.

Listowel, Ont.

A whitewear company, capitalized at \$40,000, and an electrical company, capitalized at \$100,000, are negotiating with a view to locating here. The following have been appointed on the committee to look into the matter: Messrs. J. W. Scott, J. Campbell, J. H. Gunther, J. N. Hay, J. C. Hay, W. Climie, D. Roy, J. M. Schinbein and J. Watson.

Montreal, Que.

J. A. Gerard, 923 Mt. Royal, will erect two stores and house on Papineau avenue, to cost \$5,900.

Messrs. Wetmore & Warren, of New York, are the architects for the new Carlton Hotel, which is to be erected at the southwest corner of Sherbrooke and Drummond streets. Excavation work has already begun.

New Toronto, Ont.

Contemplated addition to factory. Owner, Ritchie & Ramsay, Ogilvie Building, Toronto. Plans are being prepared for addition to factory.

Quebec, Que.

Tenders called for offices. Owner, Quebec Central Railway. Sherbrooke, Que. General Manager, J. H. Walsh. Architect, R. P. Lemay, Que. Wood, brick, metal roof, interior finish wood, hot water heating, electric lighting. Plans, etc., with architect. Tenders to be accompanied by accepted cheque, payable to J. A. Walsh, equivalent to ten per cent of amount of tender and to be addressed to same. Tenders received until August 23rd.

St. Thomas, Ont.

Specifications prepared for addition to factory. Owner, Monarch Knitting Co. 3-storey, 140 x 70. Estimated cost \$60,000. Company supervising construction. Factory to be used for worsted spinning. Machinery ordered in England.

Toronto, Ont.

Tenders to be called for office building. (E. S. Yonge street). Owner, R. S. Williams & Son, Toronto. Architect, Chapman & McGiffin, 59 Yonge street, Toronto. 10-storey, reinforced

concrete. Tenders received in about three days.

Contemplated, four stores and dwelling, Broadview avenue. Owner, W. W. Hiltz, Broadview avenue, Toronto; architect, P. H. Finney, 43 Victoria street, Toronto. Two and one-half storeys, 70 x 70, brick, brick foundation, felt and gravel roofing. Work will be done by day labor.

Tenders called for brewery, Don Esplanade. Owner, Reinhardt Salvado Brewery, Limited, River and Mark sts., Toronto. Architect, F. H. Herbert, 65 Adelaide street east, Toronto. Galvanized iron work, roofing, painting and glazing required in erection. Plans, etc., at office of architect. Tenders received until 5 p.m., August 17th.

Vancouver, B. C.

Plans prepared for bank. (Kitsilano 4th and Yew streets). Owner, Eastern Townships, Quebec. Architect, A. Cox Carter, Cotton Building, Vancouver. 1 storey, 25 x 75, brick and stone trimmings.

L. B. de Laitte contemplates the building of a factory for the manufacturing of a gas-making apparatus. A syndicate has been formed and headquarters established on Seymour street.

Plans filed for addition to plant. (First and Pine streets). Owner, National Biscuit and Confection Co., (formerly Haida Confectionery Co.) Architect, Claude P. Jones, 429 Pender W., Vancouver. 3 storeys, brick.

Work in progress for store and apartment, Victoria Drive. Owner, Peter Torrance; architect, Smith & Goodfellow, 301½ Hastings street west, Vancouver. Two storeys, frame, furnace heat, electric wiring and hard wall plaster.

Plans prepared for warehouse, (Hamilton street). Owner, J. A. Conkey, Dominion Trust Building. Architect, R. A. Nicolars, 415 Pacific Blk. Consulting engineer, Brown & McKinley, Pacific Blk. 5 storeys, 120 x 50 ft. brick, mill construction, concrete foundation, paving partly plastered, hot water heating. Tenders are being called.

Plans prepared for building. (Gore street). Owner, Salvation Army. 6 storeys, steel frame, reinforced concrete walls and floor, passenger elevator, steam heating, hard wall plaster, tar and gravel roofing, electric wiring and King cement. Gymnasium is included in the plans. Plans prepared by G. Miller, James and Albert streets, Toronto. Tenders called shortly.

Windsor, Ont.

Plans being prepared for factory addition, \$5,000. (Sandwich street W.) Owner, Frederick Stearns & Co. Architect, Crane & Pennington, Windsor, Ont. Brick building, 40 x 43 ft., adjoining present laboratory of Frederick Stearns & Co., to be remodelled. New front, additional storey to be built, interior to be made, mill construction throughout. Tenders to be called in about a week.

CONTRACTS AWARDED

Brantford, Ont.

Stores and offices, \$10,000. Owner, W. F. Cockshutt, Brantford. Architect, Geo. W. Hall, Brantford. General Contractor, P. H. Secord & Sons, Brant-

ford. 2 storeys, 56 x 70, pressed brick and stone faced, concrete foundation, hot air heating, electric and gas lighting, 2 vaults, passenger elevator. Heating and plumbing contract not yet let.

Calgary, Alta.

Office building (Lougheed Block). (First street W.) General contractor, McNeil & Trainer, Calgary. Six stys., brick, terra cotta, steel, fireproof, reinforced concrete floors, passenger and freight elevator, vacuum cleaning, 15 stores on ground floor and above about 156 offices. McNeil & Trainer have also contract for theatre being erected in conjunction.

Hamilton, Ont.

The contract for stone work in connection with store for E. Ruddy, Hamilton, has been awarded to G. Rischie; that for iron work to Hamilton Bridge Works; architects, Munro & Mead, Hamilton.

Factory, (Stanford and Wilson). Owner, Tallman Brass Co. Architect, Stewart & Witton, Hughson street S. General Contractor, W. H. Cooper, 197 Emerald street N., brick and steel, stone foundation, steam heating, electric lighting, Careys roof, cement work, structural iron, sheet metal work, skylights, steel beams, iron columns, roofing, wire glass, area gratings, one 75 h.p. boiler. Sub contracts to be let.

Montreal, Que.

The contract has been awarded to George A. Fuller Co., Ltd., Jacobs Building, Montreal, for an hotel being erected at 584 Sherbrooke street, by the Carlton Hotel Company.

St. John, N. B.

General Contract awarded for brick block. (Union and Brussels streets). Owner, Bishop Casey, St. John. General contractor, A. R. C. Clark, St. John. 3-storey and five tenements, 68 ft. on Brussels, 48 on Union and 62 feet depth. Contract awarded on Aug. 7th.

St. Thomas, Ont.

Addition to factory, \$15,000. Owner, Monarch Knitting Co. General contractor, A. E. Ponsford, St. Thomas; brick and steel construction 130 x 70.

Toronto, Ont.

Addition to factory, \$2,500, Wellington street east. Owner, Albert Kleiser, Wellington street east, Toronto; architect, Page & Warrington, 207 Confederation Life Bldg., Toronto. Two stys., 36 x 23, brick, felt and gravel roofing, interior finish maple flooring. General contractor, Chalkley & Son, James Bldg., Toronto.

Winnipeg, Man.

J. F. Graham has been awarded the contract for the erection of a terrace of seven stores on Portage avenue between Good and Balmoral streets, for W. T. & F. H. Alexander. Cost, \$15,000.

Business Building, (Portage avenue). Architect, T. D. Atchison. General contractor, Kelly-Simpson Construction Co., Winnipeg, \$230,000. Reinforced concrete. Work is expected to commence at once.

Office building, \$130,000. (Notre Dame, Garry and Ellice streets). Owner, Frank Lindsay; architect, T. Woodman, Winnipeg. General con-

tractor, Kelly-Simpson Construction Company, Winnipeg. Seven stys., brick and cement, terra cotta facings. Work is expected to start at once.

Five stores, \$20,000. (Main and Redwood avenue). Owner, E. McKenty, Winnipeg. Architect, Frank R. Evans, 506 Somerset Block, Winnipeg. General contractor, Metheson & Gay, 221 Higgins street, Winnipeg. 2 storeys, 60 x 108, brick and stone, concrete foundation, tile floors, interior finish metal and plaster.

Power Plants, Electricity and Telephones

Calgary, Alta.

Tenders called for pump and electric motor. Owner, City of Calgary; city clerk, W. D. Spence. Supply and erection of pump and electric motor in place of five million imp. gal. pump. The pump to be centrifugal and attached to a 500 h.p. electric motor with switchboard complete. Suction, lift of pump 12 ft., delivery to be continuously efficient to maintain pressure in the mains 125 lbs. per square inch. Tenders received by clerk until August 21st.

Kamloops, B.C.

The B. C. Telephone Co. will build here. See "Business Buildings."

Port Stanley, Ont.

By-law carried for purchase of power plant. Owner, City of Port Stanley. By-law carried to raise \$12,750 for purchasing Walter Mitchell's electric lighting plant and installing Hydro-electric light and power.

Sherbrooke, Que.

Application for franchise power company. Sherbrooke railway and Power Co. have purchased The North Hatley Electric Light Co. and The Stanstead and Rock Island Light Co. and are now applying to the different municipalities for a franchise for 25 years to sell power and light. Estimated expenditure \$75,000. Their object is to furnish power and clear light for a radius of about 30 miles around Sherbrooke.

St. Jerome, Que.

Tenders called for power system. Owner, Municipality of St. Jerome; consulting engineer, DeGaspé Beaubien, 112 St. James street, Montreal. Complete hydro-electric power and distribution system. Tenders received until noon, August 28th.

Winnipeg, Man.

Tenders called for six potential regulators. Owner, City of Winnipeg. Sec. Board of Control, M. Peterson, City Hall, Winnipeg. Specifications at office of Power Construction Department. Carnegie Library building, Winnipeg. Tenders received by Chairman Board of Control, until 11 a.m. August 22nd.

Miscellaneous

Hamilton, Ont.

Contemplated purchase of fire-fighting apparatus. Chairman, Fire, Police and Jail Committee, Ald. Clark. The committee contemplate buying one automobile and motors for fire trucks.

Montreal, Que.

Tenders called for fire equipment (Owner, Board of Commissioners; L. N. Senecal, secretary, city hall. Supply of (a) one automobile truck to haul aerial ladder truck; (b) one auto truck to haul 1,200 gallon steam fire engine; (c) one auto hose wagon to carry 2,000 ft. of 2½-in. cotton, rubber-lined hose, etc.; (d) one combination auto engine of a capacity of 1,000 imperial gallons, to carry also 10,00 ft. of 2½-in. cotton, rubber lined hose; (e) one 1,000 U. S. gallon steam fire engine; (f) one 800 U. S. gallon steam fire engine. Specifications at fire headquarters, Craig west and Chenneville streets. Tenders received by commissioners until August 31st.

Toronto, Ont.

Fire-fighting equipment. Owner, City of Toronto. Contract for motor driven combination chemical engine and hose wagon, awarded to W. E. Seagrave, Walkerville, Ont. The contract for fire alarm boxes and wire and cables for fire alarm telegraph has not been awarded yet. New specifications prepared for hose, see 572B.

Winnipeg, Man.

Tenders called for supply of cement. Owner, City of Winnipeg. City Engineer, H. N. Ruttan, 223 James street, Winnipeg. Sec. Board of Control, M. Peterson, City Hall, Winnipeg. Supply of 20,000 bbls. cement, delivered f. o. b. city yards. Specifications, etc., at City Engineer's office. Tenders were received by Chairman Board of Control until 11 a.m., August 10th.

Building Permits

Calgary, Alta.

The following building permits were issued recently: — Crescent Heights Presbyterians have taken out a permit for a church building to be built in that section of the city. The cost of the edifice is to be \$1,200, and it will be a frame building 25 x 41 feet; F. A. MacKenzie, \$1,500 house, Sunnyside; E. S. Munro, \$2,000 house, Hillhurst; A. Yan, \$1,500 house, Second avenue, between Seventh and Eighth streets west; Jas. Robinson, \$1,000 house, East Calgary; N. Gallelli, \$1,000 house, Bridgeland; J. E. Salter, \$2,250 house, Sunalta; C. G. Wyatt, \$2,000 house, Bridgeland.

Toronto, Ont.

Freehold Realty Co., one brick store and dwelling, 2-stys., southeast corner Bathurst and Dupont streets, \$10,000; C. A. Kennedy, two pair 2-sty. semi-detached brick dwellings, west side Emerson avenue, near Lappin avenue, \$6,000; Thompson and Mitchell, 1 brick apartment house, 2-stys., Harbord st., near Montrose avenue, \$9,000; J. Gibson, one pair 2-sty. semi-detached brick dwellings, Vanhorne street and Dovercourt road, \$5,000; A. D. Petrie, 1 pair semi-detached 2-sty. brick dwellings, south side Millicent street near Emerson avenue, \$5,000; R. J. Roger, 2 pair 2-sty. and attic semi-detached brick dwellings, west side Ridley Gardens, near Garden avenue, \$9,200; High Park Curling and Lawn Bowling Club, 2-sty. brick club house and rink on Indian road, near Algonquin avenue, \$20,000; James Sargent, 1 pair 2-sty. semi-detached

(Continued on page 66)

Tenders and For Sale Department

Tenders

Tenders will be received by the undersigned until noon, **Monday, August 14th**, for the completion of the clear water reservoir at St. Thomas waterworks. Plans and specifications may be seen and form of tender obtained at the office of the City Engineer.

GEO. K. CROCKER,
Chairman of Board of Water Commissioners. 32-33

Corporation of the City of Three Rivers

Public Notice

Sealed tenders addressed to the undersigned and marked "Tender for Steel Bridge," will be received at the City Hall, Three Rivers, up to the 25th instant at 4 o'clock p.m., for the erection of a steel bridge with two concrete abutments on the River St. Maurice, the span to be of 200 feet in length.

Plans and specifications may be seen at the office of Mr. Benj. Bourgeois, city engineer, No. 174 Notre Dame street.

An accepted cheque for 10 per cent. of the amount of tender must accompany each tender.

The lowest or any tender not necessarily accepted.

L. T. DESAULNIERS,
Sec.-Treasurer.

City Hall, Three Rivers, 32-34
August 4th, 1911.



Department of Railways and Canals, Canada

QUEBEC BRIDGE

NOTICE TO CONTRACTORS

Sealed tenders addressed to the undersigned and endorsed "Tender for Removal of old Bridge Material," will be received at this office until 10 o'clock, on **Monday, the 21st August, 1911**, for the removal of unused material delivered on the ground intended for use in connection with the construction of the old Quebec Bridge.

Specifications, forms of tender and full information can be obtained on and after this date, at the office of the secretary of the Department of Railways and Canals, Ottawa, at the office of the Chairman and Chief Engineer of the Board of Engineers of the Quebec Bridge, Canadian Express Building, Montreal, and at their office, Board of Trade Building, Quebec.

An accepted bank cheque for the sum of \$13,000, made payable to the order of the Minister of Railways and Canals must accompany each tender, which sum will be forfeited if the party tendering declines entering into contract for the work, at the rates stated in the offer submitted.

The cheque thus sent in will be returned to the respective contractors whose tenders are not accepted.

The cheque of the successful tenderer will be held as security, or part security, for the due fulfilment of the contract to be entered into.

The lowest or any tender not necessarily accepted.

By order,
H. K. JONES,
Secretary.

Department of Railways and Canals,
Ottawa, 5th August, 1911.

Newspapers inserting this advertisement without authority from the Department will not be paid for it. 32-33

Trench Machines

Parsons—Cuts trench 27 in. to 60 in., to 20 ft. deep, fine order.

Parsons—With Mattes Back Filler, cuts trench 28 in. to 78 in. to 20 ft. deep. Overhauled and first class. Write us if you have anything to sell, or if in want of anything.

THE MALES CO.

No. 82 Perin Building, Cincinnati, O.

Tenders

Tenders will be received by the undersigned until **August 19th, 1911**, for supplying and installing a six-million gallon Centrifugal Pump and Steam Engine. Specifications may be obtained from the City Engineer. Tenders must be plainly marked on the outside.

M. H. BAKER,
City Engineer. 31-33

St. Thomas, July 29, 1911.

FOR SALE

Complete Electric Generating Set, consisting of Leonard Peerless steam engine direct connected to 150 k.w. Canadian General Electric generator, 2,300 volts, 60 cycles; also condenser, switch-board, steam and exhaust piping, spare parts for engine and generator, and everything constituting the complete set as at present installed in the Thomas street lighting station of the Town of Brockville. This machine is in first-class order, having only been used on peak loads. It is now being replaced by a larger Belliss & Morcom engine with Swedish G. E. generator. Full particulars and price can be obtained from Laurie & Lamb, Consulting Engineers, Board of Trade Building, Montreal. 28-35



To Contractors

Separate tenders endorsed "Tender for New Government House," addressed to the undersigned, will be received at this Department until noon of **Tuesday, August 22nd**, for the stone and brick work, fireproofing, steel work, roofing and carpenter work, for the new Government House in Chorley Park, Rosedale, Toronto. Plans and specifications may be seen at this department.

An accepted bank cheque payable to the order of the Hon. J. O. Reaume, Minister of Public Works, for five per cent. of the amount of the tender, and the bona fide signatures and addresses of two sureties, must accompany each tender. Cheque will be forfeited to the Crown in the event of the successful tenderer refusing to carry out the work within ten days after acceptance. The department will not be bound to accept the lowest or any tender.

By order,
H. F. McNAUGHTEN,
Secretary Public Works Department.

Department of Public Works, Ontario, Toronto, July 21st, 1911.

Newspapers publishing this advertisement without authority will not be paid for it. 30-31-32-33

TOWN OF BERLIN

Sealed tenders addressed to A. H. Millar, town clerk, will be received up to 6 p.m., **August 17th**, for the construction of a reinforced concrete bridge on Albert street, Berlin. Plans and specifications may be seen at the office of Herbert Johnston, Town Engineer.

The lowest or any tender not necessarily accepted.

H. A. DIETRICH,
Chairman, Board of Works.
Berlin, August 5th, 1911. 32-33

To Contractors

Sealed bids will be received by the undersigned up to noon of **Monday, August 21st**, for all trades required in the erection of a nine-storey, stone, brick, and steel fireproof building in Richmond street west, Toronto.

The lowest or any tender not necessarily accepted.

F. S. BAKER, Architect,
Traders Bank Building,
Toronto

32-33



Department of Railways and Canals

Intercolonial Railway

Passenger Station, Truro, Nova Scotia

Sealed tenders addressed to the undersigned and endorsed "Tender for Truro Station," will be received at this office until 12 o'clock noon, on **Friday, the 25th of August, 1911**, for the construction of a stone Passenger station at Truro, Nova Scotia.

Plans, specifications and form of contract to be entered into may be seen and full information obtained on and after 10th of August, 1911, at the office of the Chief Engineer of the Department of Railways and Canals, Ottawa, and at the office of the Chief Engineer of the Intercolonial Railway at Moncton, N.B., or at the office of the Board of Trade, Halifax.

Parties tendering will be required to accept the fair wages schedule prepared or to be prepared by the Department of Labor, which schedule will form part of the contract.

Contractors are requested to bear in mind that tenders will not be considered, unless made strictly in accordance with the printed forms, and in the case of firms, unless there are attached the actual signature, the nature of the occupation, and place of residence of each member of the firm.

An accepted bank cheque for the sum of \$10,000 made payable to the order of the Minister of Railways and Canals must accompany each tender, which sum tender, which sum will be forfeited if the party tendering declines entering into the offer submitted.

The cheque thus sent in will be returned to the respective contractors whose tenders are not accepted.

The cheque of the successful tenderer will be held as security, or part security, for the due fulfilment of the contract to be entered into.

The lowest or any tender not necessarily accepted.

By order,
L. K. JONES,
Secretary.

Department of Railways and Canals,
Ottawa, August 4th, 1911.

Newspapers inserting this advertisement without authority from the Department will not be paid for it. 32-33

Tenders Wanted

Sealed tenders will be received by Messrs. Chapman & McGiffin, 59 Yonge street, Toronto, up to and including August 30th, for the various trades required in the erection of a ten-storey warehouse and store to be built at 145 Yonge street, Toronto. 33-33

ST. JEROME

Hydro-Electric System

Tenders will be received until noon, August 28th, 1911, for a complete Hydro-Electric Power and Distribution System. Total estimate \$300,000. For specifications, apply deGaspé Beaubien, Consulting Engineer, 112 St. James, Montreal. 33-33

MACHINERY BARGAINS

We have for sale for quick shipment from point near Montreal in Canada, several 18-ton saddle back four-wheel contractors' locomotives, and four dozen 4-yard two-way side dump contractors' cars, all 36-in. gauge. Also one No. 4 Austin gyratory stone crusher with elevator and screen for same. These items in good condition for immediate service and at attractive prices. For particulars, address

WILLIS SHAW MACHINERY CO.
39 South LaSalle Street, Chicago, Ill.



Department of Railways & Canals, Canada

WELLAND CANAL

NOTICE TO CONTRACTORS

Sealed tenders addressed to the undersigned and endorsed "Tenders for Turning Basin, Thorold, will be received at this office until 16 o'clock on Monday, the 21st day of August, 1911.

Plans, specifications and form of contract to be entered into, can be seen on and after this date at the office of the Chief Engineer of the Department of Railways and Canals, Ottawa, and at the office of the Superintending Engineer, St. Catharines, Ont., at which places forms of tender may be obtained.

Parties tendering will be required to accept the fair wages schedule prepared or to be prepared by the Department of Labor, which schedule will form part of the contract.

Contractors are requested to bear in mind that tenders will not be considered, unless made strictly in accordance with the printed forms, and in the case of firms, unless there are attached the actual signature, the nature of the occupation, and place of residence of each member of the firm.

An accepted bank cheque for the sum of \$1,500 made payable to the order of the Minister of Railways and Canals must accompany each tender, which sum tender, which sum will be forfeited if the party tendering declines entering into the offer submitted.

The cheque thus sent in will be returned to the respective contractors whose tenders are not accepted.

The cheque of the successful tenderer will be held as security, or part security, for the due fulfillment of the contract to be entered into.

The lowest or any tender not necessarily accepted.

By order,

L. K. JONES,
Secretary.

Department of Railways and Canals,
Ottawa, 5th August, 1911.

Newspapers inserting this advertisement without authority from the Department will not be paid for it. 32-33

Town of North Toronto

TENDERS FOR SEWAGE DISPOSAL WORKS

Tenders are invited for the construction of three separate Disposal Works to be executed under one contract. The work includes the construction of screening chambers, sedimentation tanks and filter beds, together with the laying of inlet and effluent mains, roadways, fencing, etc., and providing and fixing all iron-work.

Copies of the General Conditions of Contract, Specification, Schedule of Quantities, form of tender and contract drawings, may be obtained at the office of T. Aird Murray, 308 Lumsden Building, Toronto, and at the office of the Canadian Engineer, B-32 Board of Trade Bldg., Montreal, on or before 15th of August, upon a deposit of twenty-five dollars (\$25.00), returnable on receipt of bona fide tender, together with all plans and documents supplied.

Tenders to be sent under seal not later than 6 p.m., Monday, August 28th, addressed to the Mayor and Members of Council, Eglinton Town Hall.

Each tender must be accompanied by a certified cheque equal to two and one-half per cent. of tender, such cheque to be returned when tender is accepted or rejected.

The lowest or any tender may not be accepted.

T. AIRD MURRAY, A. J. BROWN,
Consulting Engineer. Mayor.
Dated August 11, 1911. 33-33



Department of Railways and Canals

Branch Line of Railway from Dartmouth to Deans.

Sealed tenders addressed to the undersigned and endorsed "Tenders for Branch Line, Dartmouth to Deans," will be received at this office until sixteen o'clock on Friday, September 15th, 1911.

Plans, profiles, specification and form of contract to be entered into can be seen on and after the 15th instant at the office of the Chief Engineer of the Department of Railways and Canals, Ottawa; at the office of the Chief Engineer of the Intercolonial Railway, Moncton; and at the office of the Board of Trade, Halifax. Forms of tender may be procured from the Chief Engineer of the Department of Railways and Canals or from the Chief Engineer of the Intercolonial Railway.

Parties tendering will be required to accept the fair wages schedule prepared or to be prepared by the Department of Labor, which schedule will form part of the contract.

Contractors are requested to bear in mind that tenders will not be considered unless made strictly in accordance with the printed forms, and in the case of firms, unless there are attached the actual signature, the nature of the occupation, and place of residence of each member of the firm.

An accepted bank cheque for the sum of \$150,000, made payable to the order of the Minister of Railways and Canals, must accompany each tender, which sum will be forfeited if the party tendering declines entering into contract for the work, at the rates stated in the offer submitted.

The cheque thus sent in will be returned to the respective contractors whose tenders are not accepted.

The cheque of the successful tenderer will be held as security, or part security, for the due fulfillment of the contract to be entered into.

The lowest or any tender not necessarily accepted.

By order,

L. K. JONES,
Secretary.

Department of Railways and Canals,
Ottawa, August 12th, 1911.

Newspapers inserting this advertisement without authority from the Department will not be paid for it. 33-34

For Sale

One second-hand No. 1 Smith concrete mixer, with engine and boiler complete. Apply to A. J. Cromar, Brantford, Ont. 32-33

CITY OF WINNIPEG

Electrical Distribution System

Tenders for Underground Cable

Sealed tenders on prescribed forms, addressed to the Chairman, Board of Control, Winnipeg, and marked on the envelope "Tender for Underground Cable," will be received at the office of the undersigned up to 11 a.m. on Monday, August 28th, 1911, for the manufacture, delivery and installation of underground cable for the electrical distribution system.

Copies of the instructions to bidders, specifications and form of tender may be obtained at the office of the general manager of the Light and Power Department, 449 Main street, Winnipeg.

Each tender must be accompanied by an accepted cheque, at par, payable to the order of the City Treasurer, or cash deposit for the same, called for in the instructions to bidders, which deposit will become forfeit to the Corporation in the event of the successful tenderer failing to sign a satisfactory contract when called upon to do so.

The City reserves the right to reject any or all tenders and to accept any bid which appears advantageous.

M. PETERSON,
Secretary, Board of Control
Winnipeg, Aug. 10th, 1911. 33-33

CITY OF SASKATOON

Storm Sewers and Paving

TENDERS WANTED

Sealed tenders, addressed to the City Commissioners, Saskatoon, and marked as to contents, will be received up to 12 o'clock noon on Friday, August 18th, 1911, for the following work and materials, viz.:-

Contract No. 97.—All labor necessary for laying pipes, and furnishing certain materials, according to the following quantities:—

1,090 lin. ft. 15-in. vitrified tile pipe.

2,150 lin. ft. 12-in. vitrified tile pipe.

1,700 lin. ft. 10-in. vitrified tile pipe.

6,940 lin. ft. 8-in. vitrified tile pipe.

2,865 lin. ft. 8-in. vitrified tile pipe.

(catch basin branches)

2,205 lin. ft. 42-in. reinforced concrete pipe.

Contract No. 98.—Furnishing 2,205 lineal feet reinforced concrete sewer pipe; and 6 reinforced concrete manholes, 42-in. in diameter.

Contract No. 99.—Furnishing 40 manhole frames and covers, and 92 catch basin gullies.

Contract No. 100.—Laying approximately 21,000 square yards of pavement, and grading incident thereto.

Plans, specifications, instructions to bidders, general conditions, and forms of tender may be seen at the offices of George T. Clark, City Engineer, Saskatoon. Copies of instructions to bidders, and forms of tender will be furnished on application to the City Engineer, but copies of plans and specifications will not be furnished.

The lowest or any tender not necessarily accepted.

JAS. CLINSKILL,
W. B. NEIL,
E. M. SNELL,
City Commissioners.

Saskatoon, Sask., August 2nd, 1911 32-33

TOWN OF AYLMER

Tenders for Pavement

D. C. Davis, town clerk, will receive tenders for about 2,400 square yards of Bermudez road asphalt or vitrified brick pavement up till 6 p.m., August 30, 1911, tenders to include grading drains, gutters, etc., to complete the work. Specifications can be seen at the clerk's office, Aylmer.

The work to be commenced at once and pushed through until completed.

The lowest or any tender not necessarily accepted.

F. WOOSTER,
Town Engineer.
33-33

Aylmer, Aug. 8th, 1911.



Department of Railways and Canals

Branch Line of Railway from Guysborough to Sunny Brae through Country Harbour Crossroads to Deep Water of Country Harbour.

Sealed tenders addressed to the undersigned and endorsed "Tender for Guysborough-Country Harbor Line," will be received at this office until 16 o'clock, on Friday, September 15th, 1911, for section No. 1 of the above line of railway, comprising that portion extending from Guysborough to Country Harbor Crossroads and from the latter point to Deep Water Country Harbor.

Plans profiles, specification and form of contract to be entered into can be seen on and after the 15th instant at the office of the Chief Engineer of the Department of Railways and Canals, Ottawa, at the office of the Chief Engineer of the Intercolonial Railway, Moncton; and at the office of the Board of Trade, Halifax. Forms of tender may be procured from the Chief Engineer of the Department of Railways and Canals or from the Chief Engineer of the Intercolonial Railway.

Parties tendering will be required to accept the fair wages schedule prepared or to be prepared by the Department of Labor, which schedule will form part of the contract.

Contractors are requested to bear in mind that tenders will not be considered unless made strictly in accordance with the printed forms, and in the case of firms, unless there are attached the actual signature, the nature of the occupation, and place of residence of each member of the firm.

An accepted bank cheque for the sum of \$100,000, made payable to the order of the Minister of Railways and Canals, must accompany each tender, which sum will be forfeited if the party tendering declines entering into contract for the work, at the rates stated in the offer submitted.

The cheque thus sent in will be returned to the respective contractors whose tenders are not accepted.

The cheque of the successful tenderer will be held as security, or part security, for the due fulfilment of the contract to be entered into.

The lowest or any tender not necessarily accepted.

By order,
L. K. JONES,
Secretary.

Department of Railways and Canals,
Ottawa, August 12th, 1911.

Newspapers inserting this advertisement without authority from the Department will not be paid for it. 33-34

Miscellaneous

Mixer Wanted

Wanted a second-hand Ransom Concrete Mixer, with or without power. Ed. Conray, 435 Mark street, Peterborough, Ont. 32-33

Tenders for Steel Highway Bridge

Sealed tenders will be received up to noon of Monday, August 28th, 1911, for the construction of a Steel Bridge, 62 feet clear span, over Oshawa Creek at the Base Line Road, County of Ontario.

Sealed tenders will also be received at the same time for the construction of abutments, retaining wall and reinforced concrete floor for the above bridge.

Plans and specifications may be obtained from the undersigned, upon deposit of the sum of \$1.00, which will be returned when plans etc. are returned.

The lowest or any tender not necessarily accepted.

FRANK CHAPPELL,
County Engineer.

Oshawa, Ont., Aug., 1911. 33-34

Positions Vacant

Advertisements under this heading two cents a word per insertion. Minimum charge 50 cents

WANTED—Structural steel draughtsman, accustomed to detailing simple trusses and general work. Apply Reid and Brown, 63 Esplanade East, Toronto.

WANTED—Engineer with good practical experience in all classes of interior lighting and motor installation. Special duties revising rules and regulations. An engineer with English and European experience preferred. Apply Box 314, Contract Record, Toronto, Ont. 33-33

Building Permits

(continued from page 63)

tached brick dwellings, at 199 Perth avenue, near Wallace avenue, \$4,000; Thomas Royle and Mrs. Alnas, 1 pair semi-detached 2-sty. brick dwellings, west side Symington avenue, near Bloor street, \$4,000; Standard Sanitary Mfg. Co., 1-sty. brick and steel factory, Royce and Lansdowne avenues, \$18,000; W. H. Brouse, 2½-sty. brick addition to dwelling, 73 George street, \$12,000; Wm. J. Nixon, 1 pair semi-detached 2-sty. and attic brick dwellings, north side Dixon avenue, near Rainsford road, \$4,200; J. Jennings, 1 pair semi-detached 2-sty. brick dwellings, east side Ritchie avenue, near Dundas street, \$5,000; Geo. H. Tucker, 1 pair semi-detached 2-sty. brick dwellings, south side Antler avenue, near Symington avenue, \$4,500; Frank Baxter, 1 pair semi-detached 2-sty. brick dwellings, west side Lee avenue, near Williamson road, \$4,000; D. Bowerman, 1 pair semi-detached 2½-sty. brick dwellings, west side Woodbine avenue, near Dixon avenue, \$4,400; S. R. Robinson, 1 pair semi-detached 2-sty. brick dwellings, Antler avenue, near Symington avenue, \$4,000; H. W. Macdonald, 1 brick and stone dwelling, 3-sty., south side Bloor street, near Bathurst street, \$6,000; Jesse Smith, 1-sty. frame and galvanized iron hockey rink, Ravina Park, near Ravina avenue, \$8,000; A. Fowlds, 1 brick dwelling, 2½-sty., on Crescent road, near Rosedale road, \$6,100; Thos. Bink, 1 brick dwelling, 2½-sty., at 694 Broadview avenue, \$4,500; A. J. Robinson, 1 pair semi-detached 2½-sty. brick dwellings, Applegrove avenue, near Morley avenue, \$4,500; Ed. Knechtel, 1 brick dwelling, 2-sty., on Constance street, near Keele street, \$4,600.

Winnipeg, Man.

Recent building permits include: E. J. Thompson, dwelling, Carlaw avenue, \$2,500; J. P. Shier, two dwellings, Greenwood Place, \$9,300; R. Johnstone, dwelling, Machray avenue, \$3,200; W. J. Williams, dwelling, Elgin avenue, \$1,400; A. E. Burns, dwelling, Jessie avenue, \$6,000; F. C. Allardice, dwelling, Mulvey avenue, \$3,000; Dunn and Wallace, dwelling, Canora street, \$4,500; Mackissock and Thomas Ltd., three dwellings, Lipton street, \$16,500; Midland Railway co., freight sheds, Ross avenue, between Sherbrooke and Isabel, \$45,000.

New Companies

Builders Limited, Toronto, Ont., incorporated with a capital of \$200,000, to carry on a business as contractors, etc., to purchase lease or otherwise acquire timber limits and deal in wood and timber of all kinds. The provisional directors include John Jos. Manuel and Geo. Lang Latimer, both of Toronto.

McCrea & Sharp, Limited, New Liskeard, Ont., incorporated, with a capital of \$40,000 to carry on a general land and building business. Provisional directors: John Reuben McCrea and Wilfred Clement Sharp and Francis Loudon Smiley, all of New Liskeard.

Niagara Falls Contracting Company, Limited, Niagara Falls, Ont., incorporated, with a capital of \$40,000, to carry on a building and contracting business. Provisional directors: Edwin David Lowrey and Fred. Aug. Goring, both of the township of Niagara.

Timmins Townsite Co., Ltd., Toronto, Ont., incorporated, with a capital of \$40,000, to erect buildings and deal in builders' supplies, etc. Provisional directors: Geo. Alexander Grover and John Bell Holden, both of Toronto.

The Kennedy Construction Co., Ltd., Montreal, Que., incorporated, with a capital of \$250,000. Incorporators, Jas. Kennedy, of La Tuque St., George Harvey, of West Shefford, and Geo. A. Campbell, advocate, of Montreal.

General Realty Corporation, Ltd., Port Arthur, Ont., incorporated, with a capital of \$500,000, to carry on a land and building business, dealers in builders' supplies, etc. Incorporators: Jas. Russell Lovett Starr, Jas. H. Spence and Matthew Crooks Cameron, barristers, all of Toronto, Ont.

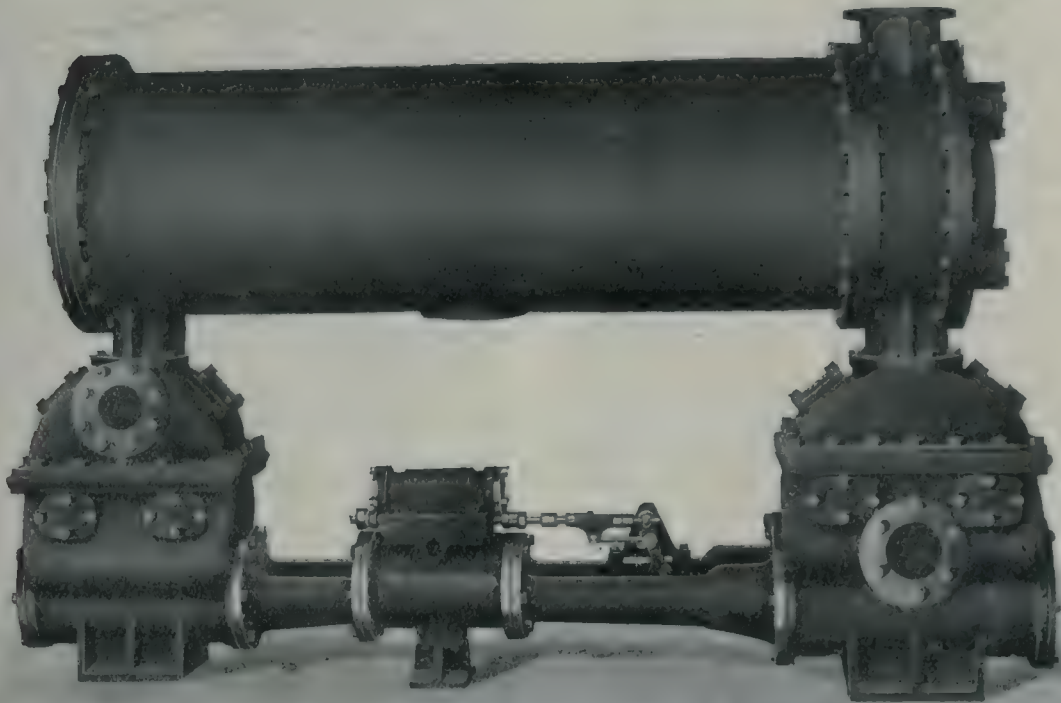
Ensign Realty Co., Ltd., Montreal, Que., incorporated, with a capital of \$50,000, to carry on a general building business, dealers in timber building materials, etc. Provisional directors, Edwin Coswill, Albert Astor Boire, and Wm. Alex Cattin, real estate dealers, all of Montreal.

Wascana Building Co., Ltd., Regina, Sask., incorporated, capital \$25,000.

Montreal, Que.

The planing mill and sash and door factory owned by J. A. Brien & Co., Craig and Delorimier avenue, was destroyed on the 7th inst. Estimated loss \$35,000. The sash and door factory of Messrs. Fevreau & Corveau in the rear damaged to the extent of \$15,000.

CONDENSORS



Condensor built by The John Inglis Co., Limited

BOILERS, ENGINES, PENSTOCKS,
Water Towers, Steel Tanks, Heavy Plate
Work, Condensers, Air Compressors, Pump-
ing Machinery, Special Machinery of all kinds

Let us Submit Prices.

The **John Inglis Company**

Engineers and Boilermakers

Limited

14 Strachan Ave., TORONTO, Canada

Vancouver Building

Notwithstanding that the strike which paralyzed the building industry at Vancouver early in June was not called off until the middle of last week, building has been quite brisk and the month's totals pass the million mark again, for the sixth time this year. The prospects for the balance of the year are keeping pace with the earlier months. According to Mr. S. M. Jarrett, Building Inspector, the number of permits issued in July were 226, at a value of \$1,108,380. July, 1910, showed a corresponding total of \$639,530. The value of building permits issued for the first seven months of the present year in Vancouver amount to \$10,296,784, which is over 35 per cent. of an increase over the first seven months of last year.

New Harbor Board Offices

The Montreal Harbor Commissioners' offices at the corner of Common and St. Peter streets, have become too small for the increased staff which is necessary in carrying out the extensive improvements which are being made on the harbor front. Accordingly a new office is being built on the wharf near the No. 1 grain elevator. The corner stone was laid a few days ago by Major G. W. Stephens, chairman of the board. The usual mementos were placed in the stone and the ceremony in this connection was quite interesting. The building is of red brick and will be completed in the course of a few weeks.

Under the new city council procedure by-law at Regina, Sask., no contract for work over \$200 in value

will be awarded without asking for tenders. This is the principal feature of the by-law and it is one which merits the consideration of every Canadian municipality which has no definite regulation covering this point.

One of the most important points to remember in the installation of lightning arresters is the ground connection. Various methods of making good grounds have been recommended, but the one that appears to give the least trouble is a number of iron pipes in parallel driven into the ground thoroughly moistened with water. A quantity of salt should be placed around each pipe at the surface of the ground. Each pipe should be connected to the iron framework of the station, metal flume, or water mains, or steel penstock; in fact, it is recommended to connect them to any good grounds around the station. The ground connections should be as short as possible, and from time to time the resistance of each ground connection should be measured to determine its condition. Ground connections for arresters should be as short and straight as possible from the arrester to the earth. A poor ground connection will render ineffective any provision for discharging the static electricity to earth. The question of ground connections is one which has been much discussed.

The town council of Raymond, Alberta, has passed a by-law authorizing the raising of a loan of \$10,000 for water-works extension. A reservoir is to be constructed at the spring, two miles south of the town, for storing water for emergency purposes.

John Whitehead & Co.

LIMITED

Albert Works: PRESTON, ENGLAND

Makers of

Reliable



Efficient

Tile and Pipe Machinery, and
CLAY WORKING PLANT

for all classes of Clays and Shales.

INQUIRIES SOLICITED.

CATALOGUES POST FREE.

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Representatives in Canada: Messrs. Chambers & Simpson, Engineers, Toronto

Contract Record

ESTABLISHED 1886

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Municipal Progress, Advance Information

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CHICAGO - - - - - 4059 Perry Street
LONDON, ENG. - - - - - 3 Regent St., S.W.

SUBSCRIPTION RATES

Canada and Great Britain, \$2.00 U.S. and Foreign, \$2.50

Vol. 25

August 23, 1911

No. 34

The City Architect's Extension of Time

At a recent meeting of the Fire and Light Committee of Toronto an extension of five months' time was granted to the city architect in which to finish his report on the Memorial presented to the Mayor and Board of Control by the Citizens' Committee a few months ago. At the time of presentation the city architect was given until August 1st in which to make his report on the Memorial, and the recent extension of time by the Fire and Light Committee has occasioned some little indignation which resulted in calling a meeting on Wednesday afternoon for the purpose of discussing this new turn in the situation.

At this meeting the fact that the bulk of the building operations for 1912 will be dependent on the present by-law if not placed in hand for revision before the beginning of the new year, was largely dealt upon, and it was deemed advisable to wait upon the Board of Control at an early date with a view to laying the entire situation before them, and vigorously asserting the necessity for immediate action being taken to secure the much-needed revision.

The Memorial has been discussed thoroughly from every point of view since its presentation last May, and the points in its favor have strongly been brought out. The investigations of the Committee in compiling this valuable work, necessitating on their part an expenditure of considerable time and energy, which were so gratuitously given, make this extra delay in their good work appear to be unoccasional. Although during the past four months the city architect's department has been extremely busy, no such present conditions of affairs should warrant the continuation of building operations on a basis that, in the opinion of the citizens, is faulty and incomplete. Why not proceed with the revision with all possible speed in order that future building might have its benefit? At any rate the building operations of the spring of 1912 should of necessity be based upon a revised by-law rather than allow a repetition of the state of affairs at present in Montreal. Here, owing

to a revision in the midst of the building season, the by-law had to be amended to allow practically all this year's building to be proceeded with, without complying with the new regulations regarding fireproofing, etc. This will be the condition of affairs in Toronto next year unless the revision is made within a reasonable time after the presentation of the Memorial. Any motive that the Fire and Light Committee may have in extending the time until Mr. McCallum makes his report, should be based upon the excessive urgency of the occasion, and upon the fact that there are a number of buildings in project that have waited a whole season for a satisfactory decision, and that will otherwise be obliged to be held over until next year, unless justice is dealt them by way of a speedy report on what has now had nearly four months' time for preparation. The advantage of this extension until 1912 is certainly not evident.

The Sanitary Adviser

The example of city council indiscretion that received some comment in the Contract Record of August 9 brought in replies to the effect that crossing the border for illustrations of this practice was entirely unnecessary, and that there were municipalities in the Dominion suffering as a result of the incompetency of their men in office to appreciate the value of offered sanitary engineering knowledge. No specific response need here be quoted as each case pointed with wonder to the fact that certain civic officials, upon whom the responsibility of the community rested, should have such lack of regard for the future health of citizens as to instal apparatus pronounced inefficient and still in the stages of experiment. Moreover, mistakes do not appear to be those of an individual but of a council or corporation.

The importance of sanitary engineering is always evident. Apart from our ideals of dominion, our schemes of railway development, canal systems, and multitudinous methods of transportation and inhabitation, the maintenance of ourselves in a normal state of health is a prime requisite. It has elsewhere been stated that no community can go beyond an available water supply at the rate of 30 gallons of potable water per head per day. An experienced sanitary engineer in this city has said that no two people can exist anywhere beyond available supply.

It is true that this branch of engineering is one apart from such problems as bridge building, railway work, power development or the laying out of a new country. The work of a sanitary engineer besides including the making of surveys, measuring of quantities and estimating of costs, would also include the study of the character of available water in a given area, followed by his ability to lay up both physical and chemical data, to draw deductions, and to tell a community just how far it can go before a change must be made in its water supply. It is obvious that the character of the water is most important, underground water being a mixture or often a chemical compound, its constitution dependent upon the absorption of soluble quantities of foreign matter taken up from the strata, and surface water being dependent upon the absorption of forms of vegetable growth and decay. In short, water is no longer water alone but presents, upon analysis, intricate chemical formula, sometimes organic, sometimes inorganic, or both. An article on page 51 of

the last issue of the Contract Record analyzes this problem concisely, and in its last paragraph states that the judgment passed upon the desirability and safety of a water for drinking purposes was based upon an accumulation of evidence from all possible sources, and that the past and present history of the water and of its surroundings must always be included.

The work of the sanitary engineer, therefore, is a very important one, and is as absolutely necessary as it is difficult, since, in the interests of the average community, no other branch of engineering presents such problems of vital importance as those connected with the obtaining of a sufficient healthful water supply for household use. These problems are comparatively new in many parts of the Dominion and are fast increasing in number and variety. It is regrettable that there is a simultaneous scarcity of sanitary engineers in Canada, since, whenever an expert is required to advise, an outsider is of necessity, called upon as the services of our own consultants in this work are in such demand as to be often unavailable for some time. Universities of the Dominion are seriously considering adoption of courses which will so draw upon engineering and medical sources of instruction as to properly fit men for this important work. Graduates equipped with thorough and up-to-date instruction in this work in the Dominion will assuredly have ample opportunities for attaining success and distinction. It would be commendable at the outset, however, to equip a number of our city councils with an accumulation of knowledge from such a source, as it is evident that their co-operation with the few fully competent sanitary engineers we now have in the Dominion would then solve at least a small number of the many problems that at present exist.

The Work of the Surveyor

An architect and surveyor of 20 years experience in North England in the person of Jas. J. Adamson, of Montreal, in a reply to the editorial entitled "Quantity Surveyors" in the August 2 issue of the Contract Record, imparts a number of important points that are well worthy of consideration. Mr. Adamson regularly took off and supplied quantities for all his work and is an authority on the subject of surveying. According to his letter the Architects' Association and the Master Builders' Association in his native city of some 30,000 inhabitants met some years ago and by mutual arrangement, agreed that quantities should be supplied for all works estimated to cost over \$1,250. His letter goes on to state:

There "Unity is strength," and the master builders were and are a strongly united body, while here in Montreal they appear to me to lack this essential, and thereby waste no end of valuable time "figuring" on various plans, and in very many cases "guessing" what many of the items are, often, no doubt, to the detriment of both owner and contractor.

The Quantity Surveyor is not there to figure out the cost of the material in any case, but to give the accurate quantity in yards, feet, squares, and inches, of all material required for each job, with a brief description of each item. These quantities are then lithographed and the result is, as you say, a concise and explicitly detailed specification. Each contractor who desires to tender is supplied with a copy and can sit down and fix up his own price to it in one-fifth of the time it takes him to figure on plans and

specifications under the present system in Montreal, which system, to my mind, is antiquated and unbusinesslike. If, for instance, a mason contractor is asked to make up a general, full, or whole tender for a building, he is given a set of blue prints and a specification, he first figures out his own work, and then must pass the plans to the other trades, and it may take him ten to fourteen days to get their results before he can complete his full tender. If on the contrary he had a full set of quantities, he could, on the day he received them, detach each separate trade, mail them to his friends, the sub-contractors, and unless it was an exceptionally big job, could have their prices back by return mail, thus saving no end of valuable time for all.

The most important objection that I have met with, in Montreal, is the question of payment for the quantities.

In England the charges are two and one-half per cent., and these charges are always added to the amount of the tender, and paid to the quantity surveyor, or architect, by the contractor who secures the work, out of the first certificate he receives and the unsuccessful contractors pay nothing. This conclusively proves that the building owner pays for quantities, and it is decidedly to his advantage to do so. The uninitiated may not think so, but when it has been fully explained to him (the owner) that the quantities are taken off by experienced and qualified men, that by this method he only pays for the exact yards of excavating, number of bricks, squares of flooring, yards of plastering, etc., and that there is no guess work about it. I have never yet found a client who objected to pay rather than leave it to chance methods or rule of thumb.

On the contract being awarded, the successful contractor is given a second copy of the quantities, these he fully prices out and hands back to the architect, the detailed price therein then form a schedule on which any extras are charged or deductions made on the contract.

An important matter like this should be adjusted here without much difficulty by, say, a deputation from the Master Builders' Association waiting upon the committee of the Architects' Association and fixing up details. It would mean money to both parties, save time, which is money, and save many disputes.

Should any of your readers desire further details I shall be pleased to hear from them or to take off quantities for them at any time.

Faithfully yours,

JAS. J. ADAMSON.

Mr. Adamson corrects an impression made by the previous editorial as to the work of pricing material falling to the surveyor, the function of whom is to take off an itemized bill of quantities which should include everything that enters into the construction of the building and submitting the same to the architect, who in turn forwards copies to the builders, together with plans and specifications for estimating. The return of this to the architect has the advantage of being an itemized tender as the bidder has only to append his prices to the list of quantities already contained therein. It is obvious that any extras or omissions that may be reckoned with after the contract is awarded will be manipulated on the same basis and will thus eliminate what has in past years been a fruitful source of trouble in this country.

The existence in Canada of commercially available clays suitable for the manufacture of better grades of stone ware and pottery has not as yet been definitely determined, although it is quite reasonable to expect that such clays will be found, particularly in the western portion of the country.

Some Conditions Affecting Dam Trenches

The Part that Geology Plays in Governing Trench Excavating—The Location of Water-tight Strata—The Necessity of Perfect Water-tightness in Trench Work

In a paper read before the Association of Water Engineers of England, Dr. Herbert Lapworth asserted that the selection of an efficient and economical site for a dam and the question of deciding when water-tight strata have been reached in the trench excavations form two of the most difficult problems with which the water engineer has to contend. In reservoirs, as in other engineering works, each case has its own peculiarities; and for this reason it is impossible to lay down rules except on the very broadest lines. There are, however, a few general principles that appear to be common to many dam trenches.

The site of the reservoir having been determined and the approximate position of the dam fixed, a contoured geological map of the site and the area for some distance above and below should be prepared, he said. A mere inspection of the surface indications and a note of the geological beds or strata alone are not sufficient. The various beds should be plotted on a fairly large scale, not less than 1/2500th, so that the map shows the order and levels of the strata.

No geologist will say that it is possible to prepare a detailed geological map of every dam site without considerable help from trial shafts or borings, in fact, the detail required for this kind of work renders the sinking of numerous shafts almost imperative. In the author's opinion, no expense should be spared in these initial explorations. An expenditure of several thousand pounds is trivial in proportion to the saving that may be effected by such means. Some engineers prefer bore-holes; but these are not nearly so satisfactory as trial shafts, Dr. Lapworth said, which should not be less than 8 or 10 ft. square, and in the superficial deposits should be well timbered from the commencement. They should be sunk to a considerable depth, occasionally well below what will probably be the final depth of the trench, in order to make perfectly certain that the water-tight strata continue downwards.

The ideal dam is one which has the whole length of its foundations in water-tight rock with all percolating ground water above the level of the foundations. The object of the trench, of course, is to sink below all loose, open, and unstable materials; these bring: (1) Superficial deposits, such as alluvial and glacial beds of sand, gravel and clay; (2) surface material broken up by weathering and surface movement; (3) surface or sub-surface material broken up by faults, folds and joints; (4) sub-surface material of a porous or water-bearing nature; and in masonry dams (5), sub-surface material not sufficiently firm to take the weight of the overlying dam. In England, dam foundations are sunk down to, and well into, the solid rock, invariably in the case of masonry dams and generally in the case of earth embankments.

In Great Britain, the superficial deposits consist principally of alluvial and glacial material, and of these only the latter offer serious trouble in dam

construction. These glacial beds consist of sheets or masses of clay, gravel and sand, sometimes of enormous thickness, and deposited in a more or less promiscuous manner over the solid rocks. They are distributed irregularly over Britain north of a line joining Bristol to London, and occupy, in general, the bottoms of the valleys. They may be considered the bugbear of the water engineer in selecting a site for a reservoir embankment, for the very simple reason that their surface indications are very little guide as to what may be expected below in the trench excavations. In this the glacial deposits differ materially from the solid rocks, in which it is sometimes possible to predict fairly accurately what will be met with underground. For this reason, in all cases where glacial deposits are known to cover the solid rocks, it becomes imperative to make an exhaustive examination of the site by means of shafts and the like, before settling on the final central line of the trench, not only because of the uncertain local distribution of these materials and their irregular thicknesses, but because of the very variable nature of the materials themselves.

One of the most important questions arising in connection with the superficial deposits, especially where they are extensive, is whether it is advisable in the case of earth embankments, to leave the solid rock bottom, and continue the trench in any water-tight layers of the overlying materials. The problem appears to be simply a matter of ascertaining whether the water-tight material (or boulder clay as generally the case in England) lies directly upon solid rock, and is not underlain by water-bearing beds, such as gravel and sand. The fact that a thick mass of boulder clay overlies the reservoir site may often be looked upon, of course, as an advantage in one way, that is, in preventing or lessening the flow of ground water in the underlying materials. But unless thorough preliminary investigations are carried out, it can never be definitely known whether water-bearing beds of gravel and sand may not occur in patches under the clay, and outcrop in the reservoir higher up the valley.

Overlying nearly all solid rock there is soil, sub-soil, and loose rock opened out and broken up by weathering and other agencies. These open materials, of course, in dam trenches have to be penetrated, because they are loose, unstable and permeable by water. The principal factors producing broken-up surface or sub-surface materials, in addition to weathering agencies, are surface-creep and landslips. A landslide is generally assumed to take place suddenly; surface-creep is a very slow and gradual process. Landslips are generally visible on the surface, though not always so; surface-creep rarely, if ever, makes any sign on the surface.

Landslips should be avoided in the selection of dam sites, not only because of the extra cost due to penetrating the broken-up material before reaching solid rock beneath, but if there is a shaley rock series, there is a possibility of the landslide moving again af-

ter the reservoir is filled, owing to lubrication from the water in the reservoir. The Woodhead dam of the Langdendale reservoirs of the Manchester Water Works is an example of a dam penetrating landslips.

The surface sliding of material often produces in shaley rocks a buckling-up or folding of the rocks in the centre of the valley. But there is a second cause for these folds, which is more serious and this is a general or regional horizontal movement of the whole of the rocks. In cases where the folds die out downwards the movement is attributed by some to general lateral creep, by others to a local movement due to the weight of the hills on either side of the valley squeezing out the beds laterally or horizontally, and resulting in an uplift of the strata in the centre of the valley similar to the uplifting movement in the floors of mines and tunnels. Whatever the explanation may be, the fact remains that such movements have taken place in many districts of the carboniferous rocks in the North of England. There are numerous dam sections showing this buckling-up or wrinkling of the strata in the centres of the valleys, often extending to considerable depths, and producing in the rocks extensive fracturing and faulting, and a general opening out of the beds to the freer percolation of water. In the Derwent Valley these wrinkles are of great depth; and evidence of horizontal sliding is very clear—pieces of shale from trial headings driven hundreds of feet into the hillside being perfectly polished by the movement. Horizontal movements of this appear to die out at certain depths below the surface, though these depths may be considerable. They are apparently resisted by thick masses of rock. Thus the Derwent Valley wrinkles die out downward, when a considerable thickness of massive beds of sandstone is reached, though their effects are continued below generally in the form of faults.

The merits or demerits of faults in dam trenches have been the subject of discussion among water engineers. Some go as far as to say they prefer faults if they can get them in a dam trench, because they serve as water-tight barriers into which the trench can be tied. Opinions on this question seem to depend mainly on the kind of rocks with which one has had experience. The water-tightness of a fault depends entirely upon the material it separates. If the rocks are generally shaley, the fault rock consists for the most part of fine ground-up shale, often of a clayey nature and water-tight. If, on the other hand, the rocks are of hard material—such as sandstone, grit or igneous rocks not decomposed—then the fault rock will generally consist of fragments of these materials, with openings allowing the passage of water.

The natural jointing of rocks below the surface independent of weathering influences is, of course, one of the principal reasons why many trenches have required to be sunk to great depths in the solid rocks, especially where the joints have been widened by earth movements subsequently to their original formation. The natural jointing of rocks extends to enormous depths, though the percolation of ground water through them is confined, as a rule, to the higher measures. The tendency of all jointing obviously is to decrease downwards; the joints becoming farther apart, and the width of the openings diminishing. But it is by no means the rule that a trench sunk or carried far into the hillsides will

eventually reach material in which the joints are so fine or so widely spaced, as to prevent the percolation of water. In the Howden dam of the Derwent Valley Water Works, trial headings driven hundreds of feet into the hillside showed no diminution in the jointing of the sandstone beds, in fact, rather the reverse; for at a distance of 500 feet in from the surface horizontally and 250 feet vertically below the surface some joints were as large as 9 in. in width and upwards of 6 ft. in height. These remarkable joints below top-water level necessitated the construction of two long wing-trenches, one on each side of the valley, following the top-water line of the reservoir.

Where there is difficulty in getting water-tight ends to a trench, or where there are water-bearing beds in the trench which out-crop in the reservoir, it is a common practice to divert the line of the main trench roughly at right angles, and proceed up the valley with "wing-trenches" until a water-tight end is met with. The trench is sometimes turned into the hill at the end at right angles to the direction of the wing. Where it is a question of founding in water-tight beds such as shales, with overlying open rocks such as sandstone, the direction of the wing-trenches should be determined, of course, by the dip; and they should run in the line of the steepest rise of the bed. In cases where the dip is up-stream, the wing-trenches should run down stream.

The second method of dealing with water-bearing beds out-cropping in the reservoir is to run out an "arm-trench" up-stream at right angles roughly to the main trench. This arm-trench may have its top and bottom in water-tight strata, and thus the water-bearing beds between are cut off from their outcrop when the trench is filled; or the bottom may be in water-tight strata, and the water-bearing beds partly cut off by the trench; the remainder on the outcrop above being concreted or puddled over, as in the Bottoms reservoir of the Langdendale works. A third method (where, by reason of the geological conditions, no advantage appears to be gained by going up or down stream) is to continue the line of the main trench into the hill in heading until water-tight material is met with, or for such a distance as is considered sufficient to offer resistance to percolation. The width of wing or arm trenches is generally not less than 5 ft. 6 in. or 6 ft., for convenience of working.

Where the trench has been carried laterally into the hill to a considerable distance, and some doubt is felt as to the water-tight nature of the ends, some engineers have left vertical shafts at the ends of the completed headings, with means of approach for inspection during and after the building of the reservoir. This has the great advantage of proving whether the ends are sound, and of locating the leakage if any occurs. The question whether leakage from a full reservoir, either under or around the trench, is serious or not, is one on which opinions differ among engineers of different countries. In America and India, for example, puddle trenches are not carried to such great depths as in Britain. Sometimes the puddle core is altogether omitted, and leakage is expected; systems of drains being provided for carrying away the percolating water. The general opinion in these countries seems to be that it is waste of money to spend large sums in order to stop small leakages of water. So long as the leakage does not affect the stability of the embankment,

or wash away the puddle in a clay puddle trench, there is something to be said of this attitude; but the difficulty when dealing with an imperfect piece of trench during construction always lies in deciding what is likely to be the amount of leakage when the full pressure of the reservoir comes upon the foundations.

The catastrophes that occurred in the early days of reservoir construction in England, though not affecting so much the question of selecting sites, have led British water engineers to aim at perfect watertightness of the trench-work; and the general practice is, if possible, to carry the work laterally and downwards into retentive material. It has not always been possible to secure these ideal conditions, the extra cost involved in obtaining them having sometimes rendered such a course prohibitive; and the result has been considerable leakage—sometimes unforeseen, sometimes expected, or even created by leading the water up from the foundations in vertical pipes. The leakage is allowed to escape into the river below the dam as compensation water, and care is taken to protect the puddle by means of concrete. This practice was adopted with the Yarrow dam of the Liverpool (Rivington) Water Works, where a strong spring was met with about 150 ft. below the surface; and since that time in many other trenches in England.

Where the area of the leakage channels is small, or where the frictional resistance of the water-passages is sufficient to prevent high velocities, the tendency is for silting to take place, and for the leakage eventually to cease. This has occurred in innumerable instances in America, India, Britain and elsewhere. Grouting, or forcing cement grout under pressure, is sometimes recommended as a means of stopping leakage from a reservoir through jointed or fissured rocks. While this may reduce the amount of leakage, it is, in the author's opinion, scarcely ever likely to be successful in stopping the flow, except by an extraordinary chance. Reservoirs that have leaked through open joints have been successfully treated by adding wing or arm trenches, or by subsequent covering of the water-bearing outcrop with a layer of either puddle or concrete.

Igneous rocks form the foundation of numerous dams on the Continent and of a few in Britain. The main characteristics of crystalline rocks generally is existence of numerous joints, often extending to great depths. These are generally vertical; but in certain rocks, such as granites, they are frequently accompanied by horizontal joints. These joints act as water channels and generally contain deep-seated percolating water, which is transmitted for considerable distances. These water-bearing joints in the igneous rocks render the trench work in such material exceedingly uncertain. Another very uncertain factor, more especially in the granites, is the depth of decomposed material.

The older rocks generally have been subjected to long-continued compressive forces of such intensity that the material has become greatly consolidated and the joints, faults and fissures are tightly closed at shallow depths. The result, as regards reservoir trenches, is that a water-tight foundation is found, as a rule, near the surface, and dam sites on these older rocks are more economical, as a general rule, than those on the later deposits.

Investigations of Flow in Brick-Lined Conduits

In a paper read before the Western Society of American Engineers by Mr. John Ericson, city engineer of Chicago, the conclusion was drawn that for brick-lined conduits a value of n in Kutter's formula of 0.0130 is readily attainable. This is a coefficient due to roughness, and is applicable to tunnels or sewers of ordinary sizes and velocities of flow, lined with sewer-brick laid in cement mortar, if the brick is properly selected and not too warped or uneven, laid in a workmanlike manner and true to line, not disturbed by blasting, and the mortar joints scraped off flush with the brick.

Under certain circumstances, especially if there has been any disturbance whatever of the brick on account of blasting, it will be found advisable and profitable to have, in addition, the entire interior surface of brick conduits washed with neat cement, the strokes of the brush applying the wash to be always along the geometrical axis of the conduit. By this method a coefficient of roughness, n , considerably smaller than 0.0130 should be obtained in well-constructed tunnels of the sewer brick-lined class.

In relation to blasting in the excavation of trenches for brick-lined conduits, Mr. Ericson pointed out that if the lining is thereby at all disturbed, whether such disturbance is especially noticeable or not, it will have the effect of increasing the resistance to flow, and consequently decreases the capacity of such a tunnel. The jarring of the brickwork undoubtedly disturbs the mortar joints more or less, so that the bond with the brick will be broken. Slight projections and irregularities will be caused by this shaking of the brickwork, and, irrespective of any visible disturbance or distortion of the same, resistances to the flow of water are created.

A brick tunnel in rock should not be lined until after the completion of the entire excavation, or at least the brick lining should be kept far enough back of the face, and be so protected as to be unaffected by the blasting.

In an earth tunnel, blasting should preferably not be permitted at all, and if anywhere found to be necessary, care should be taken to protect the brickwork from the effect of such blasting, and to remedy any defects in the brickwork that, upon close inspection, may be discovered.

Occurrence of Asphalt

Asphalt in nature occurs in two types, so far at least as concerns workable deposits. The first type embraces the occurrence of beds of practically pure, separated-out bitumen, such as occur in Trinidad and about the Red Sea. The second type embraces occurrences of asphalt bound up in limestone or in sandstone, as in the Simmer pits in Hannover, Vorwhole in Brunswick, Travers in Switzerland, Ragusa, Sicily, and Volga district in Russia, etc. Asphalt, representing perhaps a third type, occurs in commercial quantities in petroleum and oil shale deposits and exudations therefrom. The last named, as in California and Cuba, grades into the pure asphalt type of deposit characteristic of Trinidad. The oil shale deposits, depending upon the amount of asphaltic base, grade into the Travers type of deposit.

Immense asphalt beds have been discovered a few miles northeast of Fort McMurray, Alberta.

Some Details of Quebec Bridge Proposals

Investigation of the Numerous Proposals of the Bidders—A Competition of Erection Methods—Thirty-five Distinct Proposals

An investigation of the various designs submitted by the four bidders for the contract of the Quebec Bridge over the St. Lawrence river brings out a number of important points dealing with problems of erection in such structures of exceptional dimensions. From the six modifications of its own general design, together with the alternative designs, allowed by the Board of Engineers, there resulted 35 separate and distinct proposals. These were enumerated and dealt upon briefly in a previous issue of the Contract Record (May 3, 1911) and the diagrams shown herewith belong to that article, but are reproduced in connection with the following detailed examination of the various designs appearing in the Engineering News, of New York.

Maschinenfabrik Augsburg-Nuernberg A. G.; Board's Design

In two forms of the Board's design, the entire bridge is to be erected by cantilevering. Erection would start from the main piers, both the anchor and the cantilever arms being erected without falsework. To insure stability the anchor arm is temporarily supported at panel-point AL10 by a steel temporary bent resting on concrete footings.

Before erecting the permanent truss members, a temporary framework spanning from the main pier to the temporary bent is erected by derricks. The floor members of the bridge being erected on this framework, the erecting cranes would be built on this floor.

It is proposed to erect the bridge by double-jib travelling cranes, two on each arm, having cross travel on a tower or trestle arranged to run longitudinally along the floor of the bridge. All movements are to be by electric power. Each crane has a lifting capacity of 200,000 lbs. Erection can therefore proceed simultaneously at four different points. The rails on which the crane trestles are to run are to be laid on the regular stringers, which for this service could be shifted towards the main trusses of the bridge. The expense of providing four cranes on each side of the river was considered warranted on account of the amount of time saved for the completion of the work. Erection is to proceed on both sides of the river at the same time.

The cantilever-arm travelling crane will be built first and the work of erection will commence at panel A13 to C13 (panel-point 14 is the main post), including the erection of the temporary supporting bent and its adjoining members. While this work is progressing the anchor-arm crane will be erected in panel A11—A10 and work started on the erection of the first anchor-arm triangle L14—U12—L10. The diagonal members AU12—AL14 are temporarily strengthened, because they become compression members for a time. An auxiliary member is to be inserted between the points AM13—CM13 to serve for regulating the system during the first cantilevering out.

While the bridge construction below the floor is being cantilevered out panel by panel, assisted by auxiliary members, some of which are adjustable, the

posts and upper-chord members between the two compression diagonals are put in place, by means of the crane operating from central position.

When cantilevering out the cantilever-arm, the intermediate chord points M3 and M1, as well as the upper chord points U2 and U0, are connected to the floor beams of the bridge by special stiffeners in order to increase the lateral rigidity of the trusses.

Cantilever Erection of Suspended Span

In cantilevering out the suspended span, the first two panels are erected in the same manner as the last panels of the cantilever arm by using the same traveling cranes. By lowering the working platforms both the traveling cranes are then changed into upper chord cranes, thus decreasing the weight and consequently the stress in the members of the bridge. These upper chord cranes then work in the usual manner, panel by panel, up to the centre of the bridge.

The operation of connecting up at the centre of the suspended span is facilitated by means of strong adjusting devices connected with the top and bottom chords at the end of the cantilever arms.

Suspended Span Floated In

This scheme necessitates the erection of the suspended span on high steel falsework, this falsework being supported in turn on large pontoons, the whole being finally towed into position. The height of the falsework is such that at low tide the suspended span is about 2 ft. higher than corresponding points on the cantilever arms. The hanger or rocker U0—L0 is composed of wire cables, and thus is enabled to buckle under compression. On this account the connection between the suspended span and the cantilever arm (by means of the pin at L0) can be made at any time and the suspended span still remain on the falsework and move up and down with the tide. The connection need not be made simultaneously at all four corners as would be the case if these members were composed of rigid eyebars.

The steel falsework is first erected on concrete pedestals, situated in some bay or cove adjacent to the bridge site. When the span has been completely erected over the falsework, scows are floated under the falsework between the piers, and the structure transferred to the scows by first partially filling the scows with water and, when they are in place under the bearings provided, pumping the water out. Four scows each 275 ft. x 46 ft. are proposed for this operation.

When the suspended span has been towed to the site and placed in position, water is again let into the scows and the entire scaffolding is lowered to such an extent as to enable its being freely floated out from under the bridge.

Maschinenfabrik Augsburg-Nuernberg; Bidder's Design

The design proposed has a single-intersection web-system, similar to the Board's design, but the web triangles are considerably larger. The lengths of the several arms of the bridge are somewhat different,



FIG. 1. OFFICIAL DESIGN V. BOARD OF ENGINEERS.



FIG. 2. DESIGN OF MASCHINENFABRIK AUGSBURG-NUERNBERG



FIG. 3. SUSPENSION DESIGN (LINDENTHAL) OF PENNSYLVANIA STEEL CO



FIG. 4. DESIGN M-N OF THE ST. LAWRENCE BRIDGE CO



FIG. 5. DESIGN A-B-X OF THE ST. LAWRENCE BRIDGE CO



FIG. 6. DESIGN C-Y OF THE ST. LAWRENCE BRIDGE CO.

but the main span is unchanged. The design was made with the intention of floating in the suspended span.

On account of the long panels the floorbeams are very heavy. To facilitate manufacture and erection they are built as box-girders, the two webs being shipped separately and connected after erection by a cover plate. In order to limit as much as possible the use of secondary members and also to facilitate certain parts of the erection, eyebars are used to only small extent in the design. The top chords and main tension members are built-up riveted members. Each main pier is provided with a special pedestal of cast steel providing a central transmission of load on the pier and permitting of free deflection of the bridge. The pedestals are set on riveted steel grillages sunk into the masonry piers to provide a uniform distribution of load. The centre span is suspended from the cantilever arms by means of cables, just as proposed for the Board's design.

Fig. 2 illustrates the general method proposed. Both arms are to be cantilevered out from the main piers and the stability of the work ensured by temporary supports under the anchor arm. In this case, however, travelling cranes are operated on the top chords, two on each anchor arm and two on each cantilever arm at the same time. These cranes have 82-ft. booms and are arranged so as to be able to be moved crosswise on a crane trestle which itself can move longitudinally on the upper chords of the bridge. All cranes as well as the crane trestles are operated by means of electrically-driven winches. Each of the cranes has a maximum lifting capacity of 120,000 lbs. at the extreme end of its boom and a capacity of 200,000 lbs. within a closer area.

The erection of the main bridge starts with the laying down of the shoes. These shoes are designed to be floated in place and to be set on previously prepared bearings as the tide goes down. While the shoe is being put in place, the temporary falsework is raised and posts erected along with the sway bracing of the bridge. The crane trestle for the anchor arm and its two traveling cranes are placed on top of the group of posts, which, with its permanent and temporary bracing acts as a tower. After the cranes have erected the missing parts of the main trusses and the flooring between these posts, the crane trestle is brought to its second position in order to make way for the cantilever arm, and they then build panel by panel the main trusses, bracing and floor of the bridge up to the anchor pier on one side and the end of the cantilever arm on the other, employing during the operation such temporary members as are required.

All material for erection is lifted on to the bridge from scows. The hoisting is done by a crane traveling on the floor of the bridge, having a capacity of 200,000 lbs. This crane can then transport the material to any point on the bridge where it is required. The runway tracks of this crane always project beyond the last panel erected in order to serve the overhead cranes to the best advantage.

The suspended span would be erected on high falsework as for the Board's design. The span is supported at each panel-point, by a truss on the falsework, the whole carried on four pontoons each 295 feet long and 49 feet 3 inches wide. When the suspended span has been completely erected on the floating scaffolding, it is towed to the bridge site. After its arrival there it is accurately held in position by

means of wire cables and winches placed on the banks of the river.

To facilitate the operation of coupling up the suspended span to the cantilever, as well as to avoid blocking traffic on the river any longer than absolutely necessary, a special supporting and lifting device is provided at the ends of the cantilever arm. This temporary support is made of cross beams suspended from the end of posts of the cantilever arms by means of hinged tension members. At high tide these supports, previously swung back in a slanting position towards the piers to allow the suspended span to be floated into its closely approximate final position, are allowed to swing back to their normal position, the cross beams passing under the ends of the bottom chord of the suspended span at its four corners. As the tide goes out the bridge comes to rest on these temporary supports and the falsework floats clear. The suspended span is then adjusted to its final position by means of 16 hydraulic jacks located on the upper chord, each having a capacity of 1,322,000 lbs. and a lift of about 3 feet, operating a frame connected to the above mentioned cross beams. A safety device holds the crane beams in place step by step as it is raised, thus providing against any accident. When the lifting has been completed the wire hangers are fitted to their bearings and the suspended span, previously lifted a little too high, is lowered to its permanent position.

British Empire Bridge Company, Limited

The British Empire Bridge Company tendered only on the Board's design, but proposed three different schemes of erection of the suspended span: (a) cantilevering out; (b) floating in on high falsework; and (c) floating in a special truss to be used as stage or falsework upon which the suspended span proper will be afterwards erected.

The method of erection of the cantilever and anchor arm is naturally the same for all three cases. The work is started by first building a high steel tower, two legs of which will rest on the main pier, while the other two are on special concrete pedestals. These towers will be slightly higher than the top chords of the bridge. On top of the tower will be erected the two travellers to be used for the erection of the bridge itself, one to be used on the top chord of the anchor arm and the other on the top chord of the cantilever arm.

A portion of the material is to be delivered by water and a portion by rail. The material delivered by water will be erected by the travellers standing on the top of the tower and the erection will be carried forward by water as far as convenient. Afterwards the material will be delivered by rail. For this purpose a trestle will be erected between the land and the portion of the steelwork already erected.

To obtain stability during erection a temporary concrete pier will be built under panel point AL10. This pier will have eyebars built into it, to which the truss may be anchored. During erection the member AU12—AL10 will be reinforced so as to act as a compression member. After the travellers have done all the erecting possible from their position on the towers, they are transferred to special tracks on the top chords from which position they proceed with the erection, panel by panel. As both the cantilever and anchor arms are erected as cantilevers the stresses during erection are the same as in the completed

bridge, and all joints will be riveted up complete as the erection proceeds.

Suspended Span Cantilever

When the cantilever arms are completed the same top-chord travelers can proceed with the erection of the suspended span to junction at the centre. The adjustment at this point is controlled by adjustable members between the suspended span and cantilever arm.

Suspended Span Floated In

Floating the suspended span into place permits of work on this part of the structure to be pushed ahead at the same time as the other parts of the bridge. In the case of the high floating erection, the falsework consists of a long truss supported on two towers, the foot of each tower being carried on a pontoon 225 feet long, 45 feet wide and 30 feet deep. The panel-points of the supporting falsework correspond to the panel-points of the suspended span, permitting the use of eyebars in the bottom chord of this span. The falsework is not transferred to the pontoons until the sus-

truss. The construction of the stage is made as light as possible, wire cables being used for all tension members, the compression members being of nickel-steel. The weight of each double truss is about 510 tons. The spacing of the vertical posts and diagonal bracing is arranged so as to give free access to joints and connections of the permanent span to facilitate driving of pins, riveting, etc., and the top and bottom chord are either above or below the corresponding chords of the suspended span. The floor of the stage is as shallow as possible, so as not to interfere with the clear headway required for navigation. The floorbeams are attached to the side trusses by a knuckle bearing between the trusses, thus ensuring equal distribution of load.

In erecting the stage it is intended that each double truss will be hoisted in place separately by means of the top-chord travellers and slung from the end of the cantilever arms. To ensure stability during hoisting and until the floor system and bracing was put in place the particular form of truss used was decided upon. Until the wind bracing is put in, the trusses

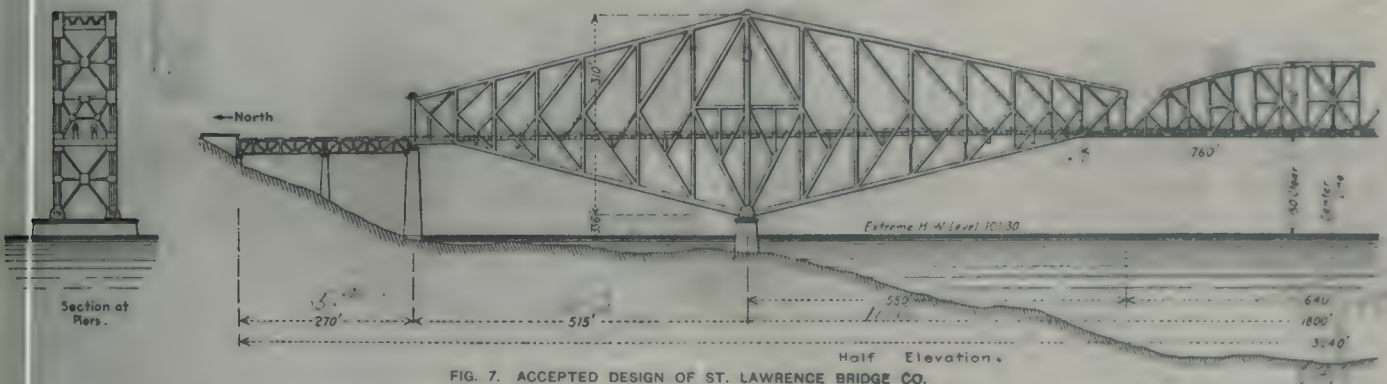


FIG. 7. ACCEPTED DESIGN OF ST. LAWRENCE BRIDGE CO.

Fig 7

pended span has been completed and everything is ready for towing to the site. It is built high enough so that at extreme low tide there is no chance of the suspended span putting any load on the supporting cables attached to the cantilever arm, during the operation of coupling up. The falsework is securely attached to the pontoons, but the span itself is supported on special bearings, preventing any side or lateral movement but leaving the falsework free to descend below the span when required. This prevents any chance of the weight of the falsework and pontoons being taken on the structure. The pontoons are fitted with pumps and valves so that the level of the steelwork can be controlled at all times. The pontoons are held in position under the bridge by the tugs supplemented by anchors and moorings attached to winches on the adjacent shores. Navigation on the river would have to be stopped during the operation of floating in.

Stage Erection

The third scheme for erecting the suspended span proposed by this company is by means of a special temporary span which is floated in and suspended between the two arms of the cantilever arms, and upon which the permanent span is finally erected.

In general this supporting stage consists of two main trusses spaced 64 feet centre to centre, each main truss being made up of two independent trusses spaced 9 feet, centre to centre, the two being securely braced together so that they would act as a single

are guyed to the ends of the travellers overhanging from the end of the cantilever arms.

The suspended span will be built on the stage floor outside the temporary girders. When this truss is completed it will be hung in its proper place, being attached, however, to the temporary truss to prevent lateral motion or stress from wind. The floor and bracing will then be put in place, the dead load of which will be carried by the permanent structure, the temporary staging being required to carry only the dead load of two main trusses. Special adjusting devices are placed under the panel points of the suspended-span trusses during construction, to correct whatever deflection may take place in the temporary staging under the constantly increased load.

Pennsylvania Steel Company

The Pennsylvania Steel Company proposed three different schemes of erection on the Board's design in addition to submitting a tender for a suspension bridge based on a design by Mr. Gustav Lindenthal. The different schemes of erection of the cantilever designs differ only in the manner of the erection of the suspended span, viz., by cantilevering out, by floating on high falsework, and by floating on low falsework and hoisting into place. The method of erecting the cantilever and anchor arms is naturally the same in all cases.

Preparatory work in the nature of storage yards, crane, runways, loading, and unloading, gantrys, etc.,

is fully provided for by the proposal. At the north side, where erection would start, there is a heavy timber elevator to deliver the bridge material from the upper to the lower level, as the company proposes to bring all material in by rail. On the lower level a yard served by a 100-ton gantry is laid out for storing and handling material to be used on the north side. The material for the south half of the bridge will be brought to the north side and carried by the north gantry crane, assisted by a special derrick car, to a barge slip, whence the steel is transferred across the river on barges. On the south shore it is received by a gantry equipment similar to that on the north shore. All machinery is operated by electric power. An electric winch helps handle the scows and a motor operates the material trucks on the tracks from the gantry yard to the slip.

The first step in the erection will be the raising of a steel tower, 46 x 50 ft. and 248½ feet high, behind the main pier. This tower will be equipped with four booms of 90 tons capacity operating from the corners at the top. The booms are fed either directly from the gantry yard or by a special track leading from the yard.

The derricks on the tower erect the falsework between the pier and AL10, after which the permanent bridge steel, including the shoe, bottom chords, laterals, etc., up to the bridge floor is put in place. With a suitable number of additional stringers placed on the floor, the upper part of the tower is disconnected from the lower part at the level of the floor. The top is then skidded along the bridge floor until it is in a position directly over the main pier. The lower part of the tower is then taken down and re-erected on top of the section already in place. On the top of this reconstructed tower the booms are again erected, the hoisting engines remaining on a platform on the tower at the floor level.

The tower in this second position erects the permanent members of the truss that can be handled within the swing of the booms, including the top-chord section between the main posts and the two diagonals completing the triangle AL14—AU12—AL10. Under panel point AL10 a temporary steel bent is placed to support this triangle, the bent being imbedded in concrete to above high-water mark, as a protection against ice, etc. As the work of erection progresses from this point, the cantilever and anchor arms are so balanced that the centre of gravity of the completed work always lies between the main pier and the temporary tower at AL10. This tower being securely anchored down is also capable of acting as an anchorage, thus affording an extra factor of safety.

When the work has proceeded this far, the top section of the erecting tower is hung up from the top chords by floorbeams in temporary positions, and the lower part of the tower is taken down. The tower booms then erect the top chord travellers, one for the anchor arm and one for the cantilever arm, taking a large part of the material from the bottom sections of the tower.

These travellers have booms 90 feet long and a lifting capacity of 100 tons. In addition they are equipped with two 20-ton derricks with booms 80 feet long, located 15 feet inside the centre line of the bridge trusses. The 20-ton derricks have double booms for convenience in driving pins. The travellers slide forward from panel point to panel point, on runway box girders. They have no wheels, but are fitted with

sliding shoes, except in the cantilevering of the suspended span, when rollers are placed under these shoes. This is done as an added factor of safety to prevent any tendency of the traveller to slide forward, or to get out of hand when unclamped and moving.

Material is supplied to the top travellers by derricks situated on the bridge floor. One 100-ton derrick is located over the main pier and one for lighter material at panel AL10, both commanding the gantry yard below. Where possible, material from the gantry yard is picked up direct by the top travellers.

Suspended Span Cantilevers.—After the main anchorages are in position the traveller on the cantilever arm continues ahead on the suspended span until the whole bridge is completed. Adjustable members are introduced at the end of the cantilever arm, in order that the work may be coupled up at the centre. The travellers are adjusted to work on a horizontal instead of inclined chord by means of extra steel members and the rollers mentioned above.

High Floating Erection.—The suspended span is erected on high steel falsework, the proposed site for this erection being at Victoria Cove, about half a mile below the bridge site. Material for the suspended span is taken from the north gantry yard and transported by water as required. The falsework is erected by gin-poles assisted by a derrick on a scow. The span is erected on the falsework by an inside steel tower traveller having two heavy derricks in front and a light one at the rear. This tower is high enough so that brackets on the top floor level overhang the top chord of the span, and from them the truss members are temporarily hung. When the span is fully assembled and the traveller taken down, the trusses connecting the two falsework towers are lowered from their top position to the bottom of the tower, where they are connected to these towers, thus acting as reinforcement to the pontoons and holding them in their relative positions.

The pontoons are floated under the falsework towers in between the temporary concrete piers upon which the falsework is erected. At high tide the load of the falsework and suspended span is transferred to the pontoons which are then towed to the site. Two pontoons are used. Each is 252 feet by 75 feet, and 13 feet deep.

Low Floating Erection.—Under this scheme, the suspended span is erected in the same manner as for the high floating scheme except that the span is erected on low timber falsework. When the span has been completely assembled the falsework is removed, allowing the span to rest on four concrete piers, in which position it is finally riveted up. At the proper time six scows, three at each end, are floated in, and when the tide rises the span is transferred to these scows and towed into position. From this position it is jacked up into its final position.

The wire suspenders attached to the suspended span are held up in place by wooden falsework, the suspenders being sufficiently slack so that any wave motion will not tend to pick up any corner of the span before all four corners are attached, and the entire weight taken simultaneously by the lifting jacks.

The cast collars are supported on a heavy frame made of girders, which are in turn attached to a chain of lifting plates. These plates are 27 inches wide and are full of bolt holes, uniformly spaced, so that they can be thoroughly bolted together. The plates lap past each other so that each plate can also be readily

removed as the span is gradually lifted. Each lifting plate has 10-in. pin holes every three feet.

On the top of the end of the cantilever arm is a steel box which has a 2,000-ton jack inside of it, and just above it is another steel box similar in design. The lifting plates pass through both of these boxes and at the start of the lifting operations the lifting plate carrying the suspended span is hung from the upper box by means of a 10-in. pin passing through the box and plate. The jack in the lower box is operated by an electrically-driven pump and is designed for a working pressure of 11,000 lbs. per square inch with an effective stroke of 3 feet and a speed of 2 ins. per minute. When everything is ready the jack is operated and the load raised 3 feet, or until the pin through the lower box and the lifting plates can be driven and the upper pin withdrawn. The upper box is then lowered until its pin hole comes opposite the next lowest in hole in the lifting plate. This pin is then driven and the lower pin withdrawn, the jacks again operated, thus completing a cycle. As sections of the lifting plates are released, they are disconnected and by means of the traveller are lifted out of the way. The lifting operation proceeds at all four corners of the suspended span simultaneously. When the span is fully raised the final pins can be driven as the pin holes in the cast collars are not used during the raising.

A safety device is provided to safeguard the raising operations. It consists of four screws at the four corners of the lower box, driven by an electric motor operating through equalizing gears. These screws are always bearing against the upper box, and as they are capable of sustaining the whole load, the temporary failure of the lifting apparatus would have no serious result. These screws can also be used for quickly lowering the upper box after each operation.

After the load of the suspended span has been transferred to the lifting jacks the screws can be released and all lines and anchors cleared from the river. It is estimated that the span can be lifted and connected in two working days. Many of the special appliances proposed by this firm in connection with the erecting of this bridge have been patented. The scows used in this scheme are each 257 feet by 38 feet and 10½ feet deep.

The St. Lawrence Bridge Company

The St. Lawrence Bridge Company, in addition to tendering on each of the Board's designs, submitted several different designs, as follows:

Design A.—This corresponds to the Board's design with respect to panel lengths, height over main pier, profile of bottom chords, and floor system. It has an anchor arm of twelve panels and a suspended span designed for floating erection, corresponding to Design V. of the Board. The Board's design has been departed from in respect to the type of web system, the substitution of built-up tension riveted members for eyebars, and as regards the outline of the top chord of the cantilever arm and the suspended span. There are also various changes in the design of many of the members.

Design B.—This is the same as Design A, with the exception that carbon steel instead of nickel-steel is used for the vertical posts in the cantilever arm, three panels away from the centre pier, as well as for all members in the anchor arm. The details of members and type of web system remains unchanged.

Design C.—This design is identical with Design

A, except that nickel-steel eyebars are used throughout, instead of built-up riveted tension members.

Design M.—This design retains the single intersection of the Board's design, and follows very closely the general features of the design submitted by Maschinenfabrik Augsburg-Nuernberg. The anchor and cantilever span arms are each 522 feet long with a suspended span of 714 feet. In this design nickel-steel is used throughout. The details of the main members have been somewhat changed from those prepared by the Board. Pin bearings are employed throughout for all abutting joints of compression members.

Design N.—This design is identical in outline with Design M, the only difference being that carbon steel is substituted for nickel-steel in a number of the members. This change was made with the idea of effecting a slight economy in design.

Design X.—Design X is similar in outline and general details to Design A, but is intended to accommodate railway traffic only, the tramway and highway roadways being omitted. A 4-ft. walk is allowed for on each side for the use of inspectors, etc. Carbon steel is used for the anchor arms, members over the main piers, and for the vertical posts of the cantilever arm for three panels from the pier. Carbon steel is also used for the centre posts of the suspended span. This design is shown in Fig. 7.

Design Y.—This corresponds to Design X as Design C compares with Design A. Here railway traffic only is provided for and nickel-steel eyebars are used instead of riveted built-up tension members.

Scheme of Erection.—Several different schemes of erection are proposed, for the suspended span as well as the cantilevers. These schemes are in the nature of studies, the final choice being subject to the design upon which the contract might be awarded, and to approval by the Board. They include the following elements:

(a) Erection of the anchor arm on steel falsework before starting the erection of the cantilever arm. In this scheme the anchor arm will be assembled and riveted up complete before moving ahead. An inside traveler is used and is operated from the floor level (see Fig. 6). This scheme can be applied to both the Board's and the contractor's designs.

(b) Erection of the anchor arm and the cantilever arm concurrently. The first step in the erection is the construction of a high tower on piers between panel points AL12 and AL14. This tower has overhanging arms from which the trusses on either side can be reached. From this tower the anchor arm is erected up to AL10, under which point a temporary masonry pier is built, which acts both as a supporting pier and an anchorage. After the floor has been put in place the tower is taken apart at the floor level, the upper part being used as an inside traveller with which the remainder of the anchor arm is erected. The erection of the anchor arm is always sufficiently in advance of the cantilever arm to ensure that the centre of gravity is always between AL10 and the main pier. A falsework trestle for the handling of material connects the shore with the work under construction. This scheme of erection can apply either to the Board's design or the alternative designs.

(c) Erection of the cantilever arm by inside traveler, similar to that used for the erection of the anchor arm. In the case of erection scheme (a) the traveler used for the anchor arm is moved ahead on

the cantilever arm and the erection proceeds, panel by panel, until this part of the bridge is entirely completed. In the case of erection scheme (b) the traveler for the cantilever arm is erected by the traveler used for the erection of the anchor arm when the erection of this arm has proceeded past panel point AL10, thus ensuring stability for the further progress of the work. From this point and to the end of the cantilever arm, the erection of schemes (b) and (c) are exactly similar.

(d) Erection of the cantilever arm with a top-chord traveler. This traveler is erected by the inside traveler of the anchor arm. This scheme of erection is intended to apply to the Board's design only.

(e) Erection of the suspended span by cantilevering. This erection is done with a small top traveler in practically the same manner as is proposed by the other bidders. This scheme of erection applies only to Designs I. and IV. of the Board.

(f) Suspended span floated in on high falsework. The falsework for this scheme of erection is constructed on concrete piers and is located on the shore directly at the bridge site. The suspended span is laid down at right angles to the bridge proper and one end is hard up against the anchor arm at almost a point corresponding to AL10. A traveling crane takes the material, both for the falsework and the suspended span, from the cars on the bridge and carries it to whatever point it is required. Eight pontoons 120 feet by 36 feet by 12 feet deep are used. At high tide the falsework is lifted off the piers and towed into position.

(g) Suspended span by floated in on low falsework. The erection of the suspended span in this case is carried out as in the preceding, except that the span is erected directly on the piers. For floating, six pontoons are required, each 238 ft. by 38 ft. by 10 ft. deep. After being towed into place the suspended span is lifted into place by means of hydraulic jacks and wedges operated by power. Both schemes (f) and (g) can be employed for either the Board's or the contractor's designs.

Accepted Design

Design X, as is shown in Fig. 7, is the one which was finally approved and contracted for. The top chord and other tension members will be built up instead of I-bar members. The channel span is 1,800 feet, while the suspended span is 64 feet in length. The design calls for members in the anchor arm and those resting upon the main pier, as well as the entire floor system, to be of carbon steel, while the cantilever arms and suspended span are to be of nickel steel. The anchor arms are 515 feet in length, which, in addition to the channel span, makes in all a length of 3,228 feet.

A progress report dealing with the concreting and pneumatic work will appear in an early issue of the Contract Record.

The Pressure of Cement

The pressure of loose cement against bin walls is a very indeterminate quantity, according to the paper on "Cement Stock Houses," recently presented to the Western Society of Engineers by Mr. Josiah Gibson. Mr. Gibson's observations are based on data acquired in the construction of a number of cement stock houses for the Universal Portland Cement Co. Portland cement when it comes from the mill is a

loose, dry powder weighing about 95 lbs. per cu. ft. When dropped into the bins it becomes very freely charged with air and stands up with a level surface, like a liquid. After standing a few days its weight causes it to settle into a more compact mass from which practically all of the air has been expelled. Unfortunately its properties of internal friction are not constant and it is impossible to predict the degree of its angle of slope. When the cement is drawn from the bottom of the bin, sections of the storage space may be emptied leaving the remainder standing with almost perpendicular sides which, without warning, will cave in against the bin walls.

In one of the earlier bins to be built a series of experiments were made whereby it was decided that it would be safe to assume the cement to be a liquid of 10 lbs. per cu. ft. weight. It was soon found, however, that there was an excess deflection of the walls so designed and the assumption was increased to 20 lbs. per cu. ft. Later experiments were made by interposing some plank backed I-beams across an opening in the bin and computing the pressure from the deflection of those beams. This experiment showed that a hydraulic pressure of 20 lbs. per cu. ft. would be safe.

In the discussion of the paper this value was objected to as being too small, first, because the experiments did not care for the arching action of the cement and second, because the shock of the falling cement, noted above, was not considered. It was generally thought that a somewhat higher assumption should be made.

A New Concrete Pavement

A distinctly new type of pavement, consisting of an ordinary properly constructed concrete base and a thin wearing surface of bitumen and sand, has been developed and extensively used by the city engineer at Ann Arbor, Mich. This pavement has been laid on the principal streets there where it has been subjected, during the past two years, to all conditions of traffic of a city of 15,000.

The materials and equipment necessary are to be found or easily obtained in all localities and such a pavement may be constructed at a very much less cost than for brick, bitulithic, wood block or the various types of asphalt, and may be considered as suitable in all places where the above would be proper.

Based upon the results obtained at Ann Arbor this pavement is to be considered especially well adapted for use on country roads and highways and upon fairly well traveled city streets.

A new warehouse is being erected for the Gowans Kent Western Company, Limited, in Winnipeg, which is said to be the largest and highest building of its kind built entirely of concrete in western Canada. It is 135 feet high, consisting of 8 storeys and has a ground area of 52 feet by 160 feet. The construction throughout will be of cement with metal window frames fitted with wire glass, the idea being a thoroughly fireproof structure. The foundations, stairways, floors and walls will all be poured concrete. The floors are designed to carry 400,000 pounds per square foot. The cantilever system used in the construction is of 26 feet span, while the footings upon which this cantileverage is carried are 52 feet by 10 feet by 5 feet deep. The Turner system of construction is being used throughout.

The Bank of Montreal, Winnipeg

Work on the Bank of Montreal building, Winnipeg, has reached a state of development where even the lay observer may get a good idea of what the complete structure will be. The site chosen for this building is probably the most attractive in the city, and lends itself peculiarly to the carrying out of an impressive architectural effect. On the east side of Main street at the junction of Portage avenue, it faces directly on the avenue that is now the principal retail thoroughfare, and along which the business of the city seems destined to extend.

The architects, McKim, Mead and White of New York, have taken full advantage of this location, and of the peculiar shape of the lot on which the building is situated. Portage avenue east is a comparatively narrow thoroughfare, and approaches Main street from the southeast at a slight acute angle. In consequence of this the bank has been built to conform with the rear line of the lot, and being square, there is a considerable piece of the point of the lot which is not being built upon. This the bank management proposes to turn over to the city for a monument or fountain space. Such an improvement will greatly enhance the appearance of the bank property, and the street as a whole.

But the bank building itself will be the greatest ornament. Of solid Vermont granite it is the most



Bank under construction as viewed through overhead wires.

massive structure at present in the city. The main entry when completed will be magnificent, for the front of the building is supported by six huge columns that rise 50 feet from the street level. These are 4 feet 9 inches in diameter and have been turned in sections of 6 and 8 feet. The plinths on which they rest weigh from 16 to 25 tons each, and all of the other stone work is in proportion. For instance, the slabs that rest on these pillars forming the colonnade floor are 9 x 13 feet while in the cornice and other sections there are single sections of granite that weigh as high as 18 tons. The sections of the columns weigh up to 12 tons. Needless to say the work of placing these requires extreme care.

The steel is of equal solidity and the same atmosphere of "bigness" prevades the whole structure. The main banking room has dimensions of 140 by 85 feet and is 59 feet to the ceiling. To support the apartments above, the design called for three truss girders, each 90 feet in length and weighing 42 tons, and by the way they are the largest that have yet

been installed in a Canadian building. They were delivered on the work in sections, assembled and then hoisted by a pair of gin poles to their resting places. In this work as in the placing of the stone the contractors, Messrs. Norcross Bros., have progressed without a slip or accident. Had it not been for an unfortunate fire at the Iberville stone cutting plant of the company, all of the stone work would have been in position now. In that fire a large amount of stone, cut ready for shipment, was damaged and had to be duplicated. As much of the stone used required a great expenditure of labor in cutting the work has been considerably delayed in this department.

However it has not delayed the balance of the work and under the direction of W. P. Mitchell, superintendent in charge, the interior finishing is well advanced. Steel deliveries were exceedingly slow on many sections but despite it, all the work has made notable progress. The copper roof has been placed over the greater part of the building so that the interior finishers have been able to make good progress.

It is in the interior that one gets probably the best idea of the development of modern buildings and building practice. Heavy flat arch floors capable of supporting a team with heavy loaded wagon have been laid on the first floor and all walls and partitions are of porous tile. In the basement are the safety deposit vaults and general bank vaults. This basement is fitted entirely in white glazed tile and marble. The public approach is from the main banking floor down easy winding stairs, while an elevator gives access for the bank employees. The vaults are now under construction, and when completed will be a model of strength. The heating system is carried in pockets in the wall, each covered by a bronze grill framed in marble.

Though the main banking room is now in the hands of the plasterers and ceiling decorators some idea may be gained of its general appearance. In it are 30 circular marble columns and four square ones running to the ceiling which two-thirds of the way up support the entablatures. They are of Botticino marble and the floor will be finished in pink Tennessee. The Botticino will be used for wainscoting and the ceiling is being finished in dead white, with a simple and dignified conventional panel design. In fact the whole effect is striking in its simplicity which with the magnitude of the structure is its best ornament.

It is the intention of the management to make this office self contained in every respect. Above the banking room there are two flats of apartments which will be fitted up for the use of the staff. In fact it will be almost in the nature of a club, for in addition to the apartments there will be baths, sitting rooms, a fully equipped dining room and billiard room.

The foundation of the building is exceptional. It is carried on a solid monolith of ferro-concrete grillage, beneath which are a number of expanding piers where the main stresses exist. The bases and side walls of the vault system are carried well into this monolith.

It is seldom that a man dies from overwork, or one's conscience becomes warped from strenuous use. It is generally abuse that results in these things.

— ÉCOLE POUR LES FRÈRES DES ÉCOLES CHRETIENNES —

— BY LES SOEURS DE JESUS MARIE —

— RUE LETOURNEUX-MAISONNEUVE —



New Montreal School

Good progress is being made with the construction of the Christian Brothers' and Sisters' School on Letourneux avenue, Maisonneuve, the walls being completed and the roof in place. The construction is of stone on stone foundations. The building has a frontage of 360 feet, a depth of 70 feet and the greatest height is 93 feet. There are four storeys and basement to the main building which will have accommodation for two thousand pupils. One-half of the building will be in charge of the Christian Brothers, and this section will be flanked by the Brothers' residence. The other half will be for the use of the girls who will be in attendance, and the nuns' residence will also be on that side of the building. The illustration shows the main building, both the residence wings being omitted. In design these resemble the central structure. The cost of this school will be in the neighborhood of \$300,000, and it is expected that it will be completed about the end of November.

A special feature of the structure is the fire escape furnished by a firm in Kentucky. One fire escape will be placed in rear of the boys' section and the other in rear of the girls'. The escape consists of a spiral steel tube running from the top storey to the ground in a fireproof encasement. Entrance to it can be gained from every storey and the arrangement enables children from all the storeys to enter very rapidly and slide down without injury to one another. During a test recently made before government and civic authorities one thousand children left their class rooms and reached the ground safely in three minutes and a half. The building will be heated by hot water and a good system of ventilation has been provided. The building was planned by and the work is being carried out under the supervision of Mr. C. A. Reeves, architect, of Montreal. The contractors for the central building were Messrs. Trudel & Company; for the Brothers' section, Mr. A. Gratton and for the Sisters' section, Mr. A. Dansereau. The steel work was manufactured and erected by the Phoenix Bridge Company.

U. S. Cement Production

Cement production in the United States during 1910, has been officially reported upon by Mr. Ernest F. Burchard, of the United States Geographical Survey. These figures compared with those of 1909, are as follows:

	Value	
	1909	1910
Natural & Puzzolan	\$ 752,209	\$ 546,292
Portland	52,858,354	67,506,479
Total	\$53,610,563	\$68,052,771

In the United States and Canada there are already about 600 central stations for the distribution of steam and hot water to the residents of some 300 towns, ranging in population from more than 10,000 inhabitants to less than 5,000 inhabitants, the first establishment of this kind dating from the year 1876.

Regarding the increased business activities in the West further evidence is given in the following report from Brandon. The subject is the want of manufacturers, and goes on to say: A local firm inquired of a lithographic firm in the East respecting the production of some work, and they replied, "At all events, we are so busy just at the present time, that we would be unable to undertake the work for immediate delivery." This kind of reply is being continually received here in the West;—so that we think that it would be a good opportunity for some of the English firms to supply the want in Brandon. It is useless for us to look to the United States, as they are as busy as we.

The floor of one of the new steel dining cars of the Pennsylvania Railway is covered with cork slabs compressed from an original thickness of 14 in. to less than ½ in. The material gives a sure but silent foothold, and if its use proves satisfactory after an extended trial all the company's steel dining cars may be so equipped.

Reinforced Concrete in Road Construction

Modern traffic, by reason of its increased weight and speed, imposes the necessity of strengthening the foundations and crusts of main roads. It will further be necessary to reconstruct a large number of small bridges over streams and similar obstacles. The writer draws attention to reinforced concrete as the best material for the work, as it is also the most economical and convenient. Most of these small bridges are unequal to the task of carrying heavy loads through—(1) Defective foundations and yielding abutments; (2) defective joints and mortar; (3) bad construction and shape. For reconstruction, the limiting conditions to be reckoned with are—(1) Span short, say 5 ft. to 20 ft.; (2) rise limited; (3) foundations often bad; (4) materials will have to be carted to the site, and labor is more or less unskilled; (5) the same type of culvert or bridge will have to be reproduced many times. For bridges of the length named, steel is out of the question, so that brick or masonry is the alternative to plain or reinforced concrete.

The objections to masonry are—(1) It must be built as an arch; (2) it is slow in construction; (3) costly; and (4) it obstructs the waterway. Many of these objections apply to brickwork. Centering is necessary for brickwork and masonry. There is little to be said in favor of plain concrete against its two rivals.

The special merits of reinforced concrete are—(1) It can be built as a flat beam: (a) The reactions are vertical—the pressure on the abutments can be very easily distributed; (b) centering is made of straight square timber, easily fixed, and can be used over and over again; (c) the waterway is not obstructed. (2) The amount of materials is a minimum and the steel of simple bars. Engineers have hitherto fought shy of reinforced concrete, partly because of its novelty, partly because of the uncertainty of the life of the steel, and partly because of the way it was exploited by firms holding patent rights. The calculations are simpler than for beam and girder work.

Moose Jaw Sewerage System

One of the largest enterprises of the city of Moose Jaw this year is in connection with its sewerage system, approximating \$400,000 being spent on the work.

The sewage disposal plant is under construction at the east end of the city. The work is being done by W. Manders, whose contract is for \$125,000. Material and labor supplied, and inspection done by the city brings the cost up to approximately \$160,000. In return for the expenditure of this sum, the city gets one of the most complete and perfect sewage disposal plants that can be obtained. When the city's waste has passed through it, it will have the appearance of pure water and it is said that no harm would result from drinking it. It is expected that the plant will be completed and in use this fall.

At present the site of the plant presents an extensive amount of excavation and huge concrete work. The plant is being connected with the existing sewer system of the city by a twenty-four inch trunk sewer. This has to pass down under the river. A siphon arrangement provides for the sewage passing down under the river bed and up on the east side.

The trunk sewer empties, through screens which remove all large hard substances, into an equalizing tank, the dimensions of which are 160 x 80 feet. The purpose of this tank is merely to secure an even flow to the plant proper. There is more sewage at some times of the day than at others, of course. The result would be that part of the time the plant would be flooded, and at other times there would be scarcely anything going through. By means of the equalizing tank a steady flow is secured. The top of this tank is about the same level as the ground. It will be covered over with earth.

From the equalizing tank the sewage is pumped by a compressed air arrangement into the separator tanks, of which there are three. These tanks are really separate compartments of a large concrete basin, 72 x 57 feet. In them the sewage lies quiet, allowing the solids to settle to the bottom. Through a "sludge" drain, the solid part of the sewage passes through to a compartment at the end of the basin. Here it is pumped out into beds that lie exposed to the sun, where it dries up and can, in a few days, be carted away as fertilizer.

The liquid part of the sewage flows off into the filtration beds. Of these there are 26 in a concrete basin 250 feet long by 150 wide. The liquid flows out over trays in which there are thousands of small openings which spray it upon the beds. The beds themselves are made up of piles of stone on a concrete base in which, at intervals, are drains sloping downward to a large central drain.

The large central drain leads out towards the river. On the way it passes through a disinfecting chamber, where, in case of any infections epidemic in the city, the offal can be thoroughly disinfected. Before passing into the river the sewage goes into a large settling pond. After all this process of separating, filtering and disinfecting, it will readily be understood that there is not much of the impure left. The material is emptied into the river in such a state that no harm can result to those who live along the river below.

The disposal plant is built large enough to serve a population of 35,000, and it can readily be extended when required. The plans, which entailed an immense amount of work, were prepared by City Engineer Wilson and his assistant, Mr. R. G. Saunders.

During a discussion at the N. A. C. U. convention in New York of the necessity for storing sand to become dry before using, to insure uniform mixing, C. M. Powell, who read a valuable paper on concrete tile plants, said some tests he had made showed that a cubic foot of damp sand weighed 87 pounds and a cubic foot of dry sand 106 pounds—this as illustrating the great difference in the amount of sand in a batch when used wet and when used dry. The sand particles covered by a film of moisture pushed each other far enough apart so that a cubic foot weighed 19 pounds less than when dry and they packed together closely.

A dam 192 ft. high at Baltimore, Md., has been recommended as a part of the proposed improvements in the water-supply of that city. The recommendation was made by a committee acting as advisers of the mayor. The dam would form a storage reservoir with a capacity of 3,000,000,000 gals., located on the Gunpowder River about a half mile above the present Loch Raven dam.

Sheet Metal Protection for Trestle Work

The Value of Protecting Trestle Timbers from Exposure—Methods of Applying Sheet Coverings—Treatment with Creosoted Timbers

The covering of trestle caps and stringers with galvanized iron, for fire protection, is a matter of ordinary practice, and incidental prolongation of the life of the timber has been observed where such covering has been used. Some years ago Mr. Hunter McDonald, chief engineer of the Nashville, Chattanooga, and St. Louis Ry., became so impressed with the preserving effect of such covering on the timber that he worked out special plans for applying it in a manner to more effectually exclude water from entering the timber than had been the case where fire protection was the only object in view.

Yellow pine timber used in the top chords of combination trusses, which had been covered with tin on top and weather-boarded on the sides, was found to be entirely sound after twenty years of service, and was used again for trestle stringers. Trestle caps which had been covered on top with galvanized-iron sheets were found to be sound after a service of nineteen years, and stringers which had been in service on the Cincinnati Southern R. R. twenty-one years had shown remarkable preservation, notwithstanding the fact that the galvanized-iron covering had not been driven through the sheet-metal covering on both the caps and the stringers mentioned, in accordance with ordinary practice, no regard being paid to the perforation of the sheets. As local decay was observed about the drift-holes, it was obvious that wherever such perforation could be avoided it should be done. The value of this method of protecting timber trestles from decay was so convincing that all stringers and caps which have been renewed on the Nashville, Chattanooga, and St. Louis Ry. during the past eleven years have been so protected, and the work has been described by Mr. McDonald in a paper read before the Engineering Association of the South.

In order to prevent drift-bolting the timber as far as possible, and to take measures for prevention of the entrance of water where such drift-bolting must be done; and to facilitate renewal of the sheet metal when corroded, Mr. McDonald has adopted the following plans:—Trestle stringers are permitted to rest directly upon the caps without sheet metal between them, and the cap is protected by sheet covering in three sections, one coming between the two lines of stringers, and the other two sections outside the stringers. The galvanized-iron sheets covering the caps are bent upward against the sides of the stringers, and extend about 3 in. over the sides of the cap, and are bent downward at an angle of about 45° over the top edges of the cap, so that the drippings from the covering fall clear of the cap. The part of the galvanized sheet bent upward against the side of the stringer is overlapped, or, rather, overhung, by the extended and downwardly-bent covering of the stringer, so that both the stringers and the caps are entirely protected against the entrance of water. In order to avoid drift-bolting the stringers to the caps, the former are anchored to the cap by means of a malleable casting, which enters the packing space between the stringers, engaging the lower packing-bolt, and a flange on the lower part of this casting is then spiked to the side of the cap. In other words, this casting is a packing-ring with a tail-piece extending downward against the side of the cap; and in addition to the spiking of this tailpiece to the cap, it is secured to the pile beneath by means of a hook-bolt.

The drift-bolting of the ties to the stringers has not been dispensed with, but the bolts are applied in such a way as to prevent perforating the covering in a manner to admit water. This is done by driving the bolt into the tie from the bottom upwards. The bolt is securely driven into the stringer, in a bored hole which is first filled with creosote oil. In order to make a clean-cut perforation of the sheet covering the top end of the bolt is cut off in a lathe instead of being sheared in the usual way. The sheet covering of the stringer is perforated from the bottom upwards, and in order to prevent the entrance of moisture around the drift-bolt a 1½ in. washer is placed on top of the stringer around the bolt, so that the galvanized covering is bulged upward as the sheet is settled home by the weight of the tie. A recess for this upward bulge is a hole 2 in. in diameter and ¼ in. deep, bored in the bottom of the tie concentric with the dowel-hole. In short, the arrangement is such that the tendency of the water about dowel-holes through the sheet is to drain away from the holes, instead of entering them by capillary action.

Of course, the life of the galvanized sheets is comparatively short, lasting only about five years, and experiments have been conducted to test the durability of various samples of galvanized sheets of both charcoal iron and the ordinary steel, the latter being commonly called "galvanized iron." These experiments have not as yet been concluded, but the indications are such that there has arisen a question as to whether the ungalvanized black iron painted with two coats of red-lead would not be more economical than galvanized iron.

The method of applying the sheet coverings is such that it can be renewed conveniently. The coverings on the caps are readily accessible, while on the stringers only necessary to jack up the ties clear of the stringers and the drift-bolts in order to remove the old sheets and insert the new ones.

The plans also cover the use of galvanized-iron protection for the caps and stringers of trestles with ballasted floors. In this work the protection for both the caps and stringers is applied as in open deck trestles, but the spiking of the creosoted floor-plank to the tops of the stringers is avoided by lag-screwing to the bottoms of the plank angle castings, the lower legs of which are spiked to the sides of the stringers. It is desirable to avoid spiking the planks to the stringers for two reasons:—In the first place, spikes driven through the creosoted plank would admit water which would start decay in the interior fibres of the plank where the creosote has not penetrated, and the spikes would also perforate the sheet covering of the stringer.

It is found that the first cost of covering caps and stringers in this manner amounts to about half of the expense required for creosoting the timbers protected. As the galvanized covering must be renewed at intervals of about five years, it could probably be shown that the ultimate economy should be in favor of the creosoted timbers were it not for the fact that the creosoted stringers and caps require covering for fire protection, the same as do the untreated timbers. There is still the further consideration that the sheet covering can at once be applied

to existing stringers that are in good condition without going to the expense of substituting creosoted ones, thus immediately converting the trestle into one with a ballasted top, if desired. To secure the best results with creosoted timbers, they should be framed in advance of creosoting. Such advance framing is always recommended by the timber-treating specialists; but for purposes of renewals on old structures it is a practice that is very difficult, or practically impossible to carry out. The absence of spikes to secure the planks to the stringers also permits jacking up the floor clear of the stringers for inspection of the condition of the stringers, as well as the renewal of the sheet covering, which would not be the case with planks spiked down upon creosoted stringers.—The Railway and Engineering Review.

The Modern Incinerator

The destruction of waste matter in towns and cities is inseparably connected with the highest efficiency of applied modern sanitary science, and great progress has been made in this branch of municipal work during the last quarter of a century in as far as relates to the successful and sanitary destroying of dangerous matters.

The earlier types of incinerators were not an unmixed blessing and were often considered a greater and more concentrated nuisance than the tipping method which they were intended to replace. But the greater necessity and urgency of the conditions required that something must be done, and as sanitary engineers universally recognized that fire was the only safe and sure way to dispose of deleterious matter, many devices and continual experiments were made to find the best solution of this problem coupled with sanitary efficiency and economy of fuel and labor.

The refuse destructor or incinerator has now become an absolute necessity in all towns and cities alive to the necessity of sanitary precautions affecting the health of their inhabitants. The modern growth, especially in sections of the great west, where towns spring up in a night, and become cities in a few years, with large populations, and owing to the rapid growth are not able to provide adequate sewer accommodation, cause naturally the accumulation of great quantities of refuse matter, on the surface of which the soakage of summer rains and winter snows drive into the earth, contaminating the water supply and causing epidemics of all kinds. It is a regrettable feature of our rapid development that owing to these unsanitary conditions with re-occurring spring, terrible consequences, sickness, disease and death occur in many of our new centres of population. Town councils and municipal guardians of health commit criminal negligence in not providing means to deal with such conditions when the best and most efficient means are at hand to improve them. A well designed incinerator, coupled with a systematic garbage and refuse collection, will eliminate these dangers and maintain the health of any town or city in an efficient and satisfactory manner.

The type of destructor used is of great importance and should possess cremating capacity reasonably in excess of the requirements at the time of erection to provide for future expansion. An incinerator should be selected that will thoroughly and sanitarily destroy every kind of refuse matter, leaving a residue absolutely clean and wholesome, and its second qualification should be that the operation should be done with the minimum of labor, fuel and cost of maintenance.

The generating of steam from the heated gases of incinerators is a process that has received considerable study, and has been tried in various old country cities, but it is

doubtful if the results so far obtained can be said to warrant the great increase in first cost and also the increased cost of fuel and labor in operation. The varying degrees of moisture in different kinds of refuse matter and constant charging of the cremating chambers make it very intermittent and uncertain in maintaining any steady steam pressure, and making it very difficult to apply the steam produced to mechanical uses economically. The tendency where steam is generated, too, seems to weaken and keep down the temperature in the cremating chambers, and as continuous high temperature is all important for the sanitary destruction of refuse it appears the generation of steam from garbage has some drawbacks, and especially where the nature of the refuse is very liquid, such as slops, night soil, sludge, etc.

The American practice has been with the few experiments in reduction plants (which have not been commercially successful), to aim at the sanitary destruction of refuse with the minimum cost for fuel and labor.

The introduction of the steel clad incinerator by the Toronto Furnace & Crematory Company appears to meet the requirements very fully. It contains many novel and patented features, the result of long experience and study of the requirements, and is made in sizes adapted to uses of towns and cities from 3,000 to 500,000 inhabitants, and at prices which enable even small communities to take advantage of the incinerator method to dispose of their waste matter. A recent installation in a town of 6,000 inhabitants, costing complete with shelter and approaches less than \$7,000, is destroying from six to ten team loads of garbage and store refuse, together with three team loads of night soil, equivalent to 14½ tons daily, with ½ ton of coal. The labor of one man to stoke, and clean away the residue is all that is necessary to manage this plant, which has been running now for over one year in weather conditions varying from 90 degrees of heat to 40 degrees below zero Fahrenheit, and doing the work without intermission and without nuisance of any kind from the stack or from the plant, owing to its low first cost, fuel and labor, economy in operation and ability to destroy any kind of refuse sanitarily and completely. This type has been enthusiastically endorsed by the Dominion and Provincial sanitary authorities, and should be investigated by the officers of any municipality contemplating the erection of an incinerator plant.

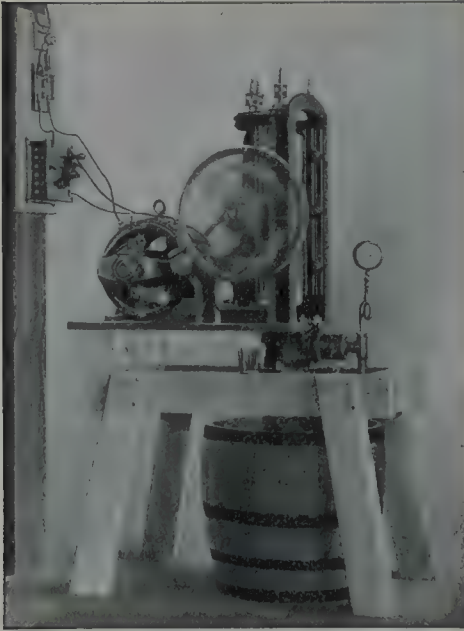
A good deal of speculation is being indulged in as a result of the purchase, by a syndicate, of a block of land at present occupied by stores and dwellings and bounded by St. Catherine, Bleury, St. Edward and St. Alexander streets in the heart of the uptown business section of Montreal. Various portions of this block have changed hands frequently within the last five years. Now this syndicate has obtained possession of all but one small strip occupied by the city as a fire station. No doubt they will acquire this in a very short time. The city has already secured a new site for this station. It is stated that the syndicate has paid \$377,000 for the property. The general opinion seems to be that a departmental store will be erected on this site. Again it has been reported that a theatre would be the most likely kind of building to be put up on such valuable property, while there is always the possibility of a hotel getting the position. It may be further remarked that this property is directly in rear of the Jesuit church of St. Mary's college recently reported to have been acquired for Canadian Northern Railway terminals. This report has been denied, but new developments may transpire at any moment.

A New Type of Pumping Motor

A pumping engine which bids fair to soon come into extensive use is one of a non-pulsating type, manufactured by the Luitwieler Pumping Engine Company. In its design there is a radical departure in that all its reciprocating parts are balanced, and entirely free from dead centres which cause intense vibration, water hammer, as well as gear back lash. This type of engine is self-contained on one base with the driving power, or is made, if desired, with belt drive. So perfect is its balance and operation that

new plans consequently involved a complete cut of fresh trenches. When the work was about to be commenced a neighboring council obtained an injunction against the sewage being dumped into the St. Lawrence, which it was able to do under the provincial health order of 1897. This injunction compelled St. Lambert to considerably modify its plans, particularly with regard to sewage. The council has now laid six-inch house communication pipe from the main sewer to the boundary of the street on every lot. Work is now being done in installing a septic and filtration system. About 9,000 feet of streets have been opened and closed again, and sewers laid for the same distance.

Eight thousand six hundred feet of street has recently been graded and seven thousand cubic yards of material



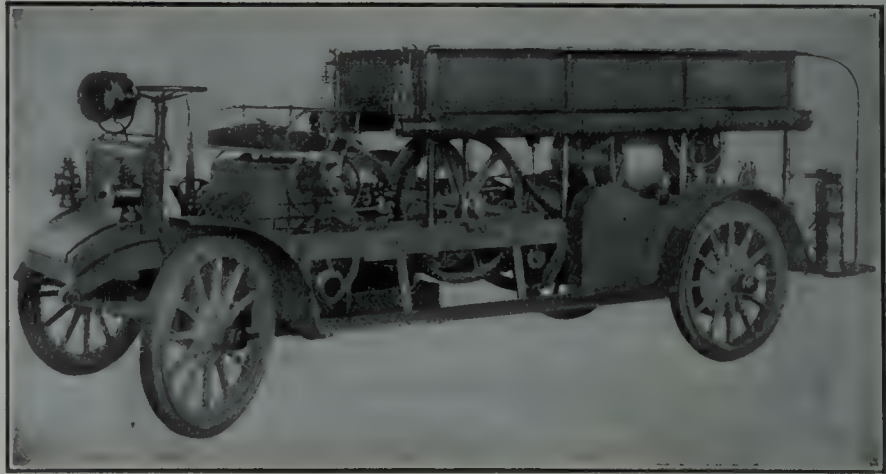
Luitwieler under Test.

it will work under a full load on an ordinary floor without bolting or without special foundation of any kind.

One of the above illustrations shows a three horse power electrically-driven pumping engine under test, the time of exposure in taking the photograph having been eight minutes. The engine is set as shown upon four water glasses and the pencil placed upon top of the frame stands erect showing absence of bound, jar or vibration. The other illustration shows one of their motor fire trucks in which this type of pumping engine is exclusively used, the one in this case being of double-acting triplex design. In this application the great advantage of lack of vibration of the power element is evident. The system of pumping under these conditions claims to be the only one in use of the non-pulsating type, having over 30 per cent. higher efficiency than the present steam fire pumps in use. The General Machinery Company, Limited, of Toronto, are the Canadian agents for the Luitwieler pumping engines, who claim on a recent installation to have effected a saving of 80 per cent. over the driving mechanism previously used.

Development in St. Lambert, Que.

Among the suburban districts in the neighborhood of Montreal, the Town of St. Lambert is an example of rapid growth. This is due in part to the car facilities, the heart of the city being reached in about twelve minutes, and to the pleasant location of the town. Within two years the population has enormously increased, and land values have in some instances more than doubled. To meet the new conditions the council has undertaken a large scheme of drainage and street improvements, including a combined storm and sewage plan. It was found that the old domestic sewage system was in very bad condition and the



Luitwieler Fire Truck

removed. One street fifty feet wide and 900 feet long has been laid with Telford macadam. The town has also installed a complete road plant, including crushers, engines and roller, and has purchased about \$17,000 worth of material. Many sidewalks have been laid with 18-inch curb and 18-inch gutter at a price of \$1.31 per running foot. Altogether about \$50,000 have been spent.

The council is carrying out a separate scheme of drainage in Brooklyn Park, an adjoining district, on which sixty men are employed. Counting this number, an average of 260 men are employed. Mr. A. S. Dickson is the engineer.

Concrete Floor Surfaces

To obviate undue wear of concrete floors and consequent dust it is desirable that the surface should consist largely of hard stone aggregate in particles of not less than $\frac{1}{8}$ -in. gauge. The use of concrete with a liberal proportion of water is apt to bring small particles to the surface during the work of trowelling. If the finishing layer is applied before the main body of the concrete has hardened the thickness of $\frac{3}{4}$ in. is usually ample, but if applied after the building is practically complete the thickness should be at least $1\frac{1}{2}$ in., so that the new material may be capable of standing without relying upon bond with the old work beneath. By taking care to make the final coat of durable character, a concrete floor should be free from "dusting," but in case remedial measures should become necessary one or two coats of boiled oil or treatment with sodium silicate solution will be found effective.

Westmount city council has authorized Mayor Ruth-erford, Alderman Sherrard and Mr. Archibald Currie, city surveyor, to attend the annual convention of the Union of Canadian Municipalities which takes place at Quebec the last three days of this month.

A Prominent Montreal Architect

Mr. Charles A. Reeves, architect, 58 St. James Street, Montreal, is one of the best known gentlemen in his profession in this city. Although not yet forty years of age he has achieved an enviable reputation and has had committed to his charge a number of important contracts, both for the city of Montreal and of Maisonneuve, as well as of other places in this province. A son of Mr. Charles Reeves of Pointe-aux-Trembles, the subject of this sketch had the privilege of attending college in Montreal and pursued his studies preparatory to business and professional life at the Plateau Commercial Academy, where his splendid natural talents, particularly in mathematics and designing, soon distinguished him. His application to study, his in-

be taken under the authority of a recent by-law, which authorized the expenditure of \$300,000 for this purpose. Half a dozen contracting firms were among the bidders. The work will be undertaken by the city and will be carried out by day labor.

The work consists of the construction of approximately 9,000 feet of egg-shaped brick or concrete sewer, and approximately 12,500 feet of cement or vitrified circular sewer pipe, ranging from fourteen to twenty-four inches in diameter with the necessary manholes, lamp-holes, putfalls chamber and pumping station, including approximately 22,500 cubic yards of excavation.

The work will provide main sewers for the northeast and northwest districts of the city.

Cork Paving Bricks

A sanitary non-absorbant, and relatively noiseless material suitable for carriage drives, courtyards, and other places has recently been patented in the United States, under the name of cork brick. It consists of finely-granulated cork mixed with asphalt and pressed into the form of bricks, measuring 9 in. by 4 in. by 2 in. The bricks are laid flat on any level foundation. Where laid on concrete the foundation should first be covered with a thin layer of hot asphalt or a bed of sand. If the foundation consists of broken stone a layer of sand should be spread before placing the bricks, and where laid on wood the surface should be covered with hot asphalt. It is stated that the bricks absorb less than 1½ per cent. of water by immersion and that they afford an excellent foothold whether wet or dry.

The Situation in Montreal

Montreal, August 19th, 1911

The carpenters' strike has at last been amicably settled, the men securing the minimum wage of 35 cents an hour from most employers. The principal contractors in the city who fought the strike rejoice in that they were able to proceed with their work without serious interruption at any time. The Harbor Commissioners are employing men indiscriminately at union wages, while Messrs. P. Lyall & Company state that their policy of employing men was in no wise disturbed by the strike.

A number of contracts were delayed a few days and the cost of several of them will be increased considerably by this advance in the minimum wage, while it is stated that a large number of inferior mechanics will shortly be laid off on this account.

At present the building trade is in the midst of its greatest rush and the progress of the large office buildings in the centre of the city is creating considerable interest. Prices double those of a year ago are being paid for ordinary properties occupied by small stores or residences on Aylmer street between St. Catherine and Sherbrooke streets owing to the impression existing that this will be the site of the new Canadian Northern terminals, while other high priced properties that have recently changed hands will be the site of departmental stores and other buildings that must shortly give way to transportation demands.

Mr. H. B. R. Craig has resigned his position as city engineer of Kingston to become senior assistant to the district engineer of the Public Works Department, with his headquarters at Windsor. Mr. Craig was first appointed to the position of city engineer of Kingston on December 1st, 1904. After several years he resigned, however, and returned to railway work, but was again appointed city engineer in March, 1908, which position he has held up to the present time.



domitable perseverance and his determination to succeed won for him the esteem of the professors and the admiration of his fellow students. Upon deciding to enter the profession of architecture, the same ability and determination that had marked his student days soon brought him into prominence among the members of his profession. The Maisonneuve parish church, the Viauville school, the Slater Shoe factory, the Kingbury Shoe factory, the Royal Shoe factory, the factory of Laniel & Company, a couple of fire stations, and a large number of private residences are among the structures which have been designed and erected under his direction. Mr. Reeves speaks English and French with equal fluency. He was formerly one of the assessors of the city of Maisonneuve and is at present building inspector for that municipality. He acted as arbitrator in connection with extensive expropriations in Maisonneuve in 1901. Mr. Reeves is described and regarded with pride among his compatriots as "a self-made man."

Vancouver's New Sewerage System

The city of Vancouver has accepted City Engineer Smith's bid for the construction of the first large portion of the proposed sewer improvement and extension work, to

Construction Work in Ottawa

Ottawa, August 21st.

Building is progressing steadily in Ottawa and all the trades as well as all the contractors are busy. There are many more houses being erected now than earlier in the year. The builders held back in the spring partly because of funds, and partly because they were well tied up with contracts for commercial building or remodeling more expensive houses. However, the indications are that houses will be none too plentiful this fall. Forseeing this, these men are hurriedly starting houses of the variety to meet this demand. Double tenements seem to be the best sellers and for this reason more of these than any other variety are being erected.

The only change in prices is in the case of brick. There has been a general advance of from 50 cents to \$1 a thousand due to the higher wages and particularly the increased cost of cartage. The price of veneer clay brick is now \$13 delivered to any part of the city, which is a dollar higher than it was in the spring. The prices of cheaper brick has advanced proportionately.

There was a prospect of an advance in galvanized iron work. However no action will be taken until after the election at least. There is a five per cent. duty on galvanized sheets coming in from the United States which would be removed if reciprocity carried. However the firms using large quantities of sheet metal in the city do not anticipate that this will make any difference in the cost to them. They state that the British price usually guides the American price, and that if the American producers can charge five per cent. more, and yet compete with the British prices, that they will do it.

Wages remain fairly satisfactory, and there is little scarcity of labor. Cheap labor continues to be in good demand.

F. C. Graves, C. A. Douglas and R. McMorran will erect a commercial building on Rideau street. It will cost in the neighborhood of \$25,000. It will be only two storeys high for the present and will be built of solid brick. Mr. J. A. Ewart is the architect and Alex. Garvock and J. and C. Low the contractors.

The government has had a large staff of workmen making repairs to the government buildings and there have been two big contracts let for changes to Rideau hall. The most important of the changes there is the erection of a large garage which A. G. Marchall is building at a cost of over \$15,000.

The factory for the Rolla Crain Company, Limited, has been started. It is one storey high and covers nearly two lots. The firm will move its lithographing and printing plants to this place.

Work is well under way on the C. P. R. round house. This is a reinforced concrete building to cost around \$60,000. It is a short distance west of the old round house which last year was for the most part destroyed by fire.

The finishing touches are being put on the Chateau Laurier and it will be ready for occupation this fall. The work of the annexes to the new Central station are under way.

The Beaver Board company has purchased a site just outside the city on which will be erected a large factory similar to the one outside of Buffalo. It will be similar in design to that one. Up to the present the company has been manufacturing in a building at the Chaudiers, but the demand has become so great for the product that this place is entirely incapable to supply it. Mr. William MacGlashan, president of the Beaver Board was in Ottawa arranging for the purchase of the property. It is proposed

in connection with this factory that a model town will also be erected.

The question of factory sites has come in for a great deal of discussion in this city, and many firms who came to Ottawa found the land suitable for factory sites too high priced for that purpose. Accordingly an effort has been made to solve the difficulty, with considerable success. Already sites in the outskirts convenient to the railways has been offered free to manufacturing concerns and a number of others have been offered at low prices per acre. It now looks as if the city would be in a position to offer unusual opportunities in this connection.

The Model Homes Association has its plans now on file. These plans are particularly good, and are available to persons wishing to secure them for a home which would be suitable for Canadian needs, and at the same time artistic and cheap to construct.

Mr. R. W. Farley has begun the preliminary survey of the electric road from Ottawa to Smiths Falls and Kingston.

The estimated cost of the improvements to Sparks street, including the building of the conduits for wires, the repaving and building of new sidewalks on the street is \$75,000, according to the city engineer, who has just completed the plans for the conduiting of all the wires on the street.

The new plans for the conduits call for an expenditure of \$45,000, about \$15,000 more than was estimated under the first plan prepared. The new plan calls for conduits for the high tension and low tension wires on either side of the street, and the extension of the conduit as far as Sussex street. This will rid Sparks street from Bank to the Plaza and on Rideau to Sussex street of all poles and overhead wires.

The work will not be undertaken until next spring however. The companies interested, the Ottawa Electric company, G. N. W. Telegraph company, the municipal electrical department, and the C. P. R. Telegraph company will have a conference in the near future, and as the plans now submitted were made with a view of meeting the objections and needs of all concerned, they will probably be accepted. A division has been made in the manholes so that each company will have separate room in which to work.

The high and low tension systems will be in different conduits, which will do away with the danger to the delicate telegraph wires.

The first part of the work of improving the street, according to the city engineer, will be to allow the Ottawa Gas Company to build its new main along the street this fall, so that everything may be ready by spring for the city to go ahead. The pavement will first be laid then, and afterwards the conduits. The conduits will be laid under the sidewalks on either side, so that in addition to the new pavement the street will also have new sidewalks.

The only clay resources of Prince Edward Island are of Pleistocene age. Common clay bricks are found at a number of points but are worked to only a slight extent.

The City of Montreal is paying over four thousand dollars a day in wages for the laying of permanent road and sidewalk pavements, besides the cost of similar work being done by contractors.

From 1909 the Canadian production of stone for building purposes amounted to 1,170,550 or 37.4 per cent. of the total stone production. Quebec shows the largest output with Ontario next. The kinds of stone quarried were classed as granite, limestone, sandstone and marble.

The Foundation Company's Chief Engineer

In connection with the erection of the mammoth Woolworth Building in New York, a 55-storey building 750 feet in height, we notice with pleasure the name of Mr. John W. Doty, whose position as chief engineer both of the Foundation Company, of New York, and the Foundation Company, Limited, of Montreal, is one that spells responsibility itself, when we consider the numerous other gigantic enterprises in which these firms are simultaneously interested. Mr. John W. Doty is a son of Mr. F. W. Doty, president of the Doty Iron Works, Goderich, Ont. He was born in Toronto in 1879 and received his early education in the city schools. He later attended the Rensselaer Polytechnic Institute and graduated in 1902 with the degree of civil engineer. Mr. Doty was also for some time in the employ of the John Doty Iron Works and the Toronto Ferry Company, as will be remembered by those who were acquainted with these firms a decade or more ago. Since graduation Mr. Doty has been with the Foundation Company, and has been for the past several years one of the

world, the Woolworth Building may with equal propriety boast of having one of the most secure foundations within the State of New York. This distinction will reflect considerable credit upon the Foundation Company and upon the Canadian, Mr. John W. Doty, its engineer.

The original name of the company was the Foundation & Contracting Company, but was changed in July, 1903, to the present title. The company is one of the most prominent concerns in its line and is quite at home with such large contracts as the present Woolworth Building undertaking. It will be remembered that last year the Foundation Company had a contract for the construction of the foundation for the municipal buildings at the Manhattan terminal of the New York and Brooklyn Bridge, which up to that time was one of the largest of its kind every given out, and entailed the cost of over a million dollars for foundation work alone. The Foundation Company of Montreal was incorporated in May, 1910. They have a number of important contracts throughout the Dominion, and whose work has several times been subjects of articles in previous issues of the Contract Record.

It will be remembered by many who had read a lengthy article by Benjamin Brooks which appeared in McClure's Magazine for May, 1909, that Mr. John W. Doty was spoken of therein in connection with the simplification of the automatic sinking of concrete piers, which was at that time a remarkable engineering feat.

Personal Notes

W. A. Hungerford, a prominent mining engineer and general manager of the Canadian Talc & Silica Company, with mines at Eldorado, died at his home at Madoc, Ont., on August 15th.

Mr. S. Harvey, A.M. Inst. C.E., A.M.I.M.E., who for some time past has been in the city mains drainage department, left last week for Lethbridge, Alta., to accept a position in the city engineer's department there.

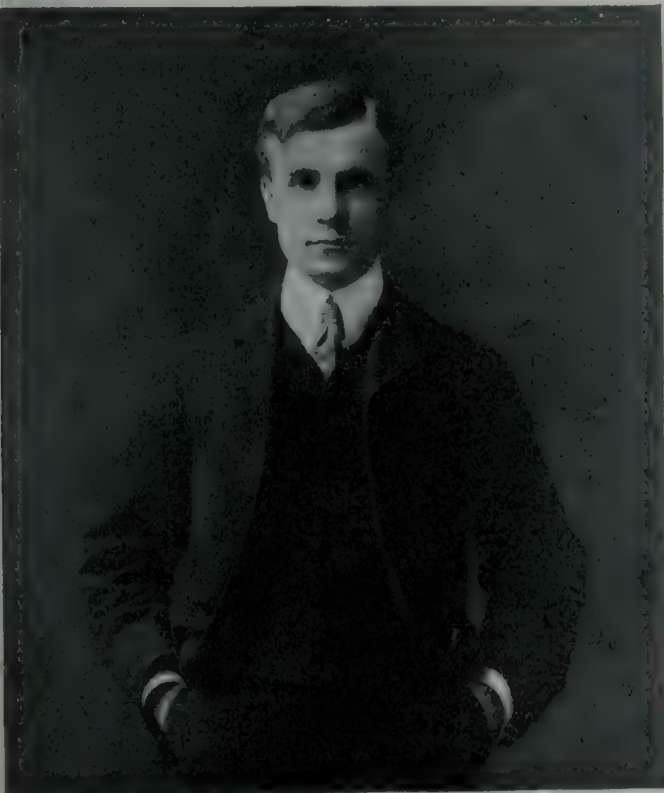
Mr. Thos. Mawson, lecturer in the Department of City Planning of Liverpool University, will deliver a series of lectures on Town Planning under the auspices of the University of Toronto, at some time during the coming winter session.

Mr. J. P. A. Laforest has received the appointment as Hull City Engineer, replacing Mr. D. Chene, who resigned a few months ago. Mr. Laforest was formerly assistant to the Montreal city engineer and has had considerable experience in corporation work.

Mr. W. F. Evans, chief engineer of Steel & Radiation, Limited, Toronto, has left the city to engage with G. W. T. Nicholson & Company, of Montreal. Mr. Evans was tendered a dinner by a number of his friends at the Engineers' Club before his departure.

Upon his departure for British Columbia Mr. K. A. Mackenzie, secretary of the Engineering Alumni Association, was tendered a farewell banquet by the Alumni at the Engineers' Club, Toronto. Mr. Mackenzie has accepted a position with a Vancouver syndicate which is taking over the development of a number of large water power and irrigation projects in British Columbia.

Mr. F. P. Adams has been appointed to succeed Mr. E. B. Jones as city engineer of Chatham, Ont. Mr. Adams has had considerable experience in municipal work in Brantford and has until recently been engaged in superintending the construction of a large sewage system in Steelton and Sault Ste. Marie. He has also had considerable experience in the installation and operation of electric light plants.



Mr. John W. Doty, Chief Engineer, Foundation Company.

directors of the firm. The company needs no introduction as every one interested in large buildings and similar construction work knows its reputation to be world wide. Specializing as they do in foundation engineering and construction an infinite amount of engineering skill and ingenuity is in constant demand, as the height of the skyscraper and the consequent greater weight and instability of the structure continues to increase.

The foundation for the Woolworth Building will require 69 pneumatic caissons to be sunk through the quicksand to bed rock to twenty feet below the curb and ninety feet below water level. The quicksand strata presents considerable difficulty as it admits water after the first thirty feet of excavation has been reached unless caisson work with an air pressure of 45 pounds per square inch be used to withhold the influx of water. It is stated that in addition to having the honor of being the highest building in the

Trade Notes and Items of Interest

Some 2,000 men are at present employed on civic works in Calgary, the last semi-monthly pay roll reaching \$82,000.

Canada's industrial expansion continues unabated, the estimated value of production for 1910 being \$1,000,000,000.

A by-law will be submitted in September in Galt for raising \$10,000 for the purposes of improving the system of waterworks.

The eleventh annual convention of the Union of Canadian Municipalities will be held at Quebec on August 29th, 30th and 31st.

The Western Pavers, Limited, have secured the contract for building over 32,000 linear feet of curb and gutter work in Regina.

The building operations in Saskatoon show an issue of 503 permits for the first seven months of the year, representing over \$3,000,000.

The city of Toronto has awarded to Q. E. Seagrave, Walkerville, Ont., the contract for motor driven combination chemical engine and fire hose.

The Thunder Bay Construction Company have sub-let a contract for 1,200 feet of breakwater at Port Arthur to M. J. Hogan, of Port Colborne, Ont.

Messrs. Chapman & McGiffin are the architects for a ten-storey building of reinforced concrete to be built for the R. S. Williams & Sons Company, Toronto.

The Niagara Falls Contracting Company, Limited, of Niagara Falls, Ont., was recently incorporated with a capital of \$40,000, to carry on a building and contracting business.

The excessive labor troubles that England has been experiencing during the past several weeks, are in danger of seriously affecting foreign trade, according to a recent report from Liverpool.

The city of Boston is contemplating a high pressure installation in its water system. Mr. J. H. Innes, chief waterworks engineer of that city, went over the Toronto plant recently on a tour of investigation.

The contract for the construction of 338,640 feet of concrete sidewalk for the city of Regina has been let to the Parsons Construction Company of that city. Future extensions are at present being planned.

The city council of Calgary has decided to widen all the thoroughfares in the business districts of the city. A by-law will be passed prohibiting the construction of buildings within five feet of the street line.

Messrs. John W. McManus & Company are the successful contractors for the reservoir dam that is being constructed by the city of Moncton, N.B. The dam is to be fifty feet high and will attain a length of over 800 feet.

A schedule of waterworks extensions for the city of Calgary has been drawn up totalling about thirty miles of new mains, of which as much as possible will be laid this fall and the remainder completed next summer.

An asylum for the insane for the province of Saskatchewan is to be erected about two miles from North Battleford. The building will be of pressed brick, three storeys in height. Grounds of considerable area have been set apart here for the institution.

Lemoine & Company, Montreal, have secured the contract for the erection of the Richileau River bridge at St. Johns, Que., and will commence the construction in a few days. The structure will be of reinforced concrete with concrete foundation and piers.

The excavation for the new million dollar Canadian Pacific Hotel which is to be erected in Calgary has been commenced, and concrete work in the basement and foundation, and also on the west wing extension of the station will be in progress in a short time.

Messrs. Laurie & Lamb, of Montreal, were awarded the contract for the construction of an incinerator of the Heenan-Froud type. The plant will consist of a 75-ton per 24 hours top feed unit, together with a 6-cell refuse destructor, and will be installed for the sum of \$34,650.

Three tenders have been received for the construction of the dry dock and harbor works at Courtenay Bay, St. John, N.B. These are Norton Griffith, Limited, of London, Sir John Jackson, of London, and a third from an American firm. Each tender was accompanied by a deposit of \$500,000.

The plans for the town of North Toronto sewage disposal works are in progress. Construction of the three separate disposal works will be let in one contract and will include construction of the screening chambers, sedimentation tanks and filter beds, together with laying the inlet and effluent mains, etc.

The announcement is made that the annual convention of The Canadian Manufacturers' Association which was to have been held from September 19 to 21 has been postponed on account of elections to October 10. It will be held in Toronto instead of Ottawa as originally planned, but Ottawa will get the convention next year.

A Canadian section of the International Waterways Commission has recently been appointed and consists of Sir George Gibbons, Toronto, Aime Geoffrion, K.C., Montreal, and A. P. Barnhill, St. John, N.B. Three members will also be appointed by the United States. The Commission will have jurisdiction over all matters relating to the international waterways of the two countries.

The imports of Portland cement into Canada, which previous to 1904 were larger than the Canadian production, have been steadily decreasing, and amounted in 1909 to only 142,194 barrels, or about three per cent. of the consumption, as compared with imports of 469,049 barrels, or 15 per cent. of the consumption in 1908. A duty of 12½ cents per hundredweight, equivalent to 43¾ cents per barrel of 350 pounds net is levied on imports.

The field staff of the provincial board of health, after conducting a careful and lengthy examination of the water of the Back River under Mr. H. H. McCready has reported that the water of the river, which is nearly all Ottawa River water, is unfit for human consumption in an unfiltered state. The greatest degree of impurity was found between Cartierville and Bordeaux where all the samples taken showed the presence of bacteria varying from 200 to 2,200 per c.c.

In reviewing the brick industry of Ontario, the Director of the Bureau of Mines states:

"There has of late years been a marked improvement in the quality of brick made in first-class yards. Kilns of modern construction burn harder and more evenly, and there is a smaller proportion of soft brick. The present taste in brick houses, too, does not demand the same uniformity of color that was formerly insisted upon; in fact, a variety of shade, instead of being objected to, is rather desired. There is also a much greater range of products than was made years ago. From white and buff to cherry red, and up to a dark even purplish hue, bricks of all tints and shades are freely used, and pleasing effects are sometimes obtained by employing clinker or overburned bricks, greenish or yellowish in color."

Contracts Department

News of Special Interest to Contractors, Engineers, Manufacturers and Dealers in Building Supplies.

Information for insertion in these columns is invited from Architects, Contractors, Engineers, etc.

Waterworks, Sewerage and Roadways

Biggar, Sask.

The ratepayers will be asked to vote \$22,000 for waterworks and sidewalks.

Barnet, B. C.

Waterworks, \$15,000. At a meeting of Burnaby Council a plan for water system at Barnet was adopted and the engineer authorized to proceed with the work. Lap-welded. Work will start at once.

Fergus, Ont.

Contemplated purchase of machinery. Purchaser, Wellington County. County clerk, James Beattie, Fergus, Ont. One complete set of road machinery including steam roller is now owned by the county. It is proposed to purchase a duplicate set of road machinery.

Hamilton, Ont.

Materials required for reservoir walls. (High Level reservoir). Owner, City of Hamilton; city clerk, S. H. Kent; city engineer, A. F. Macallum. Cement and reinforcing required for concrete wall.

Work authorized for pipe sewers. The City Engineer has been authorized by Council to proceed with the following (cost being estimated "per lineal foot")—Fairview avenue (Cannon street to Highland avenue) \$1.48. Lorne avenue (Central avenue to Cumberland avenue) 86 cents. Fairview avenue (Highland avenue to King street) \$1.46. Barnesdale avenue (King street to Dunsmuir avenue) 90 cents. Madison avenue from end of sewer north of Cannon northerly to end of street, 98 cents. Niagara st. (Ship street to Land street) 65 cents. Niagara street (Gilkison street to Land street) \$1.19. Wentworth street (Mars avenue to Gilkison street) \$1.31. Scott avenue (Beechwood avenue to Barton street) \$1.60. Scott avenue (Beechwood avenue to Rosemount avenue) \$1.35. Rosemount avenue (Sherman avenue to Scott avenue) 75 cents. Beechwood avenue (Sherman avenue to Scott avenue) \$1.00. Campbell avenue Frederick avenue to Ottawa street) \$3.25. Wentworth street (Gilkison street to Land street) \$1.75.

Plans to be prepared for sewage disposal plant. Owner, City of Hamilton, Ont. S. H. Kent, City Clerk. City Engineer, A. F. Macallum. City Engineer will prepare plans.

Tenders to be called for grading and sidewalks. J. Walter Gage, Main and Hughson streets, will do following work—lay out and grade two streets on part of lot 9, concession 2, Barton township and lay 4 ft. 6 in. cement sidewalk and curb on following properties:—Eastholme Survey about 1839 lin. ft. Delta Survey about 2408 lin. ft. Crow Point Extension about 2695 lin. ft. Work will be done under supervision of City En-

gineer Macallum, who supplies grades and specifications. Tenders to be called shortly.

City Engineer Macallum will construct the following water mains:—High Garth to Beulah, \$476. Brant, Wentworth to Niagara streets, \$431. Park Row avenue, Columbia to Edinburgh avenue, \$578. Burton street, Douglas to Wentworth street, \$1092. Douglas st., Mars avenue to Francis, \$275. Oliver street, Wentworth to Wilfred, \$868. Gilkison street, Wentworth street, 600 ft. westerly, \$827. Mayflower, Trolley street to Glendale avenue, \$929. Magnolia street, King to Sherbrooke street, \$1126. Wilson street, Madison avenue, to Wentworth street, \$530. Boyleston avenue, Barton street to Primrose avenue, \$1162. Trolley street, Barton st. to G. T. R. \$1372. Hilda avenue, Main street to King, \$830.

Haileybury, Ont.

On August 28th the ratepayers will pass on a by-law to raise \$15,000 for waterworks.

Kindersley, Sask.

Grading contemplated for street. Owner, Town of Kindersley. Secretary, J. D. McLeod. Grading about to commence on four miles of street. Town would prefer to do it by contract but may undertake work. No equipment on hand.

Lansdowne, Ont.

Tenders called for cement walks. Owner, Municipality of Lansdowne. Clerk, J. D. W. Darling. Building of cement walks on Railway avenue and Gilbert streets. Tenders to state price (1) Furnishing all the material and doing the work. (2) To do the work, the material to be furnished by the Corporation. Specifications at the office of the clerk. Tenders were received by the clerk until noon August 21st.

MaGrath, Alta.

Tenders called for cement sidewalks. Owner, Town of MaGrath. Secretary-Treasurer, Melvin Godfrey. Specifications with the secretary. Tenders to be accompanied by accepted cheque for 5 per cent. of amount of tender. Tenders received by secretary until 6 o'clock Aug. 26th.

Moncton, N. B.

Tenders called for sewerage. Owner, City of Moncton, N. B. City Clerk, T. S. Magee. City Engineer, John Edington. Extension of sewer on High street N. 800 ft. Victoria Square 700 ft. Extension of sewer on St. George street, 375 ft. Plans with City Engineer. Tenders received by City Clerk until Aug. 17th. Tenders to be accompanied by cheque equal to 5 per cent. of amount of tender.

Menard Corner, Que.

Purchase contemplated for stone crusher. Contractor, David Brault, Menard Corner. Contract calls for 4,000

tons of crushed stone, at \$2.35 per ton for completion of public road along Chambly Canal for Federal Government. One crusher has been purchased—an additional one may be required.

North Vancouver, B.C.

Tenders called for sewer. City engineer, G. S. Hanes. Supply of material and construction of sewer with connections on Esplanade and Crescent st. from St. George avenue to St. David's avenue and on Second street from a point 30 ft. E. of St. Andrews to St. David's avenues. Tenders received by city clerk until August 21st.

Port Hope, Ont.

By-law carried for waterworks extension. Owner, Town of Port Hope. Ont. Town clerk, J. W. Sanders. By-law passed by council to issue debentures for \$15,000; cost to be divided as follows:—mains, \$6,000; instal eight more hydrants, \$400; 150 water meters, \$2,000; change the pumping system from steam to electricity, \$4,000; build a filtering gallery, \$2,000 and a well to cost \$2,500.

Pincher Creek, Alta.

Plans prepared for sewerage. Engineer, Wood & Stelle, Pincher Creek, Alta. Wood & Stelle have been asked to prepare plans for sewerage system for the town. Part of system will be installed this year.

Saskatoon, Sask.

A by-law will be submitted on August 23 for the raising of \$10,000 for the improvement of Saskatchewan Drive and Victoria avenue.

A by-law will be submitted on August 23rd for the raising of \$45,000 for house sewer and water connections.

A by-law will be submitted on August 25, for the raising of \$73,000 for extensions of the waterworks system.

Ste. Anne de Bellevue, Que.

Tenders were called on the 14th for a system of drainage and also for the installation of an electric light system and waterworks for the town of Ste. Anne de Bellevue. V. H. Dupont, 62 St. James street, Montreal.

St. Mary's, Ont.

W. S. Brooke, Toronto, has plans prepared for a sewer system and a sewer disposal plant, estimated cost \$201,500.

Township West Oxford, Ont.

Tenders called for drain improvement. (Lot 6, con 4). Owner, Township of West Oxford, Ont. Township Clerk, Bryon Jenvey, Ingersoll. Specifications, etc., at office of the Clerk. Tenders received by clerk, until noon, Aug. 19th.

Town of Blandford, Ont.

Tenders called for drains. Owner, Township of Blandford, Ont. Clerk, W. J. Henderson, Bright, Ont. Engineer, F. J. Ure, Woodstock. Skilling Drain, 2,210 ft. 5 in. to 10 in. tile, 447 ft. 6 in.

tile and 36 rods open ditch. Hersee drain, 3,700 ft. 9 in. and 10 in. tile and 12 rods open ditch. Chesney drain, 3,040 ft. 10 in. and 12 in. Plans, etc., at office of F. J. Ure, Wodstock, and at the clerk's office, Bright. Tenders received by clerk until 12 o'clock, August 28th.

Toronto, Ont.

Tenders called for laying a six-foot steel conduit. Owner, Board of Control; chairman, G. R. Geary, Mayor. Laying a 6-ft. steel conduit from a connection with the present intake southerly into Lake Ontario, a distance of 500 ft., including all connections. Plans, etc., with the Waterworks Department at the office of the City Engineer. Tenders received by Chairman until Aug. 23rd.

Toronto, Ont.

Municipal work. Board of Works recommended construction of asphalt macadam roadway (60 to 130 ft.) concrete curbing and gutters on University avenue, from Queen street to a point 261 ft. N. of College. Probable cost, \$85,987. Proposed extension of Terauley street north of Bloor deferred until after Jan. when the ratepayers vote on proposed tube. Macadam roadway to be laid on St. Vincent street. Action deferred on widening of Dufferin street from King to Exhibition grounds. Matter like to be brought up at council. Plans for G. T. R. bridge awaiting decision regarding widening.

Point Grey, B. C.

Sidewalks, etc. Owner, Corporation of Point Grey. Secretary-treas., H. Floyd. Tenders to be called for cement sidewalks on several streets; a road sprinkler to be purchased; a committee appointed to confer with regard to installation of sewerage system in D. L. 472.

Plantagenet, Ont.

The council is considering the construction of concrete sidewalks here.

CONTRACTS AWARDED

Dresden, Ont.

Waterworks pipe. Owner, Corporation of Dresden, town clerk, J. T. Bridgewater; consulting engineer, F. W. Farncomb, C.E., 64 Bank of Toronto Chambers, London. Successful contractor, United States Iron Pipe and Foundry Co., Buffalo, about 15,000 feet of 4-in., 6-in. x 8-in. c.i. waterworks pipe at \$30.35 per ton. f.o.b. cars Dresden.

Edmonton, Alta.

The contract has been awarded to the Moran Co., of Seattle, Wash., for a 6,000,000 gallon steam-driven centrifugal pump. Cost, \$18,000.

Hamilton, Ont.

Sewers. Owner, City of Hamilton; S. H. Kent, City Clerk. City Engineer, A. E. McCallum. Contractors, S. Cheeseman, King and Dundurn, pipe sewer, Sherman avenue, from Main street to Maple avenue, at \$1.25 per lineal foot. J. J. Armstrong, 48 Burris street, pipe sewer, Greenaway avenue, from Wilson street to Cannon street, at 78 cents per lineal foot.

Moncton, N. B.

Reservoir dam. Owner, City of Moncton. Engineer, John Edington, Moncton. Successful contractor, John W. McManus & Co., Moncton. \$128,542 dam 50 feet high, 800 ft. long. Others

tendered as high as \$146,326 and \$156,364. Contract was awarded August 11th.

North Bay, Ont.

Waterworks. Engineer in charge, J. H. Shaw, North Bay. Successful contractors, Stewart & Co., N. Bay, laying 15,500 ft. 14 in. wood pipe, \$6,500; C. Landrelli & Co., N. Bay, 2,550 ft. 10 in., 27,745 ft. 6 in. and 1,110 ft. 4 in. pipe, \$16,000. Contract awarded Aug. 7th.

Revelstoke, B.C.

Pipe line. Owner, City of Revelstoke. General contractors, Pacific Coast Pipe Co., Vancouver, \$8,500; other tenderer, MacCarthy & Kennedy, Revelstoke, \$16,000. Construction of 1,100 feet of 6 ft. pipe line.

Regina, Sask.

Sidewalk construction, \$56,647. Owner, City of Regina. City Engineer, L. A. Thornton. Contractor, Parsons Construction Co., Regina. Material required, cement. Construction of about 338,640 ft. of concrete sidewalk. An additional programme of sidewalk extension to be drawn up by fall. Contract awarded Aug. 7th. By-laws passed by council.

Curb and gutter, \$23,603. Owner, City of Regina. City Engineer, L. A. Thornton. Contractor, Western Pavers, Ltd., Regina. Construction of about 32,334 lin. ft. of curb and gutter. Material required, cement. Contract awarded Aug. 7th. By-law passed by council.

Vancouver, B.C.

The contract for laying about 1,400 ft. of 6-in. c.i. pipe across the arm of the Fraser between Lulu and Sea Islands has been awarded to the Municipal Construction Company, 319 Pender street.

Railroads, Bridges and Wharves

Chatham, Ont.

Tenders called for concrete abutments, Baptiste Creek. City engineer, Geo. A. McCubbin, King street, Chatham; county clerk, J. Gosnell, Chatham. Construction of reinforced concrete abutments and repairing superstructure of Baptiste Creek Bridge on the Kent & Essex Co. line. Plans, etc., at office of engineer. Tenders to be accompanied by accepted cheque for \$200. Tenders received by county clerk until noon, August 26th.

Calgary, Alta.

Tenders called for bridges. (Crow's Nest Sub-division). Owner, Canadian Pacific Railway. Division Engineer, N. E. Brooks, Calgary. Construction of concrete sub-structure for bridges, 53.7 and 65.6. Plans, etc., at Asst. Chief Engineer's office, Winnipeg, or Division Engineer's office, Calgary. Tenders received until noon Aug. 25th.

Under consideration, extension of street railway. Owner, City of Calgary. City Engineer, J. T. Child. The commissioners have under consideration extensions as far as Manchester sub-division, two industries having located there. A clause in the agreement given industries locating in industrial sub-divisions stated that extensions would be made. Such extension will involve construction of an overhead bridge across C. N. R. Cost for this has been undertaken by company.

Dartmouth, N. S.

Tenders called for railway. Owner, Department of Railways and Canals, Ottawa. Secretary, L. K. Jones. Branch line from Dartmouth of Deans. Plans, etc., at office of Chief Engineer of Department; at office of chief engineer, Intercolonial Railway, Moncton, office of Board of Trade, Halifax. Tenders received by secretary until 6 o'clock Sept. 15th. Advertisement in "Tenders and For Sale Department" of this issue.

Feltzen South, N.S.

Tenders called for breakwater, Lunenburg Co. Owner, Department of Public Works, Ottawa; secretary, R. C. Desrochers. Plans, etc., at Department and at the offices of district engineer, Halifax, N.S.; district engineer, Antigonish, N.S., and on application to the local postmaster. Tenders received by secretary until 4 p.m., September 6th.

French River, N.S.

Tenders called for breakwater. (Victoria Co.) Owner, Department of Public Works, Ottawa. Secretary, R. C. Desrochers. Construction of breakwater. Plans, etc., at Department and at the offices of District Engineer, Antigonish, N. S., District Engineer, Halifax, N. S., and on application to the Postmaster at Breton Cove, North Shore, Victoria County, N. S. Tenders received by secretary until Sept. 6th.

Fort William, Que.

Tenders called for wharf. Owner, Department of Public Works, Ottawa. Secretary, R. C. Desrochers; construction of public wharf at Fort William, Pontiac County, Que. Plans, etc., at Department and at offices of the postmasters at Pembroke, Ont., and Fort William, Que. Tenders to be accompanied by accepted cheque for 10 per cent. of amount of tender. Tenders received by secretary until 4 p.m. Aug. 28.

Guysborough, N. S.

Tenders called for railway. (To Sunny Brae). Owner, Department of Railways and Canals, Ottawa. Secretary, L. K. Jones. Branch line through County Harbor crossroads with extension to deep water of County Harbor. Plans, etc., at offices of Chief Engineer's Department, Ottawa. Chief Engineer, Intercolonial Railway, Moncton, Board of Trade, Halifax. Tenders received by secretary until Sept. 15th. Advertisement in "Tenders and For Sale Department" of this issue.

Kelley's Cove, N.S.

Tenders called for extension to breakwater. (Yarmouth Co.) Owner, Department of Public Works, Ottawa. Secretary, R. C. Desrochers. Construction of extension. Plans, etc., at offices of District engineer, Halifax, N. S. District Engineer, Antigonish, N. S., on application to the local Postmaster. Tenders received by Secretary until 4 p.m. Sept. 12th.

Montreal, Que.

Terminal facilities. Owner, Canadian Pacific Railway. Buildings about to be erected: 24-stall engine house; a machine shop; a mechanical coaling plant; a stores building; a boarding house to lodge 100 men; capacity of yards increased to 1,700 cars. Work to be finished this year.

Newmarket, Ont.

Tenders called for bridge over Holland river. Owner, Town of Newmar-

ket; engineer, Frank Barber, C.E., 57 Adelaide street east, Toronto. Construction of concrete abutments and reinforced concrete, truss bridge. Tenders received until noon, August 26th.

Oromocto Shoals, N. B.

Tenders for dredging. Owner, Dept. of Public Works, Ottawa. Secretary, R. C. Desrochers. Specifications on application to secretary. Tenders received until 4 p.m. Aug. 21st.

Ste. Pierre Aux Liens, Que.

Tenders called for bridge. Owner, Department of Railways and Canals, Ottawa. Secretary, L. K. Jones. Sub-structure of Bascule Bridge at St. Pierre Aux Liens. Plans, etc., at office of the chief engineer of the Department of Railways and Canals, Ottawa and at the office of the Superintendent Engineer of Quebec Canals, 2 Place d'Armes, Montreal. Accepted cheque for \$1,000 to accompany each tender. Tenders received by secretary until 6 o'clock, Aug. 25th.

Rainy River, Ont.

The Canadian Northern Railway is to make extensive alterations and additions at this point, including a new brick station.

St. John, N.B.

Bids received for harbor and dry dock, Courtenay Bay. Owner, Department of Public Works, Ottawa. Construction of wharves, breakwater and dry dock. Those who tendered: Sir John Jackson, Ltd.; Sir Weatman Pearson, Ltd., and Norton-Griffiths, Limited. Tenders being considered.

Tuperville, Ont.

Tenders called for bridge, Maxwell Outlet Dredge Cut. Owner, Tps. of Chatham and Dover. Commissioner, A. J. Templeton. Construction of five wood and steel bridges. Plans, etc., at office of Tp. Clerk, Scane Block, King street, Chatham, on any Saturday; or at any time at the clerk's office in Tuperville.

Thessalon, Ont.

Tenders called for breakwater. Owner, Department of Public Works, Ottawa. Secretary, R. C. Desrochers, Ottawa. Construction of a breakwater at Thessalon, District of Algoma. Plans, etc., at the department and at the offices of J. G. Sing, District Engineer, Confederation Life Bldg., Toronto. H. G. Lamb, District Engineer, London, and on application to the Postmaster, Thessalon. Tenders to be accompanied by accepted cheque for 10 per cent of tenders. Tenders received by secretary until 4 p.m. Sept. 11th.

Vancouver, B.C.

Equipment required for bridges. (Mission and Westminster Jcts.) Owner, Canadian Pacific Railway. Successful contractor, Mueller & Taylor, 407 Hastings W. Vancouver. 13 bridges of concrete, 8 culverts, one arch, concrete abutments for four bridges, two 30 ft. and two 4-ft. spans. Railroads furnish sand, gravel and cement. Contractors in the market for reinforcing steel, timber, etc. A complete camp outfit is required and tenders for pile drivers will be called immediately.

The government will commence the construction of a pile, bent bridge across Lynn Creek on Third street, next week. The spacing of the piles will be about 20 feet, and the bridge will be about 175 feet in length. A large amount of lumber for this work will be required.

Whitehead, Man.

Tenders called for bridge (across Little Saskatchewan River). Owner, Department of Public Works, Winnipeg. Secretary-treasurer, M. Eaton, box 107, Alexander, Man. Plans, etc., at Department and at office of McDiarmid & Clark, Brandon, Man. Double or single span steel bridge; two cement abutments. Tenders received until noon Aug. 25th.

CONTRACTS AWARDED

Fort William, Ont.

Work is under way on the erection of the new government bridge over the Kaministiquia at Slate River. A. Jackson, government contractor, is in charge of the construction work.

Kamloops, B. C.

Railway, from Kamloops to the British Columbia-Alberta line. Owner, Canadian Northern Railway. General contractor, The Northern Construction Co., 406 Union Bank Build, Winnipeg. Sub-contracts will be awarded in a few days.

Moncton, N. B.

Station. Owner, Grand Trunk Pacific Commissioners, Montreal, Que. Dr. C. A. Murray & John A. Lea have been awarded the contract to erect stations and other buildings between Moncton and Beaver Brook, 18 in all. Expenditure about \$150,000.

Ottawa, Ont.

Hudson Bay Railroad. Dept. of Railways & Canals. Secretary of Department L. K. Jones. Contractor, J. D. McArthur, 204 McArthur Building, Winnipeg. Contract roughly amounts to \$3,000,000. Initial section from Pas Mission to Thickett Portage.

The following contracts for wharves, piers, dredging, etc., have been awarded by the Department of Public Works, Ottawa: Cape Rouge, Inverness Co., N.S., landing pier, Robert Musgrove, contractor, \$15,884; Mulgrave, N.S., wharf, Sidney W. Hagerty, contractor, \$3,000; Beaumaris, Muskoka, Ont., wharf and approach of stone, Union Construction Co., of Ottawa, Ltd., contractors, \$23,994; Labelle County, Que., wharf, Belanger & Co., contractors, Papineauville, Que., \$6,399; Dipper Harbor, N.B., dredging, James S. Gregory, contractor, of St. John, N.B., 65c. per cubic yard. River St. Francis, Que., dredging, contractors, Trewe Bastien, Jas. Laurin, W. C. Leitch, of Montreal; St. Pierre les Becquets, Que., dredging, contractors, the W. J. Poupore Company, Ltd., of Montreal, P.Q.; Berthierville, Que., dredging, contractors, the W. J. Poupore Company, Ltd., of Montreal, P.Q.; Batiscan River, Que., dredging, contractors, the W. J. Poupore Co., Ltd., of Montreal, P.Q.; St. Maurice River, Que., dredging, contractors, the W. J. Poupore Company, Limited, of Montreal, P.Q.; Nicolet River, Que., dredging, contractors, L. Cohen & Son, of Montreal; Midland, Ont., dredging, contractors, Canadian Dredging Company, Limited, of Midland, Ont.

St. Johns, Que.

Bridge, \$154,000. (Richelieu River). Owner, Municipalities of St. John and Iberville. Contractors, Lemoine & Co., 262 Park Lafontaine, Montreal, Que. Reinforced concrete, ½ mile in width. Foundation, concrete piers. Work to commence soon and to be completed October, 1912.

Smith's Falls, Ont.

Rene A. Girouard, Smith's Falls, is reported to have secured contract for construction of a section of the Canadian Northern Railway from Jones' Locks, Smith's Falls, to Otter Lake, a distance of nine miles.

Vancouver, B.C.

L. M. Rice & Co., contractors for the construction of 40 miles of the Kettle Valley line from Bull Creek to Summit, have begun construction on the line from Summit to Penticton, a distance of 35 miles. The section from Midway to Bull Creek is graded and 20 miles of track has been laid.

Vernon, B. C.

Station. Owner, Canadian Pacific Railway. Division Engineer, H. Rindall, Vancouver. Successful contractor, T. E. Crowell, Vernon. Work will commence at once.

Public Buildings, Churches, Schools, etc.

Brantford, Ont.

Excavation tenders called for Y. M. C. A., \$100,000, Queen and Darling sts. Owner, Y. M. C. A., Brantford, Ont.; architect, Burke, Horwood & White, 28 Toronto street, Toronto; associate architect, L. D. Barber, Temple Bldg., Brantford. Excavation work on the new Y. M. C. A. building. Plans, etc., at office of L. D. Barber. Tenders received until noon, August 21st by secretary Y. M. C. A., Brantford.

Bacarres, Sask.

Tenders called for school. (S. D. No. 87). Owner, Board of Education. Secretary, Robert McMillan. Plans, etc., at office of W. Penny Balcarres. Tenders closed August 16th.

Clinton, Ont.

Contemplated addition to school. Owner, Collegiate Institute Board. Secretary, J. W. Treleven, Clinton, Ont. An addition to the Collegiate Institute is to be erected.

County of Wellington, Ont.

The County of Wellington has now under construction a new gaol and gaoler's residence, and within the next year or two it is intended to completely renovate the court house, or build a new building. Apply to James Beattie, county clerk.

Delisle, Sask.

Tenders called for school. (No. 305 Frontenac). Owner, Frontenac School District No. 305. Secretary, C. D. Miller. Erection of school. Dimensions of school 24 x 36 x 10. Tenders received by secretary until Aug. 21st.

Dresden, Ont.

Tenders called for interior fittings for Post Office. Owner, Department of Public Works, Ottawa. Secretary, R. C. Desrochers. Plans, etc., with the postmaster at Dresden. Mr. T. Hastings, Clerk of Works, Postal Station F., Toronto, and at the Department of Public Work, Ottawa. Tender to be accompanied by an accepted cheque for 10 per cent. of amount of tender. Tender received by secretary until 4 p.m. Aug. 29th.

Edmonton, Alta.

Lease of building site for theatre, \$55,000. (Jasper avenue). Interested parties, N. Manasse and Dr. J. W. Rown-

tree, Red Deer. 2 storey, brick with stone trimmings. Cost of building apart from equipment, \$35,000. 36 offices in front of main floor. Construction will commence on expiration of lease in May, 1912.

Flinton, Ont.

The corporation of Flinton are contemplating the erection of a Town Hall in the near future. Moses Lessard, Flinton, Ont., Clerk.

Holland Island, Chatham Sound, B. C.

Tenders called for wooden lighthouse and dwelling. Owner, Department of Marine and Fisheries, Ottawa. Deputy Minister, A. Johnston. Construction of a wooden lighthouse and dwelling combined on a concrete pier and protection work on Holland Island, Chatham Sound, B. C. Plans, etc. at the department, Ottawa, at the agency of Department, Victoria, and at are Post Office, Vancouver, B. C. Tenders received by Deputy Minister until noon Sept. 8th.

Hazeldean, Ont.

Work has commenced on a new school house for S. S. No. 13, cost \$2,800. Debentures not yet sold. Clerk, J. F. Cummins.

Kindersley, Sask.

Plans invited for school. (S. D. No. 2628). Owner, Board of Education. Acting secretary, J. D. McLeod, Kindersley, 4 rooms with full basement, auditoriums on second floor. School when completed in every detail to cost not more than \$25,000. Plans were received until Aug. 22nd. For further information apply to secretary. for enlargement. Plans received until Aug. 22nd. For further information apply to secretary.

Kingston, Ont.

Tenders called for school. Owner, Governor's School of Mining, Kingston, Ont. Architect, Power & Son, Merchant's Bank Building, Kingston, for cabinet work, comprising tables, benches, fume cupboards, plumbing and fitters work for Nicholas Building. Plans, etc., at office of architects. Tenders received by secretary, School of Mining, until 3 p.m. Sept. 1st. Advertisement in "Tenders and For Sale Department" of this issue.

Man of War Point, N. S.

Tenders called for lighthouse tower. (Cape Breton Co.) Owner, Department of Marine and Fisheries, Ottawa. Deputy Minister, A. Johnston. Construction of a wooden lighthouse tower at Man of War Point, Bras d'or Lakes. Plans, etc., at the Department, Ottawa, at the Agency, Halifax, and at the Post Office, Sydney, North Sydney, Baddeck, and Whycomagh. Tenders received by the Deputy Minister until noon, September 5th.

Maisonneuve, Que.

Tenders to be called for post office, \$60,000. (Ontario street). Architect, C. A. Reeves, 58 St. James street, Montreal, Que. Stone and steel on concrete foundations. Floors, terra cotta and mosaic; fireproof. Tenders will be called by architect in a few days.

New Westminster, B.C.

A site of three acres has been chosen just west of the town for the new Cloverdale school. Plans are now being prepared. \$17,000 has been secured.

North Vancouver, B. C.

Competitive plans called for church, \$18,000. Owner, St. Andrews Presbyterian church. Seating capacity, 800, building to include Sunday School room and kitchen. Tenders for competitive plans must be in by Sept. 2nd.

New Westminster, B.C.

The Edmonds Club are contemplating the erection of a club house at a cost of about \$10,000.

Ottawa, Ont.

Tenders called for supply of lanterns. Owner, Department of Marine and Fisheries, Ottawa. Deputy Minister, A. Johnston. Supply of four third order ten-foot iron lanterns for lighthouses. Plans, etc., with the purchasing agent, Department of Marine and Fisheries, Ottawa, and from the agencies at St. John and Halifax. Each tender to be accompanied by accepted cheque for \$500. Tenders received by Deputy Minister until 12 o'clock, September 5th.

Red Deer, Alta.

Work in progress for ladies college, \$75,000. Owner, Presbyterian Church of Canada. Architect, C. A. Julian Sharman, Red Deer. A large concrete basement for the college will be constructed this fall.

Work in progress for parish hall. Owner, Anglican Church of Canada. Secretary of Building Committee, J. W. Hey, Red Deer. A large concrete basement for Parish Hall will be built and roofed over this fall.

Strathroy, Ont.

The council will likely ask the ratepayers to endorse an expenditure of \$35,000 for a new school.

Sherbrooke, Que.

Tenders called for academy. Owner, Catholic School Commission, Sherbrooke. Architect, J. W. Gregorie, Sherbrooke. Construction of an academy in the South Ward. Plans, etc., at office of architect. Tenders received by architects until Aug. 22nd.

St. Vital, Man.

Specifications prepared for municipal hall. Owner, Municipality of St. Vital. Architects, Hooper & Hooper, 303 McIntyre Building, Winnipeg. 2 storey, brick veneer, stone foundation, cement work, steam heating, electric lighting, shingle roof.

Tenders called for electrical supplies. Owner, Department of Public Works, Winnipeg. Minister of Public Works, R. Rogers. Wiring and supplies required at the Dormitory Building, Agriculture College, St. Vital. Plans, etc., at office of the Provincial Architect, Fort Garry Court, Winnipeg. Each tender to be accompanied by accepted cheque for 5 per cent. of amount of tender. Tenders were received by Minister of Public Works, until noon August 19.

St. John's, Que.

Equipment required for college. Supervisor of construction, Rev. A. Papineau, St. John's, N.S. A building is being fitted up for the present to be ready by September. Sanitary ware, hot water, furnaces and piping; iron seats, electroliers, furniture, etc. Alf. Beaudry, St. John's, is the electrician; J. F. Mayrand is in charge of plumbing.

Sherbrooke, Que.

Tenders called for erection of a school. (South Ward). Owner, Catho-

lic School Commission. Architect, J. W. Gregorie, Sherbrooke, Que. 3 storeys, brick and stone, stone, steel beams foundation, cement work, brick, electric work, electric lighting. Tenders received until Aug. 22nd.

Toronto, Ont.

Tenders called for purchase and removal of fire hall. (Main street E., East Toronto). Owner, City of Toronto. City Architect, R. McCallum, City Hall, Toronto. Purchase and complete removal of the old fire hall on Main st., E., Toronto. Deposit of 5 per cent. of offer to accompany each tender. Entire work to be completed before the 2nd of September, 1911. Full information with architect. Tenders received by architect until Aug. 18th.

Tenders called for library shelving and fittings. Owner, Department of Public Works, Ontario. Secretary, H. W. McNaughten. Library metal shelving and fittings, required in connection with the library addition to the Ontario Government Buildings, Queens Park, Toronto. Plans, etc., at the offices of Geo. W. Gouinlock, architect, 1108 Temple Bldg. Toronto. Tenders to be accompanied by accepted cheque for 5 per cent. of amount of tender. Tenders received by secretary until noon, Sept. 5th. Advertisement in "Tenders and For Sale Department" of this issue.

Plans in progress for hospital. (Humber River, near Weston). Owner, National Sanatorium Association, 347 King street W., Toronto. Architect, A. R. Denison & Stephenson, 20 King st. W., Toronto. 2 storeys, brick, stone and concrete. New Main building to take place of one recently burned. Fireproof construction.

Ottawa, Ont.

Tenders called for fittings for post office department. (Langevin Block). Owner, Department of Public Works, Ottawa. Secretary, R. C. Desrochers. Fittings for Post Office Department in the Langevin Block, Ottawa. Plans, etc., at Department. Each tender to be accompanied by accepted cheque for 10 per cent. of amount of tender. Tenders received by secretary until 4 p.m. Aug. 21, 1911.

Hardville, Alta.

Tenders called for school. (No. 6). Owner, Board of School Trustees. Secretary, C. H. Bowman. Erection of a frame school building. Plans, etc., at office of secretary in the Acadia Building. Each tender to be accompanied by accepted cheque for 10 per cent. of amount of tender. Tenders received by secretary until noon Aug. 25, 1911.

Saskatoon, Sask.

Tenders are called until the 16th for the erection of a frame school, house, 20 x 30, together with stable, 18 x 24, for the Berghelm School District No. 2819, Saskatoon. A. C. Traukum, sec-treas., Box 1552, Saskatoon.

Victoria, B.C.

The Chinese Young Men's Progressive party are asking for aid to build a Chinese library.

Reported purchase of church. (Quadra and North Park streets). Purchaser, First Presbyterian Church. Pastor, John Campbell, M.A., Ph. D. The present site of Church has been sold for about \$80,000, and a new site purchased on Quadra street. Nothing more definite can be learned.

Vancouver, B. C.

Tenders to be called for addition to church, \$8,000. (Jackson and Pender streets). Owner, Baptist Congregation. Supt. of Work, J. G. Price, 614 Holden Building, Vancouver. Tenders to be called on minor contracts at once.

Winnipeg, Man.

Tenders called for painting and heating. (No. 1 Fire station). Owner, Bd. of Control. Secretary, M. Peterson. Supply of labor and material required in painting 3 chemical fire engines and also installation of heating system for No. 1 fire station. Tenders received by Chairman Board of Control until 11 a. m. August 24th.

Weyburn, Sask.

Tenders called for public building. Owners, Department of Public Works, Ottawa; secretary, R. C. Desrochers. Construction of public building. Plans, etc., at office of Mr. J. E. Cyr, Superintendent of Public Buildings for Manitoba, Post Office Bldg., Winnipeg, Man., at local post office and at Department. Tenders received by secretary until 4 p.m. September 5th.

Winnipeg, Man.

Tenders called for school equipment. (Technical High Schools). Commissioner of School Buildings, J. B. Mitchell. Students Physics tables; Analytical tables; teachers tables; stools, stools clamped to floor (curved back); gas cupboard, 11 ft. long; Biological students' benches; individual Chemistry tables; wallcases—1, 12 ft. long; 1, 14 ft. long; 2, 10 ft. long; 1 apparatus case, 10 ft. 6 in. long, and 7 ft. 6 in. high. Glass used must be 32 oz. British manufacture. Delivery within 60 days from date of acceptance. The school board reserves the right to order only part of the goods from one firm. Prices must include all charges to place article in position they are to occupy in the building. Door openings into rooms, 2 ft. 6 in. x 6 ft. 10 in. For plans, etc., write J. B. Mitchell, architect. Tenders received by R. H. Smith, Secy.-treas., Public School Board, until 5 p.m. August 25th.

CONTRACTS AWARDED**Hamilton, Ont.**

Church, \$12,000. (Barton street E.) Owner, Roman Catholic Diocese of Hamilton. Mgr. Mahoney, Dean. Architect, S. A. Wardell, 110 Hunter West. 1 storey, 130 x 57, stone foundation, brick, stone, cement, hot air heating, electric lighting, shingle roofing, cut stone. Contractor, Joseph Stein, Beach Rd., Hamilton. Contract awarded August 11th.

Ottawa, Ont.

The following contracts for public buildings have been awarded by Department of Public Works, Ottawa:—Cranbrook, B.C., public building, McCallum & Co., Cranbrook, at \$43,833; Parrsboro, N.S., public building, Falconer & MacDonald, of Halifax, builders, \$26,900; Rideau Hall, cottages, August Boehmer, contractor, Ottawa, \$7,250; Rideau Hall garage and residence, A. G. Marshall, contractor, \$15,100; Wetaskiwin, Alta., public building, Brown Construction Co., Ltd., Winnipeg, \$25,650; Rock Island, Que., public building, contractor, N. A. Beach, Georgeville, Que.; Humboldt, Sask., public, the Brown Construction Company, Ltd., Winnipeg, contractors, \$37,673; Kingston, Ont., alterations and ad-

ditions, McKelvey and Birch, contractors, \$49,100; Shawinigan Falls, Que., public building, A. Durand, contractor, \$32,860.

Toronto, Ont.

Addition to club house, Kingston rd. Owner, Toronto Hunt Club, East Toronto; architect, Darling & Pearson, Leader Lane, Toronto; general contractor, S. R. Hughes, 79 Portland street, Toronto. Two stys., 24 x 70, frame, lath and stucco, concrete foundation, cement work, metallic lath roofing, sheathing or deafening paper, sheet metal work, asbestos materials, hot water heating, electric light.

Church and Sunday school, \$60,000, corner of College and Montrose. Owner, West Presbyterian Church, Toronto; architect, Gordon & Helliwell, Confederation Life Bldg., Toronto; contractors, masonry, J. Aldrich & Son, Shaw street, Toronto; carpentry, A. McCall, 432 Gladstone ave.; iron work, Dominion Bridge Co., Toronto. Other contracts not yet awarded.

The contracts for the additions to Holy Family School, Close avenue, have been awarded as follows: Masonry, John McGlue, 285 Sherbourne st.; carpentry, Maden Bros., 300 Dufferin street; cement, Queen City Paving Co., Toronto; plastering, A. J. Madden, Queen street east; heating, P. J. Hayes, 452 Gladstone avenue; plumbing, J. E. Gray, Toronto; roofing, J. J. Glynn, Arthur street; painting, J. W. Morgan, 210 Parliament street; wiring, Geo. J. Beatty, 109 Victoria street.

The contracts for the additions to St. Anthony's school have been awarded as follows: Masonry, John McGlue, 285 Sherbourne street; carpentry, T. J. Sullivan, 552 Ontario street; cement, Queen City Paving Co., Toronto; plastering, A. J. Madden, Queen street east; heating, Toronto Furnace Co., Toronto; plumbing, J. E. Gray, Toronto; roofing, J. J. Glynn, Arthur street, Toronto; ing, W. J. Phelan, Queen street east; wiring, George J. Beatty, 109 Victoria street.

Victoria, B.C.

Frank D. Woodward, Kamloops, has been awarded the contract for the Long Lake school. Changes are being made in the specifications for the Columbia Gardens school, and the awarding of that contract will be delayed.

Residences**Bowmanville, Ont.**

Tenders called for cottage, \$3,000. Owner, T. H. Bull, Toronto; architect, Forsey Page, Confederation Life Bldg., concrete foundation, shingle roof. Ten Toronto, Ont., 1-sty. 30 x 40, frame, ders received until August 24th.

Brantford, Ont.

Tenders called for four dwellings, (Terrace). (Fleet street.) Owner, G. W. Bookman, Brantford. Architect, Taylor & Taylor, Brantford. 2 storeys and basement; 72 x 37, brick, concrete foundation, cement work, telephone system, gas heating, gas and electric lighting, shingle roofing, interior finish pine. Tenders received after Aug. 23rd, until Sept. 4th.

Tenders to be called for residence, \$3,000, Egerton street. Owner, Mr. Thos. Elliott, 80 Brant ave., Brantford; architect, L. D. Barber, Brantford. Two

stys., 28 x 32, brick, concrete foundation, hot air heating, electric lighting, roofing, shingles on 14-lb. asbestos, interior finish pine, cement work, brick, telephone system, electric bell. Tenders received after August 23, close September 2nd.

Hamilton, Ont.

Residence, \$4,500. (Melrose avenue). Owner, R. Laidlaw, 11 Ashley street, Hamilton. Architect, George J. White, 165 Main street E., Hamilton. 2½ storeys, brick and stone, stone foundation, shingle roofing, hot air heating, electric light. Georgia pine finish. Architect will sub let it by day labor.

Halifax, N.S.

Residence, \$2,500, Owen street. Owner, J. Kirkwood. Three stys., 31 x 42 x 20, wood, concrete foundation, electric lighting, shingle roofing, cement work, brick, terra cotta, mantels, fireproofing, asbestos materials, pipe covering, sheeting and deafening paper, "asbestos fire stop" to be used. Owner will supervise building.

St. Boniface, Man.

Tenders received for apartment, Marion and Tache streets. Owner, Mrs. H. S. Dick; architects, Jordan & Over, 47 Canada Life Bldg., Winnipeg. Four stys., ordinary brick, stone foundation, steam heating, electric light, felt and gravel roof, oak and fir interior finish. Tenders closed on August 19th. A gasoline vapor lighting and heating plant will be installed but not tendered on.

Sherbrooke, Que.

Tenders to be called for erection of four residences, \$10,000. Owner, Fuller & Wiggett (private plan). 2 storeys, brick and stone, hot air heating, electric lighting. Tenders received after the 25th of August.

Toronto, Ont.

Residence, \$3,500. (W. S. Triller avenue.) Owner, D. J. Lynch, 548 Front street W. Architect, J. H. Galloway, 23 Toronto street. 2½ storeys, 21 ft. 6 in. x 33 ft., brick and stone, stone foundation, shingle roofing, cement work, cut stone, brick tile, mantels, electric work, electric bells, electric lighting, hot water heating, plate glass.

Tenders called for apartment house, \$20,500. Owner, Dundas Building Co., 17 Murray street, Toronto. Architect, L. S. Yolles, 224 Simcoe street, Toronto. 2 storey, 80 x 66, brick, stone, cut stone, cement work.

Work in progress for residence, \$5,000. (High Park Gardens). Owner, J. P. Lockhardt, 47 Hewitt avenue, Toronto. Architect, W. G. Burns, 74 Indian Grove, Toronto. General contractor, C. C. Fry, 71 Lynd, avenue, Toronto. 2½ storeys, 34 x 36, brick and stone, stone foundation, hot water heating, electric lighting, shingle roofing, interior finish hardwood, tile mantels, sheet metal work, plate glass.

Eight detached dwellings, \$14,400. (E. S. Gilmour avenue). Owner, Max Slatkin, 235 Gilmour avenue, Toronto. Architect, W. Millship, 193 Gilmour avenue, Toronto. 2 storeys, 38 x 17, brick, stone foundation, hot air heating, electric lighting, shingle, felt and gravel roofing, electric work, electric bells. Work will be done by day labor.

Tenders called for pair dwellings, \$5,000. (E. S. Roxton Road). Owner, Allan C. Love, 379 Ossington avenue, Toronto. Architects, Designing and

Tenders and For Sale Department

Tenders for Steel Highway Bridge

Sealed tenders will be received up to noon of Monday, August 28th, 1911, for the construction of a Steel Bridge, 62 feet clear span, over Oshawa Creek at the Base Line Road, County of Ontario.

Sealed tenders will also be received at the same time for the construction of abutments, retaining wall and reinforced concrete floor for the above bridge.

Plans and specifications may be obtained from the undersigned, upon deposit of the sum of \$1.00, which will be returned when plans etc. are returned.

The lowest or any tender not necessarily accepted.

FRANK CHAPPELL,
County Engineer.

Oshawa, Ont., Aug., 1911. 33-34



Department of Railways and Canals

Branch Line of Railway from Dartmouth to Deans.

Sealed tenders addressed to the undersigned and endorsed "Tenders for Branch Line, Dartmouth to Deans," will be received at this office until sixteen o'clock on Friday, September 15th, 1911.

Plans profiles, specification and form of contract to be entered into can be seen on and after the 15th instant at the office of the Chief Engineer of the Department of Railways and Canals, Ottawa; at the office of the Chief Engineer of the Intercolonial Railway, Moncton; and at the office of the Board of Trade, Halifax. Forms of tender may be procured from the Chief Engineer of the Department of Railways and Canals or from the Chief Engineer of the Intercolonial Railway.

Parties tendering will be required to accept the fair wages schedule prepared or to be prepared by the Department of Labor, which schedule will form part of the contract.

Contractors are requested to bear in mind that tenders will not be considered unless made strictly in accordance with the printed forms, and in the case of firms, unless there are attached the actual signature, the nature of the occupation, and place of residence of each member of the firm.

An accepted bank cheque for the sum of \$150,000, made payable to the order of the Minister of Railways and Canals, must accompany each tender, which sum will be forfeited if the party tendering declines entering into contract for the work, at the rates stated in the offer submitted.

The cheque thus sent in will be returned to the respective contractors whose tenders are not accepted.

The cheque of the successful tenderer will be held as security, or part security, for the due fulfilment of the contract to be entered into.

The lowest or any tender not necessarily accepted.

By order,

L. K. JONES,
Secretary.

Department of Railways and Canals,
Ottawa, August 12th, 1911.

Newspapers inserting this advertisement without authority from the Department will not be paid for it. 33-34

Trench Machines

Parsons—Cuts trench 27 in. to 60 in., to 20 ft. deep, fine order.

Parsons—With Mattes Back Filler, cuts trench 28 in. to 78 in. to 20 ft. deep. Overhauled and first class. Write us if you have anything to sell, or if in want of anything.

THE MALES CO.

No. 82 Perin Building, Cincinnati, O.

MACHINERY BARGAINS

We have for sale for quick shipment from point near Montreal in Canada, several 18-ton saddle back four-wheel contractors' locomotives, and four dozen 4-yard two-way side dump contractors' cars, all 36-in. gauge.

Also one No. 4 Austin gyratory stone crusher with elevator and screen for same.

These items in good condition for immediate service and at attractive prices. For particulars, address—

WILLIS SHAW MACHINERY CO.,
39 South LaSalle Street, Chicago, Ill.

To Contractors

Tenders will be received at the office of the Secretary, School of Mining, Kingston, up to 3 p.m. of Friday, September 1st, for the Cabinet Work, comprising Tables, Benches, Fume Cupboards and other Furniture, and also Plumbing and Fitters' Works required in the completion of the Nichol Building for Governors of the School of Mining.

Plans and Specifications may be seen at the office of the undersigned.

The lowest or any tender not necessarily accepted.

POWER & SON,
Architects.

Merchants Bank Chambers,
Kingston, Ont. 34-35

Corporation of the City of Three Rivers

Public Notice

Sealed tenders addressed to the undersigned and marked "Tender for Steel Bridge," will be received at the City Hall, Three Rivers, up to the 25th instant at 4 o'clock p.m., for the erection of a steel bridge with two concrete abutments on the River St. Maurice, the span to be of 200 feet in length.

Plans and specifications may be seen at the office of Mr. Benj. Bourgeois, city engineer, No. 174 Notre Dame street.

An accepted cheque for 10 per cent. of the amount of tender must accompany each tender.

The lowest or any tender not necessarily accepted.

L. T. DESAULNIERS,
Sec.-Treasurer.

City Hall, Three Rivers,
August 4th, 1911. 32-34

FOR SALE

Complete Electric Generating Set, consisting of Leonard Peerless steam engine direct connected to 150 k.w. Canadian General Electric generator, 2,300 volts, 60 cycles; also condenser, switch-board, steam and exhaust piping, spare parts for engine and generator, and everything constituting the complete set as at present installed in the Thomas street lighting station of the Town of Brockville. This machine is in first-class order, having only been used on peak loads. It is now being replaced by a larger Belliss & Morcom engine with Swedish G. E. generator. Full particulars and price can be obtained from Laurie & Lamb, Consulting Engineers, Board of Trade Building, Montreal. 28-35



Department of Railways and Canals

Branch Line of Railway from Guysborough to Sunny Brae through Country Harbour Crossroads to Deep Water of Country Harbour.

Sealed tenders addressed to the undersigned and endorsed "Tender for Guysborough-Country Harbor Line," will be received at this office until 16 o'clock, on Friday, September 15th, 1911, for section No. 1 of the above line of railway, comprising that portion extending from Guysborough to Country Harbor Crossroads and from the latter point to Deep Water Country Harbor.

Plans profiles, specification and form of contract to be entered into can be seen on and after the 15th instant at the office of the Chief Engineer of the Department of Railways and Canals, Ottawa, at the office of the Chief Engineer of the Intercolonial Railway, Moncton; and at the office of the Board of Trade, Halifax. Forms of tender may be procured from the Chief Engineer of the Department of Railways and Canals or from the Chief Engineer of the Intercolonial Railway.

Parties tendering will be required to accept the fair wages schedule prepared or to be prepared by the Department of Labor, which schedule will form part of the contract.

Contractors are requested to bear in mind that tenders will not be considered unless made strictly in accordance with the printed forms, and in the case of firms, unless there are attached the actual signature, the nature of the occupation, and place of residence of each member of the firm.

An accepted bank cheque for the sum of \$100,000, made payable to the order of the Minister of Railways and Canals, must accompany each tender, which sum will be forfeited if the party tendering declines entering into contract for the work, at the rates stated in the offer submitted.

The cheque thus sent in will be returned to the respective contractors whose tenders are not accepted.

The cheque of the successful tenderer will be held as security, or part security, for the due fulfilment of the contract to be entered into.

The lowest or any tender not necessarily accepted.

By order,
L. K. JONES,
Secretary.

Department of Railways and Canals,
Ottawa, August 12th, 1911.

Newspapers inserting this advertisement without authority from the Department will not be paid for it. 33-34

The Royal Institute of British Architects, London

Examination for Admission as Associate

An examination for admission as Associate of the Royal Institute of British Architects, London, will be held in Toronto, from the 30th of November to December 6th, 1911.

Full particulars and all information regarding this examination can be had by applying to

F. S. BAKER,
Traders Bank Building,
Toronto.

34-34



Department of Railways and Canals, Canada

Intercolonial Railway Passenger Station, Truro, Nova Scotia

Extension of Time

The time for receiving tenders for the construction of a "Stone Passenger Station" at Truro, Nova Scotia, has been extended from Friday, the 25th of August, until 12 o'clock noon on Thursday, the 31st of August.

By order,

L. K. JONES,
Secretary.

Department of Railways and Canals,
Ottawa, August 18th, 1911.

Newspapers inserting this advertisement without authority from the Department will not be paid for it.

34-34

CITY OF TORONTO

Tenders for the Supply of Rail Accessories

Separate or bulk tenders on prescribed forms will be received by registered post only addressed to the Chairman of the Board of Control, City Hall, Toronto, Canada, up to noon on Thursday, August 31, 1911, for the supply of the following:—

- (1) 325 kegs track spikes (200) per keg, size of spike $5\frac{1}{2}$ in. x 9-10 in., measured under head.
- (2) 1,950 pairs of splice bars.
- (3) 9,500 tie rods, 7-8 in. diameter.

Envelopes containing tenders must be plainly marked on the outside as to contents.

Specifications and forms of tender may be obtained on application to the Department of Railways and Bridges, City Engineer's Office, City Hall, Toronto.

The tenderers shall submit with their tender the names of two sureties (approved of by the City Treasurer, not members of the City Council or Officers of the Corporation of the City of Toronto) or in lieu of said sureties, the bond of a Guarantee Company, approved of as aforesaid.

The lowest or any tender not necessarily accepted.

R. G. GEARY, Mayor,
Chairman of the Board of Control.

City Hall, Toronto,
August 15, 1911.

34-35

Notice to Ditch Contractors

Tenders Wanted

Tenders will be received by the undersigned Township Clerk up to 2 o'clock p.m. on Monday, the 4th day of September, 1911, for the construction of Municipal Drain No. 2 in the Township of Maryborough, containing about 43,000 cubic yards of excavation.

Plans, profiles and specifications of this drain may be seen at the Township Clerk's office in the village of Moorefield, or at the engineer's office at West Montrose.

The lowest or any tender not necessarily accepted.

Satisfactory bondsmen or a marked cheque for five per cent. of tender will be required.

C. D. BOWMAN, O.L.S.,
Engineer in Charge,
West Montrose P.O.

W. W. SCOTT,
Clerk of Tp. of Maryborough.
Moorefield P.O.

34-35

CITY OF BRANTFORD

Steel Highway Bridge

Sealed tenders, addressed to Charles Hartman, Chairman of the Board of Works, in care of the City Clerk, Brantford, Ontario, will be received until 12 o'clock noon, on

WEDNESDAY, AUGUST 30th, 1911,

for the construction of a Steel Highway Bridge, length of span 65 feet; width of roadway, 16 feet.

Plans and specifications may be seen and instructions to bidders and forms of tender obtained at the office of the City Engineer.

The lowest or any tender not necessarily accepted.

T. HARRY JONES,
City Engineer.

City Engineer's Office, Brantford.
August 22, 1911.

Advertisement

Sealed proposals for an Intake Pipe and Screen Well for the City of Windsor, Ont., addressed to the Secretary of the Water Commissioners, Windsor, Ont., and endorsed "Proposals for Intake Pipe and Screen Well for Windsor Waterworks," will be received at the office of the Water Commissioners of the City of Windsor, Ont., until 12 o'clock noon, Tuesday, September 12, 1911.

Proposals shall be made in accordance with the specifications and requirements on file in the office of the Water Commissioners.

Each proposal shall be accompanied by a certified cheque equal to ten per cent. of the amount of tender as surety for the acceptance of the contract, payable on its face to the Water Commissioners of the City of Windsor, Ont.

The accepted contractor will be required to furnish an approved Guaranty or Surety Bond in the sum of 50 per cent. of the full amount of his contract.

The Commissioners reserve the right to reject any or all proposals.

Copies of plans and specifications are on file at the Water Office, Windsor, and also at the office of Smith, Hinchman & Grylls, Detroit, Mich.

By order of the Commissioners.

34-35

W. A. HANRAHAN,
Secretary.

TOWN OF DAUPHIN Province of Manitoba

Sealed tenders will be received by the Secretary-Treasurer of the Town of Dauphin until 8 p.m. on Tuesday, September 5th, 1911, for constructing the following works:—

Contract "I"—Dam and Gate House in Riding Mountains, for Waterworks Reservoir.

Contract "P" Substructure Sewage Pumping Station in Dauphin.

Plans may be seen at Dauphin or at the offices of the Engineers at Toronto and Winnipeg.

No tender necessarily accepted.

H. F. CALDWELL, Esq., Mayor.
D. D. McDONALD, Esq., Chairman.
J. W. JOHNSTON, Esq., Sec.-Treas.
CHIPMAN & POWER, Engineers.

34-34

Toronto Main Drainage Works

Sealed tenders for the construction of the following sewers will be received by registered post only, addressed to the Chairman of the Board of Control, City Hall, Toronto, up to noon of Tuesday, September 12th, 1911.

Storm Overflow Sewers—Sorauren Division.

Total length 8,897 linear feet, including the laying of 30 and 36 inch concrete pipe and the supplying and laying of 24-inch cast iron pipe, and 15, 18 and 24 inch vitrified pipe.

Storm Overflow Sewers—Manchester Division

906 linear feet of 3 ft. 4 in. x 3 ft. 8 in. concrete culvert, in open cut.

High Level Interceptor—Section No. 14

985 linear feet of 3 ft. 0 in. x 4 ft. 6 in. egg-shape, brick, in tunnel.

Plans, specifications, forms of tender and conditions relating to tendering as prescribed in City By-laws may be obtained from the Main Drainage Works, Office of City Engineer, Toronto.

The lowest or any tender not necessarily accepted.

G. R. GEARY, Mayor,
Chairman, Board of Control.

City Hall, Toronto,
August 18th, 1911.

34-35

Miscellaneous

AGENCIES WANTED

Two young men with sound practical knowledge of general engineering, mechanical and electrical, with first-class connection in Western Canada, want representation of one or two first-class houses in general electrical and mechanical engineering lines. Are hustlers and can show results. Address, Electrical, Box 2727, Winnipeg, Man.

34-34

WANTED

Large American firm manufacturing the most up-to-date dry kiln system for drying lumber wants to secure reliable Canadian representatives. System patented in Canada and several installations made. Apply E. J. MacIntyre, 4489 Perry Street, Chicago, Ill.

34-35



To Contractors

Sealed tenders endorsed "Tenders for Library Shelving and Fittings," addressed to the undersigned, will be received at this Department until noon on Tuesday, the 5th of September, 1911, for the library metal shelving and fittings required in connection with the Library Addition to the Ontario Government Buildings, Queen's Park. Plans and specifications may be seen and blank forms of tender obtained at the offices of Geo. W. Gouinlock, architect, 1108 Temple Building, Toronto.

An accepted bank cheque payable to the order of the Honorable J. O. Reaume, Minister of Public Works, for five per cent. of the amount of the tender, and the bona fide signature and addresses of two sureties, or the bond of a Guarantee Company, approved by this Department, must accompany each tender.

The Department will not be bound to accept the lowest or any tender.

By order,

H. F. McNAUGHTEN,
Secretary of Public Works.

Department of Public Works, Ontario,
Toronto, August 16th, 1911.

Newspapers publishing this advertisement without authority will not be paid for it. 34-35

Positions Wanted

Advertisement under this heading one cent a word per insertion. Box No. ten cents extra
Minimum charge 25 cents.

Thorough master of wire and rope splicing wants permanent situation. Own tools; total abstainer; all work guaranteed. Credentials world-wide. Box 320, Contract Record, Toronto, Ont. 34-34

Positions Vacant

Advertisements under this heading two cents a word per insertion. Minimum charge 50 cents

SALESMEN WANTED

Wanted—Salesman to solicit business from contractors and dealers in contractors' supplies throughout the United States and Canada. Prefer men with experience in contract work, especially with reference to road building and modern methods of transporting materials. Must be of an age, address and experience to command attention of largest contractors.

Application should be accompanied by statement of age, general appearance, class of work have been doing, reason for wanting to change, names of three parties who will vouch for integrity, ability and general worth. Also statement as to when could begin work.

In case of favorable consideration, applicant will be expected after notice from us to come to our office at his own expense before final conclusion of arrangements. Situation permanent and satisfactory to order-getters of quality.

TROY WAGON WORKS CO.,
Troy, O.

Residences

(continued from page 61)

draughting Co., Toronto street, Toronto. 2½ storeys, 44 x 25, brick and stone, stone foundation, hot air heating, electric lighting, shingle, felt and gravel roofing, Cement work, mantels, electrical work. Tenders close August 24th.

Tenders called for two pair dwellings, \$8,800, 741-3-5-7 Keele street. Owner, J. W. & W. W. Schofield, 114 Margueretta street, Toronto. Two stys., 34 x 44, brick, stone foundation, cement work, electric work, hot air heating, shingle, felt and gravel roofing, plate glass, tile, mantels. Tenders received until August 26th for all trades (each pair) but carpentering.

Chas. Johnson, 208 Jones avenue, two residences, 48-50 Englewood avenue, 2 stys., 36 x 15, brick front and roughcast, concrete foundation, shingle roofing.

Mr. Dickenson, 46 McGee street, dwelling, \$3,000, three storeys, 45 x 20, brick. C. H. Ramsden, 121 Victor avenue, architect.

E. Carmichael, 5 Evelyn Crescent, residence, \$3,000, 3 Evelyn Crescent, two stys., 28 x 28, brick, brick foundation, shingle, felt and gravel roofing.

Vancouver, B. C.

Plans being prepared for apartment and stores. (Alexander street). Owner, Grier Starratt, 1173 Pendrell street, Vancouver. Architect, W. T. White-way, Molsons Bank Building, Vancouver. Brick mill construction, pressed brick, 25 x 122, steam heating, electric wiring, hard plaster, interior finish. Tenders probably called this week.

Plans being prepared for apartment house. (Eight and Cedar streets). Owner, J. H. Griffiths, 1794 Seventh avenue W., Vancouver. Architects, Campbell & Dawson, Exchange Building, Vancouver. 2 storeys, frame construction. Work will commence immediately after approval of plans.

Plans being prepared for apartment house, \$75,000. (Victor Rd.) Owner, R. W. Partridge, 745 Prior street, Vancouver. Architect, F. H. Perkins, 67 Hutchinson Bldg., Vancouver. 3 storeys, 100 x 224, brick, 1st storey. Denny-Renton paving brick and two upper storeys of light buff brick. P. B. roofing, plate glass. Plans ready for figuring on about Aug. 20th.

Plans being prepared for apartment house. (Melville street, between Bute and Burrard streets). Owner, Name withheld. Architects, Parr & Fee, 570 Granville street, Vancouver. 8 storeys, stone and marble entrance, interior finish hardwood. Plans expected to be finished in about a week. Work is expected to start at once.

Tenders to be called for parsonage. (Pender street E.) Owner, Baptist Congregation (private plans). Superintendent of Construction, J. G. Price. 2 storeys. Tenders to be asked on this shortly.

Winnipeg, Man.

Excavation tenders called for apartment block. (Marion and Tache streets Norwood). Architects, Jordan & Over, 47 Canada Life Building. Tenders are called for excavation of cellar.

Woodstock, Ont.

Residence, \$2,700. Owner, J. V. Spedding, Woodstock, Ont. Architect, T. D. Broom & Son, Woodstock; 2 storeys, 24 x 31, brick, concrete and block foundation, combination heating, shingle roofing, interior finish georgia pine, cement work, brick, tile, mantels, electric work, electric bells.

CONTRACTS AWARDED

Halifax, N.S.

Residence, \$4,000. Owner, A. Moiten, Halifax, N.S.; general contractor, J. Dawes. Two and one-half stys., wood construction, concrete foundation, electric lighting, shingle roofing, interior finish hardwood, cement work, cut stone, brick, tile, mantels, fireproofing, cornice, weatherstrips, asbestos materials, electrical work, sheathing and deafening paper, "asbestos fire stop."

Hamilton, Ont.

Residence, \$4,000. (Fairmount ave.) Owner, W. Aitchison, Queen street S., Hamilton. Architects, J. A. Armes, Federation Life Building, Hamilton. General contractor, R. Tope, 191 Robinson street, Hamilton. 2 storeys, 45 x 50, brick and stone, hot water heating, heating, plumbing, sheet metal and iron work, contracts not yet awarded.

Toronto, Ont.

The contracts for an \$8,500 residence being erected by T. M. Rowland at Elm and Glen road, have been awarded as follows: Masonry, Smallwood Bros., 97 Clinton street; roofing, Rennie & Son, 130 Dupont street; plastering, Duckworth Bros., 119 Huron street; painting, F. C. Davis, 218 Montrose avenue; plumbing and heating, Fiddes & Hogath, 122 King street east; wiring, Robert Simpson Co., Yonge street, all of Toronto.

New Liskeard, Ont.

The contract has been awarded to Hill & Clark, New Liskeard, for a \$5,000 residence being erected by A. J. Herman; architect, C. L. Stewart; 2½ stys., 27 x 42, brick.

Red Deer, Alta.

Baird & McKenzie, contractors, Red Deer, have the contract for building a \$2,100 residence for Mr. T. W. Wright.

A. T. Morris, builder, Red Deer, has the contract for \$3,000 residence for Mr. W. Bredin Galbraith.

Paradis & Roberts, contractors, Red Deer, have the contract for a residence for Mrs. A. Welton, \$2,800.

Vancouver, B.C.

Architects W. M. Dodd & Co. have awarded the contract on a house for Mr. W. Dixon Hopcraft on Shaughnessy Heights, to Chas. Kilpin, two-sty., hot water heating, and all modern conveniences, cost \$5,000.

Business Buildings and Industrial Plants

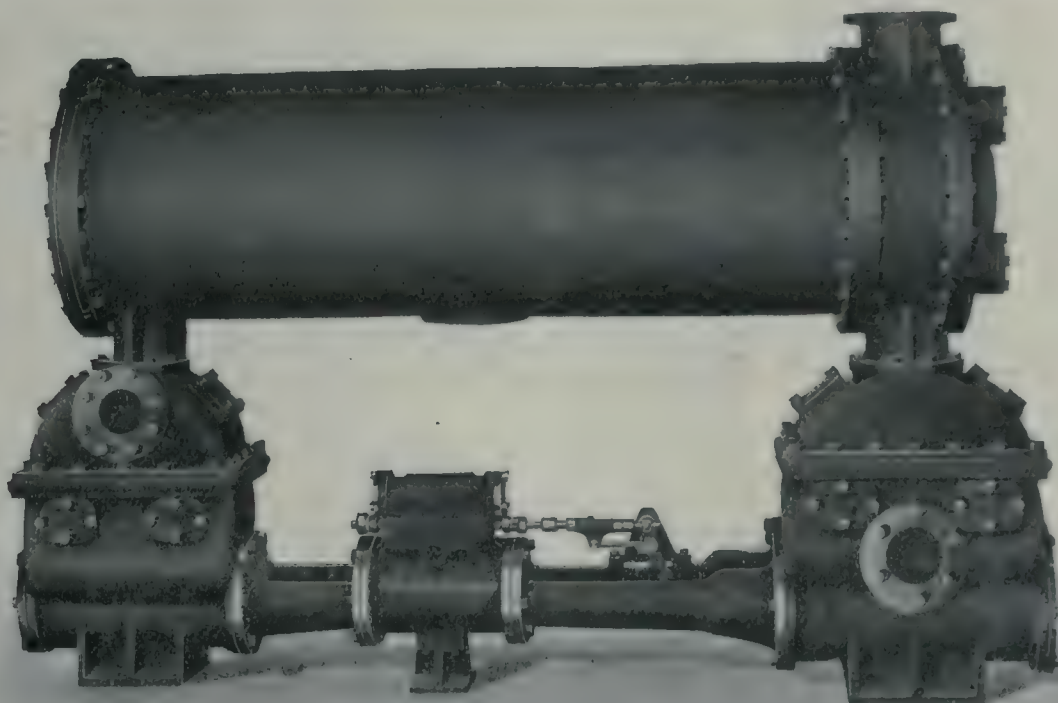
Calgary, Alta.

Tenders have been called for a \$40,000 warehouse on Eleventh avenue, between First and Second streets west, for the Coulther-Waugh Fur Company, of Montreal, who apparently intend invading the western field. The representative of the firm was in Calgary a few weeks ago and made all arrangements for the purchase of lots whereon to build a warehouse 50 by 150 feet.

The Alberta Pacific Elevator Company will at once begin the erection of a large elevator at Brooks.

Tenders called for bank, Eighth ave. west. Owner, Molsons Bank of Canada; architect, F. J. Lawson, Norman Block, Calgary. Skelton steel construction,

CONDENSORS



Condensor built by The John Inglis Co., Limited

BOILERS, ENGINES, PENSTOCKS,
Water Towers, Steel Tanks, Heavy Plate
Work, Condensers, Air Compressors, Pump-
ing Machinery, Special Machinery of all kinds

Let us Submit Prices.

The **John Inglis Company**

Engineers and Boilermakers

Limited

14 Strachan Ave., TORONTO, Canada

walls of brick, hollow tile floors and partitions, front of granite and cut stone. Plans, etc., at office of architect. Tenders received by architect until August 24th.

Chilliwack, B.C.

A. M. Rockwell & Co. are contemplating the erection of a large storage warehouse on the trackage property between the B. C. Electric tracks and those of the Canadian Northern.

Fort Frances, Ont.

Alex. Bruce & Co., Glasgow, Scotland, holders of the special "Creosote process," have made all arrangements and are now building at Fort Frances one of the largest plants for curing timber on the continent. The plant, costing about \$250,000, is now under construction, some fifteen carloads of machinery having arrived. The capacity of this plant will be not less than one million ties, not including culvert timber, poles, posts, etc. They have secured a contract from the McKenzie-Mann Company to cure 100,000 ties this fall, and one million ties for the next year. This new industry will give employment to between two hundred and three hundred men the year round.

Plans prepared for foundry, \$10,000. Owner, Russell Bros., machinists. A new foundry to manufacture castings, and several interesting devices of which the owners are the inventors will be built at once.

Grimsby, Ont.

A by-law will be submitted on the 31st of August for the raising by debentures of the sum of \$10,000 as a loan to aid the Radiant Electric Company, Ltd., of Grimsby, in establishing and carrying on the manufacture of electric appliances of all kinds.

Hamilton, Ont.

Plans being prepared for motor. Owner, Steel Co. of Canada, Ltd., Sherman ave., W., Hamilton. Mr. R. S. Kelsch, 702 Power Building, Montreal, Que., has been instructed to prepare plans and specifications for a 2,000 h.p. motor to operate their main steel works.

Langley, B.C.

Mrs. Jennie V. Jones has purchased the George Hunter property in this municipality and will erect an hotel adjoining the Griffith road and B. C. E. R.

Louisburg, N.S.

The Gorton Pew Fish Co., Gloucester, Mass., are contemplating the construction of a fish drying and cold storage plant here.

North Bay, Ont.

Plans being prepared for store, \$17,000. Owner, Cochrane Hardware, Ltd., North Bay. Architect, H. W. Angus, North Bay. 2 storey and basement, 35 x 132, solid brick, stone foundation, steam heating electric lighting, tar and felt roofing, interior finish pine, structural and ornamental iron, vaults, freight elevator, metal ceiling, skylights, fireproof doors and windows, pipe covering, electrical work, deafening paper, steel beams, plate glass. Tenders to be called in three weeks.

Nanaimo, B.C.

The Merchants Bank have purchased the home of Mark Bate, corner of Albert and Wallace streets, and will erect a building on the property.

Ottawa, Ont.

Specifications prepared for warehouse, \$10,000. Owner, Jas. Robertson, Albert street, Ottawa; architect, M. C. Edey, Sparks street, Ottawa; masonry contractor, Alex. Robertson, Ottawa; carpentry, McDiarmid & Tyndall, Ottawa; iron work, Alex. Fleck, 428 Wellington street, Ottawa. Four stys., 33 x 70, solid brick.

Rainy River, Ont.

The Western Canada Flour Mills Co., with head office at St. Boniface, is almost doubling their plant here, which is operated for the manufacture of barrel staves.

The Rat Portage Lumber Co., head office, Winnipeg, is contemplating the rebuilding of their sawmill here.

Saskatoon, Sask.

A by-law will be submitted on August 23rd for the raising of \$25,000 to provide for city stables and storehouse.

St. John's, Que.

Equipment about to be installed for manufactory. (Shirts and collars) Owner, Cluett, Peabody & Co., Troy, N. Y., U. S. and St. John, P. Q. Company about to install required machinery, steam power, electric plant, etc. Branch factory erected in St. John.

St. John, N. B.

Application for incorporation of the New Brunswick Portland Cement Co. A meeting will be held here shortly for organization. Application to Ottawa has been made. It is intended to raise \$1,000,000. Senator Domville, Rothesay, N. B., is actively interested. The oil shales at Albert County, Mines will be used in the manufacture of the cement. No coal required, as gas in rock will provide necessary fuel.

St. Catharines, Ont.

D. J. Albertson, 305 West Main street, Kalamazoo, Mich., is preparing plans for a tissue paper factory to be located here.

Toronto, Ont.

Addition to store and dwelling, 3,500. (1136 and 1136½ Dufferin street). Owner, J. H. Huckle, 1136 Dufferin street, Toronto. 2 storeys, 40 x 32 ft. 8 in., brick, stone foundation, electric lighting, shingle, felt and gravel roofing. Work will be done by day labor.

Tenders called for bank, Queen and Kingston road. Owner, Imperial Bank, Leader Lane and Wellington street; architect, Sharp & Brown, 16 Wellington east, Toronto. Two stys., 36 x 35, brick, stone foundation, hot water heating, felt and gravel roofing, electric lighting. Tenders received until August 23rd.

Plans in preparation for erection of a factory. Owner, General Business Properties, Ltd., George street (near Queen). Architect, A. R. Denison & Stephenson, 16 King street W., Toronto. 3 storeys, 100 x 54, brick.

Tenders called for factory, \$10,000. (near Dundas street bridges). Architect, A. J. Rattray, Stair Building, Toronto. 1 storey, 154 x 50 ft. 4 in., brick foundation, steam heating, electric lighting, felt and gravel roofing, cement work, brick, reinforced concrete, metallic lath. Tenders close Aug. 23rd.

Addition to warehouse, \$5,000. Owner, Wettlaufer Bros., 178 Spadina avenue, Toronto. Architect, E. H. Beck, 15 Toronto street, Toronto. 1 storey

and basement, 91 x 31, concrete, concrete foundation, electric lighting, felt and gravel roofing, reinforced concrete, structural iron, skylights, steel beams. Work will be done by day labor. System of heating undecided.

Tenders called for warehouse, (Clarence Square). Owner, Steel Briggs Seed Co., Ltd. Architect, Sproatt & Rolph, 90 Yonge street, Toronto. 5 storeys, brick and mill construction, brick foundation, steam heating, electric lighting, felt and gravel roofing, brick, 3 freight elevators, plate glass. Tenders for excavation close Aug. 19th, and for masonry, Aug. 26th.

Tenders called for addition to warehouse, \$3,000. (927 Dufferin street). Owner, H. E. Hayhoe & Co., 927 Dufferin street, Toronto. Architect, W. J. Thompson, 567 Bloor street W., Toronto. 1 storey 41 x 70, brick, stone foundation, steam heating, electric lighting, felt and gravel roofing. Tenders received until Aug. 19th.

Vancouver, B. C.

Office Building. (Richards street). Owner, Canada Permanent Mortgage Corporation, 543 Granville street. Architect, T. S. D. Taylor, 543 Granville street. 2 storeys, (at present) granite facing, marble panelling and counters, hardwood floors, hot water heating, electric wiring.

Plans prepared for store and apartments. Architect, G. P. Bowie, R. I. B. A., 570 Granville street, Vancouver. 4-storey 25 x 120, mill and brick construction 3 flats to be used as apartments. Tenders called shortly. Plans are being prepared by same architect for several fireproof garages.

Tenders to be called for two hotels. Architect, R. T. Perry, 744 Hastings street, W., Vancouver. Brick, mill construction. Plans are being completed for two hotels, one to cost about \$50,000; the other \$60,000. Tenders called about Aug. 20th. Supplementary report later.

Plans have been prepared for a 2-sty. brick addition to the Eligh-Depencier block on Powell street.

Tenders to be called for store and office building, \$80,000. (Broad and View streets). Owners, Messrs. McPherson Fullerton, McLean, Elliott and Shandley. 6 storey proposed, (4 storey at present) tar and gravel roofing, marble, tile, sheet metal, reinforced and structural steel, metallic lath, hard plastering, plate glass. Excavation has started. Tenders invited after August 20th on general contract, electric wiring, plumbing and heating.

Winnipeg, Man.

Site purchased for office building, 436 Main street. Purchaser, Great West Permanent Loan Company. Dimensions of site, frontage, 50 by 120 ft. depth. Proposed structure 6 storeys. Lease of building on property purchased expires in February, 1912, when work of tearing down will commence.

A new company has been organized under the name of the Hardstone Brick Manufacturing Co., with a capitalization of \$500,000. Foundations are already being laid for a building.

The Canadian Bread Company is preparing to erect a large bakery plant at the corner of Burnell street and Portage avenue. Building to be two storeys, and to cost \$250,000. The W. J. Boyd Company incorporated with this company a short time ago.

Contract Record

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Municipal Progress, Advance Information

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SUBSCRIPTION RATES

Canada and Great Britain, \$2.00 U.S. and Foreign, \$2.50

Vol. 25 August 30, 1911 No. 35

Toronto Sewage Disposal

In this issue we publish an article descriptive of the steps the city of Toronto is taking towards a satisfactory disposal of sewage. Based upon thorough investigation and expert advice, the aim has been to subject the discarded water supply to as high a degree of purification as prevailing conditions warrant. The project has been an immense one, and the method of procedure necessitated a curtailment of needless expense. To this end advantage was taken of the capability of the adjacent lake to complete the removal of putrescibility which is the final process of oxidation.

The crude sewage is first subjected to screening for the removal of suspended organic matter of a coarse nature. Of the numerous ways of dealing with the retained sludge the one chosen in the Toronto system is that of burying between alternate layers of ordinary refuse in a marsh, thus performing the additional service of filling up a low lying piece of land. The sewage, after being thus relieved, undergoes a further clarifying in the settling basins thus reaching the stage where it will rapidly undergo putrefaction by the decomposition of organic matter in solution. It is then hustled into the lake where Nature is relied upon to practise her economical methods of oxidation. This is inferior to a contact bed of natural soil of an open and friable kind for the purpose, but such land in the quantity required could not be obtained, nor is it here sufficiently porous to allow of both liquid retention and air retention necessary to oxidation and nitrification. Furthermore, since nitrification ceases during frost, the system would be thrown out of office for at least one-fourth of the year.

Evidently the whole system to the mouth of the outfall was designed with a view to securing the efficient aid of nitrifying bacteria in the lake water without resulting nuisance.

When the project was under official discussion, an extension of the system to remove putrescibility

and secure a high degree of purification was advocated. The conclusion arrived at was however that an efficient dispersion at a suitable distance from shore into lake water would result in a marked economy in first cost and operating expense and would attain the result desired, thus eliminating the installation of an expensive disinfection process.

The construction entailed a number of engineering problems that are worthy of note apart from the general work, including as it did a sub-aqueous pipe siphon under the Don and tunneling and open cut work under unusual conditions.

The Toronto Water Supply

Intakes pipes of waterworks in a number of American cities have been causing considerable inconvenience and trouble during the past several years. The city of Toronto is not alone in its sufferings in this respect and has a score or more of sympathizers. The sources of trouble appear to be many and leaks occur at almost every possible opportune point. Where these pipes are run out for a long distance in order to avoid the use of water which may be contaminated, it is manifestly important that they should remain tight throughout their entire length. Few water departments drawing their supplies through such intakes maintain such a frequent inspection of the quality of the water that it will afford immediate notice of any pollution, and consequently a leak is likely to continue for an indefinite time until there is an outbreak of disease due to water-borne bacteria. The subject has received considerable attention from consulting engineers, although very little has been said about it. The detection of a leak, after the probability of one has been indicated by a change in the quality of the water, may be a very troublesome task unless provision is made for testing the pipe from time to time by some means. Some of the water-works associations would do a useful work by finding out how many cases of leakage have actually occurred, the nature of the trouble and the way in which the location of the faulty section was found in each case. Another trouble with intakes which experience shows could be carefully considered is due to the shifting of sand about the mouth, whereby a large amount of this material is drawn into the pipe so as to restrict its capacity. It is evident from the experience of a number of cities in the last two years that both these sources of trouble should be studied carefully.

The first intake pipe installed by the Waterworks Department of Toronto was in 1882. It was of wooden construction six feet in diameter and its location was just west of the present steel pipe. It extended at that period to the top of the slope which rapidly descends into the lake bed and was at that time in 30 feet of water.

In May, 1891, this intake was extended 361 feet farther out into the lake, the mouth of it being in the same location as that of the present intake pipe. This extension was also 6 feet in diameter and is built of steel pipe. In 1893 Engineer Keating gave the intake a thorough personal examination and found the steel extension to be defective, the principal cause of which was its having been laid upon stilts. This was remedied by relaying the pipe upon sand at the bottom and furnishing it with an uptake at its terminus. The repair work also included a remak-

ing of some of the joints in the wooden pipe, which had been laid open owing to the change of position which occurred to the steel pipe. Three years later the work of improvement consisted in abandoning the wooden pipe and laying 6-inch steel pipe in its stead joining to the shore terminus of the 361 feet that had been previously laid. The operation completed, no further trouble was evinced until last year when it was noted that the sand was gradually sifting down the slope and in this way lessening the effective height of the uptake at the extremity of the pipe. The most feasible, economical and simple remedy which was suggested was the lengthening of this uptake some 15 feet, which would assure its safety against any further tendency the sand would inevitably have. However, this plan was rejected and orders were given to extend the intake pipe 500 feet farther out into the lake. Equipment was obtained and operations were commenced in September, 1910, for this addition, but owing to the inclement weather of the fall and early winter the undertaking did not make much progress. The extension called for steel pipe 160 feet in length with cast steel flanges double rivetted. Wooden gaskets were inserted in the joints and the pipe lengths were united with 44 bolts. The new pipe to prevent scouring has a row of interlocking sheet steel piling driven down into a sufficient depth of sand to assure steadfastness and filled around the pipe with concrete to a depth of one foot on sides and top. In December, 1910, the mouth of the intake was stopped up by a considerable amount of anchor ice resulting in an insufficient supply of water and causing considerable trouble in its removal.

It was not until February 7th of last year, however, that the intake gave the most serious trouble. This was due to a very severe storm causing waves sufficient to wash away the sand foundation from under the intake for over 600 feet of its length and to a depth of about 5 feet, thus dropping the pipe into the lake and causing several breaks in the system, which, aided by the storm rapidly filled up with sand. The deterioration was the cause of a whole winter's work for the Waterworks Department. An investigation showed the trouble to be in the outer portion of the pipe as no sand was present in the sections nearer shore. To the city the entrance of the sand had the effect of depriving its northern portion entirely of water and decreasing the pressure even in the business district to a very low figure, thus placing all in eminent danger from fire, and causing the closing down of a number of factories and manufacturing establishments.

To eliminate a catastrophe the waterworks engineer ordered the opening of Long Pond for water supply. The examination of the water here showed it to be, if anything, better than that supplied from the lake. This owing to the fact that during the winter months the pond had been under cover of a thick covering of ice and was not subjected to under currents from a dangerous direction.

The brief time during which the injured intake was in operation after the accident was nevertheless sufficient to introduce great quantities of sand into the pipe thus rendering it for the time being useless and necessitating the constant employment of a large force of men for its removal. This extra work occupied a considerable portion of the spring and summer, and it is only recently that operations have been recommenced on the 500 foot extension into the

lake. This proposal of the city council has been a subject for considerable discussion as the benefit to be derived therefrom is not easily apparent. The analysis of water 500 feet farther from the shore than the mouth of the present intake does not show an improvement for drinking purposes that would authorize the procedure. Examination of water at a distance of four miles into the lake has shown it to be no more suitable for drinking than that nearer at hand. The alteration in the uptake at the extremity of the pipe would eliminate the difficulty caused by sand injection and would supply water from which dangerous impurities are to be removed before it reaches the city mains. However, with the completion and entrance into operation in a short time of the immense filtration plant which has been described in detail from an engineering point of view in a series of articles in the Contract Record, together with the completion of the main drainage works described in this issue, the extended intake pipe will put to a severe test the advisability of continuing to search for a suitable water supply in the bed of Lake Ontario.

Montreal's New Building Code

The Montreal city council has recently adopted an amendment to the present building by-laws which prescribes that in future all such buildings as theatres, asylums, schools with dormitories, hotels, departmental stores and large apartment houses, shall be in future constructed of fireproof materials. The present building by-law, with these amendments, reads as follows:

"Sec. 1.—Paragraph (j) of sec. 97 of by-law No. 260, as added by sec. 8 of by-law No. 337, is repealed, and the following substituted therefor:

"(j.) All theatres, orphanages, boarding schools, schools having more than one storey above the basement, schools with dormitories, hotels, asylums, houses of refuge, hospitals, departmental stores, apartment houses containing more than seven lodgings, apartment houses having more than three storeys above the basement, and all buildings over sixty feet high and having more than four storeys above the basement, hereafter erected or altered, shall be built or altered with fireproof materials, as provided in sec. 97 of said by-law No. 260."

"Sec. 2.—This by-law shall be considered as forming part of said by-law No. 260, which it amends, as to regards the penal clause and to all other intents and purposes."

As a concession to those who have already started building, a clause was added permitting the building inspector to allow the erection of special brick buildings of mill construction to a greater height than 60 feet, in any case where the contracts have been let at least thirty days before the passing of this by-law.

The preservation of iron in concrete is again attested in the demolition of an old gasometer in Hamburg, Germany, as reported by "Fer et Acier," of Brussels. This structure was built about 1852, and when taken down 48 years later, the iron anchor bolts which had been completely encased in a cement concrete were found to be as fresh and bright as new iron, with no traces whatsoever of rust.

Reinforced Concrete and Electrolysis

Electrolytic Corrosion of Steel in Concrete—Methods of Overcoming this Source of Danger — Necessity of Good Materials

The possible danger to reinforced concrete structures from electrolysis began to be frequently mentioned five or six years ago. Since then a half-dozen laboratory studies have been made and the results published. These last experiments not only review and confirm the conclusion of previous experiments, that electric currents will cause failures in reinforced concrete, but they throw light on several matters not made clear in previous experiments. These are briefly the resistance to electric currents, or conductivity of concrete; the weakening effect, if any, on concrete, of passing electric currents through it; the possible efficiency of insulating coatings applied to the concrete or the reinforcement; the possible value of mixing or impregnating the concrete with some non-conducting material, etc. The experiments, in brief, tell us more of the possibilities of overcoming the danger of electrolysis than of the certainty and nature of this danger, and for this reason they are particularly interesting to engineers.

Reviewing the data at hand, we may feel certain that electric current may cause failure in reinforced concrete. The nature of this failure is not chemical, or at least not principally chemical disintegration, but is mechanical. Electrolytic corrosion of the reinforcement occurs, by which one volume of the original metal becomes 2.2 volumes of another substance, and this increase in volume ruptures the concrete surrounding the metal. It is clear that dry concrete is a fairly good insulator, and that its conductivity increases with the presence in it of moisture, and with the nature of the salts in solution with this moisture. It is further clear that the passing of an electric current through concrete does not materially affect its cohesive properties; that is, its compressive strength is not decreased by such action. These conclusions may be modified by further test data, but it is reasonable to believe that they will not in the main part be reversed.

With the nature of the danger to reinforced concrete of electric current thus definitely defined, one is in position to study methods of avoiding the danger. The authors of the papers contemplate several possible methods and present test data and discussions bearing on them. One method is to keep the iron negative in respect to the concrete, so that the current will be from the concrete to the reinforcement. This will accomplish the result desired; but it is a laboratory possibility only to secure the requisite conditions. Another method, which is likewise a laboratory possibility only, is confining the current to alternating currents of equal positive and negative wave forms. A third method, which seems at first glance more promising as a practical resource, is to render the concrete non-conducting by filling the pores with some non-conductor or by an insulating coating. Tests made with blocks treated by the Sylvester process (soap and alum) showed no particular value for the treatment. The possibilities for an

insulating paint appear small in actual construction work; the concrete must be dry before the insulation is applied, the material must be completely insulated, and the insulation must remain intact and in good condition.

The three methods so far referred to for overcoming electrolysis are based upon the idea of either changing the nature or direction of the current or of securing a concrete which will be a perfect insulator. The next thought naturally is: Can the reinforcement itself be protected? Two possibilities of this nature suggest themselves. One is to coat the steel with some metal which will make the conduction of the current from the steel to the concrete metallic instead of electrolytic; the other is to cover the steel with an insulating compound which will cut off all flow of current from the reinforcement to the concrete. The tests made to determine these possibilities give rather negative results. They indicate that an aluminum plated reinforcement may quite likely solve the problem, and that a paint has yet to be found which will be a perfect permanent insulator, assuming that coating reinforcement with paint has no other objections.

At this point it is instructive to notice the results of the tests made to determine the effect of a paint coat on the shear or holding power of steel embedded in concrete. It seems likely that engineers will be loth to give up efficiency in holding power to the extent indicated, for anything less than a very serious menace not otherwise possible to escape.

Summarizing the facts which are presented by these laboratory studies, we obtain the general conclusion that electric current can cause electrolytic corrosion tending to destroy reinforced concrete, and that no practicable means as yet, offer themselves for preventing this corrosion where the dangerous current is present. Theoretically this appears to be somewhat appalling; practically it is not easy to work up a very high degree of terror over it. Like the corrosion of steel skeleton buildings so frequently prophesied some years ago, the possibilities for trouble are great, while the probabilities are negligible. An insulated reinforced concrete structure is not so very easily got at by electric current in a manner to cause grave danger. In the nature of things, too, the places where dangers will occur are those where considerable damage in detail can occur without injuring much the integrity of the structure as a whole.—

In the above connection, special interest attaches to the recently issued draft report of a standing committee of the British Concrete Institute, on the rusting of steel in concrete. The report is based on replies received in response to a circular letter sent early in 1909 to 1,000 engineers and others engaged in concrete construction, asking for the results of experience and investigation as to whether rusting of steel takes place when the steel is embedded in con-

crete. The following are the conclusions of the committee:

"Reinforced concrete will last as long as plain concrete in any situation, provided that certain special precautions are taken during its construction. The precautions to be taken are as follows:

"The materials (cement, sand, and stone) must be of good quality. They must be most carefully and thoroughly mixed and scientifically proportioned, so as to be practically waterproof and air-proof. The mixture must be fairly wet, and must be well compacted into position so as to minimize voids. The aggregate should be as non-porous as possible, and any aggregate which is known to have a chemical action on steel should be avoided. The aggregates should all pass through a $\frac{3}{4}$ -inch mesh. The concrete covering should in no case be less than $\frac{1}{2}$ -inch; and it is suggested that if round or square bars are used, the covering should not be less than the diameter of the bar. In structures exposed to the action of water or damp air, the thickness of covering should be increased at least 50 per cent., or the size of the aggregate should be reduced so as to insure a dense skin. In the case of structures exposed to very severe conditions, the concrete might be covered with some impervious coating, as an extra precaution.

"The reinforcement should be so arranged that there shall be sufficient space between one piece and its neighbor to allow the concrete to pass and to completely surround every part of the steel. All steel should be firmly supported during the placing of the concrete, so as to avoid displacement. It should not be oiled or painted, and thick rust should be scraped and brushed off before placing."

Pressure of Ground Water on Tanks

The behavior of underground reinforced concrete storage tanks when subjected to external pressure from subsoil water was commented upon by Mr. H. Richardson, surveyor to the urban district of Handsworth, England, in a recent paper before the Institution of Municipal and County Engineers. The excavation for the tanks, he stated, was made in very wet, soft sandstone, the site being only 150 yds. from a river. The subsoil, 5 ft. below the roof of the tanks, was made ground, free from water, but below that level to the bottom water-bearing sandstone was encountered. During construction the pits were drained by pumps and after the concrete had been placed the working space around the tanks was filled in and the ground water allowed to assume its normal level.

It was known that the dead weight of the tanks themselves, except a small portion upon which the engine house is built, would be insufficient to maintain their stability against the upward pressure of the subsoil water, and the designers of the tanks adopted means for anchoring them down. The floor of the tanks is extended outwards to make a projecting sill all around, 18 in. beyond the outer face of the walls. This, Mr. Richardson states, should have had the effect of anchoring down the tanks and enabling them to resist the upward pressure of the subsoil water which stands at a height of 16 ft. above the floor of the tanks. As the subsoil water began to attain its normal level it was found to be lifting the tanks at the end furthest from the engine house, and as the water increased in height the tanks came further out of the ground; the maximum

displacement was $6\frac{1}{2}$ in. The subsoil water pumps were at once re-started and the water level lowered, water being at the same time admitted into the tanks so that the levels inside and outside were soon equal, the result being that the tanks went back into position with practically no damage, the only serious fracture being where the inlet pipes passed through the walls of the tanks. Apparently the reason why the anchor or sill was ineffective was because it was covered only with the filled-in material around the tanks, which compressed as they rose. This was afterwards remedied by filling the trench all around the tanks with concrete, which tended to hold the tanks in place.

Tar-Macadam Roads in Scotland

The roads laid with tar macadam several years ago in this part of Scotland have fulfilled all expectations as regards durability and cleanliness. It is a noticeable fact that the enormous increase in automobile traffic in recent years has told very heavily on such sections of the highways laid with the ordinary macadam surface, while the surface of tar-macadam roads remains practically intact.

It has been found that to convert an ordinary macadamized road into a tar-macadamized road it is not sufficient simply to cover the old macadamized surface with tarred metal. The surface must first be "scarified." The road rolling engines are now provided with an instrument attached behind one of the driving rollers of the engine. This instrument acts somewhat in the nature of a plow. The effect is that, as the engine progresses, several steel points penetrate several inches below the surface of the road and tear it up into the condition of a plowed field. When the whole of the original surface has been so "scarified," the tarred metal is laid upon it and rolled in. If the surface is not scarified, but the tarred metal simply laid down upon the old surface of an uneven macadamized road, the finished road soon begins to show unevenness of surface, and finally it is apt to break up at various points.

Experiments with Pavements

It has been found by experience that granolithic or cement foot pavements are more satisfactory than foot pavements by the Walker system of tar macadam, although the tar-macadam pavement is more agreeable to walk upon. It is observed that certain parts of a foot pavement are used by pedestrians more than other, for example, close to shop fronts, close to corners, and, in country districts, close to the inner side of the pavement. The effect of this on a tar-macadam sidewalk is that about one-fourth of the surface becomes worn to such an extent as to require patching, thus spoiling the appearance of the pavement. The dripping of water from eaves of buildings also appears to have a disintegrating effect upon tar-macadam pavements.

In hot weather tar-macadam sidewalks (and, to a lesser degree, roadways) become distinctly soft, an important fact that should be seriously considered by road makers desirous of introducing the tar-macadam system in very warm climates. The science of chemistry may yet discover some sufficiently viscid substance to be used with or substituted for tar, which after setting, would not become unduly soft during the heat of the day.

Toronto's Proposed System of Drainage

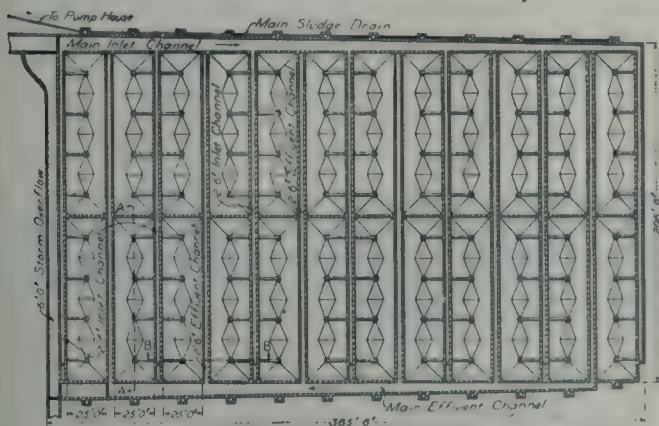
Extensive Construction for Proper Disposal of Sewage—Part of the System to be in Operation This Year—General Layout and Difficulties Encountered

The rapid growth of the city of Toronto during recent years has occasioned in many ways the necessity of improvement in the public water supply and disposal of sewage. The civic departments responsible for these improvements have each solved their problems and it is to be expected that a year's time will see Toronto obtaining its water from the best available part of Lake Ontario, subjecting it to a most modern filtration treatment to be followed by further sterilization before it passes through the mains to the consumer. After use the waste will be subjected to interception and clarification, and will be discharged into the lake through a long submerged outfall pipe.

The coming of this event is being eagerly looked forward to by citizens of Toronto. The present intimate relation between the water supply and sewage problems has long been serious. It is true that the present intake is over two miles distant from the nearest existing sewer outlet, but it is a fact that the discharge of untreated sewage into the bay at various points has in stormy weather created conditions which analyses of water supply have proven to be really dangerous, and deeper than sentiment. Then too the present system maintains a prolonged nuisance owing to the decomposition of organic matter under the water front during the summer months. Thus the completion and commencement of opera-

cation, but such a screening and sedimentation treatment as will produce an effluent highly diluted and properly devoid of nuisance creating powers. The tank treatment and disposal by dilution was developed under the direction of Mr. C. H. Rust, city engineer, Mr. Rudolph Hering, of New York, and Mr. J. D. Watson, of Birmingham, England, the latter two engineers having been called into consultation for advice regarding details of the work. Their conclusions were published in part in a paper on this subject by Mr. C. H. Rust, in the Contract Record of November 9th, 1910.

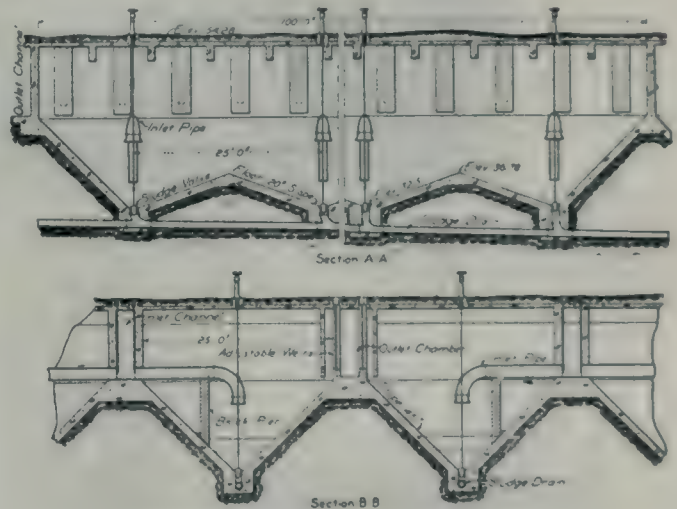
Illustrations showing the general arrangement of the settling tanks are shown herewith. A site for these was selected near the foot of Morley avenue in the east end of the city where the low lying marsh bordering upon Ashbridge's Bay furnishes an area upon which the tank sludge could be satisfactorily disposed of, by mixing it with the dry refuse and spoil which is being dumped there to fill up the



Completion of Settling Tanks, Main Drainage Works

tion of the new main drainage system will mean much to Toronto from an aesthetic as well as from a sanitary standpoint. Apart from the interests of amusement parks and summer residences there will undoubtedly be a perceptible increase in the value of property along the water front extending eastward for a distance of several miles.

The main drainage works will comprise, when finished, a high and low level intercepting sewer, an electrically operated pumping station for low level flow, a screening and sedimentation plant, and a submerged outfall line of pipe extending into Lake Ontario, the point of discharge being five miles east of the present waterworks intake, and 3,500 feet from shore where a depth of 30 feet of water obtains. The aim of the system is not a high degree of purifi-



Sectional Elevation of Settling Tanks

marsh. According to the advice of the experts alternate layers of tank sludge and city refuse, not exceeding two feet in thickness, will provide a suitable feeding ground for nitrifying bacteria, to very speedily reduce both constituents into a non-offensive substance.

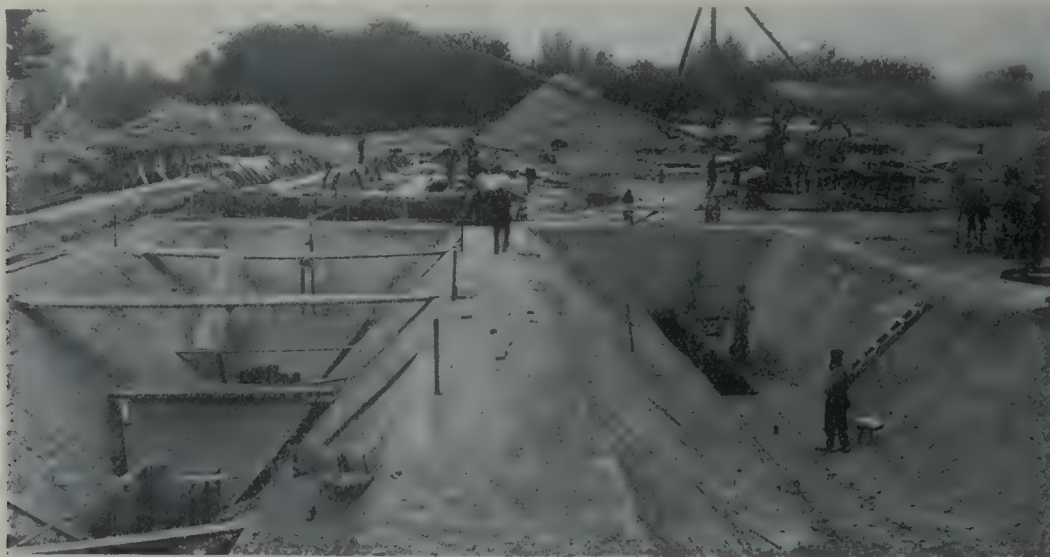
Before the sewage enters the settling tank, the heavier solids in suspension will be removed by mechanically cleaned screens. The screens will be made up of $\frac{1}{2}$ -in. bars, with clear openings of $\frac{1}{2}$ in. between each pair, and the cleaning apparatus will consist of teeth, mounted upon a mechanically driven endless chain. The rakings from the screens will be discharged into bucket conveyors, and disposed of.

After passing the screens, the sewage will enter the settling tanks, and from them be carried out into Lake Ontario through a long submerged pipe line. There are 24 separate tank units, each measuring 100 x 25 ft. in plan, and arranged as shown in one of the drawings. They are built of concrete and are cover-

ed by a 5-in. reinforced-concrete roof slab, supported by transverse beams. The sides of each unit are vertical for a distance of about 10 ft. from the top, and below this point are built at a slope of 45 deg. The concrete bottom of each unit is 1 ft. thick and is built to form a series of three ridges and four valleys, the latter each being connected through a 9-in. sluice valve to a 10-in. cast-iron sludge drain leading to the pumping station. The height of the flow line above the lowest point of the bottom will be about 16 ft., and the capacity of each tank is approximately 150,000 imp. gal at the present flow line. The inlet and outlet channels are so arranged that any number of tank units may be operated or cut out of the system

The disposal works are so located that about two-thirds of the entire sewage of the city will be intercepted by the high level line and carried by gravitation to the settling tanks, while the remaining one-third collected by the low level interceptor will flow by gravity to a pump well at the east end of the line, from which it will be raised through a height of 22 feet to a point of discharge above the elevation of the flow line in the tanks.

The system has been designed for a maximum carrying capacity of 200 Imperial gallons of sewage per capita per day, based upon the assumption that in 1930 the city's population will be 550,000. The interceptors will be made large enough to carry all of



Settling Tanks, Preliminary Stages of Construction

as desired. Screened sewage first passed into a main inlet channel extending along the entire north side of the plant, from which lateral channels are carried at right angles between alternate rows of tanks, so that one lateral serves as a feeder for four tank units, except on the ends, where one lateral channel serves only two tanks. From the lateral inlet channels sewage enters each tank unit through four 18-in. cast-iron pipes controlled by sluice gates. These pipes extend out to the centre of each tank and their ends are supported by brick piers. The flow through them is made to discharge downward into the tank through a 90-deg. bend. Sewage leaves each tank through 13 outlet openings, through which the flow is controlled by adjustable weirs. In front of each outlet is a reinforced-concrete baffle plate to prevent scum or floating matter being carried out into the bay. The outlet openings connect directly with lateral effluent channels, which carry the flow into a main effluent channel which extends along the south end of the tanks and connects with the outfall line into the lake. Provision is made for by-passing the tank through a 6-ft. storm overflow. A battery of six Venturi meters will be installed for the measurement of the high and low-level sewage after passing into the sewage tanks; they will be located just east of the screens and pumping outfit.

At the present period of construction the concrete bottoms and side walls of the settling basins have been completed. To date 50 per cent. of these have been roofed, and 25 per cent. are complete including back fill.

the dry weather flow when running a little over half full, leaving the balance available for storm weather.

The size of the sewer section and the grade of the line were based on the assumption that one-half



Inlet Channel Pipes and Forms for Side Walls

the average daily flow would be discharged in eight hours, the allowable velocities of the flow being fixed between limits of $2\frac{1}{2}$ feet and 4 feet per second. The area drained when the system is in operation

will be about 30 square miles. The drainage of Toronto is from north to south and the topography of the city made it possible to locate high and low level interceptors approximately parallel to each other and also parallel to the shore line of Toronto Bay, the alignment in both cases being almost due east and west.

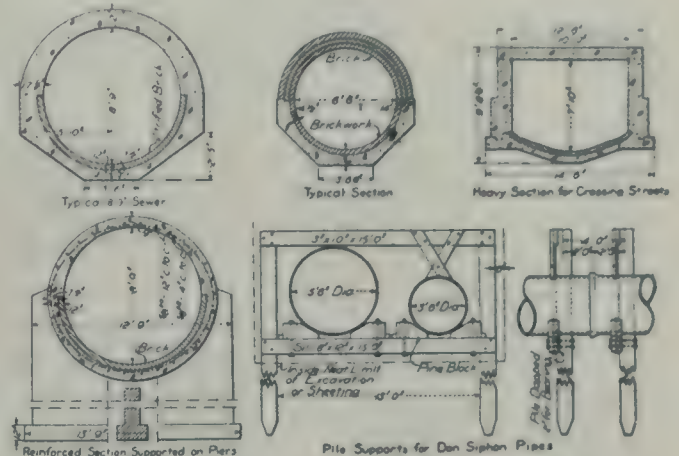
The High Level Interceptor

The portion of the high level interceptor now under contract or completed extends from Garrison Creek to the disposal works, a distance of about $5\frac{1}{2}$ miles, although it is proposed to extend the line westward from Garrison Creek an additional $2\frac{1}{2}$ miles. A connection between the high-level intercepting sewer and an existing $6\frac{1}{2}$ -ft. circular brick sewer in the vicinity of Garrison Creek is made by a branch line comprising 1340 lin. ft. of 5-ft. reinforced concrete pipe. This work is included in section 6 of the main drainage work and the contractor is the Orpen Company, of Toronto. The pipe is of the Meriwether lock-joint type, and was laid in open trench ranging in depth from 34 ft. at the upper end to 18 ft. at the lower end, except where the line crosses under Queen street in tunnel. At this point there was encountered an old masonry culvert, portions of which had to be cut out to allow for the new work; the short stretch of tunnel was heavily timbered throughout its length. At the upper end of the Garrison Creek branch line a bellmouth connection is made with the existing $6\frac{1}{2}$ -ft. sewer and the dry weather flow diverted from the latter by means of a weir whose crest is 1 ft. 6 in. above the invert. During flood periods the storm water will pass over this weir and be discharged through the old outlet, thus preventing the high-level interceptor from being surcharged, the flow into the interceptor being further regulated by a penstock gate at its upper end.

The high level interceptor (including its branches and extensions) will be, when finished, approximately

tangular section will be used on account of lack of head room. At Garrison Creek the interceptor has a diameter of 6 ft.

The section is generally of plain concrete and the lower half of the inside is lined with one course of vitrified brick. The specifications allow for two alternative types of construction, the only difference between them being that in one case the arch is of concrete and in the other is formed by three rings of sewer brick. The first two sections of work, east of



Sections of Interceptor at Various Points in the Line

Garrison Creek, comprising, respectively, 6481 and 4211 lin. ft. of sewer, were awarded to J. Wagner & Son, of Cleveland, O. The next section, No. 3, extends easterly 6421 ft., terminating at the Don river, which flows in a southerly direction and empties into Toronto Bay; section 3 is built by the Godson Contracting Company, of Toronto. The interceptor between Garrison Creek and the Don river is being



Settling Tanks partly completed showing Manholes, Pedestals, etc.

50,000 feet in length. It is intended to throw into operation about 30,000 feet of this work this fall, of which 27,000 feet have already been completed. It will have a circular section which varies in diameter from 6 ft. to 9 ft. 6 in., except the portion in the vicinity of the settling basins, where a special flat rec-

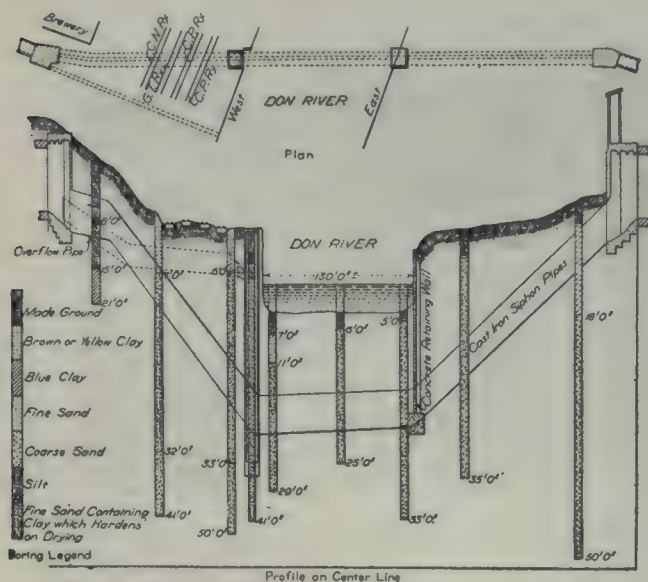
built in open cut and with this method of construction a plain concrete arch is used. The line extends through Adelaide street within two blocks of the City Hall and on account of the congestion of the streets in this vicinity sections 4 and 5 and part of section 3 are being built in tunnel. Sections 4 and 5 in tun-

nel are entirely of brick. The total length of tunnel is about $3\frac{1}{2}$ miles.

Tunneling in Clay.—On the tunnel work shafts were put down along the side of the street at about 400-ft. intervals and headings driven in both directions from their bottoms. The material encountered was a stiff blue clay for the most part and was practically watertight, although at some places where the clay was mixed with sand timbering was required for there was a tendency for the material to run and some leakage was encountered; in the stiff clay no timbering was required and it was possible to take the material out almost exactly to the desired section. The excavation was made by slicing long strips of the clay from the face of the heading with a draw-knife. This tool is simply a U-shaped band of steel with two wooden handles. In the stiffer material four men are required to operate it.

The clay falls from the cutting edge of the knife in strips from 1 to 2 ft. long and is loaded into buckets by one man who also pushes the material to the shaft bottom along narrow-gauge lines of track. In some places the clay is mixed with small boulders and in material of this character the draw-knife has not proved effective; under such conditions mattocks are used, which take the clay out in chunks which are roughly cubical. In the smaller size sewers with a force of 5 men (3 miners and 2 muckers) at each heading, the average progress of excavation per 8-hour shift is from 7 to 10 ft. The brickwork is carried along immediately behind the excavation, each shift of masons comprising about 8 bricklayers. The portion of the high-level interceptor constructed in tunnel varied in finished inside diameter from 6 to 8 ft. In the larger section it was possible for four men with mattocks to work in a heading simultaneously. The streets under which the tunnel is driven are filled with underground obstructions, such as water and gas mains, sewers, and electrical conduits, so that excavation in open cut would have been difficult and costly.

Don River Siphon.—The line crosses the Don river in an inverted siphon of two cast-iron pipes.



Sketch of Siphon under the Don River

The width of the stream at that point of crossing is about 130 ft. and the depth of water 5 ft. The two lines of pipe are respectively 3 ft. 6 in. and 5 ft. 6 in. in diameter and are spaced 6 ft. apart on centres. For

the present the smaller line will have a capacity sufficient for the maximum dry weather flow and the 5 ft. 6-in. pipe will be held in reserve for a future increase in the quantity of sewage to be handled or used during flood periods to carry an excess of storm water. The regular high-level intercepting sewer section terminates in a concrete siphon chamber where the flow into either or both lines of cast-iron pipe is controlled by stop planks.

There is also a blow-off chamber on the west bank of the river so that the siphon may be unwatered for purposes of being inspected and repaired.

Due to the likelihood that the Don might be converted into a navigable stream, pipes were placed so that their tops were 10 ft. below the existing river bed. The material encountered was composed of fine sand containing clay and the trench was excavated and the pipe laid within the walls of a cofferdam. The pipe for both lines is the bell-and-spigot type in 8-ft. lengths, the joints being poured with lead. In order to insure the permanent alignment of the siphon and prevent breaks at the joints due to settlement, the line is carried under the river by timber pile bents, there being two of these bents for each 8-ft. length of pipe.

The work was started by building a wooden flume to carry the flow of the river, and by driving four rows of sheet piling across the stream, two on either side of the pipe line. The material excavated within the inner cofferdam thus formed was deposited between the inner and outer rows of sheeting on the upstream and downstream sides. For the outer cofferdam Wakefield sheeting was used, being made up of three rows of 2 x 12-in. hemlock planks, 16 ft. long, held in place by 3 x 12-in. waling strips, bolted to piles spaced 8 ft. centre to centre across the stream.

The two inner rows of sheeting were made of Southern pine 30 ft. long, 6 by 12 in. tongued and grooved planks. The minimum distance between the inner and outer rows of sheeting was about 40 feet. The pipes were handled by a derrick plant on the west side of the river and also by an A-frame carriage, which ran on tracks supported over the trench. The larger pipes weighed about 5 tons per 8-ft. section.

The method of supporting the pipe on pile bents is illustrated in one of the drawings. Pine sills 8 by 12 in. by 15 ft. extended between two rows of piles and timber blocks were bolted to them as shown to hold the pipe in place. After the pipe had been placed men were sent through it and caulked the joints from the inside with lead wool. The Don river siphon work was done by the firm of Ryan & Reilly, of Philadelphia.

East of the Don river the standard sewer sections are used, and, with the exception of some 200 ft., all the work is being done in open cut. The lengths between the Don river and the sewage pumping station which forms the end of the line is divided into four sections, on which the contractors are the J. H. McKnight Company, of Toronto; John Wagner, of Cleveland; J. W. Gawne, of Cleveland, and Leham, Nicholson & Jerou, of Cleveland. One portion of the line crosses filled ground, and here a special reinforced concrete section, supported on piers, was used. The details are shown in one of the drawings which, together with their descriptions, are reproduced from the Engineering Record of March 18, 1911.

At the easterly end of the high level interceptor

it was necessary to change from a circular to a rectangular section, 10 ft. wide and 7 ft. 10 in. high, inside dimensions, for the grade of the sewer was not far enough below the ground surface to have permitted the use of the standard circular section. The rectangular section has a vitrified brick invert and a flat roof slab, reinforced as shown in one of the drawings.

Low Level Interceptor

Construction on the low level interceptor, of which mention has been made, has been started, and over 5,500 feet of the 20,000 feet has been laid. This sewer will in general be parallel to the high level line, the two terminating at a screening and pumping plant. The low level interceptor will have an egg-shaped section for 2 miles, this shape having been adopted to give the maximum headroom, since this part of the line will be built in tunnel. The remainder will be a circular section ranging in diameter from 4 feet to 5 feet 6 inches, $2\frac{1}{2}$ miles of which will be constructed of reinforced concrete pipe.

Sewage collected by the low-level interceptor will flow by gravity to the east end line, and there will be lifted about 23 ft. by a pumping plant consisting of four centrifugal units with a combined capacity of 100 cu. ft. per second. Ordinarily the pumps will be driven by electric motors, but an auxiliary gas-engine plant is to be installed, in case of accident to



A Section of Outfall Pipe in Process of Lowering

the electrical equipment. In addition to raising the low-level sewage to a point from which it can flow by gravity to the settling tank, the pumping plant also will handle the tank sludge, forcing it through pipe lines to the disposal area of Ashbridges Marsh.

Submerged Outfall.—From the settling tanks sewage is discharged into Lake Ontario through a 5-ft. submerged effluent carrier, consisting of about 1600 ft. of reinforced concrete pipe and 3600 ft. of riveted-steel pipe. The concrete pipe was cast in 24-ft. sections, with a cast-metal flange at either end. The pipe sections were carried out to place on barges and lowered on to cross-timbers between rows of piles, spaced 8 ft. apart on centres. The sections were bolted up under water by divers; a piece of kiln-dried pine was used as a gasket between each pair of pipe flanges. Each length of reinforced-concrete pipe weighed about $16\frac{1}{2}$ tons; the reinforcement consisted of expanded metal and longitudinal steel bars. The steel pipe is built in 50-ft. lengths, two of these being bolted up on shore and laid at one time. The experience at Toronto has been that the steel pipe is preferable to the 24-ft. sections of reinforced-

concrete pipe, both from standpoint of ease in laying and freedom from danger in cracking. The submerged steel pipe also is supported at the bottom on pile bents, spaced about $12\frac{1}{2}$ ft. on centres. The joining of successive sections is accomplished under water by divers, and a wooden gasket is used between flanges, as was the case with the reinforced concrete pipe.

The last 500 ft. of steel pipe line tapers from 5 to 2 ft. in internal diameter. In designing the outlet portion of the line an effort was made to secure the maximum dilution and dispersion of the sewage, by allowing it to leave the pipe through a series of small holes in its sides. In the 500-ft. tapered section of pipe, therefore, 4-in. holes were made at intervals of 8 ft. 4 in. on either side. The sewage discharges in about 30 ft. of water, and, with the scheme of distribution adopted, no nuisance at the surface is anticipated.

Earth Dams for Reservoirs

Questions that enter into the building of reservoir dams are generally complicated and frequently of greater importance than they appear at first glance. A study of the water supply should, of course, precede the location of any reservoir, and this must include the annual fall over the entire watershed. After the water supply, the next most important consideration is the nature of the foundation. Whenever possible an earth dam should be founded on bed rock. A mixture of sand, gravel and clay forms the best material for dam construction, and if this mixture is laid on a solid foundation in a dam of proper size and design there will, as a rule, be little or no need of a core wall. It is important to determine in advance the angle of saturation in a dam of the materials that can be found at hand. For this purpose a miniature dam is often constructed and close study is given to the seepage of waters through it. The angle of repose may be obtained by trying successive slopes to determine the steepness of slope the material will stand under pressure from water.

The homogeneous earth dam is regarded as the best type by modern engineers, but the profile and dimensions of the dam must be determined by the special conditions. The angle of saturation as shown on a miniature dam of the given materials will be an important factor in determining the special design of the large dam. The site of the dam must be stripped of all vegetable growth, springs must be carried to the outer toe in bed-rock drains. The earth is dumped in rows on the dam, leveled and sprinkled, the amount of water depending on the nature of the soil. A heavy roller should then be applied. After rolling until it is thoroughly compacted, the surface should be harrowed before applying another layer. The face of the dam should be ripped for the thickness of at least a foot. The outlet and spillway should both be separated from the structure of the dam proper, and they should be adequate for the largest flow of water in seasons of extreme flood.

The Crane Company, of Chicago, are preparing for the erection of an 8-storey building in Vancouver to cost in the neighborhood of \$125,000. The construction will be of pressed brick with stone facing and will be used for store and office purposes.

Construction, Maintenance and Repair of Highways

One of the most pressing questions at the present moment is the change which it is absolutely necessary to adopt in the making of macadamized roads in order to suit the altered conditions of the traffic passing over them. In recent years a more extended use of the highways has been made in this country and the employment of traction engines, with wagons and heavy motor vehicles, for conveying produce and merchandise, and also the greater use of fast-traveling motor cars, demand that some means be adopted for protecting and improving the road surfaces, thus making them more resistant against the greater amount of wear created by the ever-increasing form of new traffic. There is no doubt in my mind that in a great many instances inferior material procured from a local source has been used, with bad results, productive of mud and dust. It will not do nowadays to apply macadam to a road surface without knowing how that material will wear, and it should be laid and consolidated in such a manner as to obtain the very best results as far as its wearing capacity is concerned. The different classes of traffic which pass over our roads will have to be considered. It is only common sense that a length of road which carries heavy vehicular traffic near a city or town cannot possibly be compared with another length of road maintained with identically the same material carrying less traffic. There can be no model type of road which can be fitly adopted universally.

My practice is briefly as follows: Before spreading the granite or other material I fill up all potholes or uneven parts, so as to render the old surface as even as possible. The new material is then applied in the ordinary way, care being taken to see that every shovelful is evenly spread and thoroughly dry rolled until every stone is firmly bedded before the binding is put on. Just sufficient of this material is used to bed the stones, after which clean $\frac{1}{2}$ -in. chippings, to fill up the interstices, are swept about and rolled. We use good, clean, sharp pit gravel for binding purposes. When patching becomes necessary, as soon as a hollow appears, the roadman fills it with small stone, about $1\frac{1}{2}$ -in., care being taken not to loosen the surface previously in any way.

Dust upon our highways will never be absolutely abolished; but we can and must reduce it. I have laid several dust palliatives, but do not think we have a remedy here sufficiently good, as I find that they answer admirably for a time, but when winter comes there is an increase in the mud on the roadways, and I fear that the wearing properties of the material are reduced considerably. Tar-macadam has been laid as a pavement in many towns and cities, but the cost would appear to make its application to country roads on a large scale prohibitive. The most successful system is that of tarred furnace slag, introduced by Mr. E. P. Hooley. The method of preparing this road material, as in most cases of tar-macadam, is to thoroughly dry the stone by heating, and then to apply hot tar and mix thoroughly. Limestone was very extensively used at first, and selected for tar-macadam, on account of its absorbent properties, while dense, blast-furnace slag of best quality, a harder and comparatively better wearing material, has since been largely adopted. When roads have a good face, and it is possible to tar-wash the surface at least once every four months, tar as a sur-

face binder will undoubtedly be a success. It will not, of course, make a weak road, subject to disintegration from below, a strong one. A road compound throughout of thoroughly tarred material will do all that surface treatment cannot do. The failure of tar-macadam has been in a great measure due to inability to get the tar to adhere to the material to be tarred. Moisture on the material or cooling of the tar means failure to adherence, and the use of soft materials which would adhere quickly means failure through the road giving way owing to inferior material.

In order to construct a good tar-macadam road it will be necessary to have an ordinary road as a bottom, or to form as good a foundation as possible. If a waterproof road is desired, then it must be of tarred macadam. The bottom layer can be 4-in. gauged material, laid and rolled, with the interstices filled up with finer tar-macadam, and the whole steam rolled. The second layer should be about $\frac{3}{4}$ -in. in thickness of $\frac{5}{8}$ -in. tar-macadam, and left unrolled; on this should be applied a layer of $2\frac{1}{4}$ -in. gauge tar-macadam, and rolled into the $\frac{5}{8}$ -in. and when rolled $\frac{3}{8}$ -in. tar-macadam should be swept with a brush into every crevice or open joint. As a last coating, in order to join the face, a perfect layer of $1\frac{1}{2}$ -in. tar-macadam should be applied and after the roller has passed twice each way over its face $\frac{5}{8}$ -in. tar-macadam should again be swept into every crevice, so that a perfect surface is obtained.

The New Union Bank

The Union Bank of Canada is erecting a building at the southeast corner of King and Bay streets, Toronto, and will have it ready for occupation in a short time. Several photographs showing the exterior of the building and its location are reproduced herewith. It will be a fireproof structure of glazed terra cotta and steel, and will be built on nineteen concrete caissons sunk to bed rock.



South-east corner King and Bay Streets, Toronto, showing Union Bank and Toronto General Trusts Building.

sons sunk to bed rock. The building will be five storeys in height, including mezzanine. The structure is faced with Crotch Island granite up to the sill line.

The corridor floors are of Tennessee marble, while those in the offices above will be maple finish. The banking rooms will occupy the entire main floor, the interior walls of which are finished in Botticino, Escalante and Formosa. The top floor of the building will

be devoted to the offices of the inspector, board and president, while the mezzanine and second floor will be occupied by the A. E. Ames Company, Limited. The remainder of the building will be devoted to offices, the interior woodwork of which will be of quarter-cut oak. The interior woodwork on the banking floor and mezzanine will be of mahogany. Fireproof partitions throughout the building are of four



Union Bank of Toronto, H. C. Hitch & Co., contractors.

and six-inch tile of National Fireproofing Company design. The firm of Darling & Pearson are the architects, while the building was built by H. C. Hitch & Company, of Montreal and Toronto.

Hudson's Bay Railway Bridge

Delivery of steel for the big railway bridge across the Saskatchewan River at The Pas will start in the near future. This announcement was made recently by Mr. John Armstrong, chief engineer in charge of construction of the Hudson's Bay Railway. Word has been received from the Canada Foundry Company that it will shortly start erecting.

The bridge is planned for a 12-foot traffic section each side of the railway track. At the present time everything is in readiness for the first three spans. The piers have been completed as far as the pivot pier, and the three fixed spans can be proceeded with at once. There are two piers still to be completed on the north side, but the shore piers are done. The cofferdams are all in for the uncompleted piers, and as soon as the flood water recedes they will be pumped out and the placing of concrete rushed.

Unlike rivers farther to the south the freshet in this section of the Saskatchewan comes in July, when the flood waters from the foothills and upper levels of the Rockies come down. This year the floods have been more than usually heavy and to save the great additional expense the work on the two piers has

been partially called off. It would have cost a great deal to carry the cofferdams above flood level and the delay means only a couple of weeks lost.

The engineers have been exceptionally fortunate in their selection of a bridge site, though the character of the bottom has added somewhat to the cost of the work. A hardpan bottom was encountered at a depth of six feet which was so solid that it was impossible to drive the ordinary sheet piling. This necessitated a delay while the contractors could send for sheet piling of the interlocking variety with which to make a water-tight cofferdam. In fact the bottom was so extremely firm that picks and shovels were useless in removing it to the desired depth, and dynamite had to be used. The excavation has been carried down six feet so as to be below any danger of scouring due to the rapid current of the river. Three river piers and two shore piers now rest on this bottom.

The annual report on the samples of Portland and other cements examined in the testing laboratory of Gross- Lichterfeld has recently been issued by Professor Burchartz. During 1909, the year covered by the report, 150 Portland cements were tested, of which 135 were slow-setting, and 15 quick-setting. Whilst all the samples withstood the cold water test for soundness, 19 failed in the boiling test. Five cements left more than 5 per cent. residue on the fine sieve. Two cements failed to reach the prescribed tensile strength after seven days, whilst twelve failed to reach the required compressive strength after twenty-eight days under water. The specific gravity lay, in the great majority of cases, between 3.05 and 3.15, or after ignition, between 3.20 and 3.25. A special series of tests showed that those cements which failed in the boiling test were inferior in strength to those which withstood the test, but most of them, nevertheless, satisfied the requirements of the Prussian Standard Specification as to strength. The figures show a very considerable increase in the average strength of German Portland cements from 1907 to 1909. The number of cements, other than Portland, examined is too small to permit of a useful comparison being made.

A bottom ballast of large stones, carrying the ordinary track ballast, was laid on the entire line of the new Shanghai-Nanking Railway in China, which is a modern, high-speed road, built by English engineers. This ballast is of 12-in. x 6-in. stones, 8 in. thick, hand packed, while the top ballast is broken to pass a 2-in. ring. Granite is used from quarries located favorably for water transportation and from the vicinity of the railway. On the main line 85-lb. rails are used. The road is 200 miles long and is operated at speeds up to 65 miles per hour, according to Mr. Lewis R. Freeman.

It is useful that a man should knock a nail skillfully, truly and with precision, but if the action is controlled only by the instinct which causes a bird to build its nest with precision, he is no more than an instinctive animal. The man should, at the back of each knock, feel and know all the reasons and accumulative evidence which make for what is termed efficiency in work. Absolute efficiency in production is found in machine results; machine termination is the result of scientific application. The man must be superior to the machine; and must, therefore, be something more than a tool capable of producing technical results.

Recent Bridge Construction in America

General Review of Accomplishments in Canada and the United States—Popular Types of Bridges—Developments in Foundation and Caisson Work*

By Henry S. Jacoby

It is surprising to notice how few railroad bridge trusses with pin connections are being built in America at present. This tendency is not merely due to the decreased cost of foundations and piers or abutments due to the extensive use of concrete which makes the economic span shorter than formerly, but wherever an old pin span can be divided by an intermediate pier without excessive cost, two riveted truss spans or two plate-girder spans will replace it. The length of riveted trusses has been steadily increasing as the shops have changed their equipment and methods so that the maximum span has passed 400 feet, and spans between 200 and 300 feet are numerous. Accordingly, pin spans are mainly confined on railroads to crossings of the larger rivers where the interests of navigation require long spans.

The longest rivetted spans in the United States are those of the new terminal bridge over the Missouri River at Kansas City, the span being 425 feet and $6\frac{1}{2}$ inches. The special reason for making this a riveted truss bridge is that one of the spans has a suspended lifting deck in which the stiff suspenders telescope into the hollow posts of the truss. The upper deck accommodates the highway and electric railway traffic, and the lower deck the railroad traffic. The bridge has such an elevation that deck trusses are used over the river in all spans except that of the lift bridge. Since structural reasons required the through trusses of the lift span to be made with riveted connections the same details were used for the fixed spans to secure uniformity.

In the United States the riveted trusses that are next in length to those mentioned in the preceding paragraph, are located in the channel spans of the Sixth Street Viaduct over the Kaw River at Kansas City. The trusses are also of the Baltimore type, with a span of 300 feet, 10 inches. Next in order come the riveted truss spans of the Idaho & Washington Northern Railroad over the Pend Orielle River at Box Canyon, Idaho, completed in 1910. The channel span is 280 feet and was erected from one end by the cantilever method without the use of falsework. The adjacent shorter span was used for this purpose as an anchor span.

In Canada the largest riveted truss bridge for railroad traffic has an effective span of 412 feet 8 inches. It is on the Canadian Pacific Railway where it crosses the French River, 43 miles south of Romford, Ontario. Special conditions also led to the adoption of this unusually long span for riveted trusses. The Cisco bridge over the Fraser River in British Columbia, erected in 1910 on the same railroad, has riveted trusses with a span of 315 feet, which are designed for E50 loading.

It is worthy of note that the longest span of a pin truss railroad bridge remains the same to-day as in 1893, or 546.5 feet. Only one light highway bridge exceeds this in effective span, with a length of 586 feet. At present, however, the sub-structure is well

advanced for the new Municipal bridge at St. Louis, popularly known as the "free bridge," in which the effective spans are 668 feet, due to the demands of navigation as decided by the United States government. This bridge is to accommodate the highway on an upper deck and a double-track railroad on the lower deck. It is to be built of nickel steel and it is proposed to begin the erection this spring.

Plans are under consideration which make it probable that in a few years the largest span for simple truss bridges will exceed 700 feet.

The larger live loads now adopted by some railroads tend to increase still further the magnitude of plate-girder construction. The construction of bridges now in progress on the Boston & Albany Railroad for E60 loading includes a plate girder for a skew span with solid floor which has an effective span of 115 feet and a gross flange section of 249.5 sq. in. exclusive of the equivalent flange area of the web.

There are at least two other railroads, both of recent construction, in which all the bridges are designed for E60 loading, the Virginian and the Carolina, Clinchfield & Ohio. They were built primarily for the economic transportation of coal, requiring very costly construction in order to secure the low grades adopted.

A number of prominent bridges are being replaced or reconstructed. The Lachine bridge over the St. Lawrence River near Montreal is to be changed from a single-track to a double-track bridge, using only simple trusses, thus causing the only statically indeterminate continuous truss bridge in the country to disappear. During the past season work was begun in lengthening the piers and in building some additional piers. After completing a new single-track bridge alongside of the present trusses on the longer piers, the old structure will be removed, many of the spans being used elsewhere on branch lines, and a new single-track structure built to replace it.

The Fraser River cantilever bridge on the Canadian Pacific Railway near Cisco in British Columbia, completed in 1884, was removed last year and will be re-erected on Vancouver Island on the Esquimalt & Nanaimo R.R., one of the operated lines of the Canadian Pacific. The Cisco bridge was replaced by three simple truss spans. The middle one with a span of 315 feet was erected by the cantilever method, using the side spans as temporary anchor spans. All of the trusses have riveted connections.

The superstructure of the Coteau bridge over the St. Lawrence River was also reconstructed last year by the Grand Trunk Railway by substituting heavier riveted trusses designed for modern loading. The trusses were built on skids on an island, and between trains one of the old spans was removed by floating it out on a barge, and a new span put in its place by the same method. One of the most interesting features of the design consists in the complete elimination of all lacing in the web members of the trusses, exclusive of the end posts. The difference in appear-

* The Cornell Civil Engineer.

ance due to this feature is apparent to an observer at a considerable distance. The web members are composed of two pairs of bulb angles connected by a solid web plate. This gives an H-section with a bulb at each corner of the post, thus securing greater resistance to injury in the shops, during transportation, and in erection. In some cases the section is increased by adding two plates on the outside. The value of the bulb angle in shipbuilding has long been recognized, but it appears that the value of this detail of bridge construction in Canada has not been recognized in the United States. It is claimed that it has been used in Canada for a number of years with entire satisfaction.

An item of bridge history worth noting is the fact that in 1909 the Grand Trunk Railway replaced a deck tubular bridge which had been in continuous service since 1855. The excellent quality of the material and workmanship is attested by such long service under steadily increasing live loads.

The old chain suspension bridge over the Merrimac River between Newburyport and Amesbury, Mass., built in 1810 and strengthened for electric car service in 1900, was replaced last year by an entirely new suspension bridge of modern design. Because of their historic associations it was at first proposed to suspend the old iron link cables alongside of the new wire cables, but this plan was abandoned for fear of detracting from the handsome appearance of the new structure.

The first cantilever bridge in this country was located on the Cincinnati Southern R.R. (now a part of the Queen and Crescent route) across the Kentucky River, and was completed in 1877. At that time it was also the highest bridge in the United States. This bridge was replaced in 1910 by three simple truss spans of the same length, or 375 feet. The deck of the new bridge is 31.3 feet higher than the old one in order to improve the railroad grade. The trusses were erected by the balanced cantilever method from each tower, and without interference with traffic.

A new cantilever bridge for highway traffic has recently been built over the Ohio River at Sewickley, Pa. The anchor spans are 300 feet long and the cantilever span 750 feet.

A large steel arch bridge is being erected at present over the St. Croix River seven miles north of Stillwater, Minn., on the Minneapolis, St. Paul & Sault Saint Marie R.R., known as the "Soo line." It consists of five arch spans of 350 feet each, exclusive of the viaduct approaches. The arches contain one particularly novel feature in design, by means of which the arches have practically three hinges for dead load and temperature, and two hinges for live load. The bridge is 150 feet high.

Work has been begun on another important 3-hinged spandrel-braced arch bridge over the Crooked River in Oregon, for the Oregon Trunk Railway. Its span is 40 feet. This railroad is to connect with the Spokane, Portland & Seattle Railway at the Falls of Columbia River at Celilo by means of a bridge with simple truss spans, which is now under construction.

A number of direct lift bridges have been built in the last two years and others are now under construction, thus indicating a considerable revival of the type of the South Halstead Street bridge in Chicago, completed in 1894. Previous to that time the type in which a simple span is lifted vertically with the aid of counterweights had only been used for very short spans like those over the Erie Canal.

One span of this type is in the new Mississippi River bridge at Keithsburg, Ill., on the Iowa Central Railway. The span is about 230 feet and the lift about 45 feet. The inclined legs of the towers are connected to the adjacent fixed spans, and in case the river channel shifts the towers may be transferred and another span arranged to lift. Another one completed last year is the Hawthorne Avenue bridge at Portland, Ore., which has a lift span about 244 feet long. The width of this highway bridge is 63 ft. 8 in., and the vertical lift is 110 feet.

Reference has been made previously to the lifting suspended deck of one of the spans in the Kansas City bridge, which gives a clearance of 55 feet for steamboats. At Portland a bridge is under construction in which a suspended deck is to be lifted for vessels requiring a low clearance while the entire span is lifted for higher clearances. At Chicago the direct lift has been adopted for a skew span on the Pennsylvania Lines. The span is about 217 feet between centres of bearings and the vertical lift about 130 ft. Several other examples of this type are located in Arkansas, Idaho, and Washington, and during the past year one was completed at Mohawk Place in Cincinnati over the Miami and Erie Canal.

Bascule bridges are being built extensively and their use is no longer confined to locations where it is necessary to avoid encroachment upon the adjacent frontage for docks. They seem to enjoy the especial favor of the operating departments of the railroads.

A large number of reinforced concrete arch bridges are being built throughout the country, both for railroad and highway purposes. The bridge over Rocky River near Cleveland which has the longest clear span in America, or 280 feet, was completed last year. The smaller spans of the large bridge at Spokane are doubtless completed by this time. Work on the 281-foot span was delayed on account of the accident to the centering, and in order to avoid dangers due to high water it was proposed to build the new centering on top of a steel truss bridge designed for another location, but temporarily used for this purpose.

The bridge of the Boston Elevated Railway over the Charles River at Boston and Cambridge, is unique in being the first one in which two hinges are employed. Two separate ribs are used in each span which support reinforced concrete floor beams. The stringers consist of steel I-beams on which the ordinary type of open bridge floor is laid, while between the two tracks and outside of them there is a concrete slab floor.

The spandrel walls cover the entire area about the arch ribs between the supporting pillars of the floor, but they are made hollow and as light as possible since they are not intended to carry any live load. Being adjacent to the Charles River dam special attention was given to the architectural treatment so as to give it the appearance of a monumental structure.

An interesting feature in its construction was the use of an electric locomotive to haul the cars to carry concrete from the elevator at the mixer to the various places on the bridge where it was deposited through chutes.

A bridge which deserves special mention is that completed in 1910 over the Colorado River at Austin, Texas. Its total length is about 1,000 feet, and it has eight equal arch spans. The bridge is very simple in design but of excellent form and proportions, while the overhanging sidewalks and its supporting brackets give that distribution of light and shadow which

adds so much to the beautiful appearance of the structure.

Another concrete arch bridge of importance is being built on Kings-highway in the city of St. Louis. The three large spans are 140, 170 and 140 feet respectively. On account of the character of the foundation bed it was necessary to adopt an unusual construction to spread the load over a large bearing area by means of reinforced footing slabs, and vertical partitions and sidewalks forming a kind of cellular construction.

More than thirty concrete structures are included in the Hopatcong cut-off east of the Delaware water gap on the Delaware, Lackawanna & Western Railroad, which has been under construction for some time. Among these are two very large arch bridges, the one over the Delaware River being 1,450 feet long and containing more yardage of concrete than any other concrete bridge in the country. It has five spans of 150 feet in the clear, and two spans of 120 feet, beside several smaller approach spans. The Paulins Kill bridge, not far distant, is 1,100 feet long, but on account of its greater height and favorable location presents a more impressive appearance than the other.

In many cases the single arch culverts accommodate a highway and waterway in the same structure, the waterway being placed beneath the floor of the highway, in one or two culverts of rectangular cross section. On account of the high fills these structures are sometimes over 300 feet long, giving the appearance of a short tunnel. All of these concrete structures give the impression of being excellent in the character of their construction as well as in design, and this quality will undoubtedly have a good influence on future construction, because of the very large number of engineers and contractors who have visited the work on the cut-off.

The preliminary investigations in regard to foundations were so thorough that it was not necessary to revise the plans of structures after the required excavations were made. This feature deserves special mention because it is frequently not given adequate attention, and in that case it either leads to a considerable increase in subsequent cost of the structure above what it would have been if the true conditions had been known before the design was first made, or it places extra burdens upon the contractor for which he is not fairly responsible.

Considerable increase is noticeable in the construction of reinforced concrete slabs supported by concrete pile bents thus forming a trestle on which the regular ballast and track are carried. There are many localities where a low trestle must be used in order to avoid restricting the openings for flood waters. At certain intervals a concrete pier is substituted for a pile bent in order to give addition resistance to longitudinal traction. The Chicago, Burlington & Quincy R. R. has been a pioneer in this type of construction, the Chicago, Milwaukee & St. Paul, Rock Island, Northern Pacific and western railroads either have built similar structures or have adopted plans for future construction. The reinforced concrete slab for short openings has been adopted as standard on a large number of the leading railroads of the country. The track elevation of the Chicago, Milwaukee & St. Paul R. R. in Evanston, is notable for its successful application of the slab and ballast deck with intermediate supports on beams and columns on the lines of the curb at street crossings.

The same railroad has made the most extensive

development of the hollow abutment. The form most frequently used is the reinforced U-abutment with arched openings on the sides and slab top, the sides being merely curtain walls to support the slabs. The retaining wall feature is largely eliminated. In the more advanced form arched openings are run in both directions leaving heavily reinforced pillars or column to support a part of the slab floor.

The largest reinforced concrete beam which has probably been built in this country was observed last November under construction at Tacoma, Wash., where North 23rd Street crosses Buckley Gulch. The viaduct has seven spans, of which the largest is about 68½ feet. Two beams carry a total width of roadway and sidewalks of 42 feet and the floor beams are spaced a little over 7½ feet between centers. The beams in the long span are 6 feet wide and 10 feet deep. A detailed description of this design will doubtless be prepared for publication in due time by the Consulting Engineers, for the engineering profession must be interested in the design and construction involving beams of such magnitude. Their observation under traffic ought to furnish important information as a guide for future designs.

The use of concrete piles for the foundations of both bridges and buildings is extending very rapidly. Most of those now in service are of patented forms in which the pile is cast in place after a hole is formed by means of a steel core or a hollow pipe fitted with a point. Frequently the opening is lined with sheet iron to maintain its shape until the concrete is deposited.

In the other class employed the piles are molded in forms and reinforced in longitudinal bars which are tied together at intervals by wire. These piles are driven like timber piles with the aid of the water jet and hammer. Some of the designs are also patented while others are not. On railroad construction at least, the piles which are molded, and driven after seasoning, are regarded with increasing favor.

A new development in foundation work consists in building open caissons of reinforced concrete instead of timber or steel. At Black Rock on Niagara river a caisson of this character was successfully sunk in 1910 through 50 feet of very tough red clay to the rock bottom. The frictional resistance was found to be greater than that heretofore recorded either with or without the pneumatic method of sinking. The caisson was sunk for the pivot pier of the new swing span of the Grand Trunk R. R. bridge, necessitated by the construction of the new lock and canal built by the United States.

At Portland, Ore., caissons of a similar type were used for two bridges over the Willamette river, one for Hawthorne avenue highway bridge, and the other for the bridge of the Oregon Railroad and Navigation Co., which also accommodates highway traffic. These foundations had to be sunk to a depth of about 120 feet.

The great advantage in using concrete in these caissons is that when the sinking is completed and the interior is then filled up with concrete the walls and portions of the caisson become a permanent part of the substructure.

The use of reinforced concrete in the roof of pneumatic caissons has reduced the amount of timber very materially, and correspondingly reduced the compressibility of the roof when the pier and its load are supported. In the caissons of the McKinley and Municipal bridges at St. Louis, the timber in the roof

of the air chamber consists of one layer of 12 by 12-inch and 14-inch timbers respectively, and a lining of 3-inch plank.

The progress in pneumatic foundations during the past forty years is shown comparing the construction of the foundations for the Municipal bridge in 1910 with those of the Eads or St. Louis bridge and in which the depths are nearly the same. The total time including delays was cut down over 50 per cent., the loss of human life due to caisson disease was reduced to but a small fraction of that entailed in the older structure, while the cost of the substructure per cubic yard has been reduced about 70 per cent.

As another illustration of the use of reinforced concrete in substructures, reference may be made to the protection pier of a swing bridge over Red river in Alexandria, La., on the Missouri Pacific Railway system. So far as the writer knows this is the first time that a protection pier has been built of this practically permanent material.

The use of reinforced concrete in building construction is steadily advancing. The value of a rigid building in reducing the cost of maintenance of machinery is becoming more evident with increasing experience. In one six-storey building where considerable machinery is employed the cost of maintenance is several thousand dollars a year less than in the old structure with its floor vibrating under the machines. In another case where the operatives experienced serious fatigue due to vibration in the old building, they find considerable relief since the presses are installed in the new concrete building.

In a new concrete building on pile foundations used for a flour mill, a series of gyrators weighing four tons each on the fourth floor when rotating 150 times per minute produce scarcely a tremor. When the machinery was once lined up true it remained in that condition.

It is interesting to notice the character of the floor construction in office and mercantile buildings. In Greater New York the beam and slab construction is used almost exclusively, if not entirely so. In Boston only about half of the floors are of that form, while the flat ceiling is used for the balance. In some of the narrower buildings only transverse beams about ten feet apart are used, thus interfering less with lighting from the two sides. In St. Paul and Minneapolis the flat ceiling or mushroom construction predominates in a large degree. In Chicago and St. Louis a third form is being introduced in which the beams are shallow and about four feet wide, running in both directions giving the effect of a paneled ceiling. In Seattle the flat ceiling is used only to a limited extent.

In the tall steel buildings the reinforced concrete slab floor seems to be used in the majority of cases, the slabs being supported by encased steel beams. In some of the lower office buildings steel columns are used, with enough steel in the form of horizontal bracing for the steel frame as well as for the reinforcement of the concrete beams. Such steel bracing may take the form of pairs of angles laced. They are strong enough as beams to support the forms for the concrete beams which envelope them, as well as the floor slabs.

It may be of interest to call attention to the severe test applied by the forces of nature to the reinforced concrete arches of Long Key Viaduct on the Florida East Coast R. R. The arches are full centered and have a span of 60 feet. The top of the spandrel walls

is about 30 feet above mean sea level. Since its construction the viaduct has been subjected to the combined action of wind and waves in the hurricanes of 1909 and 1910. The ocean waves broke over the top and cut out the track filling, but the concrete arches withstood the fury of the storm practically uninjured.

It is interesting to find an engineer who is a master in the design of simple structures especially when the material used is timber. It is unfortunate that so many engineers have regarded the design of many of the details of timber structures as unworthy of their serious study and have turned them over to the master carpenter for solution. For this reason the development of timber design has been materially retarded, while modern conditions have not been adequately met.

In Seattle, the plans were seen of an auditorium in which all the timbers of the roof trusses were connected at the joints by spikes or nails except at the end joint where a casting and bolts were used. Since the structure was intended for temporary use, this method of framing was especially appropriate. The engineer made the design of every detail, however, the plans show the location and size of every spike, with proper spacing and relation to the grain of the wood, and a knowledge of the strength of nails based upon experimental investigation. It is readily appreciated that this method gives cheap and rapid construction.

The same engineer used the same details in the design of a truss span which in connection with a trestle was required for construction purposes at a power plant. The bridge had to be built across a deep gorge where falsework could not be used, and the only means of crossing the gorge was a suspension foot bridge that would permit one man to carry one plank across at a time. These unusual conditions were met by using planks and spiked joints in building each half of the truss, and of its connection to a counterweight consisting of a box of sand, then rolling it out on the bank until the projecting cantilevers could be united at the middle. The central span consisted of 10 panels each 16 feet long, and was designed to carry an electric locomotive and dump cars.

A number of evidences were found of a tendency to develop a more rational type of contract for construction. In the ordinary form of contract the usual tendency is to place the whole burden of responsibility upon the contractor even if there are many uncertain elements due to lack of information. In many cases the owner and his engineer omit to make the previous investigations regarding actual conditions affecting foundations or other details and as a result there is an element of gambling in the contractor's bid. Sometimes the engineer does not even assume full responsibility for his own plans.

As an illustration of a new and equitable method of payment, the contractor is to be paid for the actual cost of labor and material, plus a given percentage for the use of his equipment and organization including profit, plus a bonus of a certain percentage of what he can save below an approved estimate of cost, minus a penalty consisting of a corresponding percentage of any excess of cost over the estimate. Such a contract makes it to the interest of both parties to cooperate in advancing the work, and it furnishes an incentive to the contractor to maintain or improve the efficiency of his organization.

Another element of progress which is apparent as one observes new construction throughout the country, is the increased attention given to a systematic arrangement of the work. This is particularly noticeable in reinforced concrete building construction, and the remarkable speed with which good work of this kind is done to-day is largely due to an orderly arrangement of the work of the different groups of men engaged in the erection of forms for columns, beams and slabs, placing reinforcement, depositing concrete, and the many other operations incident to the handling of the material and placing it in position, without interfering with each other.

It is very instructive to see the careful analyses of cost for both material and workmanship which are made by some of the leading contracting engineers for buildings under construction, by means of which it is possible to prepare fairly accurate estimates of buildings of different forms and subject to various conditions. The number of elements considered at present in this connection is very much greater than was regarded necessary some years ago. There are bills of material for the time keeper, superintendent, and the purchasing department; costs of material and of labor, divided by storeys in the building; columns, beams, windows, and other details are all numbered according to a simple plan, so that every item can be located promptly. There are preliminary estimates to answer the questions that arise when a project is under consideration; official estimates for the tender of bids; and final statements of cost, and a discussion of the variations between them that may be of service in future work.

Victoria's Large Paving Project

The city of Victoria is now carrying out a great paving project. Thirty-six miles is the length of the pavement to be laid. The cost will be about one and one-quarter million dollars. Work was started on June 9th and will be finished by the first day of January, 1912. The paving consists of asphalt laid on cement. The area to be covered is 625,000 square yards.

The contract for the entire work was awarded to the Canadian Mineral Rubber Company. The statement has been made that it was the largest individual paving contract ever awarded. The company is using a plant worth \$150,000. The work is being done under the supervision of J. E. Keppes.

At different points along the thirty odd miles of streets which are included in the paving contract, the company has stored immense quantities of sand to be used for the concrete basing as the work advances to that stage. Along the different streets as they are being graded, where possible, the curb and gutters are being laid, this construction being carried on at the rate of from 1,500 to 1,700 lineal feet per day.

Included in the plant necessary to such extensive operations are three steam propelled rollers, averaging in weight from seven and a half to eight tons each; an elevated grader hauled by a traction engine which directly conveys the dirt into wagons; and 104 wagons, which provide employment for from 150 to 200 men. At the headquarters of the company on the harbor front is also located an immense electrically worked derrick for lifting the sand into the bunkers from scows. Another derrick is located on the Ross Bay waterfront.

Two remarkably large cement mixers are being used in connection with the work, each weighing some 137 tons,

and each capable of handling continuously from 90 to 100 tons of gravel. These plants, which are transported from place to place by rail, are each 66 ft. 5 in. in length, the maximum length of any car allowed on a railroad. The machinery by which the asphalt is mixed is interdependent in the process of turning out the material ready for laying on the streets. Machinery moves the gravel out into the large receptacle above the furnaces, another machine is there for grinding the gravel, yet another for screening is so fine that a pin head point is not overlooked. Automatically the asphalt material, while at a temperature of 360 degrees is loaded into sheet iron asbestos-lined wagons, and in this condition, with the minimum of delay, conveyed to the points where the paving is in progress. Three smaller mixers are also being used, one driven by gasoline and the other two by steam.

A Western wheeled scraper is also used in connection with the work and the outfit includes two asphalt plants.

Comparative Cost of Fireproof Construction

Philip H. Bevier, C. E., addressing a society at Orange, N. J., on "Fireproof Construction," gave the following interesting figures as to the comparative cost and arguments as to public and private utility:

"At the present price of building material, fireproof construction can be erected at a cost of not to exceed 10 or 15 per cent. more than non-fireproof, and when we consider that fireproof buildings deteriorate about one-ninth of 1 per cent. per year, as compared to 4 per cent. for ordinary buildings; that they rent better and that money can be borrowed on them on better terms; that they are vermine-proof, cooler in summer and warmer in winter, it would certainly seem a part of wisdom and self-interest to adopt a better method in every case when the building is to be of a permanent character.

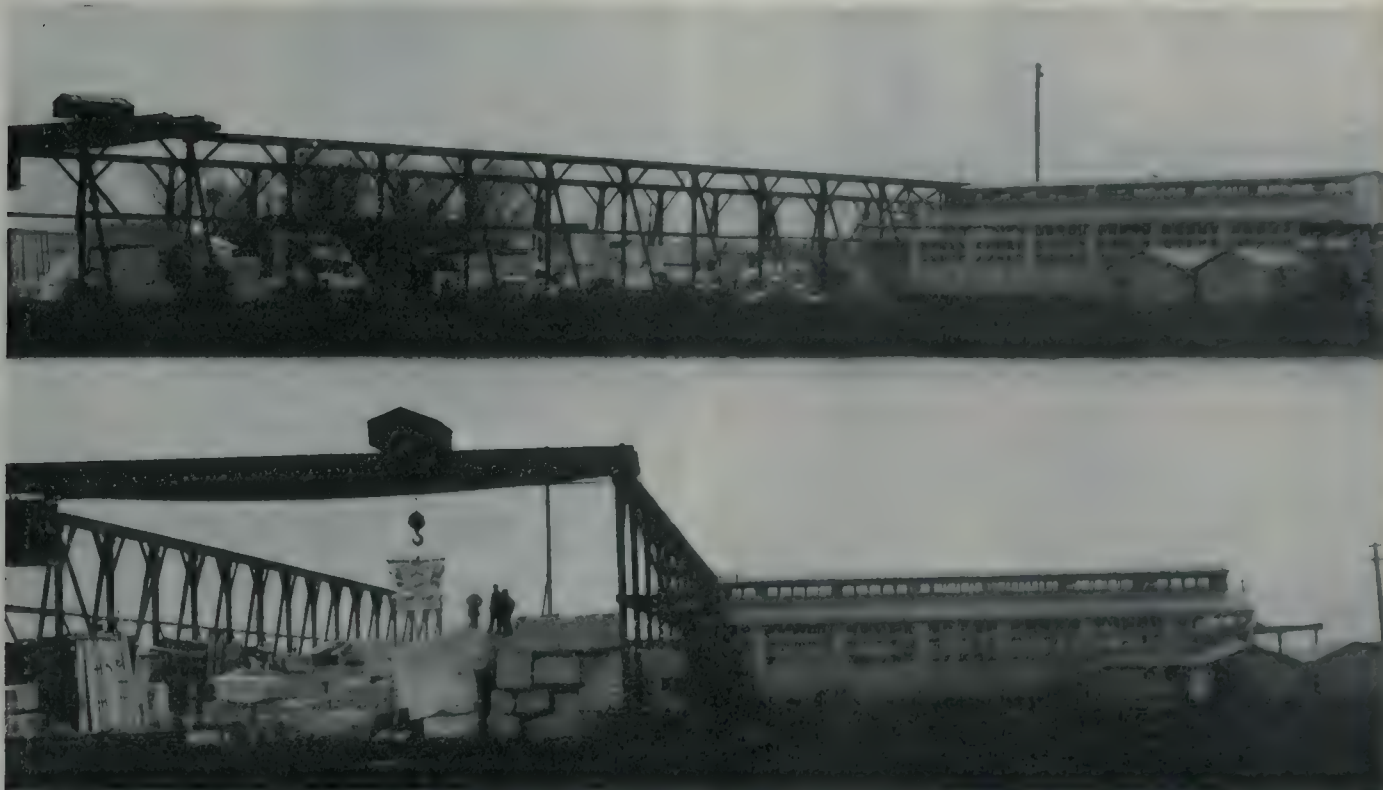
"When a man builds a house in the country, it may be that he had a right to jeopardize his own life and property and those of his family and gamble with the insurance companies, but there is no question that the owner of the property in a city or town has no right to erect a structure which will be a menace to the safety of the property of the adjacent owner. This principle is clearly recognized in practice, and many of the smaller cities are adopting building codes requiring fireproof construction throughout a certain portion of the business section, and semi-fireproof buildings in less congested districts.

"If one-half of the money spent by American cities for fire losses was spent for better building construction, the annual loss by fire would soon begin to decrease. Improvement along the line of better construction can only come gradually. It can and should be hastened in thickly settled communities and the individual shown that his own pecuniary interests lie in lessening the fire waste. Old buildings cannot be torn down at once and rebuilt, but we can see to it that no more fire traps shall be built where they are a menace to other structures."

The rate at which Vancouver is outstripping Seattle is perhaps more conspicuously indicated by a comparison of building permits than in any other way. The statistics of the two cities for July and for the first seven months of the year show that in both cases those issued locally have amounted to considerably more than double those of the Puget Sound metropolis. The exact figures are \$541,600 for Seattle, against \$1,108,378 for Vancouver. For the first seven months of the year the Seattle total was \$4,513,935, as compared with \$10,296,784 issued in this city.

Some Canadian Stone Cutting Plants

The Iberville and Toronto Shops of the Norcross Bros. Company - The handling and Working of Large Stone Pillars—Description of Plant and Machinery



Views of the plant at Iberville

The Norcross Bros. Company, Limited, with headquarters at Worcester, Mass., have established in Canada two of the most up-to-date plants for the cutting and finishing of the various kinds of granite, marble and sandstone to be used for their Canadian contracts. The company has sixteen plants in the United States, with nearly \$12,000,000 worth of work at present under construction. This immense business has been in the process of development since 1865, being one of the pioneer building organizations of that country. The founder of the firm was Mr. O. W. Norcross, who is now president. With him are associated Mr. Wm. J. Denholm, as vice-president; Mr. A. G. Park as treasurer, and C. A. Perry as Canadian manager.

The business established at Iberville is a thoroughly Canadian enterprise, and has associated with it a more recently installed plant on Logan avenue, Toronto, which commenced operations some little time ago and is now the largest stone cutting works between Montreal and Winnipeg.

One of the first facts which strikes anyone upon entering either of these plants is the remarkable facilities that are at hand for the handling and working of pieces of stone of all sizes. The plants are both well lighted and ventilated, and the comfort and safety of the stone cutters has been well looked after. Each plant is designed to employ from 100 to 150 men.

The working space in each plant is served by two overhead travelling cranes with continuation of track at each end of the building for yard work.

In granite cutting an important part is the keeping in excellent order all the tools and machinery used. A black-

smith shop is a very necessary department, and the above works are well equipped for this work with forges and compressed air, whilst in another department are to be found some huge grindstones for tool sharpening, each with an 8-inch face and 6 to 7 feet in diameter. The carpenter shop



Train Loads of Stone upon arrival from quarries

also is equipped with woodworking tools for the boxing of the finished product before shipment.

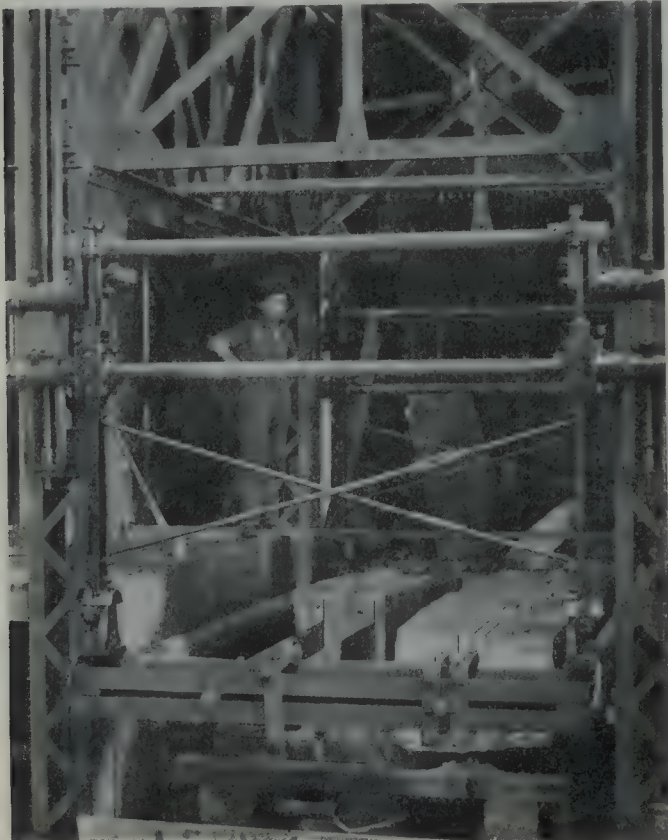
Each plant is furnished with an air compressor system supplying in the neighborhood of a thousand feet of air per minute with additional compressors for reserve in case of accident or breakdown, all of the granite and marble cutting and chipping being performed by the use of compressed tools. The compressors are run by electric motors, those of Iberville being supplied with current generated at Cham-

bly and transmitted to the works at 2,200 volts, part of the machinery being operated at that voltage and part requiring a step down of the current to 550 volts. In this respect the whole plant is operated on the unit system and provision has been made for further development.



The Rough Stone and the Finished Product

In their completely equipped and modern machine shops for taking care of all repairs, a very important feature in connection with the stone business, the company have in operation a large force of lathes, drills, etc., insuring prompt and quick work and independence from outside sources.



Gang Saw in operation, Toronto Plant

The Iberville plant is situated in the suburbs of the town, and has seven acres of space for operations. It has facilities on five different railway lines in the vicinity, sidings from the C. P. R. and G. T. R. being already on the land, while those from the other roads are being put in.

One of the accompanying photographs shows one of four huge monolith marble columns, which are said to be the largest ever shipped out of a marble quarry in the United States. They are 32 feet 2 inches in length with an average



Monolith Pillar over 32 feet long, Iberville

diameter of 4 feet 2 inches, this being the size of the finished monolith shaft. They are being cut in the Ionic order of architecture for the new Art Museum to be located on Sherbrooke street in the city of Montreal. They will each weigh twenty-six tons and are worth at the quarry in the neighborhood of \$800, while in the finished form their value will be between \$4,000 and \$5,000 each. The huge outdoor overhead travelling crane which handles these Titanic

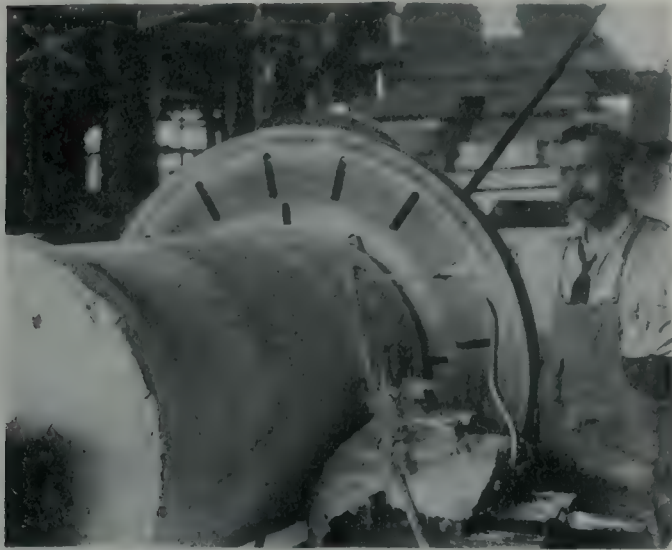


At work on Fancy Patterns, Toronto

pieces has a runway of 75 feet span and 380 feet length, the C. P. R. and G. T. R. switches passing underneath.

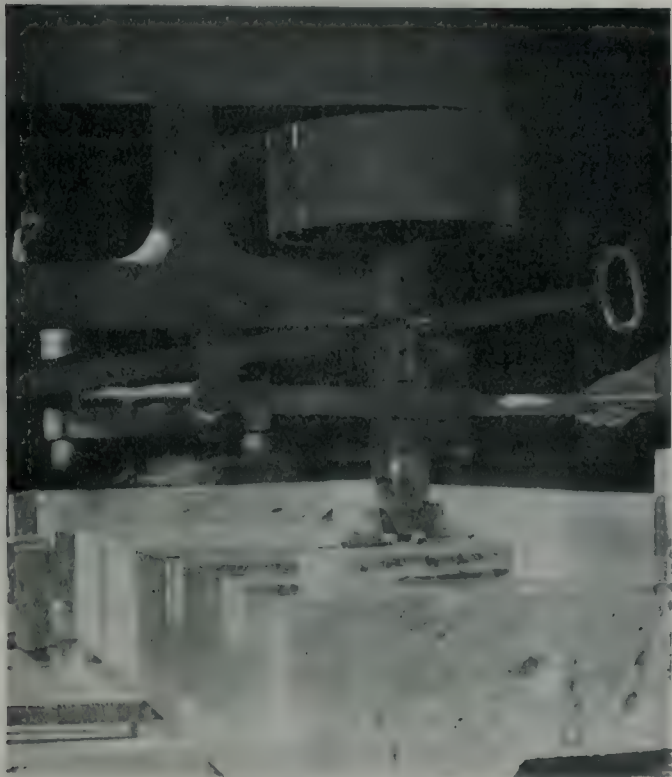
A brief description of the operation of the Toronto plant may be obtained from the following photographs. One illustration shows a gang saw with straight or parallel cut, of which there are two. In addition there is also a gang saw with pendulum motion in operation. These machines handle the immense blocks of rough material that come into the works and cut through them at the rate of $2\frac{1}{2}$ to 3 inches per hour. The illustration shows also the method

of putting chilled steel shot into the cuts to facilitate the action of the saw teeth. In contrast to these machines one that surpasses them for speed in steel and stone cutting is a circular machine with specially designed teeth, which operates through about $1\frac{1}{2}$ inches per minute upon the block of stone subjected to it. For the cutting of pillars a large cylindrical saw toothed at the base is used. From



Pillar in position in lathe

it the product is placed in the turning lathe shown in the illustration, where it is operated upon by an ordinary cutting tool and brought to within one-quarter to one-eighth of an inch of the desired dimension. It is then either placed in the hands of the compressed air chisel brigade, or goes to polishing machines, of which there are a number of types. Additional illustrations show various machines and polishers used in the works. The machines, including the air compressors, are electrically driven here also.



Polisher at work on Marble

The firm owns and operates a number of quarries turning out the following kinds of granite: Milford, Mascona and Bradford Red, Troy and New Hampshire Grey, Bethel white, and Windsor green. They also produce marble of the following kinds: Dorset, Danby, Tuckahoe and Georgia white. They are, from their wide experience and ample facilities, quite at home in handling granite, marble or soft stone of any color which the architect may specify, and from the foregoing description it may be inferred that greatest promptness and thorough carefullness may be expected from the well established firm.

Sand-Lime Brick Output

According to a bulletin of the United States Geological Survey, the production of sand-lime brick in the United States last year was \$1,169,153, being the output of 76 factories.

Michigan led in 1910, as for several years, and reported products valued at \$240,649; this was a gain of \$22,423, or 10.28 per cent. over 1909. Michigan's product constituted 20.58 per cent. of the total value of all sand-lime products



Several of the Milling Machines in use, Toronto

in 1910, and 18.97 per cent. of the total of 1909. Minnesota was the State to show the largest increase—\$41,181, or 36.42 per cent.—and was second in value of product in both years; New York was third in both years, Florida fourth, and Pennsylvania fifth. Of the States for which totals are given Indiana showed the largest proportional gain, 93.70 per cent.

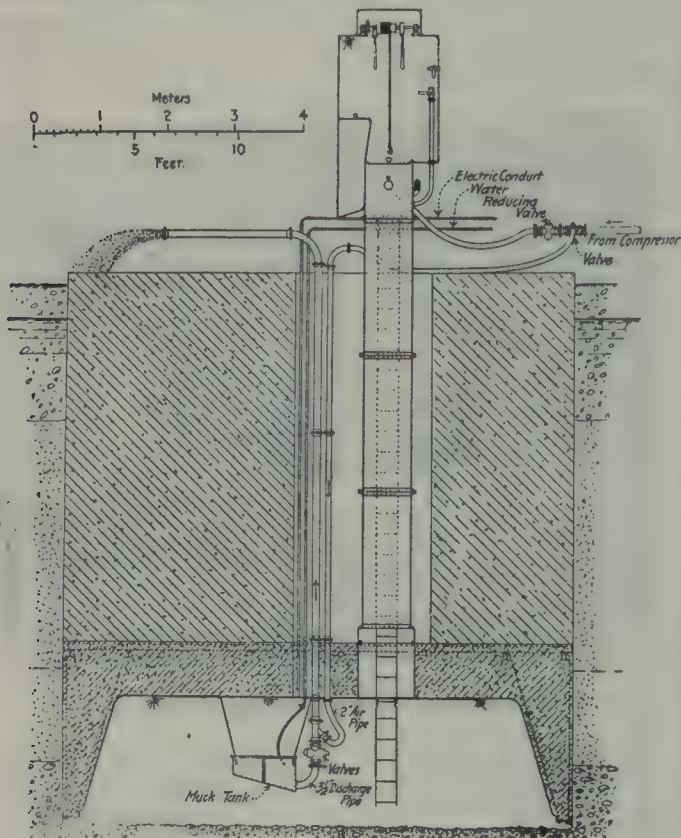
The average price per thousand received for common sand-lime brick was \$6.36 in 1910, as compared with \$6.39 in 1909, and \$6.33 in 1908; for front brick, \$10.90, as against \$11.98 in 1909, \$12.16 in 1908, and \$10.96 in 1907. In 1910 common brick yielded 87.57 per cent. of the value of all products; front brick, 10.53 per cent.; and all other products 1.90 per cent. In 1909 those percentages were 77.12, 13.35, and 9.53, respectively.

A comprehensive survey of all the rivers and streams of British Columbia, to determine the volume of water and power available, is to be carried on during the next few years under the direction of the Canadian conservation commission. Similar work will be carried out for the other provinces. A start has already been made in British Columbia. The principal work this season will be devoted to the waste water powers on the Fraser River, Kootenay and Columbia Rivers and their tributaries.

Pneumatic Muck Ejector

The cut here reproduced from Schweizerische Bauzeitung is a diagrammatic representation of a specialized form of pneumatic muck ejector used in caisson foundation work at Aaran, Switzerland, as described by G. Luscher, its designer. The usual air supply is maintained in the working chamber of the caisson sufficient to resist the water inflow corresponding to the depth, but as pneumatic tools are used in the caisson, an air supply is maintained sufficient to operate them while exhausting into the air of the caisson. The entire air supply is in fact furnished at the higher pressure, while the caisson pressure is controlled by passing that portion of the air through a pressure reducer.

The ejector comprises a hopper-bottom muck-tank, a valve discharge pipe leading from the bottom of the tank to the open air, a valved auxiliary, high pressure air pipe leading into the discharge pipe at an acute angle, and a water pipe for furnishing water to keep the contents of the tank



Diagrammatic Sketch of Ejector.

in fluid condition. The tank is made in sections, so as to permit taking it through the air-lock. The discharge pipe as used was $3\frac{1}{2}$ in. diameter, the high pressure air pipe 2 in. The latter pipe joins the discharge pipe at a forward angle of about 45 degrees.

In operation, the tank is filled with muck, and if this is clayey in nature sufficient water is added to enable it to be blown out, while sand is handled without water addition. The discharge valve being kept closed, the auxiliary air valve is opened, producing a strong ejector action in the discharge pipe. Then the discharge valve is opened, and the muck is blown out very rapidly. The tank is kept constantly supplied by shovelers; whenever the tank becomes nearly empty the discharge valve must be opened at once, to prevent serious loss of air from the caisson.

The working principle of the apparatus is that the caisson pressure is used only to force the material far enough for the ejector action of the auxiliary or high pressure air to take hold of it; the latter then does the main part of the lifting.

A New Industry

The John McDougall Caledonian Iron Works Company, Limited, of Montreal, have entered upon the manufacture of both plunger and electric elevators for either passenger or freight purposes. They have secured the services of Mr. Thure Larsson, for many years chief engineer of the Standard Plunger Elevator Company, of New York, and of the superintendent of construction of that company, and, at the same time, the control for Canada of the Larsson elevator patents.

For the plunger elevator, these patents include a new main valve which eliminates any bounding of the car when stopping, a new cam automatic terminal stop valve, and a new pilot or control valve which prevents any accidental movement of the car in the opposite direction when passengers are entering or leaving. The patented improvements on the electric car embody the good features of the drum and traction type and eliminate their bad ones and give greater security and economy in operation.

These elevators will be built in the company's shops in Montreal, where they have just completed 11 passenger and freight elevators of the plunger type, with lifts varying from 40 feet to 176 feet for the C. P. R. Windsor Station extension.

Raymond Concrete Piling

The Raymond Concrete Piling Company of Canada with offices at 405 Dorchester street west, Montreal, has just completed for the C. P. R. an important piece of work for a viaduct between Edmonton and Strathcona, Alta. The contract involved the placing of 1500 Raymond piles. The general contractors for the viaduct are, John Gunn & Sons, of Winnipeg.

This system of piling has been adopted for the two new sheds now being erected on the Tarte pier in Montreal Harbor for which Mr. E. G. M. Cape is the general contractor. About 1400 piles will be used on this job.

The Raymond Company has also been awarded a contract for the piling on which will be constructed an extensive addition to the Harbor Commissioners' elevator No. 2 now under construction by the John S. Metcalfe Company of Montreal. One thousand piles or more will be required on this piece of work. The original plan of this elevator provided for a capacity of 1,772,000 bushels of grain; the addition will provide for 848,000 more at the west end of the main structure. About 800 men are employed on the job. It is expected that the elevator will be equipped and ready for operation about a year from now.

By the Raymond system a sheet metal tube containing a steel core is driven into the ground to an average depth of twenty feet; the maximum depth being forty feet. When the penetration required to carry the desired load has been reached the core is collapsed and withdrawn and the shell which remains in the ground is filled with concrete. The core is conical in shape being six inches in diameter at the point and twenty inches across the top.

We have just received a copy of the Bell Bros.' catalogue describing their process for the purifying and softening of public water supplies. The booklet contains an instructive treatise on the properties of filtration systems, results of numerous tests from chemical and bacteriological laboratories, in addition to numerous descriptions of installations. The publication constitutes 80 pages of valuable matter for manufacturers, municipalities and physicists. The Bell Filtration Company, of Toronto, are Canadian representatives of the firm, whose headquarters are in Manchester, England.

Montreal News

The city has purchased a house at 209 Champ de Mars street for the purpose of a juvenile court, at a cost of \$13,500. Further funds are to be voted for fitting up the house.

The Board of Control has been instructed to consider the question of making an offer for the structure of Laval University, St. Denis street, for a civic library. The administrators of the university have under consideration the removal of the institution and the disposition of the present building, and the idea of the council is to exchange a vacant lot boarded by Park, Pine and Duluth avenues, for the building now occupied by Laval University.

The police committee of the Westmount city council has made a recommendation that the council accept the tender of the St. Lawrence Wagon Company for a new hose sleigh, \$265, and repairs to the ladder \$210; also the tender of the Dominion Bridge Company for steel work on the new fire station for \$4,420; and that of M. J. Quigley for plumbing in the fire station to the amount of \$1,080. The road committee recommended the expenditure of \$7,500 on drainage, sidewalks, etc.

The first meeting after the holidays of the Province of Quebec Architects' Association will be held at their rooms, Beaver Hall Square, September 5th. A committee is arranging a programme of technical papers to be read during the coming season which will be announced shortly.

The awards in the competition of plans for a new library to be erected by the Seminary of St. Sulpice, on St. Denis street, Montreal, have just been made. The first prize of \$1,500 goes to Mr. Eugene Payette of 103 St. Francois Xavier street, the second of \$600 to Mr. J. O. Marchand, of Marchand & Haskell, St. James street; the third of \$300 to Mr. Joseph Venne, Beaver Hall Square. There were eleven competitors. The Seminary has accepted the design of Mr. Payette subject to minor alterations.

Trade Notes and Items of Interest

Building permits issued in Vancouver for the first half of the current month amount to \$745,468.

Superintendent Richley, of Dill, Russel & Chambers, contractors on the Toronto filtration plant, states that their part of the work on the construction of the plant will be entirely completed late in October.

The Goodyear Tire & Rubber Company of Canada, Limited, have received an order for 12,000 feet of elevator belting, which is the rubber belt equipment of twenty-seven elevators for the Province of Saskatchewan.

The Nova Scotia Construction Company, of Sydney, N.S., has been awarded the contract for the construction of the Canadian Pacific Railway branch line in Quebec, of a breakwater at Brooklyn, Shelburne County, and of the power house for the Windsor Hotel, Montreal.

City Engineer Blanchard, of Lethbridge, is making a number of changes since taking up his official duties in that city. One of these is a complete reorganization of the city engineer's department, dividing it into three branches, a record branch a public works branch and the buildings branch, the heads of each being directly responsible to the engineer.

Experiments in France have shown that natural turf is an excellent material from which to form beds for the filtering of sewage. A volume of between three and four

cubic meters of sewage can be purified every day for every square meter of the surface of the turf. A turf filter that has been in use for some time shows no diminution of efficiency.

The contract for the balance of the Canadian Northern line from Kamloops to the British Columbia-Alberta boundary reaching rail-head from the prairies was awarded recently to the Northern Construction Company, and the Cowan Construction Company conjointly. This is the largest contract that has been let for some time in the west and one of the largest ever let in Canada. It will be a most difficult piece of work as the greater part of it will be mountain construction.

A faulty piece of construction work is much in evidence in the city of Hull, Que. The city's main sewer, recently laid, has sunk in places to a depth of nearly five feet, and the pipes have broken a number of joints, the result being that the sewage is flowing overground into the lake at several points. Along the lake, where the earth is not of a sustaining nature, two rows of tiles were driven down to the rock about two feet apart, and carried beams which supported a row of 2-inch planks, upon which the pipes were laid. The white mud into which the piles were driven has not proved hard enough to support them laterally and they have swayed out of plumb. The contractor will be required to reconstruct and repair the damage.

Five days in jail was the sentence passed by Judge Leet, Montreal, in the case of Jules Gratton, accused of intimidating the workmen and preventing others from seeking employment during the progress of a strike by carpenters in the employ of P. Lyall & Sons. The Judge said it was clear that men had been prevented from going to work; but as the evidence against the defendant was not conclusive he gave him the benefit of the doubt. On the charge of intimidation and using threats to those who applied for positions there was strong evidence by the detectives, on which he found the defendant guilty. The maximum penalty was a fine of \$100 or three months. The Judge continued: "It seems to me that in cases of this kind when the rights of others are interfered with that \$100 is not enough. This is a small sum and as in the present case the union will pay at a cost of a few cents to the members, and nothing for the accused. As this is the first case I will not impose the fine but sentence the accused to five days in jail." The case has been appealed, and will be heard in the Court of King's Bench on September 11.

The Polson Iron Works will build a new steel dry dock and repair shop on Toronto Harbor. It is expected that the new dock will be ready for use early next spring. The dock will be built in three sections, which, when coupled, will be 600 feet long by 100 feet wide, and will when finished have a lifting capacity of 9,000 tons and will be able to handle the largest vessels now on Lake Ontario.

The equipment will be the latest up-to-date in everything. The pumps will be operated by electric power, and each of the three sections of the dock can be used as a separate dock. The two sections now being built will each accommodate steamers up to 175 feet. In cases where large boats are to be built, two sections will be joined together. New steel sheer-legs of 100 tons lifting capacity are to be installed.

The Polsons Company have decided to locate the dry dock at the foot of Frederick street, just west of the company's present plant. One hundred and thirty-six feet of land has been leased from the city, on which a basin will be blasted to the depth of 28 feet to accommodate the floating dock.

Contracts Department

News of Special Interest to Contractors, Engineers, Manufacturers and Dealers in Building Supplies.

Information for insertion in these columns is invited from Architects, Contractors, Engineers, etc.

Waterworks, Sewerage and Roadways

Dauphin, Man.

Tenders called for waterworks and sewerage. Owner, Town of Dauphin, Man.; mayor, H. F. Caldwell; chairman, D. D. McDonald; secretary-treasurer, J. W. Johnson; engineers, Chipman & Power, Mail Bldg., Toronto. Constructing the following works: Contract I.—Dam and gate house in Riding Mountains, for waterworks reservoir. Contract P.—Substructure sewerage pumping station in Dauphin. Plans at Dauphin or at offices of the engineers, Toronto and Winnipeg. Tenders received by secretary-treasurer until 8 p.m., September 5th.

High River, Alta.

By-laws to be submitted for waterworks and sewerage. Owner, town of High River; clerk, W. E. C. Holmes. Plans call for a steam pumping station and compressed air sewer ejector. Level too low to drain sewerage by gravity. By-law to be submitted on September 5th to raise \$125,000, 40 years 5 per cent. debenture bonds.

High River, Alta.

Tenders to be invited for cement sidewalks. Owner, Corporation of High River; secretary-treasurer, Geo. E. Mack; 10,000 square feet cement sidewalks to be laid. Tenders for which will be called this month.

Kingston, Ont.

Dr. A. B. Williamson, M.H.O., states that the system of water supply is very unsatisfactory, and the municipality are contemplating the installation of a filtration plant.

Magrath, Alta.

The council intend to submit a by-law to raise \$11,000 for the laying of sidewalks.

Moorefield, Ont.

Tenders called for municipal drain No. 1. Owner, Tp. of Maryborough; township clerk, W. W. Scott, Moorefield; engineer, C. D. Bowman, West Montrose, Ont. Construction of drain, containing about 43,000 cubic yards of excavation. Plans, etc., at office of Tp. Clerk or at office of engineer. Tenders received until 2 p.m. September 4th by township clerk. Advertisement in "Tenders and For Sale Department" of this issue.

Montreal, Que.

The city of Montreal, assisted by the Federal Government, will cover the section of the Little River St. Pierre running through the city limits, at an estimated cost of \$150,000. The covering will be of concrete and may be constructed so as to make a driveway.

New Westminster, B.C.

Drainage system. Petition presented by property owners of Queensborough for drainage into river. A pump is among the requirements. Matter referred to city engineer for preparation of by-law.

Oshawa, Ont.

Equipment required for asphalt block pavement. Owner, Corporation of Oshawa; engineer, Frank Chappell, C.E. Required up-to-date street cleaning apparatus, sweepers, etc. Apparatus required October or thereabouts.

Ottawa, Ont.

Tenders called for waterworks supplies. City engineer, N. J. Ker, Ottawa. Tender for 30-in. c.i. pipe and thirty special castings. Specifications at office of city engineer. Tenders received by chairman, waterworks committee until August 29th.

Revelstoke, B.C.

The Corporation of Revelstoke will extend their waterworks one mile. Piping supplied by the Pacific Coast Pipe Co. Work being done by day labor. Engineer, J. B. Scott.

Roche Point, B.C.

Waterworks, Strathcona D. L. 543. Engineer, Mr. Cosgrove, North Vancouver. Preliminary plans for waterworks for eastern part of municipality have been prepared. Initial plans provided for supplying Red Fir Lum-Co. with water. Tenders will be called for installation of main a distance of 4,000 feet, which, although temporary, foreshadows a large scheme.

Tp. of Stamford, Ont.

Tenders to be called for cement sidewalks, \$7,000. Clerk, C. Munroe, South End, Ont.; engineer, J. Gardiner, Niagara Falls, Ont. At the next meeting of township council tenders will be called for cement sidewalks. Estimated expenditure, \$7,000.

Tp. of North Darchester.

Tenders called for drain, Lots 12, 13 and 14, etc. Clerk, W. B. Lane, London, Ont. Construction of drain. Plans, etc., at office of clerk. Tenders received by clerk until August 28th.

Toronto, Ont.

Tenders called for sewer. Owner, city of Toronto; city engineer, C. H. Rust. Construction of sewer on Curzon street from Myrtle avenue to 530 feet south. Specifications, etc., at office of city engineer. Tenders received until noon August 29th.

Tenders called for laying water drain, Yonge to Broadview. Owner, City of Toronto, G. R. Geary, Chairman, Board of Control. Excavation, laying and jointing of 16-in. c.i. water main along Rosedale Valley Drive. Plans, etc., at office of city engineer. Tenders received by chairman until noon August 29th.

Tenders called for main drainage works. Owner, City of Toronto. G. R. Geary, Chairman Board of Control. Storm overflow sewers (Sorauren Div.) total length 8,897 lin. ft., including laying of 30 and 36-in. concrete pipe and supply and laying of 24-in. c.i. pipe and 15, 18 and 24-in. vitrified pipe; storm overflow sewers (Manchester Div.), 906 lin. ft. of 3-ft. 4-in. x 3-ft. 8-in. concrete culvert in open cut; high level interceptor (Sec. No. 14) 985 lin. ft. of 3-ft. x 4-ft. 6 in. egg shape, brick in tunnel. Plans, etc., at office of city engineer. Tenders received by Chairman, Board of Control, until noon September 12th. Advertisement in "Tenders and For Sale" department of this issue.

Tenders called for pavements and concrete walks. Owner, City of Toronto; G. R. Geary, Chairman Board of Control. Asphalt pavements on Delaware avenue, Edwin ave., and Edgewood Crescent; Saskville and Somerset ave.; bitulithic pavements on three streets; brick block pavements on Gerrard; concrete curbs on eight streets; concrete pavements on two streets; concrete walks on 26 streets. Specifications received by chairman until noon August 29th.

Tenders called for supply of pipe. Owner, Board of Control, Toronto; chairman, G. R. Geary, City Hall. Supply of 600 feet of 16-in. steel riveted or lap welded pipe and 420 feet 12-in. welded steel pipe. Tenders received by chairman board of control until September 5th.

Winnipeg, Man.

Tenders called for valves and hydrants. Owner, Board of Control, Winnipeg; secretary, M. Peterson. Supply of quantity of valves and hydrants for the domestic waterworks supply system. Specifications, etc., at office of city engineer, 223 James ave., Winnipeg. Tenders received, by secretary board of control until 11 a.m., September 8th.

CONTRACTS AWARDED

Aylmer, Ont.

Pavement. Owner, Town of Aylmer, tp. clerk, D. C. Davis; town engineer, F. Wooster; contractor, Jos. L. Davis, \$5,500, Aylmer. 2,400 square yards vitrified brick pavement. Tenders to include grading drains, gutters, etc. Work commences at once and to be finished not later than Oct. 14th.

Harriston, Ont.

Municipal drain, Tp. of Minto. Tp. Clerk, W. D. McLellan, Harriston, Ont. Contractor, Charles Martin, Harriston, \$5,980. Construction of municipal drain.

Nanaimo, B.C.

Street paving; city engineer, A. Waters; contractor, El-Oso Co., Vancouver. Asphalt at \$1.74 per yard, guaranteed five years. Approximate area, 14,450 superficial yards. City preparing subgrade.

St. Vital, Man.

Pavement. Owner, municipality of St. Vital; secretary, E. A. Poulasin; engineer, G. Mullen, 372 St. Jean Baptiste street, St. Boniface. Contractor, Bitulithic & Paving Co., 354 Main street, Winnipeg. St. Mary's road, 18 feet in width with one curb, approximate length one mile.

Toronto, Ont.

The contracts for the following valves have been awarded to the Canadian Fairbanks Co., Ltd.; 20-in. valves, \$102.61; 20-in. check valves, \$137.81; 12-in. check valves, \$45.24.

Grading, Sydenham, Ottawa Br. Owner, Canadian Northern Ontario Ry., Toronto; general contractor, J. P. Mul-larky, Montreal; sub-contractors, Morin & Chisholm, Perth road, Ont. Two and a half miles, near Sydenham. R. A. Girouard, Smith's Falls, Ont., five miles.

Vancouver, B.C.

Water mains, D. L. 139 and 540. Owner, City of Vancouver; city clerk, W. McQueen; engineers, Cleveland & Cameron, Winch Bldg., Vancouver. Contractors, Municipal Construction Co., 319 Pender street west, Vancouver, \$515,000. Work will begin at once.

Burnaby, B.C.

Tenders called for bridges and grading, Johnston road; municipal clerk, Wm. Griffiths. Three timber bridges. Grading involves removal of about 22,000 cubic yards of earth. Tenders received until August 28th.

Railroads, Bridges and Wharves**Brantford, Ont.**

Tenders called for bridge. Owner, Board of Works, Brantford, Ont.; chairman, Chas. Hartman; city engineer, T. Harry Jones. Construction of a steel highway bridge, length of span, 65 feet; width, 16 feet. Plans, etc., at office of engineer. Tenders received by Chairman, Board of Works, until August 30.

Chatham, Ont.

Tenders called for five bridges. Owner, Tp. of Chatham; A. J. Templeton, Commissioner. Construction of five wood and steel bridges to be built over the Maxwell Outlet Dredge Cut in the Tp. of Chatham and Dover. Plans at the Tp. of Chatham office, Scane Block, King street, Chatham, and at the clerk's office, Tupperville. Accepted cheque for \$100 to accompany each tender. Tenders received at Township of Chatham office until 2 p.m. September 2nd.

Kingston, Ont.

The reports presented at the annual meeting of the shareholders of the Kingston & Pembroke Railway Company were considered very satisfactory. Extension improvements have been made during the year and further work will be done this year.

Lloydtown, Ont.

Tenders called for bridge. Owner, Tp. of King; clerk, J. O. Jenkins, King P.O.; engineers, Barber & Young, 57 Adelaide street east, Toronto. Concrete arch. Tenders were called until August 25th.

London, Ont.

Work in progress for railroad facilities. Owner, Canadian Pacific Railway Co., Montreal; contractors, Coal chutes,

Jno. Hayman, London; work on sub-structure has commenced. Steel (bridge on Thames), Dominion Bridge Co., Walkerville. Work has commenced. Contracts will be let shortly for new all-steel water tank, 1-sty. sand house, concrete ash pits and extensions to the yards to cost about \$65,000.

Montreal, Que.

Work in progress for railroad. Owner, Canadian Pacific Railway, Montreal; St. Therese to Quebec Jct., 11 miles. Contractors, Nova Scotia Construction Co., St. Timothee, Que.

Three Rivers, Que.

Siding construction, 5 or 6 miles; contractors, Macdonald & Dibbles, Three Rivers, Que.

Ottawa, Ont.

Entrance approved for railroad. Board of Control decides in favor of railway entrance for C. P. R. and C. N. R. on west side of Rideau Canal, with tunnel for C. P. R. under city. Government will be approached at once regarding the narrowing of canal. C. P. R. expect this means early starting of the tunnel through rock to cost \$1,250,000.

Tenders called for improvement to canal. Owner, Department of Railways & Canals, Ottawa; secretary, L. K. Jones. Improvement to St. Peter's Canal. Plans, etc., at office of department, at offices of resident engineers at Cornwall, St. Peters, C.B. Tenders received by secretary until 6 o'clock September 12th. Advertisement in "Tenders and For Sale" department of this issue.

Portage la Prairie, Man.

Proposed enlargement of freight shed. Owner, Canadian Northern Railroad. Divisional superintendent, A. E. Warren. Addition likely about 50 or 60 ft. and will include new offices. Work will commence at once. A station is also proposed for Delta Beach next year.

Stratford, Ont.

Tenders called for concrete arch. Owner, City of Brantford; city engineer, M. Ferguson. Construction of concrete arch on Lorne ave. Plans, etc., at office of city engineer. Tenders received by engineer until 5 p.m. September 2nd.

Ste. Rose, Que.

Tenders called for aqueduct. Owner, Village of Ste. Rose; sec.-treas., J. E. David; engineers, Ouimet & Lesage, 15 St. Lawrence Blvd., Montreal. Construction of aqueduct. Plans, etc., at office of engineers. Tenders received by sec.-treas., until September 15th.

Tp. of Amaranth, Ont.

The by-law to raise \$3,500 for bridges was carried.

Wheatley, Ont.

Tenders called for landing piers. Owner, Department of Public Works, Ottawa; secretary, D. C. Desrochers. Construction of a landing pier at Wheatley, Kent Co. W., Ont. Plans, etc., at the department and at the offices of J. G. Sing, district engineer, Confederation Life Bldg., Toronto; H. G. Lamb, district engineer, London, and on application to the postmaster at Wheatley. Tenders to be accompanied by accepted cheque for ten per cent. of amount of tender. Tenders received by secretary until 4 p.m. September 13.

Walkerton, Ont.

New tenders to be called for bridge (Over Saugeen River). County engineer, Jas. Warren. Two spans 125 ft. each and one span 90 feet; also two concrete abutments and two piers for same bridge. Tenders called for August 5th were not opened. New tenders called later on.

CONTRACTS AWARDED**Arthur, Ont.**

Three bridges. Engineers, Bowman & Connor, 36 Toronto street, Toronto. Successful tenderers, John Drurie, Arthur, Ont., 20 feet beam bridge; J. D. Callahan, Arthur, Ont., 30 feet girder bridge; Jno. Langdon, Kennilworth, 26 ft. arch bridge.

Brooklyn, Shelburne Co., N.S.

Breakwater. Successful contractors, The Nova Scotia Construction Company, Sydney, N.S., at about \$180,000. This company have the contract for all future construction work on the Dominion Steel Company's plant at Sydney, also contract for the construction of a branch line for C.P.R. in Quebec.

Guelph, Ont.

Bridge. Owner, City of Guelph, T. J. Moore, clerk; acting city engineer, L. Malcolm. Contractors, Rutherford & Patten, St. Catharines, Ont., \$7,250. Construction of concrete arch bridge and viaduct. Approximate amount of concrete; 572 cubic yards. Two others tendered at \$10,080 and \$9,975.

Kamloops, B.C.

Railway, Kamloops to Yellow Head Pass. Owner, Canadian Northern Railway; general contractors, the Northern Construction Co., 406 Union Bank Bldg., Winnipeg, and the Cowan Construction Co., Scott Bldg., Winnipeg. Sub-contracts are to be awarded at once. Manager of Northern Construction Company, Vancouver, J. M. Mercer.

Montreal, Que.

Terminal facilities, Western junction. Owner, Canadian Pacific Railway; general contractor, C. E. Deaken, 11 St. Sacramento street, Montreal. Buildings about to be erected—24-stall engine house; a machine shop; a mechanical coaling plant; a store building; a boarding house to lodge 100 men; capacity of yards increased to 1,700 cars. Work to be finished this year.

Oakville, Ont.

Bridge, over 16-mile Creek. Owner, County of Halton; Wm. Panton, clerk, Milton, Ont.; engineer, J. Hutcheon, Guelph; contractor, Rutherford & Par-ron, St. Catharines, \$22,744. Concrete, one span, width 18 feet.

Toronto, Ont.

Cleaning and painting bridges. Owner, City of Toronto. President of Board of Control, F. S. Spence; successful contractor, Canadian Sand Blast Co., 406 Eastern Township Bank Bldg., Montreal, \$4,500.

Three bridges, Dundast street, Moore Park and Sherbourne street.

Bridge, across Don River near Russell Hill. Owner, County of York; engineer, Barber & Young, Adelaide street, Toronto; contractor, E. H. Beck, 15 Toronto street, Toronto. Concrete bridge, 60 ft. arch.

Vancouver, B.C.

Wharf and freight shed, False Creek property. Owner, the Great Northern Railway; general manager, M. T. Costello; general contractor, W. H. Chase, 1154 Broadway W. Wharf, 800 x 148, freight shed, 1,008 wide. About 160,000 lin. ft. of piling will be needed. Dominion Creosoting Co., Ltd., will furnish about 3,000 creosoted piles as well as bracing. Other contracts to be awarded shortly.

Public Buildings, Churches, Schools, etc.

Granby, Que.

Contemplated, school, \$60,000. Owner, Catholic School Commissioners. architect, Mr. Dalbe Viau, 76 St. Gabriel street, Montreal. Plans are being prepared for a school. Tenders will be called in about two weeks by the architect.

Gleneden, B.C.

Tenders called for school. Owner, Department of Public Works, Victoria. Public Works Engineer, J. E. Griffith, Victoria. One-room and sub-basement. Plans, etc., at office of M. MacKay, secretary school board, Salmon Arm, B.C., and at above department. Tenders received by engineer until September 1st.

Gravenhurst, Ont.

Tenders called for church. Owner, Presbyterian Church of Canada. Chairman building committee, W. J. White, Gravenhurst; architect, C. J. Gibson, 75 Yonge street Toronto. For the different trades in the erection of a church. Plans, etc., at office of J. A. Cockburn, Gravenhurst. Tenders received by architect until September 1st.

Hog Island, Ont.

Tenders are called until September 20 by A. Johnston, Deputy Minister of Marine & Fisheries, Ottawa, for construction of modern lighthouse tower, plans, etc., at Department, Ottawa, and at the Post Office, Chippewa, Niagara-on-the-Lake, Clinton, Dalhousie, Port Colborne and Niagara Falls.

Hope, B.C.

Tenders called for school. Owner, Department of Public Works, Victoria, B.C.; public works engineer, J. E. Griffith. Erection of a large one room frame schoolhouse with sub-basement at Hope, B.C. in the Yale Electoral District. Plans, etc., at the offices of the Government agent, Ashcroft, B.C., and at the department, Victoria. Tenders to be accompanied by accepted cheque for \$300. Tenders received by Minister of Public Works until noon September 5th.

Kildonan, Man.

A by-law to issue \$13,000 school debentures has been passed by the rate-payers.

Kingsville, Ont.

Plans being prepared for library, \$7,000. Owner, Kingsville Library Board; architect, W. A. Mahoney, Guelph, Ont. Two stys., 36 x 36, cement foundation, brick, cement work, cut stone, concrete block, artificial stone, slate roof, metal ceiling, roofing and siding, sheet metal work, steel beams, plate glass, art glass, electric work, pipe covering. Tenders called about September 15th.

Lake St. Louis, Que.

Contemplated, club house. Owner, the Country Club, care general delivery, local post office; architect, not chosen. Plans being considered. No details for a month yet.

Lunenburg, N.S.

Tenders called for post office fittings. Owner, Department of Public Works, Ottawa; secretary, R. C. Desrochers. Interior fittings. Plans, etc., on application to Mr. N. Myra, caretaker, public bldg., Lunenburg, and at the department. Tenders received by secretary until September 5th.

MacLeod, Alta.

The town of MacLeod is contemplating the erection of a new skating rink. A meeting will be called shortly to see what arrangements can be made.

Moore Park, Man.

Tenders called for school. Owner, Public School Board; secretary, E. Dearing; architect, W. W. Blair, Nanton Bldg., Main & Portage ave., Winnipeg. Two-roomed, brick veneer, full cement basement. Plans at office of architect and with Mr. Maybee, manager, Bank of Commerce, Brandon, and with secretary. Tenders received by secretary until September 1st. Brick and cement to be completed by November 10. Plastering by December 20.

Montreal, Que.

Plans accepted for fire and police station, \$60,000, Marechal street and St. Antoine road. Owner, Corporation of Montreal; architect, Thos. Daoust, 90 St. James street. Terra cotta, steel, pressed brick, cut stone. Tenders will be called for in a week or more.

Fire station, Mansfield street; City of Montreal, City Hall. Plans to build a new modern fire station with electric fixtures and apparatus.

Work in progress for school, \$60,000, St. Joseph Blvd. Owner, Catholic School Commissioners, 1937 St. Dominique street, Montreal; architect, Dalbe Viau, 76 St. Gabriel street, Montreal; contractors, T. Lessard, 210 Park ave., brick; Bouchard & Guilbault, 112 Laurier ave., stone; Henry Forge, 25 Irene street, carpentry; Goudreau Bros. & Co., 264 Visitation street, cement; J. A. Lacombe, plastering; Cadieux & Briard, 1277 St. Dominique, steam heating and ventilating; H. Turcot, 1556 St. Lawrence Blvd., plumbing; F. X. Lavelle, 241 Clarke street, painting; Structural Steel Co., Ltd., Longue Pointe, iron work.

New Westminster, B.C.

Tenders called for isolation hospital. City clerk, W. A. Duncan. Erection of an isolation hospital on the Reserve, between 8th and 10th streets, above 8th ave. Plans, etc., at office of city engineer. Tenders to be accompanied by accepted cheque for five per cent. of amount of tender. Tenders received by clerk until 5 p.m. August 28th, 1911.

Ottawa, Ont.

Plans being prepared for church, \$35,000. Owner, Roman Catholic Church; architect, A. LeB Weeks, Canada Life Bldg., Ottawa. Brick, seating capacity 750.

Saskatoon, Sask.

The United Norwegian Lutheran Church have under consideration the erection of a college here in affiliation

with the university of which Prof. W. Murray is president; Rev. T. H. Dahl, D.D., Minneapolis, Minn., president

St. John, N.B.

Site chosen for post office, Prince William street. Owner, Department of Public Works, Ottawa; secretary, R. C. Desrochers. The new post office will be similar to the one in Winnipeg and is estimated to cost \$240,000.

Swift Current, Sask.

Theatre, \$30,000. Architect, Sharon & Darrach, Regina and Swift Current, are preparing plans for erection of a new brick and steel theatre, 50 x 125, with seating capacity of 900.

Vancouver, B.C.

Plans being prepared for church, Carl and Pender streets. Owner, St. James Congregation; architects, Alexander & Brown, 445 Granville street, Vancouver. When plans are completed it is expected work will start at once.

Winnipeg, Man.

Tenders called for driving shed and fumigating room. Owner, City Tubercular Hospital; secretary, Board of Control, M. Peterson. Supply of labor and materials. Plans, etc., at office of Inspector of Buildings, 223 James avenue. Tenders received until 11 a.m. August 28th, by chairman, Board of Control.

Winnipeg, Man.

Plans being prepared for isolation hospital. Architect, H. B. Rugh, 927 Union Bank, Winnipeg. Tenders are expected to be called within one month.

CONTRACTS AWARDED

Gasperian, N.S.

Church, \$8,500. Owner, Baptist Church, Gasperian. General contractor, J. H. Hicks, Bridgetown, N.S., wood construction, stone and brick foundation, hot air heating, wood roofing.

Hamilton, Ont.

School, \$87,500, Trolley street. Owner, Board of Education, Hamilton; secretary, R. H. Foster; architect, Stewart & Witton, Hamilton & Provincial Loan Bldg., Hamilton. General contractor, W. H. Yates, Jr., 24 Leeming street, Hamilton. Two stys., 65 x 120, brick construction, stone foundation, cement work, cut stone, marble, tile, mantels, fireproofing, metallic lath, metal ceiling, cornice, fireproof doors and windows, steel beams, iron columns, plate glass.

Montreal, Que.

School, \$36,000. Owner, Catholic School Commissioners, St. Laurent, Quebec; architect, Dalbe Viau, 76 St. Gabriel street, Montreal; general contractor, Jas. Dorais, St. Laurent, Que. Three stys., brick and stone, stone foundation, hot water heating, concrete basement, 1st floor stone, 2nd and 3rd stys. brick. Sub-contracts not yet awarded.

Ottawa, Ont.

Experimental farm building. Owner, Department of Public Works, Ottawa. Secretary, R. C. Desrochers. Ottawa; contractors, S. A. Matte, Ottawa, \$6,500. Construction of Tobacco Curing Barn.

Toronto, Ont.

Club house, \$25,000. Owner, Knights of Columbus, Toronto; architect, C. J. Reid, Confederation Life Bldg., Toronto. General contractor, M. Healey, 183 St.

George street, Toronto. Three stys., brick and stone, 100 ft. x 75 ft., brick foundation, steam heating, combination lighting, felt and gravel roofing, reinforced concrete.

Victoria, B.C.

Building. Owner, Union Club, Victoria; architect, L. R. Rixford, Victoria. Contractors, Sound Contractor & Engineering Co., Seattle, Wash. Four stys., 85 x 85, brick and terra cotta, reinforced concrete, interior finish mahogany, mantels.

Vancouver, B.C.

Church, \$72,000, Thurlow and Pendrill streets. Owner, First Congregation Church; pastor, Rev. J. K. Unsworth; architect, Sharpe & Thompson, 536 Hastings street west, Vancouver; superintendent of construction, Wm. Neve, 1090 Thurlow street, Vancouver; contractor, Adams Construction Co., 44 Seymour street, \$23,000. Plumbing will be done by Johnston-Thompson Co., 525 Burrard street. Plastering, sheet metal work, electric wiring, painting, not let yet.

Wing, general hospital, 10th to 12th streets. Owner, General Hospital Bldg. Geo. Haddon, secretary, Vancouver; architect, Grant & Henderson, Williams Bldg., Vancouver; general contractor, McDonald & Wilson, Howe & Robson streets; heating contractor, Leek & Co., 1098 Homer st., Vancouver, over \$15,000. Three sty. and basement, stone and concrete wing.

Wetaskiwin, Alta.

The contracts for the \$12,000 Roman Catholic Church on Lansdowne street have been awarded as follows: General contractor, S. Reist; masonry and cement, Scott Bros.; heating, City Plumbing Co.; stone work, Scott Bros., all of Wetaskiwin.

Residences

Brantford, Ont.

Residence, \$3,000, Egerton street. Owner, Mrs. Thos. Elliott, 80 Brant ave., Brantford; architect, L. D. Barber, Brantford. 2-sty., 28 x 32, brick, concrete foundation, hot air heating, electric lighting, roofing, shingles on 14-lb. asbestos, interior finish pine, cement work, brick, telephone system, electric bells. Tenders received until September 2nd. This building on same lot, but detached from that reported in No. 1476.

Hamilton, Ont.

Buildings contemplated or in progress: Thos. Hamilton, owner and contractor, 173 Niagara street, brick dwelling, Wentworth street, \$1,500; M. Swales, 214 East ave. north, two brick dwellings, Wallace street, for Industrial Park Survey, \$1,000; S. Bowman, owner and contractor, Stoney Creek, cement block dwelling, Balsam ave., \$1,700; A. Rowbotham, contractor, 33 Fraser ave., two frame dwellings, Campbell ave., for R. F. Saudy, of the Bank of Hamilton Bldg., \$1,800; F. M. Reed, owner and contractor, 50 West ave., brick dwelling, Hunter street, \$2,000.

Malvern Square, N.S.

Contemplated, residence, \$3,000; W. M. Smith, Melvern Square, N.S. Two stys., wood construction, cement foundation, hot air heating, acetylene gas, wood roof. Work will probably commence in

the fall and be completed in spring. No tenders likely to be called.

Montreal, Que.

Tenders received for residence, Westmount ave. Owner, Ben. Tooke, 65 Linton Apartments; architect, MacVicar & Heriot, 104 Union ave., Montreal. 3 stys., 45 x 65, brick and stone, concrete foundation, hot water heating, electric light, oak interior finish, tile bath.

Specifications prepared for residence, \$6,500, Messier street. Owner, Toussaint Milot, 1400 Messier street, Montreal; general contractor, T. Belheumeur, 1400 Messier street, Montreal. Three stys., 50 x 40, cement, stucco, gravel roofing.

Specifications prepared for residence, \$4,000, Tenth ave., Rosemount. Owner, P. Gagnon, 339 Sixth ave., Montreal; architect, Z. Trudel, 238 St. Andre street, Montreal. Two stys., 50 x 40, wood and brick. Owner is supervising construction.

Work in progress for residence. Owner, C. I. DeSola, 71 McGill ave., Montreal; architect, Messrs. Saxe & Archibald, 59 Beaver Hall Hill, Montreal; carpentry contractor, Laird Paton & Son, Ltd., 485 St. James street, Montreal. There are still several contracts to be awarded.

Specifications prepared for residence, \$8,000, Gray ave. Owner, Helen Knowles, 473 Guy st., Montreal; architect, J. W. McGregor, 5 Beaver Hall Square, Montreal; general contractor, F. Barrette, 342 Wolfe street, Montreal. Two stys., 48 x 50, brick front, slate and gravel roofing, galvanized iron, cornice.

Ottawa, Ont.

Buildings contemplated or in progress in Ottawa: A. Pelton, brick dwelling, Jos. Meagher, builder, \$2,100; Jacob Polowin, brick dwelling, Bell st., \$2,500; A. Carpentier, brick veneer dwelling, Main street, \$2,050; E. M. Barrett, dwelling, Carling avenue, C. P. Meredith, architect, \$4,700; G. L. & M. Orme, factory for Rolla Crain Company, J. A. Ewart, architect, Spruce street, \$19,775; Adam Ballantyne, solid brick stable, Echo drive, \$1,500; Miss Victoria Bigras, dwelling, St. Patrick st., J. & C. Lowe, builders, \$3,000.

Ottawa, Ont.

Tenders to be called for residence, \$13,000. (Rockliffe). Owner, T. C. Keefer, Jr., Rockliffe. Architect, Allan Keefer, Free Press Bldg., Ottawa. 30 x 60, stone and brick, stone foundation, hot water heating, electric light, shingle roof. Tenders called shortly.

Plans being prepared for alterations to residence, Daly ave., Ottawa. Architect, Allan Keefer, Free Press Bldg., Ottawa.

Residence. Owner, Allan Keefer, Free Press Bldg., Ottawa (private plans). Limestone brick, stone foundation, hot water heating, electric lighting, tile roofing, interior finish hardwood, marble, brick, tile, mantels, electrical work, electric bells. Work will be done by day labor.

Specifications prepared for garage and two cottages. Owner, W. C. Edwards, Sussex street, Ottawa. Architect, Allan Keefer, Free Press Bldg., Ottawa. Stucco construction, metallic lath, shingle roofing. Work will be done by day labor.

Ottawa, Ont.

Specifications being prepared for residence, \$12,000. Rockliffe. Owner, Mrs. McConnell; architect, Allan Keefer, Free Press Bldg., Ottawa. Brick, stone foundation, hot water heating, electric light, shingle roof, tile, mantels, fireproofing, weather strips, electric work, electric bells, shingle stain. Date for calling tenders not decided yet.

Prince Rupert, B.C.

Residence, \$3,000. Owner, F. S. Clements, Third ave., Prince Rupert; architect, W. L. Barker, Third ave., Prince Rupert. One sty., 25 x 40, frame and shingle construction, hot water heating, electric lighting, shingle roofing, tile, mantels, fireproofing, metallic lath, asbestos materials, electrical work, electric bells, shingle stain, ornamental columns or caps, art glass, marble finish, hard plaster on metallic lath.

St. David's, Ont.

Work in progress for residence. Architect, Jas. Calvert, Queenston, Ont. Two and a half stys., 40 x 40, frame. Excavation has commenced. Work will be done by day labor.

Toronto, Ont.

Work in progress for pair dwellings, \$6,000, 123-5 Concord ave. Owner, Mr. Walkie, 326 Shaw street, Toronto; architect, H. C. Roberts, 16 Foxley street, Toronto; general contractors, Robert Bros., 16 Foxley street, Toronto. Two and one-half stys., 32 x 22, brick and stone, stone foundation, hot air heating, electric light, shingle, felt and gravel roofing, plate glass, tile, mantels. Footings being laid.

Tenders to be called for additions to residence and garage, 126 Spadina road. Architect, S. B. Coon, 1106 Temple Bldg., Toronto. Two stys., stone and brick, stone foundation, hot water heating, electric lighting, shingle roofing, interior finish hardwood floors, cement work, cut stone, brick, mantels, plate glass and art glass. Tenders received after August 22, close 29th.

Tenders called for three dwellings, \$5,000, west side Empire avenue. Owner, E. J. Croker, 154 Booth ave., Toronto. Two stys., 35 x 36, brick, brick foundation, hot air heating, electric lighting, shingle roofing. Tenders will be received for next ten days for brick and carpentry work. Other trades will be done by day labor.

Tenders to be called for three pair of dwellings, \$18,000, west side Sunnyside avenue. Owner, A. Grassi, 288 Bathurst street, Toronto; architect, J. M. Cowan, 65 Adelaide street east, Toronto. Two and one-half stys., 34 x 44, brick, stone foundation, hot air heating, electric light, slate roofing. Tenders received after August 26th, close September 2nd.

Residence, \$3,500, west side Glendale ave. Owner, Mrs. M. A. Patterson, 180 Euclid avenue, Toronto. Two and one-half stys., 26 ft. 8 in. x 35 ft. 3 in., concrete block construction, concrete block foundation, hot water heating, combination lighting, open plumbing, slate, felt and gravel roofing, interior finish pine and hardwood, cement work, tile, mantels, pipe covering, electrical work, electric bells, shingle stain, plate glass. Work will be done by day labor.

T. J. Brown, 817 Dundas street, will erect three attached residences on Sym-

ington ave., 2-sty., brick, stone foundation, felt and gravel roofing, \$7,500.

Jas. Bodie, 159 Victor ave., will erect a pair of dwellings on Pape ave., 2½-stys., 44 ft. 6 in. x 29 ft., brick, brick foundation, shingle roofing.

L. K. Tallis, 477 Parliament street, will erect a dwelling, 2½-stys., 30 x 20, brick, brick foundation, slate roofing, \$3,000.

Jas. Brury, 152 Davenport road, will erect a pair of dwellings on the south side of Davenport road, 2½-stys., 32 ft. 10 in. x 46 ft., brick, brick foundation, shingle, felt and gravel roofing.

Two pair residences, \$6,500, east side Empire ave. Owners, A. Jeffrey, 55 Laing street; architect, H. Hollingsworth, 146 Beech ave. Two stys., 22 x 39, roughcast, brick front, hot air heating, electric lighting, felt and gravel roof. Work will be done by day labor.

Tenders to be called for four pair dwellings, \$9,600, Pauline ave. Owner, B. J. Case, 189 Western ave., Toronto. Two and one-half stys., 40 x 35, brick and stone foundation, hot air heating, shingle, felt and gravel roofing. Tenders to be called in about three weeks.

Tenders called for apartment house, \$22,000, Spadina ave., between Dupont and Bernard; architect, D. E. Smith, 75 Victoria street, Toronto. Two stys. and basement, 78 x 112, brick and stucco, brick foundation, steam heating, electric lighting, shingle roofing, cement work, marble, brick, tile, mantels, freight elevator, pipe covering, electrical work, telephone system, shingle stain, roofing sheathing and deafening paper, steel beams, plate and art glass, refrigerator, electric fixtures, gas stoves. Brick and carpenter work being done by owner. Heating and plumbing tenders closed August 28.

Vancouver, B.C.

Plans changed for apartment house. Owner, Mrs. M. S. McDonald, Collingwood, B.C.; architects, Jones & Aspell, 347 Pender street west, Vancouver. Plans to be changed to admit of the building being increased in size. The architects have completed plans for a residence for Mr. Bridge, to be built on Shaughnessy Heights. Tenders for this will be called shortly.

Contemplated, apartment house. Architects, Stuart & White, 919 Metropolitan Bldg., Vancouver, are preparing plans for three apartment houses, five stys., cost \$45,000; 3 stys., \$30,000; details on third not definitely settled, estimated cost \$100,000.

Plans being prepared for residence, Shaughnessy Heights. Architect, Bamforth & Beattie, 404 Homer street, Vancouver. Two stys., hardwood flooring, hot water heating, plumbing and electric wiring. Plans awaiting approval of owner.

Plans prepared for residence, \$11,000, Shaughnessy Heights. Owner, Dr. W. S. Dalby, 510 Granville street. Two sty. and basement, 46 x 36, granite, interior, hardwood, hot water heating, electric wiring.

CONTRACTS AWARDED

Digby, N.S.

Residence. Owner, Mrs. Louis Morse, Digby; architect, Leslie R. Fairn, Aylesford; general contractor, J. F. Bent, Middleton, N.S. Wood construction,

stone and concrete foundation, wood roofing. Contract awarded August 17th.

Hamilton, Ont.

The contracts for the \$3,000 residence being erected on Westmoreland ave. by W. G. Patrick, 127 Wentworth street, have been awarded as follows: Masonry, Yates & Randall, 68 Wentworth N.; heating, Burrow Stewart & Milne Co., Cannon st. E.; plumbing, G. Pyle, 374 Barton street.

Maisonnette, Que.

P. J. Guay, 93 Third ave., has awarded the contract for three flats, \$10,000, to be erected on Adam and Fourth ave., to F. Metoché, 122 Fourth ave., 3-sty., 23 x 90, stone and wood.

Residence Christophe Colomb. Owner, W. Lacroix, 235 First ave., Maisonnette; general contractor, J. B. Maleport, 229 First ave. Three sty., 25 x 40, wood and stone, flat roof, concrete foundation, \$4,000.

Residence, Beaulieu. Owner, J. Lacasse, 191 Beaulieu, Montreal; general contractor, H. Boisjoli, 137 Davidson street, Montreal. Two sty., 26 x 42, brick and wood, flat gravel roof, concrete foundation, \$2,000.

The contract for a \$6,800 residence at 363 St. Catharine street west, being erected by John Robertson, has been awarded to Simpson & Peel, 10 Benoit street, 2½-sty., 25 x 120, brick construction. Hutchison Wood & Miller, 53 Royal Insurance Building, Montreal, architects.

Toronto, Ont.

Residence, 23 Central ave., \$3,500. Owner, Geo. Stirrett, 17 Central ave., Toronto; general contractor, Wm. Clark, Indian road, Toronto. Two and one-half sty., 32 x 20 ft. 6 in., brick stone foundation, hot air heating, electric lighting, shingle roofing, interior finish, red oak flooring, cement work, cut stone, tile, mantels, electrical work, plate glass.

Business Buildings and Industrial Plants

Brandon, Man.

The Independent Harvester Co., of Plano, Ill., are about to open up a factory for the manufacture of their machines.

Plans in progress for warehouse. Owners, Geo. White & Sons, London, Ont., and Brandon; architect, W. A. Elliott, Brandon. Two sty., 200 x 60. Company will use Brandon as point of assembling and distribution for West.

Burnaby, B.C.

Contemplated, foundry. Owner, Canadian Sumner Iron Works, 744 Hastings west, Vancouver, B.C.; head offices, Everett, Washington. This company will erect a small foundry and iron works here, the first unit of a large plant.

Brantford, Ont.

Sale of property for business block, Dalhousie street. Owner, City of Brantford. Tenders received by chairman buildings and grounds committee, City Hall, for purchase of Watrous property, frontage 176 feet, until August 30th. Purchaser to covenant to erect modern 3-sty. buildings, property now vacant land.

Chippewa, Ont.

Equipment required for factory extension. Owner, the Norton Co., Chippewa. Motor shafting, electric furnaces, crushing machinery, etc. Contract for factory extension has been let to Braas Bros., Niagara Falls, N.Y., reinforced concrete, \$28,000.

Florenceville, N.B.

Plans being prepared for bank building. Owner, Bank of New Brunswick, St. John, N.B.; general manager, R. B. Kessen; architect, F. Neil Brodie, St. John, N.B., 32 x 48.

Hamilton, Ont.

Plans to be prepared for factory. Owner, Hamilton Bridge Works; architects, Prack & Perrine, Sherman ave. north. Plans are being prepared for large buildings to cost between \$150,000 to \$200,000.

Kenora, Man.

Iron smelter, near Keewatin Power Company's dam. Parties interested, D. L. Mather, Winnipeg; Cawthra Mulock, Toronto. Advising engineer, Reese Engineering Co., 158 Portage ave. east, Winnipeg; local representative, Thos. Walsh, Kenora, 40,000 h.p. available at the dam will be utilized.

London, Ont.

Work in progress for business buildings. The Molsons Bank will erect a new brick and stone branch on the Market Square, costing \$6,000. John Hayman, builder. The London & Lake Erie Railway & Transportation Company are building a new \$4,000 brick station on Horton street. J. Purdon, builder.

Montreal, Que.

Tenders received for factory, St. Urban and Lagauchetiere streets. Owner, W. V. Dawson & Co., manufacturing stationers, 16 DeBresoles street, Montreal; architects, MacVicar & Heriot, 104 Union ave., Montreal. Four sty. and basement, 100 x 130, brick and mill, concrete foundation, gravel roof.

Work in progress for garage, University street. Owner, The Comet Motor Co., Ltd., University ave.; architects, MacVicar & Heriot, 104 Union avenue, Montreal. Two sty., 88 x 88, brick and reinforced concrete. Excavation started. Plans may be changed to a four or six sty. building. Building to be completed in three months.

Contemplated, garage, \$25,000, Amherst street near Craig street. Owner, Harry Weber; architects, Finley & Spence, 46 Beaver Hall Hill, Montreal. Three sty. fireproof construction with LaPrairie brick and stone trimmings. Contracts will be awarded in a few days.

Permit applied for storage, \$80,000, Notre Dame street. Owner, Harbor Commissioners, Common street; architect, Marchand & Haskell, 164 St. James street, Montreal. Reinforced concrete, concrete foundation. Also blacksmith shop and offices.

The firm of Commercial Cars Limited, of Luton, Bedfordshire, Eng., manufacturers of auto trucks, etc., are securing option on land for a large factory.

Specifications prepared for brass factory. Owner, C. O. Clark Bros., St. Patrick street, Montreal; architect, Ross and McFarlane, 1 Belmont street, Montreal; general contractor, Shearer, Brown & Wills, Ltd., St. Patrick street,

Montreal. Two sty., 42 x 48, plastic brick, flat roof, tar and gravel, hot water heating.

Work in progress for clothing factory extension, \$30,000, Elmire street. Owner, Campbell Mfg. Co., Ltd., Elmire st., Montreal; architect, Jos. Perrault, 2106 Park ave., Montreal; general contractor, Shearer, Brown & Wills, Ltd., 225 St. Patrick street, Montreal. Pile driving is being done by J. H. Wood & Son, 27 Edward street, Montreal. Four sty., 50 x 46, plastic brick, foundation on piles, gravel roofing, steam heating, sprinkler system of fire protection. Other sub-contracts not yet awarded.

Penticton, B.C.

Work in progress for hotel, \$35,000; architect, A. F. Pelton, Penticton, 145 x 110, 60 bed rooms, first floor, concrete with half timber finish. Plans being prepared for superstructure. Work in foundation has started.

St. John, N.B.

John Reid, representing Campbell, Laird Company, shipbuilders, of Berkenhead and Sheffield, England, was here last week and states that they are contemplating the establishment of a plant in St. John.

J. C. Dalzell, who conducted a manufacturing establishment at Moncton for making spring mattresses and lounges, has removed his plant to St. John. He intends opening a larger and better equipped factory here.

Stratford, Ont.

Site purchased for factory. Owner, the MacDonald Thresher Co., Ltd.; manager, J. R. MacDonald, President Board of Trade. The enlargement of the factory is under consideration.

St. Catharines, Ont.

Tenders called for two buildings. Owner, Canadian Yale & Towne, Ltd.; architect, E. D. Pitt, 405 Victoria ave., Niagara Falls, Ont. Brick, concrete, steel and timber, with sprinkler equipment, area of floor, about 75,000 square feet. Tenders called until August 31st.

Truro, N.S.

The Truro Foundry Co. are contemplating the erection of a new machine shop at once on the site now occupied by the moulding shop on Yonge street. Building to be 120 feet by 80 feet.

Toronto, Ont.

Contemplated, offices. Owner, Toronto Stock Exchange, 20 King street east, Toronto; secretary, E. B. Freeland. Owners have authorized the purchase of site and intend erecting offices and stock exchange rooms. No plans have been considered yet.

Tenders called for addition to bakery, Bloor street west. Owner, Canada Bread Co., Toronto; architect, C. J. Gibson, 75 Yonge street, Toronto. 188 x 148, brick foundation, felt and gravel roofing, interior finish Georgia pine, skylights. Tenders were received until August 28th.

Victoria, B.C.

Frances S. Swales, architect, from London, Eng., is here for the purpose of drawing plans for the proposed addition to the Empress Hotel.

Vancouver, B.C.

Contemplated, addition to building, Hastings west and Homer streets. S.

Jones, proprietor Dominion Hotel, Victoria. Plans to build a six-sty. addition on site at present occupied by McMillan Jewelry Co., extension to be used as offices. Work is expected to begin in January.

Plans prepared for garage, \$6,000, Georgia street. Owner, Archibald Auto Co. (M. B. Archibald); architect, G. P. Bowie, 570 Granville street, Vancouver. 40 x 66, concrete floor and foundation, cement entrances, sheet metal doors, steel trusses and supports and 1-in. corrugated iron walls supported by steel frame fireproof glass in skylights. Gas tanks will be installed.

Welland, Ont.

Business buildings. A. J. J. Brennan has under consideration the erection of a 3-sty. business block next spring, on East Main street. H. A. Rose is considering the erection of a new 3-sty. brick block on East Main street early next spring.

Weymouth, N.S.

Contemplated, sawmill. The Campbell Lumber Co., Weymouth, N.S., plan to erect a sawmill, brick and cement, with metal roof, this fall or next spring. About 500,000 bricks will be required.

Winnipeg, Man.

It is reported here that Irish linen manufacturers have decided to establish three factories in Western Canada. Two places have already been named, one in Moose Jaw and one in Winnipeg, the other has not yet been decided on, but will be somewhere in Alberta.

Tenders called for Business building. Owner, Free Press Co. (Printing and Publishing). Architects, Woodman & Carey, Free Press Bldg., Winnipeg. Tenders received by architect until August 26th.

CONTRACTS AWARDED

Brantford, Ont.

Steel structural shop, \$13,500, Mohawk street. Owner, Cockshutt Plow Co., Brantford; general contractor, A. E. Faulkner, Brantford. One sty. and basement, 112 x 50, brick, concrete foundation, tar and gravel roof. Contract let August 23rd. Heating and plumbing contract not let yet. No plastering. Iron work supplied by company. Building to be completed November 1, 1911.

Guelph, Ont.

Factory for rubber goods. Owner, Independent Tire Co., Guelph; architect, W. Mahoney, Guelph; general contractor, P. H. Secord & Sons, Limited, Brantford. Three stys., 65 x 225 and basement, reinforced concrete, fireproof. Contract let August 22nd; building to be completed February 1, 1912. Heating and plumbing contract not let yet.

Hamilton, Ont.

Addition to factory, \$250,000. Owner, International Harvester Co.; general contractor, David Dick & Sons, Welland, 400 x 100 feet, 2-sty., and basement, reinforced concrete and steel. Other extensions are also contemplated.

Montreal, Que.

Graham & Brouillette, 79a Elizabeth st., have been awarded the contract for the erection of a \$3,000 dry goods store at 195 Notre Dame, by O. Massicotte & Cotes, La Patrie Bldg. G. A. Monette,

35 St. James street, architect. 2-sty., 60 x 24, brick and stone.

Warehouse, \$24,000. Owner, Imperial Oil Co., Ltd., 105 Board of Trade Bldg., Montreal; architect, Thos. W. Clark, New York; general contractors, Reid, MacGregor & Reid, 668 St. Catharine street west, Montreal. Three sty., 82 ft 6 in x 65 ft, fireproof construction, concrete foundation.

Neepawa, Man.

Telephone exchange. Jas. McIntosh has been awarded contract for the new brick and stone building, 81 x 32. Cost \$11,000. A hoist will also be installed. Ottawa, Ont.

Business building. Owner, D. H. McLean, Ottawa; architect, W. E. Noffke, Central Chambers, Ottawa. Two stys., 100 x 60, brick and steel, concrete foundation, tar and gravel roofing, electric light, structural iron, sheet metal. Heating and plumbing contracts not yet awarded.

Addition to warehouse, Nicholas st. Owner, Dominion Warehousing Co., Ottawa; architect, Jas. Mather, Wellington street, Ottawa; general contractor, Holbrook & Sutherland, Ottawa; steel work contractor, Dominion Steel Company. Three stys., steel and brick. Tenders to be called for freight elevators, 12 ft. x 8½ ft., also for galvanized iron work, electric work, plumbing, felt and gravel roofing.

Saskatoon, Sask.

Business building, \$60,000, 22nd st. and 2nd ave. Owner, Herbert Weston; architects, Thompson, Daniel & Colthurst; contractor, George Archibald, Winnipeg. Brick, fireproof construction.

Toronto, Ont.

Stores and dwelling, \$5,000, Kingston road and Beach ave. Owner, H. Zimmerman, 540 Kingston road, Toronto; architect, T. A. Kapes, 72 Spruce Hill road, Toronto; masonry contractor, Geo. Wibby, Silver Birch ave., Toronto; carpentry, T. A. Kapes, 72 Spruce Hill road, Toronto. Two stys., 55 x 32, brick, brick foundation, hot water heating, electric light, shingle, felt and gravel roofing, mantels, plate glass. Tenders will be called in about three weeks for plumbing, heating, plastering and wiring.

Winnipeg, Man.

Warehouse. Owner, Swift Canadian Co., Ltd., Louise Bridge, Winnipeg; architect, C. H. Kane, Chicago; general contractor, McDiarmid Co., Ltd., 138 Portage ave., Winnipeg. Three sty. and basement, 78 x 132, reinforced concrete. All work will be done by general contractor. Building to be completed February, 1912.

Power Plants, Electricity and Telephones

Edmonda, Burnaby, B.C.

By-laws carried for power. The ratepayers voted in favor of the Western Canada Power by-law. This authorizes the construction of steel towers capable of carrying high voltage electric wires along the Johnston road and also poles on other roads for stringing electric light and power wires.

(Continued on page 66)

Tenders and For Sale Department

Trench Machines

Parsons—Cuts trench 27 in. to 60 in., to 20 ft. deep, fine order.

Parsons—With Mattes Back Filler, cuts trench 28 in. to 78 in. to 20 ft. deep. Overhauled and first class. Write us if you have anything to sell, or if in want of anything.

THE MALES CO.

No. 82 Perin Building, Cincinnati, O.

Notice to Ditch Contractors

Tenders Wanted

Tenders will be received by the undersigned Township Clerk up to 2 o'clock p.m. on Monday, the 4th day of September, 1911, for the construction of Municipal Drain No. 2 in the Township of Maryborough, containing about 43,000 cubic yards of excavation.

Plans, profiles and specifications of this drain may be seen at the Township Clerk's office in the village of Moorefield, or at the engineer's office at West Montrose.

The lowest or any tender not necessarily accepted.

Satisfactory bondsmen or a marked cheque for five per cent. of tender will be required.

C. D. BOWMAN, O.L.S.,
Engineer in Charge,
West Montrose P.O.

W. W. SCOTT,
Clerk of Tp. of Maryborough.
Moorefield P.O.

34-35



To Contractors

Sealed tenders endorsed "Tenders for Library Shelving and Fittings," addressed to the undersigned, will be received at this Department until noon on Tuesday, the 5th of September, 1911, for the library metal shelving and fittings required in connection with the Library Addition to the Ontario Government Buildings, Queen's Park. Plans and specifications may be seen and blank forms of tender obtained at the offices of Geo. W. Gouinlock, architect, 1108 Temple Building, Toronto.

An accepted bank cheque payable to the order of the Honorable J. O. Reaume, Minister of Public Works, for five per cent. of the amount of the tender, and the bona fide signature and addresses of two sureties, or the bond of a Guarantee Company, approved by this Department, must accompany each tender.

The Department will not be bound to accept the lowest or any tender.

By order,

H. F. McNAUGHTEN,
Secretary of Public Works.

Department of Public Works, Ontario,
Toronto, August 18th, 1911.

Newspapers publishing this advertisement without authority will not be paid for it. 34-35

FOR SALE

Complete Electric Generating Set, consisting of Leonard Peerless steam engine direct connected to 150 k.w. Canadian General Electric generator, 2,300 volts, 60 cycles; also condenser, switchboard, steam and exhaust piping, spare parts for engine and generator, and everything constituting the complete set as at present installed in the Thomas street lighting station of the Town of Brockville. This machine is in first-class order, having only been used on peak loads. It is now being replaced by a larger Belliss & Morcom engine with Swedish G. E. generator. Full particulars and price can be obtained from Laurie & Lamb, Consulting Engineers, Board of Trade Building, Montreal.

28-35

To Contractors

Tenders will be received at the office of the Secretary, School of Mining, Kingston, up to 3 p.m. of Friday, September 1st, for the Cabinet Work, comprising Tables, Benches, Fume Cupboards and other Furniture, and also Plumbing and Fitters' Works required in the completion of the Nichol Building for Governors of the School of Mining.

Plans and Specifications may be seen at the office of the undersigned.

The lowest or any tender not necessarily accepted.

POWER & SON,
Architects.

Merchants Bank Chambers,
Kingston, Ont.

34-35

Tenders Wanted

Sealed proposals for an Intake Pipe and Screen Well for the City of Windsor, Ont., addressed to the Secretary of the Water Commissioners, Windsor, Ont., and endorsed "Proposals for Intake Pipe and Screen Well for Windsor Waterworks," will be received at the office of the Water Commissioners of the City of Windsor, Ont., until 12 o'clock noon, Tuesday, September 12, 1911.

Proposals shall be made in accordance with the specifications and requirements on file in the office of the Water Commissioners.

Each proposal shall be accompanied by a certified cheque equal to ten per cent. of the amount of tender as surety for the acceptance of the contract, payable on its face to the Water Commissioners of the City of Windsor, Ont.

The accepted contractor will be required to furnish an approved Guaranty or Surety Bond in the sum of 50 per cent. of the full amount of his contract.

The Commissioners reserve the right to reject any or all proposals.

Copies of plans and specifications are on file at the Water Office, Windsor, and also at the office of Smith, Hinchman & Grylls, Detroit, Mich.

By order of the Commissioners,

34 35

W. A. HANRAHAN,
Secretary.

CITY OF TORONTO

Extension of Time

Tenders for the Supply of Rail Accessories

Separate or bulk tenders on prescribed forms will be received by registered post only addressed to the Chairman of the Board of Control, City Hall, Toronto, Canada, up to noon on Thursday, September 7th, 1911, instead of August 31st, as previously advertised, for the supply of the following:—

- (1) 325 kegs track spikes (200 lbs.) per keg, size of spike 5½ in. x 9-16 in., measured under head.
- (2) 1,950 pairs of splice bars.
- (3) 9,500 tie rods, 7-8 in. diameter.

Envelopes containing tenders must be plainly marked on the outside as to contents.

Specifications and forms of tender may be obtained on application to the Department of Railways and Canals, City Hall, Toronto.

The tenderers shall submit with their tender the names of two sureties (approved of by the City Treasurer, not members of the City Council or Officers of the Corporation of the City of Toronto) or in lieu of said sureties, the bond of a Guarantee Company, approved of as aforesaid.

The lowest or any tender not necessarily accepted.

G. R. Geary, Mayor,
Chairman of the Board of Control.

City Hall, Toronto,
August 21st, 1911.

35-35

Toronto Main Drainage Works

Sealed tenders for the construction of the following sewers will be received by registered post only, addressed to the Chairman of the Board of Control, City Hall, Toronto, up to noon of Tuesday, September 12th, 1911.

Storm Overflow Sewers—Sorauren Division.

Total length 8,897 linear feet, including the laying of 30 and 36 inch concrete pipe and the supplying and laying of 24-inch cast iron pipe, and 15, 18 and 24 inch vitrified pipe.

Storm Overflow Sewers—Manchester Division

906 linear feet of 3 ft. 4 in. x 3 ft. 8 in. concrete culvert, in open cut.

High Level Interceptor—Section No. 14

985 linear feet of 3 ft. 0 in. x 4 ft. 6 in. egg-shape, brick, in tunnel.

Plans, specifications, forms of tender and conditions relating to tendering as prescribed in City By-laws may be obtained from the Main Drainage Works, Office of City Engineer, Toronto.

The lowest or any tender not necessarily accepted.

G. R. GEARY, Mayor,
Chairman, Board of Control.

City Hall, Toronto,
August 18th, 1911.

34-35

Tenders Wanted

Sealed tenders, marked "Tenders for Tile Drains," will be received by the undersigned up to September 11th, for the construction of a system of tile drains, consisting of approximately 20,000 feet of tile. Plans and specifications may be seen at the office of the undersigned, Bell Telephone Building, Guelph, and at the office of the Canadian Engineer, 62 Church Street, Toronto.

The lowest or any tender not necessarily accepted.

J. W. LYON, President,
Guelph Radial Railway Co.

35-35



Department of Railways and Canals, Canada

Intercolonial Railway
Passenger Station, Truro,
Nova Scotia

Extension of Time

The time for receiving tenders for the construction of a "Stone Passenger Station" at Truro, Nova Scotia, has been further extended from Thursday, the 31st August until 12 o'clock noon on Friday, the 16th September, 1911.

By order,

L. K. JONES,
Secretary.

Department of Railways and Canals,
Ottawa, August 24th, 1911.

Newspapers inserting this advertisement without authority from the Department will not be paid for it. 35-36

Town of Scott

Sealed tenders will be received by G. M. Phillips, Secretary-treasurer, of the Town of Scott, Sask., until noon of Monday, September 25, 1911, for supply and delivery of the following machinery and materials, and for the performance of certain works.

Tender A.—Supply and Delivery of—
Generator and exciter and switchboard.
Transformers and meters.
Series tungsten street lighting system.
Pumping machinery.

Tender B.—Supply and Delivery of—
Two pneumatic storage tanks.

Tender C.—Supply and Delivery of—
Approximately 2,200 ft. of 8-inch steel wire pipe.
Approximately 7,000 feet of 6-inch steel water pipe.
Approximately 5,400 feet of 4-inch steel water pipe.
Approximately 15 hydrants and 22 valves.

Tender D.—
Trenching and laying steel water pipe, setting hydrants, valves, etc., and back filling.

Tender E.—
Erection of a power house and construction of a reservoir.

Plans and specifications may be seen at the offices of the Canadian Engineer, Winnipeg, Toronto and Montreal, and at the Consulting Engineer's office, Bottomly Block, Saskatoon.

A marked cheque for five per cent. of amount of the tender must accompany each bid.

The lowest or any tender not necessarily accepted.

McARTHUR & MURPHY, Engineers,
Bottomly Block, Saskatoon.

G. M. PHILLIPS, Sec.-Treasurer,
Scott, Sask.

For Sale

One R. McDougal engine lathe, new, swing over bed 30-in., distance between centers 20 ft., with motor drive; also one set of 3-in. raising blocks. Price \$2,050. Address: The Canadian Pipe Company, Limited, 550 Pacific street, Vancouver, B.C. 35-37

CITY OF HULL

Water Works System

Cast Iron Pipes

Sealed tenders addressed to the City Clerk, Hull, and marked as to contents, will be received up to 4 o'clock, September 6th, 1911, for the following materials:

1,500 ft. of 20-in. cast iron pipe.
4,356 ft. of 12-in. cast iron pipe.
6,760 ft. of 10-in. cast iron pipe.
4,425 ft. of 8-in. cast iron pipe.
9,685 ft. of 6-in. cast iron pipe.
200 ft. of 5-in. cast iron pipe.
2,525 ft. of 4-in. cast iron pipe.
61,193 lbs. connection of different sizes and style, according to plans.

Valves

Two valves of 20-in.
Three valves of 12-in.
Seven valves of 10-in.
Five valves of 8-in.
Twelve valves of 6-in.
Four valves of 5-in.
Three valves of 4-in.

Twenty-two 3-nozzle hydrants, sketch of different make shall accompany the tenders.

N.B.—The lowest or any tender not necessarily accepted.

J. P. ALBERT LAFOREST,
City Engineer.

35-35



Department of Militia and Defence

Concrete Retaining Wall, Long
Branch Rifle Range, Toronto

Notice to Contractors

Sealed tenders marked on envelope "Tender for Retaining Wall, Long Branch Rifle Range," and addressed to the Director of Contracts, Department of Militia and Defence, Ottawa, will be received until noon, September 4th, 1911, for the construction of a concrete retaining wall at Long Branch Rifle Range, Toronto, Ont.

Plans and specifications can be seen and full information obtained at the offices of the General Officer Commanding 2nd Division, 215 Simcoe street, Toronto, Ont., and the Director of Engineer Services, Department of Militia and Defence, Ottawa.

Tenders must be made on the form supplied by the Department, and accompanied by an accepted cheque on a Canadian chartered bank for ten per cent. (10 p.c.) of the amount of the tender, payable to the order of the Honorable the Minister of Militia and Defence, which amount will be forfeited if the party tendering declines to enter into or fails to complete the contract in accordance with his tender.

The Department does not bind itself to accept the lowest or any tender.

EUGENE FISET, Colonel,
Deputy Minister,
Department of Militia and Defence,
Ottawa, August 23, 1911.

Newspapers will not be paid if this advertisement is inserted without the authority of the Department. 35-35

CITY OF TORONTO CANADA

Underground Subway Construction

It is the intention of the City of Toronto to call for tender for construction of double track underground subways, approximately three miles in length, on or about September 15th.

Intending bidders please be governed accordingly.

G. R. GEARY, Mayor.

City Hall, Toronto,
August 25th, 1911.

35-36

Tenders Wanted

Sealed tenders will be received for the construction of a new Y. M. C. A. building in Guelph, Ont., up to noon on September 5th, 1911.

Plans and specifications can be seen at the office of Messrs. Mills & Hutton, architects, Hamilton, or Mr. W. A. Mahoney, architect, Guelph, Ont., from whom all information will be given.

Tenders will be received for each work separately or in bulk and to be addressed to H. G. Cockburn, Chairman, Guelph, Ont., marked "Tender, Y. M. C. A."

The lowest or any tender not necessarily accepted. 35-35



Department of Railways and Canals

Notice to Contractors

ST. PETERS CANAL

Sealed tenders addressed to the undersigned and endorsed "Tender for St. Peters Canal Improvements," will be received at this office until 16 o'clock on Tuesday, September 12th.

Plans, specifications and form of contract to be entered into can be seen on and after August 21st at the office of the Chief Engineer of the Department of Railways and Canals, Ottawa, at the office of the Resident Engineer, Ontario St. Lawrence Canals, Cornwall, Ont., and at the office of the Resident Engineer, St. Peters Canals, St. Peters, Cape Breton, at which places forms of tender may be obtained.

Parties tendering will be required to accept the fair wages schedule prepared or to be prepared by the Department of Labor, which schedule will form part of the contract.

Contractors are requested to bear in mind that tenders will not be considered unless made strictly in accordance with the printed forms, and in the case of firms, unless there are attached the actual signature, the nature of the occupation, and place of residence of each member of the firm.

An accepted bank cheque for the sum of \$25,000, made payable to the order of the Minister of Railways and Canals, must accompany each tender, which sum will be forfeited if the party tendering declines entering into contract for the work, at the rates stated in the offer submitted.

The cheque thus sent in will be returned to the respective contractors whose tenders are not accepted.

The cheque of the successful tenderer will be held as security, or part security, for the due fulfilment of the contract to be entered into. The lowest or any tender not necessarily accepted.

By order,

L. K. JONES,
Secretary.

Department of Railways and Canals,
Ottawa, August 18th, 1911

Newspapers inserting this advertisement without authority from the Department will not be paid for it. 35-36

MACHINERY BARGAINS

We have for sale for quick shipment from point near Montreal in Canada, several 18-ton saddle back four-wheel contractors' locomotives, and four dozen 4-yard two-way side dump contractors' cars, all 36-in. gauge.

Also one No. 4 Austin gyratory stone crusher with elevator and screen for same.

These items in good condition for immediate service and at attractive prices. For particulars, address—

WILLIS SHAW MACHINERY CO.,
39 South LaSalle Street, Chicago, Ill.

Positions Vacant

Advertisements under this heading two cents a word per insertion. Minimum charge 50 cents

Draughtsman having good general experience in civil draughting and design. Must be able to produce neat and speedy work. Permanent position for suitable man. Apply, stating experience and salary expected, to J. M. Wilson, City Engineer, Moose Jaw. 35-36

Miscellaneous

Advertisements under this heading one cent a word per insertion. Box No. ten cents extra

An experienced man with executive ability to take position of Superintendent of Operation of extensive high tension transmission system. Ability to handle men necessary. State fully training and experience, whether married, age, salary required, and other particulars. Apply Box 323, Contract Record, Toronto, Ont. 35-36

WANTED

Large American firm manufacturing the most up-to-date dry kiln system for drying lumber wants to secure reliable Canadian representatives. System patented in Canada and several installations made. Apply E. J. MacIntyre, 4059 Perry Street, Chicago, Ill. 34-35

Power Plants, Electricity and Telephones

(continued from page 63)

Calgary, Alta.

In order to meet the demand for power which the industrial growth of the city has necessitated, the Calgary Power Company is at present engaged in locating a second transmission line from the Horseshoe Falls, on the Elbow River, to their power house in this city.

Mimico, Ont.

On September 16th a by-law to provide \$7,500 for a power plant will be voted on.

Prince Rupert, B.C.

Surveys being made for supply of power, Khtada River, 42 miles distant. Owner, Prince Rupert Hydro-electric Co.; general superintendent, T. Clark Durant, Prince Rupert. Plans are being prepared by R. F. Hayward, of the Western Canada Power Company, Winnipeg. Surveys being made by Thos. Kennaugh, C.E. Work has begun on construction camp. The company will instal a 3,000 kw. plant within twelve months.

Niagara Falls, Ont.

Canadian Niagara Power Company, Niagara Falls, plan to instal new dynamos, turbines and general power house equipment. Work is now in progress for power house. Contractor for iron

work, Hamilton Bridge Works Company. Balance of work to be done by day labor. Estimated cost of extension about \$125,000.

Portage la Prairie, Man.

The ratepayers will shortly vote on a by-law to purchase the entire plant of the Central Electric and Gas Co., for \$110,000.

Red Deer, Alta.

Preliminary surveys for hydro-electric plant. The Board of Trade have engaged the John Galt Engineering Co. of Calgary to make preliminary surveys for a hydro-electric plant. Sec'y of Bd. of Trade, R. T. Davison.

Saskatoon, Sask.

A by-law will be submitted on August 24, for the raising of \$75,000 for extensions to the electric light and power system of the city.

Victoria, B.C.

Proposed extension of street lighting, View street. Owner, City of Victoria; purchasing agent, W. W. Northcott. Plan proposed for extension of cluster lighting system. Provision to be made for arc wires supplying light to James Bay district.

Winnipeg, Man.

Tenders called for electrical supplies. Owner, Board of Control, Winnipeg. Manufacture and delivery f.o.b. Winnipeg, of the following supplies. A.—Mercury arc transformers and rectifiers. B.—Magnetite or metallic flame arc lamps. C.—Electrodes. D.—Inner and outer globes. Specifications, etc., at office of the general manager of the City Light & Power Dept., 449 Main street, Winnipeg. Tenders received by Chairman, Board of Control, until 11 a.m., September 11th.

Tenders called for power house and laundry. Owner, Board of Control, Winnipeg; secretary, M. Peterson, Board of Control office, Winnipeg; architect, G. G. Teeter, Builders' Exchange. Supply of labor and materials required in the erection of a power house and laundry for the city hospitals on the Riverview site. Plans, etc., at office of the architect. Tenders to be accompanied by accepted cheque for 5 per cent. of amount of tender. Tenders received by Chairman, Board of Control, until 11 a.m., September 5th.

Tenders called for underground cable. Owner, City of Winnipeg. Sec'y, Board of Control, M. Peterson. Manufacture delivery and installation of underground cable for electrical distribution system. Specifications, etc., at office of general manager, Light & Power Dept., 449 Main street, Winnipeg. Tenders received by Chairman, Board of Control, until 11 a.m. August 28th.

Miscellaneous

Winnipeg, Man.

Tenders called for supply of cedar poles. Owner, City of Winnipeg. M. Peterson, secretary, Board of Control. Supply of poles for Winnipeg Electrical Distribution system. Specifications at office of general manager, light and power department, 449 Main street. Tenders received by chairman until 11 a.m., August 25.

New Companies

Prince Rupert Hydro-Electric Company, Ltd., incorporated, with a capital of \$5,000,000, head office Prince Rupert. Lewis W. Patmore, attorney for the company.

de Northall Engineering and Construction Co., Ltd., Vancouver, B.C., incorporated, with a capital of \$100,000.

Vancouver Lumber Co., Ltd., Vancouver, B.C., incorporated, with a capital of \$4,000,000.

Victoria Shoe Manufacturing Co., Ltd., 924 Langley street, Victoria, B.C., incorporated, with a capital of \$5,000,000.

Thompson and Carper, Limited, Vancouver, B.C., incorporated, capital \$50,000, to act as agents for purchase of real estate, timber limits, power sites, etc.

The National Timber Co., Ltd., Vancouver, B.C., incorporated, with a capital of \$250,000.

Jones and Rant, Limited, incorporated, with a capital of \$50,000, to carry on business as bridge and road builders, brick and tile manufacturers, etc., head office, Vancouver, B.C.

Becker & Co. of America, Ltd., Toronto, Ont., incorporated, with a capital of \$100,000, to carry on business as timber merchants, dealers in pulpwood, wood, lumber, etc. Incorporators, Wm. P. Ryrie, Francis Cole Lalonde and Wm. Symon Mortlock, all of Toronto.

Economic Realty Limited, Montreal, Que., incorporated, with a capital of \$100,000, to carry on the business of a general land and building company. Incorporators include Jas. W. Domville, Casimir Dessaulles and Paul Lorrain, all of Montreal.

The Whalen Land Corporation, Ltd., Port Arthur, Ont., has been incorporated, with a capital of \$250,000, to carry on a general land, building and lumbering business. Incorporators, Alex. Jarvis McComber and Wm. Fitzgerald Langworthy, both of Port Arthur.

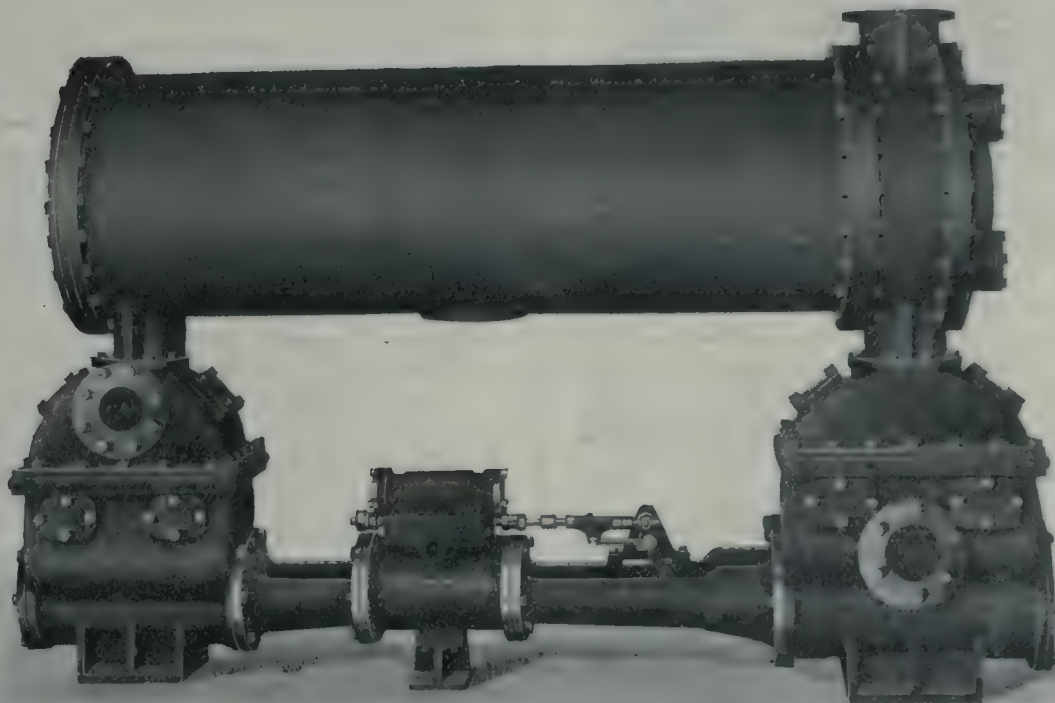
The Flexible Conduit Co., Ltd., Guelph, Ont., has been incorporated, with a capital stock of \$50,000, to manufacture and deal in textile materials, conduits, cables and other electric supplies. Provisional directors include Geo. Edmund Courtice of Clinton, Ont., Jas. Ernest Carter and John McPherson Taylor, both of Guelph.

The Raye Finance Co., Ltd., Montreal, Que., incorporated, with a capital of \$125,000, to carry on business as builders, to purchase or acquire power sites, timber limits, mining rights, etc. The Incorporators include Jno. Joseph Meagher and Lawrence De K. Stephens, advocates, both of Montreal.

Canadian Sunbeam Co., Ltd., Toronto, Ont., incorporated, with a capital of \$200,000, to manufacture and deal in electrical machinery, apparatus, generators, motors, etc. Incorporators, Roland Sydney Morgan, Herbert Sargent Salt and Byron Young Haddy, all of Toronto.

The Bishop Construction Co., Ltd., Traders Bank Building, Toronto, have been awarded the contract for the erection of the plant for the Swift Canadian Co., Toronto Junction, and also for the Union Stock Yards Company's new reinforced concrete building.

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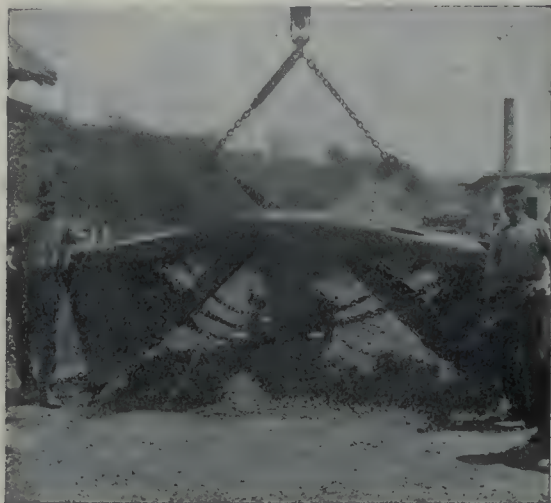
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Canada's Advancement

Canada has scores of big undertakings, both governmental and corporate, under way. A few of them are as follows:

The new Quebec bridge is in a progress of construction and will be one of the greatest structures of its kind. It will cost over \$12,000,000 and the total length will be 3,228 feet and 150 feet in height above the water mark, with a central suspended span of 610 feet.

The Grand Trunk Pacific Railway will build during 1911, 140 new stations, and the Canadian Pacific Railway will open 50 new towns.

A \$3,000,000 dry dock and new naval works are to be built at Montreal. Halifax is to have \$2,000,000 spent upon harbor improvements and St. John, \$5,000,000 on decks and ship building plants.

The development of water powers of the country is proceeding with great speed. That of Niagara is already serving many parts of Ontario as widely separated as Windsor and Toronto, while plans are being made for the increased utilization of water power from the other great falls in the land and the long canal system.

A direct steamship line from Manchester to the head of Lake Superior is projected.

A new Canadian navy which is to include 12 vessels at the start, already has two of them in commission, largely manned by young Canadian cadets, while a naval college has been opened at Halifax.

Expansions of the commercial and industrial operations are witnessed on every hand. Cities are conducting extensive improvements. Capital is invested in enterprises of all kinds and at no time since confederation has the Canadian national prosperity been so marked or the outlook better.

It is proposed by overcoming certain obstacles in the Saskatchewan river to make a waterway for light draught crafts all the way from the Rocky Mountains to Winnipeg, a distance of over 1,000 miles, while only two breaks occur in the river system of the far north, including the Peace and MacKenzie rivers to the Arctic Ocean.

Old Roman Brick

When the preparations for rebuilding the Campanile in Venice were undertaken the archaeologists were afforded an opportunity to make some interesting studies of the bricks, says Harper's Weekly. It was found that they had been used in arches, fortifications, the tops of walls, and in other ways before they were built, into the Campanile, and that they were not Venetian, but Roman brick. These ancient brick were made in courses, for in many the layers could be seen undisturbed. It is said that brick made this way can bear a greater weight than modern brick. The brick examined were of the first century. One of them bore the imprint of a horseshoe, which may prove that Romans used a horseshoe like ours, although it is generally believed that their horseshoes were strapped on, not nailed.

Over 52 per cent. of the total production of building brick in Canada in 1909 was made in the province of Ontario, and of the Ontario production over 47 per cent. was made in the county of York, so that the city of Toronto and vicinity produces about one-quarter or nearly 30 per cent. of the total brick production of Canada.

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Canada and It's National Exhibition

The 33rd annual Canadian National Exhibition now in progress in Toronto continues to draw, as in previous years, hosts of exhibitors and spectators from all parts of the Dominion and from beyond our boundaries as well. It is yearly growing as international in its influence as it has been for many years national in spirit. In more ways than one the exhibition bespeaks for Canada one of the most prosperous years in its history. Not only is the commercial activity of the country at a high point but the prospect of abundant crops is materializing to the fullest extent. Canadian development has been so rapid in recent years that it has been necessary to attract outside capital to finance many of its industries. According to Canadian banking reports, the country has been very successful in this respect, the British contribution alone having been estimated at \$200,000,000 a year.

Western Canada has been receiving a great deal of attention this year and a vast amount of money has been invested in its land and development. The crops are abnormally good and, with the crop-moving period at hand, the financing of the western harvest is bringing a great deal of money into that section of the country. In fact the Dominion is drawing upon its London and New York banks, and its local banks have applied for permission to extend the time for the use of the emergency currency two months.

The attention that has been attracted to Canadian industries in this way is being reflected in its magnanimity by the vast assemblage of manufacturing and industrial representatives from all parts, which gives the assurance that, as an annual exhibition, the Canadian National leads the world. There is every assurance that the present exhibition will produce an immediate increase in its yield and sustain the previous tradition of a new yearly record.

This year over \$300,000 have been spent on improvement work on the Exhibition grounds, in pav-

ing and brilliantly lighting the grounds, and in new buildings. Considerable dissatisfaction still expresses itself among manufacturing exhibitors due to lack of accommodation. The machinery Hall, Process Building, Industrial Hall, Manufacturers' Building and Annex are crowded to the limit, and not a few exhibitors have been compelled to employ tents for the protection from the weather of their machinery and exhibits, and the result is not the desired location which they had expected for the advantage of their interests.

The Exhibition Board deserves a great deal of credit for the arrangement throughout the grounds and for the assistance that they have given exhibitors in general. Considering the numbers, the complaints are few, but some of them appear to be well justified, and in future years accommodation should be found for all machinery that will deteriorate under the influence of adverse weather.

Comparison of Fire Losses

One of the strongest arguments in favor of permanent fireproof construction is contained in the remarkable difference in figures representing fire losses in Canadian, American and European cities, as recently published. The property losses from fire abroad appear to be about one-tenth of those sustained in this country, while loss of life in Europe bears a still small proportion to that suffered in our cities of even moderate size. In July 26th issue of the Contract Record the fire loss per capita in the Dominion for the year 1910 was estimated at \$3.14, while the average loss of six European nations compiled from records of varying years, and the years grouped, amounts to 29 cents per capita. The American Architect, in commenting upon this condition, states that it should be borne in mind that the startling contrast in figures is not due entirely to superior forms of construction abroad, but in a measure to the habits of the people, which are a result of laws fixing the responsibility for fire damage in many sections upon the owner of property upon which the fire originates. Probably this law has an effect in encouraging fireproof construction as well as stimulating habits of care in the handling of fire.

If the movement now beginning to be felt in this country, which has for its object, better and more permanent construction of all classes and types of buildings, could be supplemented with some sort of legal enactment holding the owner who failed or declined to so improve his property as to minimize the danger of fire to adjoining buildings, responsible in case of damage to his neighbor's property, an immediate improvement would doubtless be apparent, both in construction and the careless methods now in vogue in the handling of both necessary and unnecessary fire producers.

Day Labor in Winnipeg

The City of Winnipeg is taking up for consideration a problem which has been a theme for debate on many occasions and in many places—that of the question of day labor as compared with competitive contract. In a number of the departments of the city's work the day labor system has been used. It is now questioned whether or not the city is gaining or losing by this arrangement. A thorough investigation has been ordered and a committee ap-

pointed to go into the question and make a report, according to the Western Canada Contractor.

It is stated by members of the city council that in many cases the work has proven more expensive to the city than if a competitive contract had been made. In the case of all asphalt work there is no competition, as the city owns the only available asphalt plant, and all work of this nature is, under present conditions, necessarily carried out by day labor. It is probable that the committee will make a recommendation that will open this branch of the work to tender, and there seems little doubt that the contract will figure much more largely in all public projects in the future than in the past.

Such a policy as has been followed by the City of Winnipeg has rarely been found to result in any actual gain. The greatest element in the better results derived from doing civic work by competitive contract is summed up in one word—competition. There is every incentive for a contractor to make the price as low as possible in order to get the work, and there is every incentive also for him to do the work well in order that he may gain the confidence of the civic authorities and secure further contracts from the same source. The contractor is likely to obtain the services of thoroughly competent men to superintend the work; it is to his financial and general interests to do so. It is not always the case when a city or municipality is carrying out a project that the most competent men are secured either as workmen or bosses. It very often happens that men are hired for other reasons than because of their ability.

When dealing with a contractor of standing and reliability a civic body has but one thing to consider—the price. It is sure of its ground; the contractor takes all the chances. On the contrary, when the work is done by day labor the cost cannot be figured until operations are completed, and there is a great deal of uncertainty. This uncertainty, with the probability of added costs and the need of additional funds for unforeseen expenditures, has always a detrimental effect upon the work, the men who are carrying the job being hampered by the complicated methods of the civic or municipal body.

These are but a few of the reasons; there are many others which lead to the conclusion that a competent contractor is able to do the work more cheaply, more promptly and to produce quite as high a class of work as can the appointed agent of any civic body.

Hints on Estimating for the Building Contractor

Don't forget that rates of wages are lowest in dull times and in winter, and highest in boom times and in summer.

In estimating the cost of transportation give special attention to the character of available roads, the direction of the proposed traffic, and the time of year.

Insurance against accidents depends upon the riskiness, not to the plant, but to the men.

After making an estimate in detail, lay it aside a day or two if possible, forget the figures and then go over them again critically.

If some one else is going to carry on the work, take his personality into account in making an estimate of how much his work is going to cost.

Check up an estimate against average contract prices, selecting particularly contracts where the con-

ditions are well known, and selecting the contract bids from firms of experience in the line of work in question.

Check over the bidding sheet to see that it compares with the estimate.

A long and big job can be estimated on more safely than a short and small one, since the accidental conditions on big work are more likely to balance themselves.

The worst estimate made upon even assumed data is generally a good deal better than guess.

To estimate the quantity of sheeting or of shiplap, calculate the exact surface to be covered, deducting openings; then add the following percentage:

For Floors 1/7, or 15 p.c. 1/6, or 17 p.c.
For sidewalks 1/6, or 17 p.c. 1/5, or 20 p.c.
For roofs 1/5, or 20 p.c. 1/4, or 25 p.c.

The cost of materials will vary from year to year. A study should be made of the characteristic fluctuations in prices, when figuring closely, in order that proper prices of materials can be determined for some time in advance.

Winnipeg's Proposed Harbor

Winnipeg, as is well known, is located at the junction of the Red and Assiniboine Rivers, and up to last year, when the locks at St. Andrews were completed, the city was virtually an inland port. With the completion of these locks, however, considerable business has developed, and the Red River of the North is being navigated now to a considerable extent.

At a meeting of the city council on August 2 the committee on wharfage and dockage took up the question of giving Winnipeg a harbor with sufficient docks and other appurtenances pertaining thereto. It was unanimously decided to develop the harbor at Winnipeg, and with this in view the chief engineer of the city was sent to Ottawa to confer with the authorities there and learn upon what terms the Dominion Government would assist the Province of Manitoba in establishing a system of docks. Just what form the harbor improvements will take permanently, will depend upon the report which the city engineer brings from Ottawa.

It is understood that special legislation will be sought at the next meeting of the provincial legislature and that a by-law covering the probable cost of the improvements will be submitted to the ratepayers.

The initiative in supplying free legal advice in Germany came from the working classes but the need of these "workmen's secretaries," as the free legal advice bureaux are termed, became so generally recognized that their establishment has come to be regarded as falling within the sphere of municipalities or even of the State itself. There are in all 693 legal advice agencies in Germany and 101 of these are under control of a public authority. The first of these was founded at Gottingen in 1896, Elberfeld, Mulhausen and Mainz in 1897 and Ulm in 1899. Between 1905 and 1909 the fever for legal advice increased in virulence and the majority sprung up during this period.

In Regina a by-law is in preparation dealing with a material reduction of the meter charges to water consumers.

Water Conservancy in British Columbia

**The Water Act of 1909—The Duties of the Government Board of Investigation—
A Valuable Paper Read Before the Recent Convention of Canadian Municipalities**

By John Y. McNaught*

In a province such as British Columbia with its many splendid rivers, streams, and lakes it may seem at first thought superfluous to take action to conserve the water supply. This idea unfortunately too long dominated our governments, and it was not till about four years ago, when the necessity for and advantage of irrigation for the dry belt was realized, that the matter of conservancy was duly considered. A Royal Commission was appointed to gather data and make report, and the whole subject was fully discussed by them. As a result of the works of that commission we got from the legislature the "Water Act 1909."

The Water Act very naively but appropriately narrates that "in the past records of the right to divert and use water have been honestly, but imperfectly made resulting in confusion and litigation."

As a fact not a few of those who became possessors of land at once made application for records on the nearest stream to their land, and measured their asking more by the flow of water in the stream than by the amount they actually required. The mischief thence caused became evident as the needs for water for actual use arose. These needs will continually arise in a new and fast growing country, and the loss and detriment is very great if for any reason there is a barrier between the supply and the necessity. Not infrequently the purposes for which water is required conflict the one with the other, hence the need for a clearly defined order of priority; and the effectual carrying out of any adequate system of conservancy called for the organization of a Board of Capable Administrators.

The following are the more important uses now recognized by the Water Act and their order of priority:—

1. The requirements of riparian proprietors for domestic purposes.
2. Domestic purposes generally which means and includes household, sanitary and fire protective purposes and the watering of cattle and poultry.
3. Municipal purposes which mean the supply of water by any company, to any city, town or village, or unincorporated locality for domestic purposes.
4. Irrigation of lands for agricultural or horticultural purposes.
5. Industrial purposes, which mean water required for the production of steam, and all other purposes save domestic, municipal, irrigation, the production of power for same and mining.
6. Power purposes including the use of water for generating power for sale.
7. Mining purposes including the use of water for any purpose in connection with mining—and,
8. Clearing streams for driving logs.

A very important step in water conservancy was taken in 1892 when an Act was passed providing that all water in the province remaining unrecorded and unappropriated should be vested in the Crown in the

right of the province and this declaration was confirmed and amplified by the Water Act, 1909. But the 1909 Act went much further and enacted that all holders of former water records must apply for a license, and this license would only be allowed them for the quantity they were actually using or requiring to use within a year of the date of the license. These drastic provisions were necessary to put an end to many existing anomalies and to make the most for all of the water of the country.

But the most important provision of the Water Act was the organization of the Board of Water Commissioners with very wide conservancy powers. This board consists of a chief commissioner and not less than two others—all appointees of the Provincial Government. The powers and duties of this tribunal which is designated a Board of Investigation are thus defined:—

"For the purpose of hearing the claims of all persons holding or claiming to hold records of water, or other water rights under any former Act or Ordinance of determining the priorities of the respective claimants; of prescribing the terms under this Act upon which new licenses to take and use water pursuant to this Act will be granted, and generally of determining all other matters and things referred to the Board for determination."

This Board of Investigation has the assistance of a local water commissioner in each district who has also himself considerable powers in reference to new applications for records.

These commissioners are now the actual controlling factors for water conservancy throughout this province and they must see that the supply is equitably distributed according to the statutory order of priority.

The first task set this board is to ascertain, with the assistance of hydrographers, what the available water resources are in each district, and how they are meantime held. Then their readjusting powers will come into play and they can restrict private and company holdings that are not being fully used. Municipal records have to be treated differently. They cannot be annulled or restricted, but private parties may get temporary use of the unused portion of the Municipal Record till it is required by the municipality.

Companies that are supplying towns or villages with water are brought under control that they may be compelled to make good. The town or municipality may call on such company at any time:—

1. To make such extensions of their systems that are necessary for the wants of the community.
2. To provide necessary water pressure to afford fire protection, and
3. To keep their whole water system in good repair.

The municipality is given very summary power to enforce their call even to the extent of issuing a writ of sequestration. Municipalities are given

* Reeve, District of North Vancouver.

authority also to expropriate any company water system serving it at a price to be ascertained by arbitration. In valuing the system the arbitrators are to take into account the cost of construction and the then existing condition of the system. In addition to the value so ascertained the municipality must pay the company a percentage bonus according to the age of the system. If the system has been only five years in operation the bonus will be 30 per cent. of the valuation, but if it has been 20 years in operation the bonus will only be 10 per cent.

The arrangements made for granting new water records are now very complete and when carried out under the careful supervision of a fully informed Board of Commissioners, there should be much less danger of the tying up of any of our water resources improperly.

Records now can be so easily annulled that there is no inducement to take them up for speculation purposes.

As time passes, and population grows the value of this Water Conservancy Act will become more and more apparent, and the duties devolving on the Board will become more onerous. Meantime attention is being given especially to the distribution of water in the dry belt for irrigation purposes and splendid work has been done—thereby making arid barren land capable of being tilled and productive of excellent crops.

Dry Basements and Walls

Drain tile should be porous and laid with open end joints and covered with a layer of crushed stone or screened gravel. Care should be taken to lay the tile well below the finished floor of the cement to insure a dry floor, says the Building Bulletin.

When concrete footings are used, the tile should be laid at the bottom and not at the top of the footings, as is often done. This will insure dry footings and prevent the water accumulating outside the footings and a few inches up on the stone or brick wall before getting into the drain tile, which is the case where tile is laid on top of concrete footings.

Where this method is followed, the water saturates the wall, and capillary attraction causes the water to travel upwards until the whole wall is saturated with water. This occurs when great care has been taken to waterproof the outside of the walls, and is often charged to poor work of the contractors, when the fault was with the method. A damp course should be placed on top of concrete footings to stop all moisture from entering the wall.

Where great weight is to be carried by the footings and it is desirable to cast the concrete solid in the trench, two lines of drain tile should be used, one line cast in the concrete at the outside on the clay in the bottom of the trench. Strips of No. 2 tarred felt, cut four inches wide and two-thirds the outside diameter of the pipe, should be placed at every joint so as to prevent the liquid cement in the concrete from flowing into the tile.

Drain tile should be laid with a fall of three inches to the 100 feet. Some builders place them on the level, with very good results. In this case, the water will stand in the drain at the low points, but will do very little damage.

The inside of all walls below ground and for all basements where it is desired to have the rooms dry should be lined on the inside with porous hollow

brick or block. This will prevent the condensation of moisture from the atmosphere caused by warm air coming in contact with a solid cold body.

This condensation of moisture from the air is not well understood. Many builders treat the walls to keep out the moisture when the trouble is the same as takes place on a pitcher of ice water on a hot day—air moisture formed in beads or drops on the outer surface of the glass. This moisture did not come through the glass, but was taken from the air.

We speak of dead air; that is, air that has little or no moisture and subject to no change. A space in the brick wall is often called a dead air space, but that is not altogether right, as the outer course of brick becomes wet from a storm and the air in the hollow wall space becomes damp, and when damp is a good conductor of cold; therefore, a hollow wall is not always a good protector for a house.

The more dense the walls of a house the more need of protection against cold, as the wall will store up cold in direct ratio to its solidity. A wall made of cork would absorb and hold very little cold, while one made of cast iron would store away almost as much cold as water frozen into ice, and would radiate this cold to the room inside unless the wall had a proper insulator.

For fireproof buildings of stone, brick or concrete there is no better material than hollow porous brick and blocks, while for frame buildings a good grade of building paper is used. Furring and lathing for plaster in a brick building make a firetrap of the brick wall, as fire gets between the plaster and the wall, and is soon spread all over the building.

Care should be taken to have no circulation of air from gables, church lofts, attics and rafters down into the hollow space intended for weather-proofing, as this air will condense on the outside wall and cool the inside wall or plaster. Warm air will not seek a lower level, hence hot air in the attic will not circulate in an air space open at the top; but cold air, being heavy, will pass to the bottom and be warmed by the heat of the rooms and then rise to the attic, to be replaced by cold air again. This cause makes many houses and churches very difficult to heat.

Clay Deposits of Alberta

A very exhaustive series of tests have been made on samples of shales and fire-clays taken from various mines in the vicinity and from points along the river bank where the original stratified shales were exposed. The clays and shales have peculiarly sticky and soapy characteristics, which render them hard to work in the moulds; they also show a large percentage of shrinkage in drying, which causes an amount of cracking such as to render the products useless. By a series of experiments, however, it has been demonstrated that these difficulties can be overcome, and in the opinion of the expert the profitable production of certain forms of the tile and terra-cotta and vitrified products is commercially possible. A considerable period of costly experimenting would probably have to be passed through before a plant could be adjusted to do on a large scale what has already been demonstrated on a small scale in the tests. The expert considers, however, that a firm with capital and ability to undertake the enterprise would be able to produce vitrified clay products of at least fair quality at a cost far below that at which similar goods can be brought to Edmonton from Vancouver or Ontario, or from the nearest United States clay working centres.

British Manufacturers and Co-operation

The Canadian Field as it Appears to Industrial Britain—Impressions gained by Interviews with Heads of British Manufacturing Houses

By the Editor

London, August 25, 1911.

An investigation of the conditions obtaining in London in particular, and in the Old Country in general, leaves the impression that before business can be carried on to mutual advantage between the two countries certain reforms must be effected on both sides. Criticism, like charity, should begin at home, and so in the first place it may be said that a revision of the prevailing method of obtaining bids in Canada is necessary. As for the Englishman—or shall we say Britisher?—we would suggest that he lend a more willing ear to the emissaries of the Dominion, and adapt himself a little more generously to Canadian requirements.

The writer had intended to dilate at some length upon English customs, but perhaps it will be better to confine ourselves in this article to the more important consideration of shortcomings and desiderata as seen from both viewpoints.

Uncertainty of Disposition

Concerning the disposition of the English manufacturer toward Canada, much may be said. While it is generally conceded that our country is one of great possibilities, the admission is often qualified by a somewhat disparaging after-comparison with other fields, such as Australia, India and Japan, in which the factor of competition does not loom so large as in Canada. There is nearly always the element of uncertainty. It is hard to convince the Britisher that we are doing our best to stimulate old country trade; that we are giving England preferential tariffs and concessions wherever possible; and that in face of our tremendous development we positively cannot afford to allow Canadian and United States manufacturers a monopoly of our trade.

One encounters in not a few cases a surprising lack of confidence in the sterling worth of British goods and an exaggerated idea of the resources of American manufacturers. The manager of a leading London house acknowledged that at present his firm were doing a fair business in Canada, but was strongly opposed to any policy of extending that business on the ground that such a move would induce American manufacturers to make a cut on their goods and that they, with the "better facilities" at their disposal, would quickly flood the market and make competition impossible. Fallacies of this kind are by no means uncommon.

Canadian Shortcomings

The secretary of one company held the opinion that Canada was only bluffing in "pretending to encourage Old Country firms." He was quite sure that we were amply supplied in all lines and he concluded by implying ulterior motives on our part in luring British firms into the field. Pressed further, this gentleman stated that he could cite a number of cases where English and Scotch firms had been turned down on large contracts after submitting the lowest

figure in what purported to be a fair competition conducted on the basis of equality for all. No factor, he said, could be a more powerful deterrent than such treatment. Inasmuch as the details were only given in confidence, further elucidation is impossible, but, it is not too much to say that there appeared to be fair ground for complaint, and the conclusion can only be made—and it is a time-honored contention in these columns—that our commercial life depends upon our reputation for strict integrity in matters of this kind.

The head of a large engineering firm, who formerly resided for some years in Ottawa, expressed himself very strongly upon the unreasonably short time allowed for tendering on Canadian work, and also upon the requirement of excessive deposits. These objections were discussed very fully in our issue of June 21 last. It need only be added that our continued adherence to these arbitrary practices is doing much to injure the reputation of Canada in outside contracting circles. If our works are of sufficient magnitude and importance to be worth the consideration of the leading British and European firms, and if we desire—as we certainly do—to obtain the best figure consistent with the best work and the best material, we must see to it that all the preliminaries connected with our big projects are settled well in advance of the actual season of construction, so that an adequate allowance of time can be made for advertising the work, sending out plans and specifications, and preparing bids.

The Question of Adaptability

The matter of adapting his product to Canadian requirements is a subject worthy of more careful consideration on the part of the British manufacturer than it usually receives. One supply firm told the writer, very resentfully, of a loss that it had sustained on a large shipment of stoves to the west. Enquiry elicited the fact that these stoves were of an English stock pattern quite unsuited to the field, but no concession would be made on this account. The stoves sold in England, and the firm was not going to spend thousands of pounds in getting out fresh patterns for Canada. Such enterprise as "fresh patterns," it is only reasonable to assume, is left to any other country that wants the business. And yet the same Britisher grumbles later on because his chances have slipped away from him!

Canadian Representatives

The difficulty of securing proper representation in Canada has proved a stumbling block with many excellent British firms and in some cases it has deterred them from entering the field at all. Now the engineering and building trades in our industrial centres include in their ranks many capable, aggressive men who would find it well worth while to devote a considerable portion of their time to work of this kind. The fact is that hitherto these men have not been reached. Agencies have been arranged without proper investigation and quite naturally the re-

sults have been unsatisfactory to all concerned. With a view to improving the relations under discussion we take this opportunity of inviting enquiries from supply firms, and others willing to handle British business. For the rest we are prepared to undertake all preliminaries and to do our utmost in every way to facilitate the appointment of reliable and competent representatives in Canada for British firms. The Contract Record reaches all branches of the trade and such work is peculiarly its province.

"Wake Up, England!"

One cannot but think that England would be a better country if Englishmen were more receptive. Canada is worth watching closely. Those who have made it their business to study the country and its requirements have not studied in vain. We all know men who have prospered; few can point to failures. And there was never greater prosperity than we are enjoying now!

In spite of the excellent publicity work which is being carried on in England one still encounters deplorable ignorance. To say the least it is disconcerting to be asked whether Ontario is "a part of Toronto," while it is positively exasperating to have to reply to such a question as, "How far is your nearest railway station?" Such queries are uncommon, of course, but the fact remains that they are still possible in a day's journey. And among the best informed men over here there is little enough inside knowledge of Canada's wonderful progress and of its illimitable resources, which point to so great a future.

Sooner or later the Britisher must come to a relation of Canada's greatness. Let us but hope, in the interest of the empire, that the time will come quickly and that he will awaken early to his golden opportunity in a land which has brought forth, in recent years, cities and railroads and great enterprises on a scale which has had no parallel since the world began.

The Surface Treatment of Concrete Buildings

In the art of architecture, which depends for its appeal so much upon the judicious use of forms familiarized and sanctified by tradition, it is only with the greatest caution that we can break away from the methods of design based on materials that have been long in use. From time to time ingenious pleas have been put forward for the abandonment of all the "hackneyed" paraphernalia of design and the return to "first principles" of design based on the embellishment of construction. Even the logical temperament of such a man as Viollet-le-Duc did not prevent his copueting with this idea. Despite the support this theory has received, it is now, we imagine, sufficiently discredited to render its further consideration superfluous. With the introduction of a new building material the point must always arise as to how far it can achieve expression independently of the traditional forms. It may take forms so nearly akin to the material it supplants as to render the transition easy and natural, but, on the other hand, it may involve such drastic changes of method as to necessitate a long experimental period before it comes into its own as a recognized means of attaining architectural effect. As with the Ionian Greeks, stone took time to assume the characteristic forms appropriate to its structural capacity, and as during the last century iron and steel were embellished with de-

coration borrowed from other materials, so at the present time the rapid development of concrete as a constructive material, due to the discovery of the monolithic combination of concrete and steel, presents to us the new problem of the range of possible architectural expression in this monolithic type.

In order to avoid confusing the issues, we may at once dismiss from consideration all structures compounded of reinforced construction and the pre-existing methods of building and confine ourselves to those formed of concrete cast in moulds, which will probably enclose, in some manner or other, steel tension members. In regard to these there can clearly be but three possible systems on which the surface left by the removal of the moulds can be treated, as, while each of these is capable of almost infinite variety, it must either be by addition, by simple inaction, or by subtraction that the surface will be determined.

The first of these includes all such methods as plastering, tiling, and other means used for concealing in whole or in part the surface left from the forms. In the case of the second, the forms must themselves be of a character giving the desired surface. In the third the materials used must be such that the erosion or dressing off leaves a face suitable for exposure.

We do not propose to enter into the question as to which of these three methods may be regarded the more legitimate as a means of architectural expression; indeed, we very much doubt if such a question can be discussed with any profit. Such attempts have so frequently been made, only to result in the bottom been knocked out of conclusions, apparently most closely reasoned out, by the man of genius, who, having ignored him, achieves his aim by processes which are not at the time explicable on any argumentative basis.

As might have been expected, most of the experimental work in all three methods has been done in the United States. There, for some years past, pottery designers have been working out decorative ornament suitable in scale and color for the embellishment of concrete buildings. A general surface of tiling or of marble slabs, recognizable as slabs and not simulating masonry, has also been accepted in the U. S. A. and on the Continent; while more recently combinations of eroded surfaces with added decorations have been attempted.

Again, in the matter of untouched surfaces we have done little here at home in regard to any substitutes for the usual boarded forms, though in cases efforts have been made to produce a surface as clean and uniform as possible.

In the U. S. A. sheet metal forms are in use, having lines or a pattern to mark the edges—a distinct effort to impress on the building the method of its construction. On these lines an infinite variety of effect appears possible, the only limit being the restraining influence of the architects' taste. It might be considered, for example, appropriate to stiffen thin metal forms by a stamped grooving or pattern, and this would leave its impress on the face of the work, suggesting a sort of diaper in relief; again, the metal forms might be made to hold a kind of coarse mosaic, producing a result akin to the opus reticulatum of the Romans. It is obvious that we have by no means reached the limits of possibility in this direction.

Of late, more attention has been given to the system of removing the surface left by the forms, and a number of methods have been used for this purpose.

The face may be treated with dilute hydrochloric acid, which removes the cement and exposes the aggregate. The sand blast leaves a large proportion of the cement matrix exposed, and the same may be said of both the hand and pneumatic hammer work. If it is possible to remove the forms within twelve hours, scrubbing with a steel brush produces a texture much better in its effect than that left by the pneumatic hammer, which picks out the aggregate so that the color of the matrix only is shown.

In the case of all buildings proposed to be treated by one of the methods of erosion the selection of the aggregate is of the utmost importance; it should not be too varied in color and its general tone should be considered; it may be of any shade desired, but a mixture is not only less effective in itself, but has the additional disadvantage that if not kept absolutely uniform the work will appear patchy and over variegated. The mixing and deposition of the concrete must also receive much closer attention than it would otherwise need, the aggregate requiring to be kept to an exact average in size throughout, and any ramming done with the greatest caution in order to avoid packing the stones closer in one part than another. Thus the preparation of concrete suitable for erosion is an operation demanding a degree of skill materially increasing the cost of the work.

No doubt in time reinforced concrete will take its own place, much as steel is doing at the present day, and will develop some legitimate mode of expression. The time will come in due course; to try to force the pace will only, in most cases, result in adding to the abortive efforts at architecture on "first principles" before referred to, but it is not amiss to keep in touch with any possible treatment for construction of this character, and among these the question of surface has a very definite importance. It will, of course, be readily recognized that it is by no means the only one, but as it appears to us to have been somewhat neglected in this country we have thought the moment an opportune one to draw the attention of our readers to the possibilities in this direction.—The Builder.

Bamboo Bridge Building

At a recent meeting of an engineering body, it was incidentally mentioned that steel, iron, and stone were not the only available materials for bridge building. In Java, the Government engineers have recently constructed a road bridge, more than a hundred feet long, with a central span of over sixty feet, entirely of bamboo. The road bed is composed of bamboo matting, which will be covered with a layer of dry earth. In profile the bridge resembles a steel structure, but all the members are bamboo rods. It is estimated that such a bridge should be good for ten or fifteen years. It was further explained that the bamboo used is a kind having a solid stem.

Impermeable Roofing Tiles

Sooner or later certain manufacturers of roofing tiles find a demand for impermeable tiles, and they usually seek to meet this demand by covering their ordinary tiles with an impervious material. Theoretically it would appear to be better to burn the tiles until they become more vitrified, but this is practically too difficult of accomplishment in most cases, as certain roofing tiles are so thin that, with the slightest overheating, they twist and are spoiled. Hence it be-

comes imperative to apply some covering material which will make the tiles sufficiently impermeable without otherwise affecting them when in the kiln.

Under these conditions two methods of working are available: the tiles may be dipped in a glaze, or they may be tarred after they come out of the kiln. Glazing enables tiles of any desired color to be produced, but with tar only black tiles can be made, and these are liable to become unsightly in use.

The dipped or glazed tiles are usually treated before they are placed in the kiln, as this method is so much more economical than when they have first to be fired without a glaze. A suitable slip is composed of lead oxide or galena, flint and a little clay, the proportions of each depending on the temperature at which the kiln is fired the shrinkage of the clay, etc., and consequently are only ascertainable as the result of actual trials. It will usually be found that three times as much lead as clay, and twice as much flint as clay is a useful proportion to start upon, but the clay must be varied according to the nature of the tiles. The lead compound should always be present in greater amount than the flint, or the glaze will be too infusible. To increase fusibility a larger proportion of lead is added.

When the glaze is to be colored, about one-twentieth of the total weight of the whole glaze is added in the form of color, the usual pigments being manganese dioxide to produce a brown, copper oxide to produce a green, and chromium oxide to produce an opaque green. The color of the burned tiles will, naturally, depend on the proportion of pigment added, and the figure given above is only approximate, as the natural color of the tile has a considerable influence on the result.

The firing is carried out in the ordinary manner, the only difference made by the glaze being that the setters must take care that the glazed surfaces of the tiles do not come in contact with each other.

When tiles are to be made impervious by tar, it is necessary that they should be fairly porous, or the operation will not be successful. It is also important that both tiles and tar should be hot, so that the most convenient time for tarring is when the tiles are being drawn out of the kiln. They must not be too hot, or the tar will not be absorbed properly. Benfey has stated that the tar should be at a temperature of 100 C. and the tiles at 50 C., but this appears to be rather low for the tar.

It is a common fallacy to suppose that tiles are made permanently impermeable by tar, whereas in reality the tar is only a temporary protection, and when part of it has been removed by the action of the weather the tile will soon become unsatisfactory. Again, the softest and least durable tiles are the ones which absorb the tar the best, yet they are the most unsatisfactory in actual use.

A method of firing which will produce impermeable tiles without the risk of twisting them is much to be desired, but is at present unknown. All that can be done, therefore, is to choose a clay with sufficient non-plastic material in it to keep it from twisting, and sufficient fluxes to yield a reasonably impermeable tile, or to dip the whole tile in a suitable glaze.

Advice from Montreal states that progress upon new pavement and sidewalk work is being seriously held up owing to scarcity of cement. The cement producers state as a reason for this that they are impeded by labor troubles and shortage of freight cars.

The History of Reinforced Concrete Pipe

Its Advantages are Many, Disadvantages Few—Various Applications—Paper Read Before the Union of Canadian Municipalities Convention at Quebec

By Archibald Currie, C.E.*

To a French gardener, M. Mouier, must be given the credit of having first employed reinforced concrete, he having in 1867, constructed large flower pots of cement concrete with a reinforcement of metal.

Reinforced concrete was undoubtedly known before that date; a patent having been taken out in England for a suspension reinforcement in 1854, an exhibit of this material being shown at the Paris Exhibition of 1855, and several methods of its application having been proposed by a French engineer, M. Francis Coignet, as early as 1861.

No further progress seems to have been made till about 1885 when German and Austrian engineers took the question up. England and America quickly followed but it is only in very recent years that the problem of the construction of reinforced concrete pipes has been seriously taken in hand.

In this age of improvements of all kinds, but more especially with regard to those of sanitation and water supply, improvements that are necessarily of a costly character, municipal bodies are frequently debarred from carrying out such owing to,

- (1) The initial cost.
- (2) The cost of repairs owing to corrosion in iron or steel pipes.

(3) The additional burden placed upon the taxpayers. But it can be claimed that reinforced concrete pipes have the following advantages:

- (1) Reduced initial cost.
- (2) There being no corrosion or leakage repairs are reduced practically to nothing.
- (3) The tax rate under these conditions would be considerably less.

Further Advantages

The above advantages appeal largely to the public, but there are other advantages which commend themselves to the engineer who in turn acts as advocate to the public.

As is well known the principal duty of the metal in a water main is to withstand the tensile stress set up in it by the internal water pressure. Now if a cast iron main is designed simply to resist this stress, the result is that a thin cylinder of cast iron is designed which is almost too thin to cast with accuracy, and being a metal adapted to resist compressions and not tension the result does not instill confidence, and a certain percentage of metal is boldly added to cover irregularities in manufacture, unequal bedding in trench, water hammer, road traffic, etc., and, after all, a metal has been used which is not well adapted for its duty, but it is used almost universally being both cheap and convenient. If a sheet steel main is designed simply to withstand the internal pressure the result would probably be a sheet so thin as to cause doubt as to its power to resist collapse from the weight of the material filled in the trench or from road traffic; the thickness of metal is therefore increased to cover this and the weakness of

joints; this in addition to an expensive metal is costly and although the body of the pipe is of an excellent material and well adapted for its duty and would give more confidence than the more uncertain cast iron pipes, yet both of them are subject to corrosion, which will in time destroy them, the steel pipe first because it is thinner, and the rate of decay practically the same for both metals with pure water. It is therefore necessary to protect both the cast iron and the steel main from corrosion and for this purpose the pipes are probably treated with an application of bitumen or other rust preventative. How long this preventative coating will last under the best conditions it is not possible to say, but it is probable that its effect is simply to defer the time of commencement of the attack by corrosion for a few years, and that once this sets in little assistance is obtained by the coating.

A Recent Realization

It is only during the past few years that the various valuable properties of cement in combination with steel have been thoroughly realized; it has been vaguely known that when the space between the outer and the inner skins of the hull of an old iron or steel ship have been filled with liquid cement and a portion of this structure is cut into after 30 or 40 years, the metal is found to be perfectly preserved; this experience of ship builders was not generally or widely known by engineers or architects, or if known has not been acted upon. It is on record that a bar of iron after being embedded in concrete for about 400 years was perfectly preserved.

The principal features of value in adopting reinforced concrete for pipes that are to be put under pressure are,

(1) Strength, which can be made sufficient to deal with any pressure to which the pipe may be subjected.

(2) If steel is well surrounded by cement the metal is protected for a very long period, much longer than any rust preventative will increase the life of a metal pipe. The adhesion of cement to metal excludes all air and prevents rust, thereby allowing the metal to maintain its original strength. As to the cement covering it is well known that cement concrete increases in durability with age and particularly so when impregnated with water.

An Example of Pipe Installation

The following description of the manufacture, laying and jointing of one of the many systems of reinforced concrete pipe, and carried out under the writer's supervision may be of interest.

The pipe consists of an interior tube or sheet of mild steel, varying in thickness from 1/32 in. to 1/8 in. according to the pressure to which the pipe is to be subjected, built up in sheets manufactured locally. The jointing of the steel tube sheets is effected by means of oxy-hydrogen blow pipes, which make autogenous welds. The oxygen and the acetylene, or

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other heating gas, may be so regulated at the blow pipe as to give either a fusing flame or a burning or oxidizing flame. With this latter flame iron or steel can be cut to any shape; with the former it can be fused or welded together with no waste.

The circumferential joints in the tube are made by turning up the edges of the sheets and welding the adjoining edges, whereas the longitudinal joints are butt joints. The ends of each tube are turned up and a collar made of sheet steel is turned up to form a stop end for the external cement coating.

Outside this steel tube is placed the external reinforcement consisting of bars of the section of a Latin cross wound in helical form around longitudinal parallel bars of smaller cross section, all the cross-ings of the tube being wired together.

The external reinforcement and the steel tube only are taken into consideration in calculating the strength of the pipe, and the distance apart of the helices is varied to suit the pressure of the main. An internal reinforcement constructed with a lighter section of bar is constructed in the same manner. The only duty of this internal reinforcement is to support the inner portion of the cement, and is not taken into account in the calculations of the strength of the pipe. When the three portions of the steel skeleton are completed, the inner reinforcement is placed inside the tube and the outer reinforcement outside; they are then placed vertically on curved wooden curbs made to the exact shape necessary to centre them and preserve the correct thickness of the cement coating.

The next operation is the moulding or casting of the pipe. A collapsible core made much on the principle of an umbrella is lowered into position in the inside and sheet steel moulds outside, the space between the core and the mould being then run with mortar consisting of two parts of clean, sharp river sand to one part of Portland cement, mixed on an elevated travelling platform to the consistency of thin mortar, so that it will flow readily and completely surround every portion of the enclosed steel. During the process of running the cement, the outer steel mould is sharply struck with wooden mallets to facilitate the escape of air bubbles and assist in consolidation.

This portion of the work may appear simple, yet great care has to be exercised in its execution; before the cement is run into the moulds they should be well rubbed with a mixture of soap and oil, so that when they are withdrawn they will leave the finished concrete clean.

Removal of Pipe Core

A somewhat difficult point is to determine exactly when the concrete has set sufficiently to enable the core and external moulds to be removed, the time of setting of course varying with the temperature, mixture, quality of cement and various other conditions. The writer has known cement to set sufficiently in forty-five minutes to enable moulds to be removed, whereas in other cases six hours have elapsed.

When the moulds are taken off, the pipes are allowed to stand vertically for four or five days to harden, after which they are lowered and left in a drying yard until required. They should be allowed to dry for about a month before being laid and when ready for laying will stand quite as much rough usage as a cast iron pipe.

The next operation is laying and jointing the pipe, At the ends of the pipes a rebate of about two inches

long and 1½ inches deep is left, the ends of pipes are laid hard up against each other, the rebate filled with bitumen on the outside of the pipes thus joined together, a reinforced concrete collar, made similar to the body of the pipe, is constructed and thus forms the main joint.

Bends and specials are made on much the same principle as the straight pipe, except that the cement concrete moulding is done by hand moulding and not by steel shields. This system has considerable advantage over either cast iron or steel pipes, as the angle of splay or radius of the bend can be executed by the workmen to suit the actual conditions and not dependent on a stock pattern.

Testing Samples of Pipe

As regards testing, the writer was engineer on several works where this system was used and made many experiments during the process of making and laying the mains to strength and watertightness.

The first testing was made on the welded steel tube before any of the reinforcing rods were fixed, in order to detect any pin holes in the welding and, if necessary, repair before the pipe was concreted. Every tube was placed in a specially designed proving frame and subjected to a test of 50 feet static head.

The finished pipe was placed in the same testing frame, about one month after being moulded, and subjected as a rule to a test of 1½ times the working pressure, which varied from 350 to 900 feet static head or in other words, from 152 to 391 lbs. per sq. in. One special tube was tested to a static head of 1500 feet or 651 pounds per square inch and showed no sign of fracture.

These pipes can be made for all diameters above eighteen inches and are essentially for trunk mains.

Where junctions have to be made for stop valves, air valves, scour valves or branch services, a specially made steel casting is usually welded on to the internal steel tube, then heavily reinforced and surrounded with concrete.

Application to Sewer Work

Having generally described the use of these pipes for water mains, the question of their use for main sewer need only very briefly be touched upon, as it is only a question of designing and reinforcing to suit the pressure. In one sewer made for the Corporation of Belfast, Ireland, the steel tube was entirely omitted, the only reinforcing being the spiral rods. This pipe stood a pressure of 50 pounds per square inch.

These pipes are usually made in about ten or fourteen foot lengths, where the diameter does not exceed two feet, the total thickness of the shell from two and one-half to three inches.

As regards cost, the writer found in Great Britain on the works he was engaged, that these pipes were manufactured, laid and jointed at about three-quarters of the price of steel and slightly more than one-half the cost of cast iron.

In the City of Grenoble, in the south of France, the city authorities arrived at the following conclusions on a line of reinforced concrete pipes which had been laid for fifteen years.

(1) The irreproachable state of preservation of the pipes, in which there was found a slight calcareous deposit about 1/16 inch thick. They did not show the least fissure, either internally or externally.

(2) There existed no trace of oxidation from the metal. The binding in wire which connected the

longitudinal rods was absolutely free from oxidation.

(3) The adherence between the metal and the cement concrete constituting the body of the pipe was such that, despite the thinness of the concrete (1-3/8 inches) they could only be separated by heavy blows from a sledge hammer.

(4) When struck with a hammer, these pipes evinced remarkable seniority, such as might be obtained from a sound cast iron pipe.

(5) The detached fragments of the cement concrete showed very sharp angles.

(6) No repairs had been executed on these pipes from the time they were laid until the time of examination, a period of fifteen years.

A great advantage in reinforced concrete pipes is

that with the aid of a few experienced men local and other authorities can carry on the manufacture themselves. This appealed to the writer very much where city councils in other countries had to deal with the great unemployed problem and provide relief work. In Johannesburg, South Africa, after the Boer War, the Municipal Council provided considerable relief work to the unemployed by undertaking the manufacture of reinforced concrete for the main outfall sewer.

In Scotland, about two years ago, the writer engaged a number of unemployed men on manufacturing, laying and jointing the pipes already described and which to some extent aided the Corporation in alleviating the relief problem, and it is hoped a problem which will never require solving in this country.

Construction Work on Midland Railway

Entrance into City of Winnipeg is in Progress—Description of the Several Subways—Difficulties Owing to Promiscuous Paths of Water and Other Mains



Foundations and Piers for Freight Sheds being placed

When the C. P. R. ran its first line through Winnipeg it had the embryo city under its control, with the result that the C. P. R. can practically dictate to the city what its lines shall be, how and where they may run. It has only been within recent years that the city has been able to secure other than grade crossings. Since the Main street subway was built, several years ago the conditions have been somewhat improved and with the completion of the McPhillips street subway and the Brown-Brant street bridge there will be rather better means of inter-communication between the north and south sections of the city.

Having this lesson in mind, and the lesson before them of what it has cost to overcome the obstacle offered by the C. P. R. tracks and yards, the city council did not look with favor upon the proposed grade entry of the Midland Railway into the city. After negotiations extending over several months a compromise was finally arrived at whereby the railway was to enter the city on a high level, and subways were to be constructed by the railway at all of the streets crossed by them. The layout of the district through which they are entering is such that but five subways are needed to bring traffic to the

point where their freight sheds are being built, and contractors are now at work on these five subways.



Forms for retaining wall at Sherbrook Street, showing car line diversion

At Sherbrooke and Arlington streets the railway lines cross street car lines so that there must be ample

clearance provided, and with the tracks up for these, it has been a simple matter to provide full clearance throughout. Beginning at the terminal between Ross and Pacific avenues the line runs west, crossing Sherbrooke street. It then swings southwest crossing Ross and Elgin avenues at acute angles, and Tecumseh and Arlington streets more directly.

One of the chief reasons for the city's insisting on having the tracks raised lay in the fact that the block between Ross and Pacific avenues is a very short one, and if it had been necessary to depress the street level to any great extent there would not have been sufficient distance at the ends to provide for the five per cent. demanded. As it is the street level is being dropped 5 feet 4 inches, and the balance of the head room required is arrived at by elevating the tracks.

The type of construction decided upon is the same for all subways. Heavy concrete retaining walls carried on staggered piling, support the dump at either side of the street. There is a space for the 12-foot sidewalks and concrete piers carry the through plate girders which span the main traffic roadway. All subways are to be full width of the streets. Where the tracks cross the streets diagonally groined arches are run over the sidewalks, with centre piers to carry the long spans necessary. The subways are being built for double tracks, though they will not be needed for a couple of years at least, as at Sherbrooke street it will be possible to make provision for three or more tracks. This point is the western end of their proposed freight terminals.

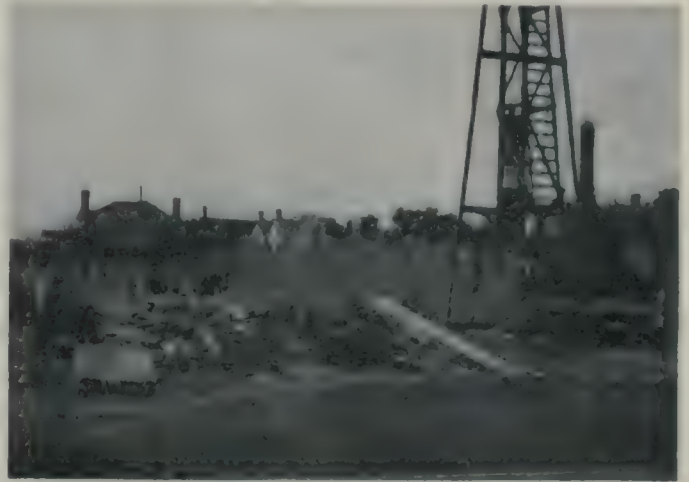
Sherbrooke street has proved one of the most difficult pieces of work for the contractors. It carries one of the 16-inch domestic water mains supplying Centre and South Winnipeg, as well as a 12-inch gas main. Both of these have to be shifted as they are on the line of the main piers, and the water main will have to be depressed to below the accepted frost line. This latter work is a difficult one for the soil is most unfavorable and especial precautions have to be taken to guard against breakage and opening joints. They will be bedded in concrete where the angles come, and as the domestic pressure seldom exceeds 90 pounds, this is thought to be sufficient. The subways will be paved with sandstone blocks laid on concrete with a sand cushion between.

At the present time the east retaining wall at Sherbrooke street is completed and the excavation down to grade. There has been a slight delay due to the necessity of removing a quantity of deep footings which were beneath a couple of the buildings cleared away by the railway company. At Ross avenue the excavation is finished and concrete is being placed for the south retaining wall and pier. At the three others the excavation is still in progress but well advanced. The spoil is being utilized in building the railway dump, and where this is not sufficient, a pile viaduct is being erected which will later be filled. John Gunn and Sons have the contract for the first two pieces of work; Wallace and Aikins are at work at Elgin avenue, and Homer, Powell and Webster are doing the work at Tecumseh and Arlington streets. The general contractors are Guthrie and Co. T. D. Eddy is engineer in charge and H. Saltzman is chief inspector for the city.

Speed is the first essential of the work. The contract provides that the work shall be completed by December 1st of this year, and if not a penalty of \$25 a day for each subway not completed will be

demand, up to January 1st, 1912. If not completed by that date the penalty will be \$100 a day. Ample provision has been made for handling traffic while the work is in progress. The company has provided roadways through their property for traffic diversion, and at Sherbrooke street, a busy artery, the street railway lines have been diverted to a single track east of the retaining wall. The disturbance resulting is but slight.

In addition to the subway work and grading, the Midland is also rushing work on their freight sheds. The main building will be 400 feet in length with frontage on Ross avenue and extending eastward to Isabel street. The main line will be carried through the centre of the block and on the north side, opening on Pacific avenue there will be team tracks. The concrete foundations and piers for the sheds have been placed and the brick work will be commenced at once. The offices will be located at the east end



Piling for main line track west of Sherbrooke Street, showing part of subway excavation

of the sheds where the structure will be carried to three storeys. At the present time the company has not decided as to the location of their passenger depot. They have suggested using the new Union Depot or of building one for themselves to the east of Isabel street. This would necessitate another subway at Isabel, and the purchase of property for an opening on Princess street, which would give them access to the heart of the city. The necessary property, however, is being held at a ruinous price.

The effect of lightning on concrete, which has long been a matter of dispute, has been observed by a leading member of the American Society of Civil Engineers, who has a reinforced concrete water tank on his country place. This was struck by lightning, which caused no injury, but changed the texture of the concrete in places from granular to vitreous. The tank was heavily reinforced.

A 6,000,000-ft. gas holder, with a steel tank 225 feet 9 inches in diameter and 35 feet deep, will be built by the Riter-Conley Manufacturing Company for the Allegheny Heating Company, of Pittsburg. This will not be the largest gas holder in the world, as widely reported, for it will be an exact duplicate of one constructed by the same builders several years ago for the Milwaukee Gas Company.

The Purification of Public Water Supply

**A Comprehensive Paper Dealing with the Undesirable Constituents of Water—
Detection of Impurities—Bacteria of Two Classes, Beneficial and Dangerous**

By Wm. Ransom, C. E.*

The filtration and purification of water for public supply is a problem that has become increasingly important with the march of civilization. There is an ever-expanding demand for water, both for domestic and manufacturing purposes, and the sources of our water supplies are being taxed to their utmost. The watersheds of the country are being appropriated by the great municipalities, so that not only has the problem of filtration and purification to be faced, but there is now the initial difficulty of procuring fresh sources of supply, where those existing are insufficient to meet the increasing demands, or those likely to arise in the near future. We have not in this paper to deal with these difficulties, and are able to assume that we can obtain a supply of water, but which requires to be filtered and purified to make it fit for a public water supply. The practical working out of this problem involves the application of many principles and a knowledge of many factors, so that it will be necessary to explain many of these before proceeding with the practical side of our subject. The filtration of water has only within comparatively recent years been conducted upon scientific principles, and, indeed, for a long time, its theoretical side was not understood, and theory and practice were not reconciled until after an extended experimental stage.

Pure water (H_2O) is free from taste and smell. It is also transparent and almost colorless under ordinary atmospheric pressure. Water can be tested for smell by half-filling a bottle and then warming and well shaking the contents. The color can be judged by observing a white surface through a column of water two feet high. Pure water has a slightly bluish tint. A green or yellow tint indicates the presence of organic matter. A brown tint is given by peaty water, and a reddish tint by water containing iron. Water is not found chemically pure in nature, and, as a rule, by the time it is available for the use of man it has become laden with many impurities. These impurities can be divided under three headings: (1) Gaseous; (2) mineral, and (3) organic. Gaseous impurities are nearly always present in water. Oxygen is necessary to make it palatable. Carbonic acid gas will give a sparkling appearance to water, and impart such an effect even to water which has been highly polluted with dangerous matter. Water quickly absorbs gases, and, therefore, should not be stored in proximity to foetid or obnoxious gases. It is seldom necessary to remove gaseous impurities upon a large scale, as water selected for a public supply is rarely charged with any objectionable gas. Mineral impurities vary with the soil through which the water has travelled. Water has a very strong solvent action upon the various minerals with which it comes in contact, and this action is increased by the carbonic acid gas which water is able to absorb from the ground air. The mineral impurities of water determine its relative hardness, and it is often necessary to adopt means of purification to render

the water less hard for drinking and manufacturing purposes. Water should not contain more than forty grains of solids per gallon. Organic impurities in water are due to vegetable and animal pollution. The term is usually applied to dead organic matter arising from decaying vegetable matter, sewage, etc., but can also be fairly extended to include pollution caused by organic life as represented by bacteria. The two are inseparably united, as the decomposition of dead organic matter is effected by the bacteria as part of nature's plan to get rid of obnoxious matter. The dead organic pollution supplies the food necessary for the growth and maintenance of bacterial life. The one is indicative of the other, and even in water in which the dead organic matter has been reduced to a comparatively harmless form, the fact of past pollution is indicated by the presence of bacteria in large numbers. Forewarned is forearmed, and in such water we are never certain but that the dead organic matter may not appear in its unreduced and dangerous form, and therefore the presence of bacteria in large numbers enforces the need of proper filtration and purification to prevent possible danger from organic pollution.

Chemical Analysis

Impurities in water are chiefly detected by means of chemical and bacterial examinations. A preliminary inspection of water will enable us to judge of its turbidity, which is principally due to inorganic matter in suspension. Vegetable growths such as algae may render water turbid, and this will vary with the seasons. If we now examine water by chemical and bacterial means, we shall the more readily understand what is implied in the work of filtration and purification of water to make it fit for the purpose of a public supply. Chemical analysis will reveal to us something of the previous history of the water; but, as a result of such an examination, it would be very unwise to be dogmatic, because chemical analysis takes no account of the bacteria, among which are the direct agents of water-borne diseases. The presence, too, of some substances which are detected by chemical analysis may or may not be dangerous, according to their source and the changes which they have undergone. The solids which are found in water consist of mineral matter, such as carbonates, chlorides, sulphates, etc., together with organic impurities. Each substance found has its special significance, and as we briefly refer to the various substances which chemical analysis is able to detect we will, at the same time, glance at the reasonable inferences that may be drawn from such detection. Chlorine is found in varying proportions in all ground waters, and is chiefly present in the form of common salt (sodium chloride). Its presence in large quantities should be viewed with suspicion, because chlorine is always found in sewage, and there is the possibility that the water under examination has obtained its chlorine from sewage pollution.

It is difficult, by means of chemical analysis, to determine the source of organic pollution, or to differ-

* Extracted from paper read before Convention of Municipal and County Engineers, Worcester.

entiate the extent of the danger arising therefrom. A water containing organic pollution due to vegetable matter is, therefore, equally condemned with the water contaminated with dangerous animal organic matter, and accordingly our inferences must be very carefully drawn with respect to organic pollution. The nitrogenous portion of organic matter is a good index of its character and previous history. When organic matter decomposes many nitrogenous substances are produced and appear in the form of ammonia, which may either be free or united with acids to form salts. These products are again changed by the activity of bacterial life, and converted into nitrites and nitrates. Albuminoid ammonia and free ammonia are found in the early stages of decomposition of organic matter, and are always to be found in sewage, and therefore their presence in drinking water is dangerous, and calls for immediate inquiries. On the other hand, moorland waters may contain free ammonia and still be quite wholesome. In some ground waters free ammonia may be due to the action of the soil upon the nitrites and nitrates. Ground waters containing albuminoid ammonia are almost sure to have been polluted with sewage matter. The ratio between albuminoid and free ammonia affords a means of judging the probable cause of organic pollution. It has been found that a high ratio between albuminoid and free ammonia, together with a small proportion of chlorides and nitrates, indicates vegetable pollution, whereas an increase in free ammonia and chlorides indicates animal pollution. The slow evolution of ammonia points to recent pollution, while in cases of more advanced decomposition the ammonia is evolved more rapidly. Biological changes so quickly take place in water, and ammonia being by no means stable, that to form a proper opinion of the water a chemical analysis should be made as soon after the sample is taken as possible. Albuminoid ammonia should not be present in drinking water to a greater extent than 0.1 part per million.

The Oxidation Method

Another method for determining the amount of organic matter in water is to ascertain how much oxygen is required to oxidise it, and by the formation of an experimental standard to determine the amount of pollution. Nitrites represent the intermediate stage of decomposition of nitrogenous matter, and when found in water indicate pollution with organic matter, and therefore should be viewed with great suspicion. High nitrites and high free ammonia when found in surface waters may be taken as conclusive evidence of sewage pollution. Nitrates represent the final stage of nitrogenous matter, as the result of bacterial action. The nitrogen is in a more stable form, and is able to collect in the soil. Nitrates do not present a serious danger, but as they indicate past pollution, the possibility may arise when the pollution may be present in its unchanged or less reduced form. Such an eventuality should be guarded against, for if no provision be made for filtration and purification, a favorable opportunity may otherwise occur when organic pollution may be passed directly on to the consumer.

Sewage pollution is chiefly dangerous because of the possibility of disease germs being thereby communicated to the water. Substances that are present in sewage are frequently found in water which has not been polluted, so that unless we know something of the source of supply, a chemical analysis does not en-

able us to form a thoroughly reliable opinion of the water for domestic purposes. We are considerably aided by the bacterial examination of water, and can quickly detect sewage pollution, and form a good opinion as to the time which has elapsed since the water received pollution. It is the most "sensitive test of change," taking place from hour to hour in water, although in the multiplicity of bacterial life it is very difficult to individualise the specific germ of disease. It is the best guide to the effect of filtration. A chemical analysis will often be unable to detect much difference between unfiltered and filtered water, owing to substances in solution being practically the same in each case, having been able to pass through the filter. It is unable to demonstrate the work of filtration which has been effected by the holding back of the greater proportion of bacterial life, which possibly may contain the actual germs of disease. Bacterial examination is able to demonstrate the removal of bacterial life by means of filtration. The actual detection or isolation of disease germs, is, however, very difficult, but the numbers of bacteria in filtered and unfiltered water can be determined, and will give an idea of the amount of purification. This test must be cautiously applied when judging the efficiency of a filter, for it is possible for circumstances to arise when ordinary water bacteria will find a favorable opportunity to multiply in the filtered water. In bacterial examinations a special point is made upon the number of liquefying bacteria which are found when a cultivation is made upon gelatine. Putrefactive organisms are, as a rule, liquefying specimens, that is, are able to render gelatine, upon which they are cultivated, more or less fluid. In a good water it would, therefore, be undesirable to have many liquefying bacteria. A method is sometimes adopted of adding specific bacteria to the unfiltered water, and then testing the effluent to ascertain the percentage retained in the filter. The bacteria should be of a class that will not develop and multiply in the conditions provided by filtered water. *Bacillus coli* is often taken as a bacterial index of sewage pollution. It is found in human sewage, and its presence in water should give rise to caution. Special means are taken to isolate this specimen from other forms of bacterial life in water samples, so that an opinion may be formed of the previous history of the water. The *Bacillus coli* is very like the germ of typhoid fever, and some experiments have gone so far as to say that both are varieties of one germ, but with pathogenic powers very much developed in the case of the *Bacillus typhosus*. The vast majority of water bacteria are harmless, but the danger, to the water consumer, consists in the possibility that amongst the harmless bacteria a few of those causing disease may be present. The greater the number present the greater the risk incurred in drinking the water. If the majority of bacteria are not removed by means of filtration, it requires but "an accident of disease to start an epidemic" among the consumers of water, for if once disease germs obtained access to the water no obstacle would be placed in the way of their reaching the consumer.

Water Purification

There are many methods of water purification, but they can be summarized under the following headings:—

(1) The removal of suspended matter by means of sedimentation and filtration. Sedimentation is carried out in large storage reservoirs or basins, and may or

may not be aided by the addition of chemicals to produce a precipitant which will carry down the suspended matter with it. By careful sedimentation it is possible to effect a considerable reduction in the number of bacteria. Filtration is chiefly effected by passing water through sand filters, whereby not only is suspended matter retained by the sand, but the bacteria are prevented from passing through the sand. Some chemical changes also take place in the filter.

(2) The removal of dissolved impurities by chemical means. This is chiefly necessary in the case of hard waters when an excess of lime, magnesia, etc., has to be removed to make the water soft for domestic purposes. The removal of an excess of iron has sometimes to be undertaken.

(3) The process of distillation is used when it is necessary to obtain a chemically pure water. All impurities are removed, but the water is flat and tasteless and unsuitable for drinking purposes.

(4) The process of sterilization consists in killing off all bacterial life, but does not remove the pabulum upon which such life is able to thrive.

The method or methods of purification to be adopted for any particular water depends upon its character, and whether required upon a large or small scale. For public supplies, however, the only method that has found almost universal acceptance is that of sand filtration, preceded by the process of sedimentation. Water is able to undergo in favorable circumstances a process of natural purification, and if we glance at how this is done it may help us in the task of laying down the principles of artificial purification, because, as a rule, artificial processes are simply a scientific application of natural laws. Water in passing through soil is naturally purified. A mechanical process of filtration removes the suspended matter. Chemical changes also take place by the action of various minerals upon each other, some being dissolved and others precipitated. The most important change is caused by biological means, whereby organic matter is gradually reduced and rendered harmless. Water which passes through sufficient unpolluted soil of a proper nature is rendered practically sterile.

Natural Agencies

Rivers which receive sewage pollution are known to undergo an appreciable amount of self-purification. This is effected by the following means:—

(1) Dilution by the influx of ground water and tributary streams, especially in the case of rapid rivers, soon improves the quality of the water.

(2) Sedimentation effects a marked improvement, by the gradual settling down of silt, especially where the current becomes sluggish. In tidal rivers, if water be drawn off at flood time it will be found that the check thereby caused to the current causes 50 per cent. of the bacteria to subside and be deposited in the sand. In lakes sedimentation has a very great purifying effect.

(3) Aeration improves the quality of river water by bringing an abundance of oxygen in contact with unoxidized organic matter. This is effected chiefly as rivers are broken up and exposed to the air as they fall over weirs. The latest experiments, however, have failed to verify the importance of aeration, and the popular belief in its efficiency has probably been overrated. The oxygen is of use as it becomes available to bacterial life.

(4) Destruction of bacteria takes place to a limited extent in river water. Sunlight affects bacterial life chiefly through its chemical rays. The heat rays are not sufficiently powerful to have much influence. Direct sunlight has a powerful germicidal effect, but it is very questionable whether its action takes place much below the top surface of the water. Diffused light has also an appreciable germicidal effect. In lakes the action of sunlight is greater because the water is usually less turbid. Another factor in the reduction of bacteria in river water is caused by the struggle for existence. The food supply is usually limited, and the competition thereby created kills off the weaker specimens. It is also likely that the natural water bacteria are antagonistic to the bacteria introduced by sewage pollution, by reason of the toxic by-products of their bacterial life. On the other hand, even after sewage pollution in a river is no longer to be detected, disease germs are still able to retain their vitality, so that natural purification can never be relied upon in water known to have been polluted at one period of their existence.

Some waters, especially surface waters, are improved by storage simply because of the sedimentation which is thus able to take place, while the color is likewise improved. Stagnation may, however, cause a bad odor to be imparted to the water. When the vertical circulation of water is suspended in times of stagnation the oxygen in the deeper portions is soon exhausted by the organic matter, and the aerobic bacteria are therefore killed off and give a bad odor to the water. In stored water normal bacteria may develop, but while not necessarily harmful, they are not desirable. Plant life often develops in running and stored water, and while not dangerous in itself, the decay of vegetable matter may seriously affect the quality of the water. Vegetable life has a certain purifying effect by the liberation of oxygen, but when dead may be a source of danger. Dead algae, etc., may obtain an entrance into distribution mains and afford the nutriment necessary for the development of animal life and also for those forms of bacterial life not needing sunlight for their growth. The iron bacterium (*Crenothrix*) will develop in darkness in water containing iron and will clog the mains by its growth. Sponges such as protozoa and bryozoa may also be encouraged and become deposited as "pipe moss" within the distributing mains. The remedy is to prevent the growth of the algae, etc., in the storage tanks by excluding the light or by deepening the tanks. Algae soon die in darkness, so that if admitted to the distributing mains, they quickly help to encourage the growth of organisms which can feed upon them.

The Value of Subsidence

In all systems of purification it is now universally recognized that purification should be preceded by the preliminary process of sedimentation, so as to remove a large portion of suspended matter, consisting chiefly of inorganic matter, such as sand, clay, etc., which would otherwise interfere with the later stages of purification. Clay particles are sometimes very finely divided and are even smaller than bacteria. Such clay particles would in time clog a sand filter by passing into the pores of the sand, besides imparting turbidity to the filtered water. Sedimentation is carried out in tanks or reservoirs, and its application is only limited by the factor of first cost. It can be divided into two systems, viz.: (1) natural sedimentation, and (2) artificial sedimentation. Natural sedi-

mentation is simply allowing the water a period of rest during which matters in suspension can settle down to the bottom of the tank or reservoir. The fine particles of clay and sand are suspended in running water by means of the current, and if the water is given a time of quiescence the particles will gradually settle down. The time required depends upon the fineness and specific gravity of the suspended matter. The heavier particles will settle down in the first day or so, but the finer particles, which really cause the turbidity, take a much longer period. The general practice is to allow about twenty-four hours minimum time for natural sedimentation to take place, when about 75 per cent. of suspended matter is removed. The greater the amount of suspended matter the greater will be the percentage that is removed. The time allowed for subsidence depends upon two factors, firstly, the amount of turbidity, and secondly the character of subsequent filtration. The effect of subsidence upon the bacteria is very great, as the bacteria are carried down with the fine particles of suspended matter. Increased storage for subsidence is now being recommended so as to remove amongst other bacteria the *Bacillus coli* whose presence is said to be a source of possible danger. A series of experiments at London waterworks gave the startling result that after twelve days' storage over 97 per cent. of the bacteria were removed by subsidence. In America experiments have likewise proved the great reduction of bacteria. At the end of three days' storage in a tank nearly 8 feet deep the bacteria had been reduced by about 90 per cent. throughout the body of the water. The bacteria which subside are not killed, but are able to develop in the mud and ooze, where they have been found to exist to the extent of seventeen millions in a cubic centimetre.

Artificial sedimentation consists in adding something to the water to quicken the work of subsidence. The added chemical combines with substances present in the water to form a gelatinous precipitant which acts as a coagulant, thereby collecting the finely divided particles and causing them more readily to subside. Artificial sedimentation is usually confined to those systems of purification where mechanical filters are adopted. Waters which contain above thirty to seventy parts of suspended matter per million are generally found to require a coagulant to hasten the work of subsidence. In waters containing carbonate of lime and magnesia a good settling agent is made by the addition of sulphate of alumina. The action takes place by the decomposition of the sulphate of alumina, the sulphuric acid forming sulphates with the lime and magnesia, while carbonic acid is liberated. The alumina unites with water to form a gelatinous substance thereby producing the coagulating agent. The sulphate of alumina must be used with care, as if in excess it will remain dissolved, and besides imparting an iron flavor to the water by dissolving the surface of the iron, will gradually rust the mains. The amount used varies from three-quarter grain to three or four grains per gallon. The disadvantage of this treatment consists in the increase of the permanent hardness of the water caused by the sulphates of lime and magnesia. The work of subsidence is done within about twenty-four hours. The very fine particles which are then left suspended would take a long time to subside, and for practical purposes it would be useless to extend the treatment for a longer period. The effect upon the bacteria is proportional to the effect upon the other suspended

matter, for they are carried down with the coagulant. The color of peaty water is also removed by this process, to an extent of between 70 and 90 per cent. Other substances used for coagulating are potash, alum, iron, lime, etc. Lime is used for the purpose of water softening, and the process will be explained when we come to the later stages of water purification.

In waterworks subsidence takes place in settling basins or subsiding tanks. Were it not for considerations of cost, large series of tanks would be provided, to allow the water a period of quiescence for the full work of subsidence to take place. The cost of this being prohibitive, tanks are provided through which a constant and uniform flow or draw off is taking place, but sufficiently large to prevent high velocities occurring and thereby interfering with the work of subsidence. This treatment is found to be quite sufficient for most practical purposes when the water is subsequently filtered. The settling basins or tanks should be provided in duplicate to allow the work of periodical cleansing to be done easily and effectually. The tanks are usually rectangular in shape, and their depth is regulated by the nature of the site and the method of construction. It is found by experience that increased depth does not have a marked influence upon the time required for subsidence. The tanks can be constructed of brickwork, masonry, concrete, etc., and the floor should be shaped towards a central drain, by means of which the sediment can be removed by hose washing. The water entering the tank should be as evenly distributed as possible, and strong currents, which interfere with subsidence, should be avoided. The outlet should be made from the clearest water, at a point away from the inlet so that all the water shall have remained an equal time in the tank. The inlet may simply be a vertical pipe with a bell mouth, or a weir may be formed over which the water is discharged. Where basins are used intermittently the outlet pipe should be placed with its opening at the lowest point from which it is deemed desirable to draw off the water. The water that remains may, with the sediment, be run off through the central drain.

The Development of Sand Filtration Methods

Water, after it has received the preliminary treatment of subsidence, is seldom fit for drinking purposes. We have seen how water may be naturally purified by passing through the soil, and we are now to see how this fact has been realized and applied to practical use under artificial conditions. The purification of water is now almost universally accomplished by means of sand filtration. Long before a theoretical explanation could be given to the work carried out in the sand filter, its valuable aid to the purification of water was recognized. It has only been within the last decade or so that the work has been placed upon a scientific basis, and practice and theory brought into line. Sand filters were first used at the Chelsea Waterworks by Mr. James Simpson in 1829, and were adopted for the purpose of removing turbidity. The results were very satisfactory, and their use was rapidly extended. In 1855 all the river water supplies in London were ordered to be filtered. Although the quality of the water was undoubtedly improved, yet chemical analysis could detect little indication of purification, and it was impossible, in the early days, to understand how the filtration was effected by means of the sand. This remained a mystery till about 1885, when Professor Frankland applied the

method of bacterial examination to the water, and found that sand filtration effected the removal of a vast number of bacteria. Natural laws have often been applied to the use of man long before their theory has been understood, and so it was in sand filtration, where the process of water purification was carried out long before it was realized how and why it was effected by passing through the sand. As soon as bacteriological experimenters established the fact that the purification of water was due to the removal of bacteria, an impetus was given to the study of bacteria, and it was not long before adequate explanations were forthcoming as to how the work was accomplished.

Sand filtration of public water supplies has now become almost universal. In Germany it has become compulsory by law, while in other countries it is practically always adopted in the case of river water supplies. Subsidence, as already described, should always be a preliminary to sand filtration. Sand filtration of water is carried out in watertight tanks or beds, in which sand and gravel in varying thicknesses are placed upon a floor. The unfiltered water is discharged upon the sand and percolates through the sand, and is collected by a system of drains or channels constructed upon the filter floor, and the filtered water is thence conveyed away, ready for distribution to the consumer. The filters are made of varying size, from half an acre upwards. The total area provided depends upon the efficiency required, for it has been found that efficiency of work consists in passing water through the filters at as slow and even rate as possible within certain limits not exceeding two or three million gallons per acre per day. As water passes through the filters the sand becomes clogged with matter which is retained by the sand. The water finds an increased difficulty in passing through, and to maintain a uniform output it is necessary to increase the head to overcome the greater resistance. When this reaches a certain point beyond which it would not be economical or practical to go, the filters are placed out of action, and the clogged sand removed by scraping, and, if necessary, new sand is added to make up the required thickness. It is difficult to vary the head as described, so as to maintain the output, the same result can be achieved by having standby filters, which can be put into action when required to supplement the diminished supply of water from the clogged filters.

The general results of sand filtration are threefold: (1) removal of suspended matter; (2) removal or reduction of color where not due to matters in solution; (3) reduction of the bacteria by about 99 per cent. The chemical result is little, because chemical substances are seldom in suspension, and being in solution are able to pass through the filter beds. Chemical analysis will, however, often reveal that a fair amount of oxygen has been consumed, which would indicate the oxidation of a certain amount of organic matter. The action of the sand is not simply a mechanical or straining one. If it were so, the filtered water would be uniform in quality, but it is found that the filtered water improves in quality as the filter is longer in use; or, as it is expressed in practice, the filter "ripens." The pores of the sand are large enough to allow the passage of bacteria, but yet we find that in time a filter will retain 99 per cent. of the bacteria. At first the action of the filter is merely a mechanical one, as is evidenced by the passage of the bacteria through the pores of the sand,

but gradually another and more important action comes into operation. This was, for a long time, unexplainable, until an examination was made of the layer which more or less quickly forms on the surface of the sand soon after a filter is put into use. This layer was found to be slimy and gelatinous, consisting of inorganic matter, such as silt which had been held in suspension by the water, and also of organic matter, such as bacteria, algae, diatoms, etc. This slimy and gelatinous layer gives the chief value to the sand filter. It is a teeming mass of bacterial life, and effectually prevents the passage of bacteria through the filter. At the same time, there is also a biological action taking place in the body of the filter itself. The filtering sand contains organic life, or becomes seeded with living organisms from the water which passes through the filter before the surface layer is formed. The development of this organic life produces a slimy matter, which also assists in the work of filtration. Recent experiments in America have proved that, when this action has been encouraged in the body of the filter, efficient filtration can be done even after the surface layer has been disturbed. As a rule, however, in waterworks it is usual to depend upon the surface or "blanket" for the work of filtration, and from a practical point of view it would be difficult to regulate the development of bacterial life in the body of the filter. The sand really forms a bed upon which the surface layer can rest, while a certain depth of sand becomes necessary to prevent the layer being disturbed, and its continuity broken by the percolation of the water or the shifting of the sand. We can therefore clearly state that the action of a sand filter is something more than a mechanical or screening process, and that its efficiency depends on biological causes. In an experimental filter, if the sand be sterilized the effluent will be found to contain more bacteria than the unfiltered water. This is due to the growth in the sand of the organisms introduced by the water, and until the surface layer is formed no filtration is effected, but bacteria from the body of the filter may for a time be added to the water.

The efficiency of sand filtration can be ascertained and tested by means of bacterial examination. The percentage of bacteria removed gives the work of the filter. The vast majority of water bacteria are harmless, but in water supplies the danger consists that amongst the harmless bacteria some of those causing disease should be present. The greater the number of bacteria in drinking water the greater is the risk incurred of including the typhoid or other disease germ. Koch, therefore, adopted the number of bacteria present in water as an index of pollution, and suggested the following as a standard or scale by which to judge the purity of water:—

	Bacteria per c.c.
Very pure water is that containing....	0 to 10
Very good water is that containing	20 to 100
Passable water is that containing	200 to 500
Bad water is that containing	500 to 1 000

This, of course, is only an empirical standard, and is not an exact method of discrimination, because water with only 10 bacteria present per c.c. might be highly dangerous, if, of that 10, one was a disease germ. Water with a large number of bacteria should be condemned, because their presence in such numbers indicates organic pollution, which provides the food necessary for the development of the greater number of bacteria. The aim in reducing the number of bac-

teria in our drinking water is to minimize the risk from water-borne diseases, and, for this purpose, it is considered that the risk is sufficiently lessened if the number of bacteria is reduced to 100 per c.c. The German standard rests upon this basis, and it is stipulated that in bacterial examinations, cultivations should be made upon gelatine, and that after two days the number of bacteria should not exceed 100 per c.c. We must, however, never forget that, despite the great reduction of bacteria that can be effected, sand filters are not disease germ proof, so that every endeavor should be made to obtain the maximum reduction of bacterial life, so as to afford the greatest protection from water-borne diseases. The number of bacteria in the water as distributed to the consumer and as compared to the unfiltered water does not represent the full efficiency of sand filtration; because, after passing through the filter, the ordinary forms of water bacteria are able to develop in the under drains. Filtered water should therefore be hurried to the consumer as quickly as possible. To obtain the full efficiency of the sand filter, a sample of the water should be taken before it enters the subdrains. Experiments have been made to test the actual efficiency by adding to the unfiltered water some specific organism which would be incapable of development in the under drains, and then to examine the filtered water for the specific organisms and thus estimate the actual number removed by means of the sand filter.

Testing a Reinforced Concrete Bridge

A novel and interesting test was carried out recently on a newly constructed reinforced concrete bridge. The bridge is over the Cheshire Lines Railway at Farnworth, near Widnes, the roadway being carried by three reinforced arched ribs with columns and decking beams upon which rests the decking arraying the roadway. The span of the arch is 57 ft. and rise 8 ft. 3 in., the ribs are 24 in. deep at the centre and 28 in. deep at the springing, the columns 12 in. by 9 in. and decking 10 in. thick. The parapets are also of reinforced concrete, 6 ft. high with sunk panels, the thickness of parapet walls being 4½ in. at the panels and 7 in. at the pilasters. The structure springs off mass concrete abutments faced with red sandstone coursed ashlar, most of which was obtained from a tunnel at the site, which has now been removed. The concrete for the reinforced work was composed of Penmaenmawr granite chippings, clean sand, and Martin, Earle and Co.'s cement, in the proportion 3½, 1½, 1, and had to sustain a load of 2½ cwt. per square foot. The test was applied on Aug. 3, and, as above stated, was done in an unusual manner. The bridge was loaded with water, this being done by erecting a clay dam 3 ft. thick at the base and 1 ft. at the top at each end of the parapet walls and filling between, with water conveyed from the main through a 2½-in. hose. The bridge took eight hours to fill to the required height, and though tested considerably in excess of the specified load of 2½ cwt. per square foot the deflection was but 1/16 in. at the centre of the ribs. The above method of testing is a great advance upon the hitherto used methods of loading with earth, rails, etc., it being less costly and more expeditious. The whole of the work was carried out by Messrs. Monk and Newell, Ltd., for the railway company, under their engineer, Mr. H. Blundell. The reinforcement was on the Kahn system, the bars, etc., for which were supplied by the

Trussed Concrete Steel Co., Ltd., and consisted of their shear bars and cup bars.

The Ontario Municipal Association

The Provincial Municipal Association began its thirteenth annual convention in Toronto on August 31st, with a fair attendance of delegates. In opening the convention Mayor Geary, of Toronto, referred to the absolute necessity of good highways in the province, and mentioned the steps that were taken in York County for thoroughfare improvement, the city of Toronto, the County of York, and the Ontario Government each contributing \$100,000. In his annual address the president, Mr. Chas. Hopewell, of Ottawa, suggested the desirability of an amendment to the Assessment Act empowering any municipality on an affirmative vote of the property holders to tax land at a higher rate than improvements. Mr. A. B. Farmer, secretary of the Tax Reform League, advocated the abolition of taxation upon buildings and improvements, and placing it upon land alone, as is done in Vancouver and New Westminster, B.C.

In his instructive address on "The Highway Improvement Situation in Ontario," Mr. W. A. McLean, C.E., Provincial Engineer of Highways, expressed regret that few municipalities had experienced superintendents or engineers to supervise road making and repair. This work, he thought, should be done by engineers.

Mr. J. P. Hynes, of Toronto, gave an illustrated address on "Town Planning Suggestions for Canadian Municipalities," and deplored the lack of civic sentiment and singly purposed personal service as a duty in Canadian cities, and that owing to lack of civic foresight property was laid out for purposes of speculative gain without due consideration for future requirements.

Further sessions were held on September 1st.

Union of Canadian Municipalities Convention

The Union of Canadian Municipalities, which began a three-days' convention in Quebec on August 29th, was largely attended. The papers delivered were of extraordinary value to Canadian municipal men. Several of them will be found reproduced in this issue.

The election of officers took place on the last day of the convention, and resulted for the ensuing year as follows: President, G. W. McCready, city clerk, Fredericton, N. B.; first vice-president, Mr. N. Champagne, controller, of Ottawa; second vice-president, W. H. Evanson, controller, of Winnipeg; third vice-president, Ald. L. A. Cannon, Quebec; hon. secretary-treasurer, W. D. Lighthall, K.C.; assistant secretary, G. S. Wilson. The choice of the next convention city was left to the executive.

The city of Montreal, assisted by the Federal Government, will cover the section of the Little River St. Pierre running through the city limits at an estimated cost of \$150,000. The covering will be of concrete and may be constructed so as to make a driveway.

The National Cash Register Company are contemplating the erection of fireproof brick and steel buildings similar to their factory at Dayton, Ohio, in Toronto. A site of about seven and one-half acres has been purchased for this purpose.

The Hotel Selkirk, Winnipeg

The George A. Fuller Company, Limited, of Montreal, has been awarded the contract for the construction of the Selkirk Hotel, to be erected in Winnipeg for the Grand Trunk Pacific Development Company, at a cost of \$1,500,000. The site is adjacent to the historic monument, Old Fort Garry, memorable in the early history of Canada's western metropolis. The building will be a magnificent edifice, to rank with the world's finest hotels, and will embody in its construction the most advanced scientific and architectural ideals. Located in the heart of the city, to which all lines of traffic converge, it will be readily accessible to the railroads and electric car lines, and within a radius of a few blocks of the leading theatres, while two minutes' walk will place one among the largest of the great stores in the centre of the shopping district, or enable one



to reach the great new terminal station of the Grand Trunk Pacific and Canadian Northern Railways.

The hotel will be built of the finest of Canadian granite and buc limestone in the style of the old French chateaus of Normandy and Touraine, and will be of fourteen storeys. The building is to have approximately three hundred and fifty sleeping chambers, and will be richly furnished. All its bedrooms are to have private bathrooms, and are to be equipped with every approved modern appointment. Nothing that will in any way contribute to the comfort and welfare of its guests has been overlooked in the preparation of the plans and interior arrangements.

The keynote of the Selkirk, as judged from the design and interior arrangements, is to be "homelike comfort." From basement to roof top every detail of construction and furnishing has been worked out in accord with this one idea, and would seem to assure the largest measure of personal enjoyment and restfulness to its guests. It is intended to be a place where comfort-loving people may enjoy life to the utmost and feel thoroughly at home.

The main entrance of the hotel faces on Winnipeg's most beautiful thoroughfare, Broadway, and opens upon a spacious and imposing rotunda which will suggest in its decoration the cheer and comfort provided within its walls—and from which one may enter the spacious dining and tea rooms, also the cafe and bar.

The central feature of the main floor is the circular tea room, of impressive and beautiful design, unbroken by col-

umns, lofty in height, and finely lighted by broad windows and circular domed ceiling.

The mezzanine gallery is also to be a novel feature of the hotel, and is obtained by the introduction of a storey midway between the office floor and the parlors. It will be reached by a broad marble staircase from the main entrance lobby, and is to be finished and decorated in white and delicate shades of color. It overlooks the entrance lobby, dining room, cafe and tea room, and will be used as ladies' parlor, writing room and library. It will command a splendid view of those portions of the hotel where the most life occurs, and yet at the same time affords a quiet sense of retirement.

The ball room, banquet hall and foyer have been located on the seventh floor. These rooms are the richest of the public rooms, and have been so arranged with separate kitchen service, reception and dressing rooms, as to in no way interfere with the privileges of the guests of the hotel. The ball room is designed in the Louis Quatorze period and will be one of the most striking rooms of its kind in Canada.

Immediately in front of the foyer of the ball room and banquet hall is a beautiful loggia of some 30 feet in width, forming a promenade for the entire width of the building, and commanding a view of the entire city of Winnipeg.

The building as a whole will form a fine example of what modern science can do in the elimination of fire risk. Every girder, beam and rafter is to be of non-expansive steel, every partition of terra cotta, every floor of marble, tile or cement and the stairways of iron. It is to be absolutely fireproof, and while every precaution has been taken to insure absolute protection to life and property, an equal measure of attention has been devoted to its sanitation and the safe-guarding of health.

The bathrooms are to be models of sanitation and simplicity and are to be equipped with porcelain fittings and finished in exquisite tile work. They are of comfortable size, and so placed as to be in direct communication with every bedchamber in the hotel.

Notable features of the residential portion of the Selkirk are the several state and family apartments on every floor from the second to the seventh. These consist of an ante-room, drawing and dining rooms and the necessary bedrooms, each suite having its own private hall and bathrooms. The remaining rooms on these floors, and the rooms of the upper floors from the seventh to the eleventh are divided into smaller rooms and suites; small only by comparison with the spacious state apartments already described, and each having its own private bathroom, seventy per cent. of which are outside bathrooms, lighted and ventilated with adequate window areas. The color tones of the interior decoration are to be in perfect harmony, and the furniture is to be made to order from special designs, such as one would ordinarily find in private homes of refinement.

There is not to be a dark or uninviting chamber in the entire building, and comfort and spaciousness have not been sacrificed to secure the maximum of accommodations. Large closets have been provided in every bed chamber, and in the suites there are to be commodious clothes presses, equipped throughout with every modern device.

The architects are Ross & MacFarlane, of Montreal and Winnipeg.

North Toronto Sewerage System

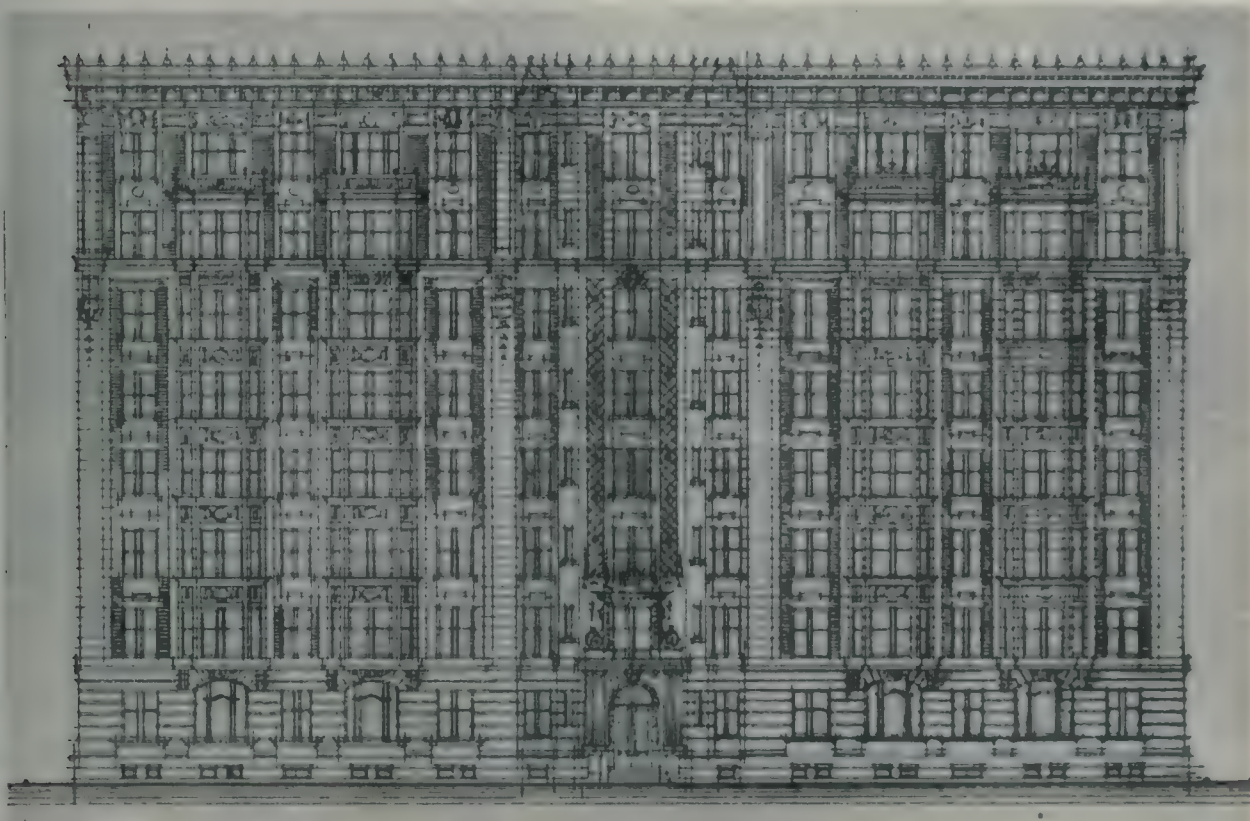
The last tender to be let in connection with the new sewerage system of the town of North Toronto, the total cost of which will amount to over \$250,000, has been awarded to Peter Nicholson, Mitchell, Ont., whose figure

for that part of the work was \$29,744.39. Mr. T. Aird Murray, of Toronto, is the engineer for the works. The sewage disposal works will be of a modern type consisting of three distinct processes of purification, viz.: Removal of all solids, removal of tendency to putrescibility, and removal of all sewage bacteria or "pathogenity." The sedimentation tanks will be on a new principle, by which the flowing liquid sewage will be separated from all contact with the collected sludge. The removal of putrescibility will be accomplished by means of circular clinker filters, the liquid sewage being fed by revolving sprinklers. The bacteria will be destroyed by apparatus supplying calcium hypochlorite to the final filtered effluents.

The automatic mechanical apparatus for distributing the

A by-law is being prepared to cover further extensions and improvements to the Calgary railway to the amount of \$400,000. It is proposed to double track a number of existing lines and to build eight miles of extensions. An additional twenty cars will also be purchased for next year, as recommended by Superintendent McCauley.

The system is now operating twenty-four cars, and by September 15th, when the twenty-five miles of extensions carried out this year will all be put into service, thirty cars will be put on. Some twenty-three miles have been completed already and put into operation. The present month will see thirty miles of route and forty miles of track completed, ten miles being double track. The capital now invested in the system is \$1,000,000.



The Crown Apartments, Montreal

liquid over the filters will be supplied by Messrs. Adams & Company, of Great Britain. This apparatus is known as the Crescent revolving distributor. All the parts of the sewage disposal works are to be covered in and rendered frost-proof.

Growth of the Calgary Street Railway

A comparative statement of the revenue and operating expenses per car mile for July, 1911 and 1910, of the Calgary Street Railway, shows an exceedingly healthy state of affairs, and, considering the expansion that the company are about to make throughout the system, an even greater increase may be anticipated before fall.

Statistics

	Cents	Cents
Revenue per car mile	41.537	36.274
Operating expenses per car mile	16.114	14.593
Profit per car mile	25.423	21.681
Cost of power per car mile	4.304	4.133
Proportion operating expenses to revenue	38.7%	40.2%

The Crown Apartment House

Mr. U. H. Dandurand has had plans prepared by Mr. Joseph Perrault, architect, for an 8-storey apartment house to be erected on Dorchester street near St. Matthew street, Montreal, and close to Alderman Dandurand's present residence. The accompanying illustration shows a front elevation of the building when completed. There will be sixty-four regular suites, or apartments, and seven bachelor apartments, besides the basement under the whole building. The design is a novel one, giving abundance of light and air, which will be a great attraction to those seeking residence in a building of this character. The structure will be of steel and concrete with Roman stone facing, white marble halls and dados, and two elevators. The whole will of course be fireproof, and will contain all the most modern appointments yet devised for apartment house construction. Mr. Dandurand calculates that the annual revenue will be \$60,500.

The Canadian Pacific Railway is building a line eleven miles in length from St. Therese to Quebec Junction. The Nova Scotia Construction Company are the contractors.

Constructional Work in City of Winnipeg

Building Conditions Indicative of a Record Year—The Story of the Real Estate Boom

Special to the Contract Record

Early in the present year it was forecasted in these columns that the building record for Winnipeg would surpass all previous figures during the present season. While recognizing that there were many adverse influences which might operate to check this development, there were forces at work which would in all probability tend to make a new high record. This forecast now seems well on the way to realization. With eight months of the year gone there is a gain of well over a million dollars over the corresponding period of last year, and there is much work still in sight, permits for which have not yet been issued.

Permits for the first seven months of the year have just been placed at the disposal of your correspondent, and a brief analysis of them will give an idea of the general character of the development. The figures go to show that it has not been confined to any one class of buildings, but embraces everything from small cottages to warehouses and hotel properties. For instance, there have been 1,500 dwellings erected costing from \$1,500 to \$3,000 each; there have been 189 costing from \$5,000 up, and 11 costing over \$15,000. Apartment houses number 50, and cost \$2,200,000, while 23 warehouses will cost approximately \$1,000,000. The permits for schools, bank and office buildings, theatres, hospitals, churches, etc., amount to over \$2,600,000. The total figures for the seven months are \$11,368,650, as against \$10,971,700 for the same period of last year.

The latest review of the building permits was made on August 17, and up to that date there had been issued 85 permits for houses costing from \$1,000 to \$1,200; there were 134 from that figure to \$1,500; 288 from that to \$2,000; 247 will range from there to \$2,500; and 259 will go closer to the \$3,000 mark. This class of structure has been demanded because of the increase of manufacturing in Winnipeg, making small homes for working men and clerks a necessity. In fact this class of residence predominate numerically, and form the basis for the contention that it is but the start of a great growth in population which will be noted in the next few years.

To continue the summary of the residences. There have been 122 permits for homes costing from \$3,000 to \$3,500; between that and the \$4,000 mark there have been 75 permits, and 54 will cost an additional \$500. It would seem that the \$5,000 home is something of a favorite, for there have been permits issued for 69 at that figure. There are 49 between that amount and \$6,000, and the next jump of \$2,000 shows a total of 39. Between that point and \$15,000 there are 21 residences on the list.

In the more expensive classes of residences, where in addition to the home there is a considerable amount available for the purchase of suitable lot and its aesthetic development, there are 11 homes recorded as follows: E. J. Lyon, \$16,000; John Stringer, \$16,000; V. C. Brown, \$18,000; W. J. Campbell, \$18,000; S. E. Richards, \$19,000; Jerry Robinson, \$20,000; E. A. Mott, \$20,000; Harry Gooderham, \$22,000; E. L. Taylor, \$30,000; Sir Daniel McMillan, \$30,000, and G. R. Crowe, \$33,000.

But the residences under construction only account for a portion of the residential property which is being developed. The charm of the apartment house is being recognized by many who ordinarily would be well able to build homes for themselves. The problem of getting

adequate help, and heating in winter, have had something to do with this, but perhaps it is even more due to the fact that a large number of Winnipeggers spend a portion of the year away from home, thus escaping the long, severe winter. The apartment house renders this more easy than if a home were to be looked after during the absence of the family. Whatever the reason, this year has seen the starting of 50 apartment houses ranging in value from \$6,000 to \$100,000, suites in which will rent from \$30 to \$200 a month.

Among the warehouses now under construction those of the Hudson's Bay Company at \$136,500, and the Gowans-Kent Western, Limited, at \$137,000, are the most elaborate, but there are five which will cost over \$50,000, and the other 18 bring the total value of this kind of property to \$1,000,000.

In the shop and factory construction the C. P. R. heads the list, with work valued at \$158,500, and the Winnipeg Electric Railway Company comes second, with a steam power plant worth \$72,000. Swift's Canadian, a western branch of the Chicago packing house, has planned additions amounting to \$88,000, which falls partly in the shop and partly in the warehouse list. The Midland Railway Company is doing \$45,000 worth of work on the Winnipeg terminals.

In hotels, office buildings and public institutions, the expenditures are also very heavy. For instance, the C. P. R. is spending \$100,000 in providing additional accommodation for help and general utilities for the hotel, Allan, Lang & Killam are spending \$90,000 on an office building; the St. Regis Hotel Company is spending \$140,000 on remodeling the premises recently purchased; the Winnipeg Sanatorium Company is spending \$65,000 on a new building; the Y. M. C. A. is spending \$469,000 on two new buildings, the Trust & Loan Company is building an office building worth \$102,000, and the general hospital board is spending \$525,000 on additions. The city is spending \$409,000 on various public utilities, and the Sterling Bank is putting \$225,000 into a new building.

All of this means that labor has been well employed, and the supply market active. It is notable that, despite the amount of work in progress, the delays so far have been but trivial, and the weather has been all that could be desired. The permits to date are by no means the last word, for architects state that at the present time there are a large number of plans in hand for buildings which, if permits are granted this year, will make a total far beyond the most sanguine expectations of the spring.

One factor which has perhaps been of great importance to the building interests is the collapse of what promised to be a decided boom in Winnipeg and western real estate. This movement started early in the season with both inside and subdivision property, and for a time the prospect looked rather blue. Financial interests took action early, however, and the criticisms which appeared from time to time had a most beneficial influence in checking a line of speculation which could not but be detrimental to the whole of the west. It was pointed out in the Contract record at the time that while there was justification for activity in Winnipeg real estate, there was no justification for the exorbitant prices being asked for subdivisions which could not well be considered as tributary to the city for several years.

at least. The financial journals took up the cudgel along the same line and this was followed by an exposure by a local weekly which shut off the excitement in short order.

There were a number of western towns which came in the same category, and some of these cherished their boom for a time. A striking example of this style of booming is furnished by a town, or rather townsite, in central Alberta, which is being placed on the market by a company claiming to be tributary to one of the great railway corporations. Located in a section of country where as yet there are but few farmers, and with only normal natural resources, this townsite has been boomed as one of the greatest prospects in Canada. Specious advertisements have been carried in all publications which have been liable to criticise and outside investors have been asked to invest their money in that townsite. The property consists of over 2,500 acres of virgin prairie with no claim for distinction other than that a railway line passes through it and still through their advertising the company has been able to sell hundreds of lots there at prices running into a thousand dollars or more. The newspapers have been flooded with pamphlets and photographs as glittering as those of the worst wild-cat mining company, many of the photographs shown being taken in various parts of the province and labelled as coming from that townsite. The majority of the purchasers have been drawn from Great Britain and Eastern Canada, where the investors have not had an opportunity of investigating for themselves. They have purchased because the scheme appeared to be backed by one of the great railway systems.

L. H. S.

Highway Systems of British Columbia

Unbounded support is being accorded the good roads movement in British Columbia, and in the course of a few years this section will have one of the finest and most picturesque highways on the North American continent. Working quietly and energetically, the government, with the hearty co-operation of the various good roads and automobile organizations, has accomplished much and has outlined a campaign for improved highways that will keep the province in the foreground in the good roads movement for years to come.

During the annual meeting of the Pacific Highways Association, held in Portland on August 4 and 5, reports were received on highway work under way and projected on the Western Coast. Of no small importance was the report of A. E. Todd, of Victoria, which brought to light a most encouraging state of affairs as regards good roads.

"Nowhere on the coast is the Pacific Highway, which extends from Vancouver, B.C., to Tia Juana, Mexico, a distance of 2,009 miles, given more enthusiastic support than is accorded it in British Columbia," said Mr. Todd. "While the highway, as it exists to-day is continuous from Vancouver, across Washington, Oregon and California, into Tia Juana, it will be but a short time until the Pacific Highway will extend northerly from British Columbia to the town of Hazelton, which is eighty miles from the Alaska boundary. An extension of this road to Stewart, which is situated on Portland Canal, right at the Alaska border line, will follow shortly.

"Not only are the residents of British Columbia strong boosters for the highway, but the government is also doing all in its power to further the movement. Assurances have been received that the Hazelton project would be rushed to completion in the shortest time possible, and these pledges are being carried out as rapidly as the difficulties of construction through a comparatively unsettled country will permit.

"Five million dollars was spent on the roads and high-

ways of British Columbia during the year 1910; in the present year in the neighborhood of five million dollars will be expended in constructing new thoroughfares and improving existing ones, and for the four years, 1910 to 1913 inclusive, a grand total of about \$20,000,000 will have been poured through these channels. Add to this enormous appropriation the existing roads and the spirit of co-operation on all sides, and you have a combination that cannot help but give British Columbia a system of roads unexcelled in North America.

"Of the most interesting of the Washingtonians is, of course, the extension of the Pacific Highway through British Columbia. However, there is also being built a trunk road from the west to the east, connecting with the Canadian Highway, which extends from Lake Superior to the Pacific Coast. In view of the fact that the Canadian Highway will be but fifty miles from the international boundary line, and in many places not more than ten miles north of the American side, it is expected that Americans will make much use of it. At numerous points it connects with the roads system of Washington and Idaho.

"From Vancouver, B.C., to Winnipeg, Manitoba, there is unanimous sentiment in favor of the Canadian Highway, and each province has already pledged to construct its part of the system. In the Eastern Canadian provinces a strong campaign is being waged for an extension to Montreal, and there are bright hopes of success in this direction.

"Should the Canadian Highway, extending from the east coast to west coast through the Dominion be realized, this part of the country will have the longest continuous highway in the world. The Canadian road will be more than 2,000 miles long, and the Pacific Highway, with which it will connect at Vancouver, is 2,009 miles in length.

"However, the international road, or rather the Pacific Highway, is perhaps the most widely supported and talked of. To this project, Hon. Thomas Taylor, Minister of Public Works of British Columbia, popularly known as "Good Roads" Taylor, is giving his personal support. He was unable to participate in the annual sessions of the Highway Association for the reason that he was starting at that time on a tour of inspection of the proposed route from Hazelton, but considerable of this distance is already splendid road. A short ways is travelled by boat in the upper Fraser River, then some hundreds of miles by automobile stage to Ashcroft, and thence by Canadian Pacific Railway, which closely follows the route of the old Cariboo road to Vancouver. The Cariboo route will undoubtedly be the route of the Pacific Highway through that section.

"Considerable work is being done at present in improving the existing sections of road between Vancouver and Hazelton, and the chief object of Mr. Taylor's trip is to personally select the best routes for the various connecting roads. While the government has as yet only pledged construction to Hazelton, which is in itself an enormous undertaking, yet those who are best informed in British Columbia say that even more than this will be done, in order to provide road connection with the city of Stewart and other northerly central points.

"There is little doubt but that this will be done. The people are a unit in demanding good roads and lots of them; the treasury is in a healthy condition, it is being anticipated that the \$20,000,000 good roads fund will be raised without borrowing a cent., and the government is following the inclination of Premier McBride and Minister Taylor by appropriating funds with which to carry on the work."

Moose Jaw, Sask., will have its street railway running in six weeks and will use power from the civic power plant until the company's power house is ready for work.

Exhibits of Note at Toronto Exhibition

Of Immense Interest to Contractors and Builders—The 33rd Annual Canadian National Exhibition an Example of Industrial Progress

A visit to the various departments of the Canadian National Exhibition shows plenty of evidence of the progress that is being made in manufacturing fields by a systematic investigation of the products exhibited. As stated elsewhere in this issue, there is need of more accommodation for machinery of various kinds. Numerous exhibits do not appear to advantage because of restricted opportunities for display. Indeed a number appear in the open without the sheltering cover of a building of any kind. An improvement in this respect next year will undoubtedly produce a more favorable opinion of the arrangements in the minds of the exhibitors themselves and will result in an increased number of manufacturers patronizing this opportunity for the publicity of their productions.

The Contract Record regrets that space does not allow the reference that a great many of interesting exhibits at the Exhibition deserve. In the following columns are enumerated a number that have attracted our particular attention and are but a few of the many deserving of recognition in this issue. Readers of the Contract Record who are visiting at the Exhibition cannot find a fairer criterion of the progress of Canadian industries than an investigation of her exhibits at this time will show.

Consumers Gas Co., Toronto—An interesting installation demonstrating the use of their gas to a few of the many appliances they have upon the market, among which might be mentioned the Crosswell gas engine, tank heaters, forge, and rivet heaters for machine shops. In another exhibit their many lighting appliances are shown to good advantage.

The Standard Paint Co. of Canada, Ltd., Montreal—Demonstrating the superiority of Ruberoid Roofing for buildings and also Sovereign sheathing felt for ceilings, walls, floors, etc., and for underlining metal, tile, or slate roofs.

Pilkington Bros., St. Helens, Eng.—Showing a wide display of window glass, rolled prismatic glass of various designs and patterns.

The Dennis Wire & Iron Works—A display of ornamental iron and bronze work. Their exhibit also included fireproof structural steel and wire work lockers, together with material lockers for factory use.

The Brantford Roofing Co., Ltd., Brantford—Showing the many applications of their product because of its high standard of durability and resistance to weather, fire, acids and gases.

S. F. Bowser & Co., Ltd.—An interesting line of gasoline and oil storage systems. The firm has two exhibits, one in the Industrial and one in the Transportation Building, both worthy of note.

The B. O. T. Manufacturing Co., Toronto—Exhibiting a splendid display of their high grade plumbing specialties and fixtures, including improved features of B. O. T. patent lever low tank construction.

Down Draft Furnace Co., Ltd., Galt—Showing by example and explanation the merits of their down draft furnace for residence heating, together with their coal and wood chutes for basement walls.

The Holden Company, Montreal—Representing the Chicago Pneumatic Tool Co. An excellent display of pneumatic tools and appliances, including spindle drills, grind-

ers, spike drivers, etc., and also the Vaughan and Q. & C. anti-railway creepers, a device having hard angle wedges inserted in the upper jaw of the two depending lugs engaging the top part of the base plate of the rail. The exhibit includes Fewing's wrecking frogs and other railroad appliances.

H. W. Petrie, Ltd., Toronto—A comprehensive and instructive exhibit of the Keighley gas engine in operation upon producer gas manufactured at the exhibit. Much interest is also taken in the exhibit of machine tools, wood-working machinery and supplies as well in Boreas vertical compound air compressor supplied with gas engine motor power. The Keighley Gas & Oil Co., of which Mr. Robt. Cluff is the president, have their headquarters at Keighley, Eng.

The General Machinery Co., Traders Bank Building, Toronto—The Luitweiler system of pumping is being exhibited, showing a pumping engine which, compared with other pumps, effects a saving of from 15 to 80 per cent. in power consumption. The Luitweiler pumping engine is creating considerable interest at the Exhibition.

The Canada Metal Co., Toronto—Showing a wide assortment of stereotype and linotype metals, and also brass, bronze, aluminum and babbitt bearing metals.

Canada Steam Pump Machinery Co.—A comprehensive line of boiler feed and vacuum heating systems.

Chambers & Simpson—Exhibiting D. & J. Tullis, Ltd., Clydebank, Scotland, laundry machinery for hotels, apartment houses, hospitals, public institutions, etc. They also exhibit for the Campbell Gas Engine Co., of Halifax, Eng., a display of horizontal and vertical twin cylinder and tandem gas and gasoline engines.

Jones & Glassco, Montreal—Demonstrating the Renold silent chain gear which silently transmits power up to 500 h.p. at speeds up to 1250 feet per minute. The gear is the invention of Hans Renold, of Manchester, Eng.

Goold, Shapley & Muir—Windmills, gas and gasoline engines, concrete mixers, tractors, form a part of their large display.

The Canadian Johns-Manville Co.—Exhibiting fire and acid proof asbestos roofing, an all-mineral product composed of pure asbestos and asphalt.

The Elliott Woodworker Co.—Exhibiting floor sanders and combination woodworker for builders and contractors, etc. The machine may be motor driven from an ordinary incandescent lamp socket, thus making it very convenient for use in any building where electric lighting is installed.

The General Supply Co. of Canada, Ltd., Toronto—Showing a well arranged and comprehensive display for the London Machine Tool Co. and the Smart Turner Co., of Hamilton, the exhibit including pumps, machinery and supplies.

The Blau-Gas Co.—Demonstrating the special advantages of their product for brazing, cutting and welding. They also exhibit the system they have for safe and economical suburban house lighting.

F. W. Bird & Sons, Hamilton, Ont.—An exhibit of Neponset products, including Neponset paroid roofing, a product of high grade material rendered strictly waterproof in the manufacturing process. The display also includes

Neponset waterproof building papers and sound deadening felt as well as paroid paints, etc.

Bains & Peckover—Representing Thos. & Wm. Smith & Co. Exhibiting among other products steel wire rope and cable.

Canada Ferrosteel Co., Bridgeburg—Showing their leading lines of manufacture: registers, faces, borders, grills, etc. for floor, side wall and base-boards to be used in direct or indirect heating installations.

The Consolidated Optical Co., Toronto—A wide display of scientific instruments and supplies for engineers and contractors, representing E. R. Watts & Son, London, Eng.

Dominion Roofing Co. of Canada, Ltd., Toronto—Malthite and Galvanite roofing materials, the former a wool felt saturated and coated with natural asphalt, the latter a heavy wool felt base triple coated on both sides with asphalt and finished with a heavy coating of flaked mica.

Benjamin Moore & Co., Toronto—Displaying a comprehensive line of waterproof cement and concrete coatings for exterior and interior work, together with special lines of "Muresco" interior decoration.

The Luxfer Prism Co., Toronto—A beautiful exhibit of art and church windows, together with various examples of sidewalk prisms for sub-surface lighting.

Goldie & McCulloch Co., Ltd., Galt—Exhibiting a wide line of fireproof safes, vaults and vault doors.

The Hoidge Marble Co., Toronto—Examples of domestic and foreign marble. Their own product from the Ontario Marble Quarries was used in the construction of the temporary offices of the Bureau of Mines at the Exhibition.

The Ontario Wind Engine & Pump Co.—Showing a wide exhibit of pumps, gas engines, windmills, water tanks, etc.

W. E. Seagrave & Co., Walkerville—Exhibiting in the Transportation Building a most modern type of auto fire truck.

The Dominion Sewer Pipe Co., Ltd., Toronto, Ont.—A comprehensive exhibit of salt-glazed and vitrified sewer pipe, culvert pipe, flue linings, invert, etc. Their sewer pipe is manufactured in various sizes from 4 in. up to 24 in. and is claimed to be impervious to water.

The Canadian P. J. Mitchell Co., Montreal, Que.—Exhibiting in a special building of their own a comprehensive refrigerating and ice-making system that is well worthy of note. Water softening and water purifying devices are also shown. The company have in operation an unique system of gas manufacture and lighting for suburban houses, the gas being produced from gasoline form, a mixture with air so rare that absolutely no danger from fire ensues.

The Geo. B. Meadows Wire, Iron & Brass Works Co., Ltd., Toronto, Ont.—A large and interesting exhibit of their various products including builders artistic iron work, ornamental iron fences and metal lockers, etc.

The Northern Electric & Manufacturing Co., Ltd., Toronto, Ont.—A large and artistic display of fire alarm equipment, together with an installation illustrating the advantages of their inter-phones well worthy of investigation.

Waterous Engine Works, Ltd., Brantford, Ont.—Their steam road rollers and various other products are creating considerable interest among municipal visitors. In the Transportation Building may be seen a splendid type of Waterous fire engine.

The Smart Turner Co., Ltd., Hamilton, Ont.—An exhibit including a number of their leading lines of steam and power pumps, condensers, travelling cranes, etc.

The Standard Ideal Co., Ltd., Port Hope, Ont.—An ex-

ceedingly artistic display of high grade enamel baths and sanitary ware, which is creating large interest among architects and sanitary engineers.

The Standard Sanitary Manufacturing Co., Ltd., Toronto, Ont.—A splendid display of their special lines of plumbing fixtures.

The Chamberlain Weather Strip Co., Ltd., Toronto, Ont.—Demonstrating the special advantages of their product which is creating much interest.

F. Sturgeon, Toronto, Ont.—Canadian agent for Major & Co., Ltd, Hull, Eng. An exhibit showing to good advantage the superiority of Solignum, a wood preservative and artistic color stain recommended strongly for use upon shingles, posts and dressed and undressed lumber exposed to injurious elements.

Batts, Limited, West Toronto, Ont.—An artistic and comprehensive exhibit of a few of their leading lines of manufacture, including staved columns, veneered doors, newel posts, pine doors and frames, sash, trim, turned newels and balusters.

The Canada Supply Co., Toronto, Ont.—An interesting and well arranged demonstration of considerable interest to contractors and builders. The exhibit includes various types of Leeknot roofing and also of Casco anti-rust paints and coatings.

The Borden Canadian Co., Toronto, Ont.—An attractive exhibit of Beaver type of cutting tools and machinery, including narrow receding dies with universal chuck and detachable barrel. The exhibit also includes the Warren non-receding and wide chaser type tapered dies.

The London Concrete Machinery Co., Ltd., London, Ont.—A grand display of concrete machinery showing a large number of their lines. including a new type of mixer with side feed and end discharge. One of these eight machines are being built for Montreal. The exhibit includes the London automatic cement drain tile machine and also their automatic batch concrete mixer.

J. W. Hunt & Sons, West Toronto, Ont.—The manufacturers of Egyptian stone are showing a display of columns, key stones, verandah caps, etc., in white and grey.

Wettlaufer Bros., Toronto, Ont.—One of the best exhibits on the grounds, of their special line of mixers and other machinery for cement users. The company have their display under a large tent to the east of the Machinery Hall.

The Lancaster Corporation is carrying out a scheme for a new footbridge across the river Lune. According to the Times, it will be in two portions, one open and the other tubular. The open section will have three spans of 95 feet each, carried on steel cylinders with close-webbed girders; the closed portion will consist of an iron cylinder, 13 feet in diameter, under the Midland Railway at the Skerton side of Lune street. There will be no steps, access being given from Lune street and St. George's Quay, near to the point where the Castle Station branch line crosses, by means of easy inclines, and the bridge will be accessible at all states of the weather and tide. A clear walking space of 10 feet throughout will be provided, and the total length will be 167 yards. It is estimated that the scheme, which has the approval of the Board of Trade, will cost £7,850. There is also a proposal for the building of a bridge over the Ribble from Preston to Penwortham, in substitution for the existing bridge.

City Engineer Fellowes, of Vancouver, is recommending a re-arrangement of the waterworks department in that city, by which the operating and accounting divisions will be more advantageously separated than they are at present.

Trade Notes and Items of Interest

G. J. Sing, of Toronto, engineer to the Dominion Government, has recommended the deepening of Toronto harbor to 28 feet in order to accommodate vessels up to 600 feet in length.

The McClary Manufacturing Company, of London, Ont., are making an addition to their present factory. The structure will be of brick, three storeys in height, with a ground area of 100 by 120 feet.

The Smith Foundry Company, Limited, Fredericton, N.B., whose foundry building was recently destroyed by fire, have awarded to Thos. Myles, St. Marys, N.B., a contract for the erection of a brick and stone building, 94 feet by 174 feet, construction to begin as soon as the site is cleared of ruins.

The contract for the 500-foot extension to the intake pipe has been awarded by the board of control to Messrs. Miller, Cumming & Robertson, at a cost to be twenty per cent. over and above the actual cost of laying. The firm has had the contract for repairing the old intake and this work is nearing completion.

The city of Hamilton is contemplating a waterworks extension to cost \$150,000, to consist of a new intake into Lake Ontario, a complete new high level pumping station, together with additional machinery to be installed at their present station. A by-law to authorize the expenditure of this amount will likely be submitted in January next.

The Ottawa Board of Control have decided in favor of a railway entrance for the C. P. R. and C. N. R. on the west side of the Rideau canal, with a tunnel for the C. N. R. under the city. The government will be approached at once regarding the narrowing of the canal. The C. P. R. are preparing to start tunneling at an early date and estimate the work to cost \$1,250,000.

The Ceresit Waterproofing Company have sent us a copy of their new catalogue dealing with their Ceresit waterproofing compound as a means of preventing penetration of dampness and water into buildings and structures of various kinds, at the same time maintaining the original strength of the cement, brick or stone. The pamphlet contains a number of illustrations of American and Canadian work and is in every way a decided improvement over its predecessor.

The Nova Scotia Construction Company, who were awarded the contract by the railway department for the extensions to the Intercolonial terminal wharf, bulkhead and concrete shed at Halifax, are commencing work immediately. The wharf will be 800 feet long and 250 feet wide, of reinforced cement concrete with two storey sheds. This will be the first of the four piers to be built according to the plans submitted by Engineer Kennedy, of Montreal. The whole work will cost about three millions.

The Bishop Construction Company, of Montreal, have the following work in progress for the Corporation of Magog, Que.: a dam about 4,000 feet long, a power house of 3,800 kw. capacity, 11,000 feet concrete wall and about 12,000 cubic yards of embankment; for the Eastern Canada Power Company, Naven's Falls, near Murray Bay, Que., hydro-electric construction work; for the Herald Publishing Company, Montreal, a new printing house and publishing offices; for the Saginaw Railway, a section to Malbaie, Que., a distance of eight miles. On the railway and Naven's Falls work about 900 men are engaged.

Among the contracts upon which the company are at present working in Toronto are the following: an addition to the Union Stock Yards, West Toronto; a large warehouse for the Verral Storage Company; the new factory of the Hamilton Gear & Machinery Company; the Can-

adian Billings Spencer Company building; two new buildings for the Swifts Canadian Company; another for the D. M. Ferry Company, of Windsor, and also another building for the National Land, Fruit & Packing Company, of Mimico.

Montreal Notes

Mr. John Barlow, city surveyor, has prepared a statement showing that the city has just completed, or is now completing 70,000 square yards of permanent paving at a cost of \$275,000.

A fine of \$10 each has been imposed on five carpenters by Magistrate McMahon, in the Westmount Police Court, on a charge of loitering and intimidating when acting as pickets during a recent carpenters' strike. It was alleged that the defendants endeavored to force a number of carpenters to stop work on buildings being erected by Messrs. William H. Creed and Jackson & Company. Notice of appeal against the sentence was given.

Three firms tendered for the immense dock work to be carried out by the Federal Government at Courtenay Bay, N.B. It is announced by the Hon. Dr. Pugsley, Minister of Public Works, that Messrs. Norton Griffiths & Company, England, are the lowest tenderers, but the Cabinet will of course have to consider the whole matter before awarding the contract. Mr. Griffiths is an English M.P., who takes a great interest in Canadian affairs, and who has visited the Dominion more than once.

The question of erecting buildings which, although conforming to the by-laws, are regarded by the residents as objectionable, has come up in Montreal. An apartment house is being erected at the junction of Mance and St. Viateur streets. The other houses are set back from the street line, while the new structure is being erected close to the line. Protests were made, and an official of the council reported against a permit being issued. Some aldermen, however, succeeded in passing a by-law authorizing the erection of the house, and the protests are now of no avail.

Death of Mr. Greening

Mr. Samuel Owen Greening, whose death occurred in his home in Hamilton recently, was born in Manchester, Eng., in 1847, and came to Hamilton, Ont., with his parents in 1856. In early youth he entered his father's office and has been identified with the business of B. Greening & Sons since that time. Upon the death of Benjamin Greening in 1877, Mr. Greening succeeded to the head of the company and he became president on the incorporation of the firm in 1889, a position which he has held until the time of his death.

Mr. Greening was also a director of the Dominion Power & Transmission Company. He was vice-commander of the Royal Hamilton Yacht Club and first president of the first Canadian automobile club.

In our issue of last week an article appeared dealing at some length with the subject of incinerators and directed attention to the new departure known as the steel clad incinerator, built by the Toronto Furnace & Crematory Co., Ltd. The question of the sanitary disposal of household garbage, town refuse, etc., is always interesting to the sanitary and municipal engineer, and the success of this new destructor has been such as to warrant a careful investigation when apparatus of this kind is under contemplation. The steel clad incinerator is further described in the company's advertisement, which appears in this issue.

Contracts Department

News of Special Interest to Contractors, Engineers, Manufacturers and Dealers in Building Supplies.

Information for insertion in these columns is invited from Architects, Contractors, Engineers, etc.

Waterworks, Sewerage and Roadways

Bracebridge, Ont.

Tenders called for drains, James and Victoria sts. Owner, Corporation of Bracebridge. Clerk, A. C. Salmon. Laying tile and constructing settling basins. Plans, etc., at office of clerk after September 2nd. Tenders on settling basins should be given at per cub. foot. Tenders received by clerk until September 12th.

Burnaby, B. C.

Laying of pipe (Edmonds) in Corporation of Burnaby. City Clerk, W. Griffiths. Contractor, W. A. Kennedy, 744 Hastings, W. Vancouver, \$94,952.30.

Castalia, Grand Manan, N. B.

Contemplated breakwater. Owner, Department of Public Works, Ottawa. Secretary, R. C. Desrochers. Construction of breakwater. Plans, etc., at Department and at offices of the District engineers, St. John, N. B., and Chatham, N. B., and on application to the local postmaster. Tenders received until 4 p.m. Sept. 20th.

Elfros, Sask.

Tenders called for debentures for sale. Owner, Rural Municipality of Elfros. Secretary-treasurer, A. Kristinson. For the purchase of \$10,000 worth of debentures of the Rural Municipality of Elfros, for constructing roads. Tenders received by sec-treas. until noon, Sept. 9th.

Guelph, Ont.

Tenders called for paving (Neeve st.) Owner, City of Guelph. City Clerk, I. J. Moore. Acting City Engineer, L. Malcolm, Guelph. Concrete curbs, gutters, concrete base for paving and concrete for St. Railway tracks. Approx. quantities 3000 yds. base, 930 ft. car track, 2000 ft. curb and gutter. Plans, etc., at office of City Engineer. Tenders received by City Clerk until 5 p.m. Sept. 20th.

London, Ont.

The following works were authorized by the city council: an 8-in. tile sewer, York street, \$763; 6-in. curb, including a 15-in. gutter on Emery street, \$670; 6-in. curb, including 15-in. gutter, south side Emery street, cost \$675; 24-ft. gravel roadway, Emery street, \$2,325; 5-ft. concrete walk, Perry street, \$127; 27-ft. macadam pavement, Horton street, cost \$1,500; 30-ft. macadam pavement on W. Horton street, \$2,320; 24-ft. macadam pavement, Ridout street, \$1,052; 30-ft. roadway, gravelled and graded, Victoria street, \$1,040; 30-ft. roadway, gravelled and graded, Victorit street west, \$1,250; 30-ft. roadway, gravelled and graded, Victoria street to river, \$5,142; 40-ft. brick pavement, Talbot street, \$6,190; 26-ft. brick pavement, Talbot street, \$3,761; 6-in. concrete curb, including a

15-in. gutter on Ridout, \$140; 6-in. concrete curb and 15-in. gutter on Maple street, \$225; 6-in. concrete curb, including 15-in. gutter on Maple street, \$228; 24-ft. roadway on Cromwell street, \$6,745; 12-in. tile sewer, Maitland street, \$1,875; four 6-in. curbs and gutters, Horton street, \$185 each; 8-in. tile sewer Harvard street, \$587.

Montreal, Que.

Tenders called for permanent pavements. Owner, Board of Commissioners, City Hall. Secretary, L. M. Senecal. Construction of permanent pavements in granite and artificial paving blocks, in asphalt or in other suitable paving materials. Tenders for other than the above must be accompanied by specifications. Tenders received by Board of Commissioners until noon Sept. 25th.

North Toronto.

Sewage disposal. Owner, Town of N. Toronto. Mayor, A. T. Brown. Engineer, T. Aird Murray, Lumsden Building, Toronto. Contractor, Peter Nicholson, Mitchell, Ont., \$29,744.39. Other tenderers—J. S. Jennings, St. Thomas, Ont., \$44,100.65; J. F. Connolly, Toronto, \$42,349.35; C. R. Allison, Toronto, \$31,826.07.

Ottawa, Ont.

Tenders called for waterworks supplies. Owner, City of Ottawa. City Engineer, N. J. Ker. Supply of 30-inch 40-inch and 42-inch valves. Specifications at City Engineer's office, City Hall. Tenders received by Chairman of the Water Works Committee until 5 p.m. Sept. 12th.

Port Arthur, Ont.

Tenders called for grading (Balsam street). Owner, City of Port Arthur. City Clerk, J. McTeigue. Grading, ditching and surfacing with crushed rock. Specifications with City Engineer. Tenders received by City Clerk until 6 p.m. Sept. 5th.

Red Deer, Alta.

Plans prepared for waterworks and sewers, \$35,000. Owner, Corporation of Red Deer. City Commissioner, A. T. Stephenson. The John Galt Engineering Co., Calgary, have prepared plans for waterworks and sewers. Work to be done by day labor.

St. Lambert, Que.

Contemplated, septic tank, \$25,000. Owner, Town of St. Lambert. Engineer, A. S. Dickson, St. Lambert. Septic tank for sewage disposal.

St. John, N. B.

Tenders called for grading, etc. Owner, Board of School Trustees. Architect, Harry H. Mott, 13 Germain St., St. John, N. B. Grading, curbing, asphalt-ing for King Edward School. Plans, etc., at office of architect. Tenders received until 6 p.m. Sept. 5th.

Toronto, Ont.

Tenders called for tile drains. Owner, Guelph Radial Ry. Co. President, J. W. Lyon. System of tile drains, about 29,000 ft. of tile. Plans at office of Radial Railway Co., Bell Telephone Bldg., Guelph, and at office of Canadian Engineer, Church street, Toronto. Tenders received by J. W. Lyon until Sept. 11th. Advertisement in "Tenders and For Sale Department" of this issue.

Tenders called for pavements, walks and sewers. Owner, City of Toronto. Mayor, G. R. Geary. Asphalt, bitulithic and brick block pavements, grading, concrete curbs, concrete walks and sewers. Tenders received by Chairman of Board of Control until September 12th.

Vancouver, B. C.

The council authorized the following street work: Macadam for Broadway from Granville street to Trafalgar rd., \$38,582; creosoted wood block pavement for Pacific street from Granville to Richards, \$15,762; bitulithic pavement for Main street from Front to south of Park, \$47,675; stone block pavement in D. L. 196, blk. 7, \$1,825; from Columbia avenue to C. P. R., and concrete pavement in blocks 70 and 71, D. L., 196, from Gore to Jackson avenue.

Victoria, B. C.

Grading, draining and paving. Municipal clerk, Wellington J. Dowler. Grading, draining and paving, curbs and gutters, light standard asphalt, Russell street; grading, etc., heavy asphalt, Rock Bay; grading, etc., asphaltic pavement, Pandora avenue; grading, bituminous macadam, Lydia and Howard streets, also permanent sidewalks, grading, etc., asphalt, Rendal street.

Windsor, Ont.

Tenders called for trunk sewer, \$17,000. (McDougall street). Owner, City of Windsor. Engineer, M. E. Brian, city engineer. Tenders to be received Tuesday, Sept. 5, for about three-quarters of a mile of sewer.

Tenders called for street paving, \$11,000. (Sandwich street). Owner, City of Windsor. Engineer, M. E. Brian. 3,000 yards of asphalt block. Tenders received Tuesday, Sept. 5th.

Winnipeg, Man.

Tenders called for supply of cedar, (1,000 cords) for block paving. Owner, Board of Control. Secretary, M. Peterson, Board of Control office. Supply of 1,000 cords of cedar for block paving. Specifications at office of City Engineer, 233 James avenue. Tenders received by chairman until 11 a.m. September 7th, 1911.

Tenders called for oil and water systems. Owner, Board of Control. Sec., M. Peterson. Supply of material and erection in place of oil and water system in the City sub-station No. 1, on King street (electrical distribution sys-

tem). Plans, etc., obtained at the office of the Power Engineers, Carnegie Library Building. Tenders received by the chairman until Sept. 6th.

CONTRACTS AWARDED

Russell, Ont.

The Trustees of the Police, Village of Russell, have awarded the contract for the construction of 35,000 sq. ft. of granolithic pavement and the macadamizing of about half a mile of street from the O. & N. Y. Railway to the Castor River to Helmer and Winstanley of Morrisburg, Ont.

Windsor, Ont.

Outlet for sewer. Owner, City of Windsor. Engineer, M. E. Brian, city engineer. Successful contractor, Elliott & Reid, Brantford. Outlet to be 120 ft. in length 7 x 4 ft. in dimensions, concrete and iron.

Railroads, Bridges and Wharves

Aylmer, Que.

Proposed erection of sub station. Owner, Hull Electric Co. General superintendent, G. Gordon Gale. Erection of sub-station to furnish additional power for railway operations.

Cedar Hall, Que.

This municipality is about to build an iron and concrete bridge. The intention is to build by day labor.

Chatham Ont.

Tenders called for piles and gravel. Owner, Essex and Kent Counties. County Clerk, J. Gosnell, Chatham, Ont. 90 oak, cedar or spruce piles, 18 ft. long, not less than 12 in. at the butt and 10 in. at top; also 100 cu. yds. of gravel suitable for concrete work. Plans, etc., prepared by G. R. McCubbin, C.E.; Material delivered F.O.B. at site of Baptiste Creek Bridge on County line not later than Oct. 1st. Tenders received until noon September 9th, by County Clerk.

Devil's Island, N. S.

Tenders called for extension to breakwater. Owner, Department of Public Works, Ottawa, Ont. Secretary, R. C. Desrochers. Construction of extension to breakwater, at Devil's Island, Halifax Co. Plans, etc., at the Dept., at the offices of H. A. Russell, Distr. Engineer, Antigonish, and on application to the Postmaster at Devil's Island. Tenders to be accompanied by accepted cheque for 10 per cent. of amount of tender. Tenders received by secretary until 4 p. m. September 20th.

Deschenes, Que.

Contemplated street railway. Owner, Hull Electric Co. General Superintendent, G. Gordon Gale. Construction of car shed, capacity, 27 cars; construction of loops, adoption of single end "Pay-as-you-enter," order for six 50 ft. cars to be placed shortly. Supplementary report later.

Fort William, Ont.

Tenders called for dredging. Owner, Dept. of Public Works, Ottawa. Secretary, R. C. Desrochers. Specifications with secretary, Dept. of Public Works, Ottawa. Tenders to include towing of plant to and from work. Contractors to begin work 30 days after acceptance of tender. Tenders to be accompanied by accepted cheque for 5 per cent. of amount of tender. Tenders received by secretary until Sept. 13th.

The contract for erection of way buildings for the Grand Trunk Pacific between Winnipeg and Cochrane has been awarded to John King. Purchasing of supplies made through office here.

Fraser Mills, B. C.

In order to accommodate the increased traffic brought by the C. N. R., the B. C. E. R. will probably build a new bridge across the river at this point

Kincardine, Ont.

Tenders called for breakwater extension and dredging. (North Pier). Owner, Department of Public Works, Ottawa. Secretary, R. C. Desrochers. Construction of breakwater. Plans, etc., at the Department and at the offices of J. G. Sing, District Engineer, Confederation Life Building, Toronto, Ont.; H. J. Lamb, District Engineer, London, Ont., and on application to the local Postmaster. Tenders received by secy. until Sept. 20th.

Kingston, Ont.

Tenders called for boat house. Owner, Department of Public Works, Ottawa. Secretary, R. C. Desrochers. Construction of a boat house and renewal of wharfs at Kingston, Royal Military College, Frontenac county. Plans, etc., at the Dept. and at the offices of J. G. Sing, District Engineer, Confederation Life Building, Toronto, and on application to the Postmaster at Kingston. Tenders to be accompanied by accepted cheque for 10 per cent. of amount of tender. Tenders received by secretary until 4 p.m. Sept. 25th.

Lake Ainslie, N. S.

Tenders called for pile work and dredging. Owner, Department of Public Works. Secretary, R. C. Desrochers. Construction of pile protection work and dredging channel at Lake Ainslie, Inverness County, N.S. Plans, etc., at Department and at office of C. E. Dodwell, district engineer, Antigonish, N. S., and with the postmaster at Kinloch, N. S. Tenders to be accompanied by accepted cheque for 10 per cent. of amount of tender. Tenders received by secretary until 4 p.m. September 20.

Meaford, Ont.

Tenders called for extension to breakwater. Owner, Department of Public Works, Ottawa, Ont. Secretary, R. C. Desrochers. Extension and removal of L. and dredging. Plans, etc., at Dept. and at offices of District Engineer, London, J. G. Sing, Confederation Life Bldg. Toronto, and on application to local Postmaster. Tenders received by secretary until 4 p.m. Sept. 20th.

Ottawa, Ont.

Contemplated bridge (Manitock rd.) Owner, County of Carleton, Court House, Ottawa. Engineer, F. W. Farley, Strathcona Chambers, Ottawa. 1 span 20 ft. reinforced concrete. Date for calling tenders not yet fixed.

Pleasant Hill Road, Parish of Kars, N. B.

Tenders called for wharf, Department of Public Works, Ottawa. Secretary, R. C. Desrochers. Construction of a low wharf at Pleasant Hill Road, Parish of Pars, Kings County, N. B. Plans, etc., at the Department and at the office of the District engineers at St. John, Chatham, N. B., and on application to the postmaster at Evandale, Kings

County, N. B. Tenders to be accompanied by accepted cheque for 10 per cent. of amount of tenders. Tenders received by secretary until 4 p.m. September 25th.

Red Bay, Ont.

Tenders called for wharf. Owner, Department of Public Works, Ottawa. Secretary, R. C. Desrochers. Construction of wharf. Plans, etc., at Department and at offices of J. G. Sing, District engineer, Confederation Life Building, Toronto; and H. J. Lamb, District engineer, London, and on application to local postmaster. Tenders received by secretary until 4 p.m. Sept. 25th.

St. John, N. B.

Tenders called for wharves. Owner, Dept. of Public Works. Secretary, R. C. Desrochers. Construction of a series of wharves in the harbor of St. John at St. John West. Plans, etc., at the Dept. and at the offices of E. T. P. Shewen, District Engineer, Chatham, N. B.; A. R. Decary, District engineer, Post Office, Quebec; J. L. Michaud, District Engineer, Montreal; J. G. Sing, District Engineer, Confederation Life Building, Toronto; and H. J. Lamb, District Engineer, London, Ont. Tenders to be accompanied by accepted cheque for 10 per cent. of amount of tender. Tenders received by secretary until 4 p.m. September 20th.

Toronto, Ont.

Tenders to be called for underground subways. Owner, City of Toronto. Mayor, G. R. Geary. Construction of double track underground subways, about 3 miles. Tenders to be called on or about Sept. 15th. Advertisement in "Tenders and For Sale Department" of this issue.

Tenders called for retaining wall. (Long Branch Rifle Range). Owner, Department of Militia and Defence, Ottawa. Deputy Minister, Col. Eugene Flset. Construction of a concrete retaining wall at Long Branch Rifle Range. Plans, etc., at offices of the General Officer commanding 2nd division, 215 Simcoe street, Toronto, and the Director of Engineer Services, Department of Militia and Defence, Ottawa. Tenders to be accompanied by accepted cheque for 10 per cent. of amount of tender. Tenders received by Director of Contracts, Dept. of Militia and Defence, Ottawa, until noon Sept. 4th.

Victoria, B. C.

Officials of the Grand Trunk Pacific state that their coast fleet will be equipped with oil burning machinery shortly. The Prince Rupert and the Prince George will be equipped this fall, and large storage tanks will be erected on the company's property at the new main street docks. Other vessels will be equipped as they can be taken from their runs.

CONTRACTS AWARDED

Halifax, N. S.

Pier and sheds, 914,600. (Deep Water Terminals, I. C. R.) Owner, Dept. of Railways and Canals, Ottawa. Secretary, L. K. Jones, Ottawa. Contractor, Nova Scotia Construction Co., Sydney, N. S. Construction of reinforced cement; concrete pier and sheds at the Deep Water Terminus, Intercolonial Railway. Pier 800 feet long.

Port Arthur, Ont.

Bridge, Current River, Black Bay rd. Owner, City of Port Arthur; city engineer, L. M. Jones, Port Arthur; contractors, Seaman & Penniman, Port William, Ont., care A. G. Seaman, Port Arthur, Ont., about \$18,000. One-span, open spandrell, reinforced arch ribbed walls, 130 feet.

Roberval, Que.

Perron & Co., St. Jerome, Que., are the contractors for thirty miles of railroad for Quebec & Lake St. John Railway Co., from Roberval, P.Q. to Bear Falls (La Chute a-l'Ours) P.O.

St. Paul, Que.

Bridge. Owner, Provincial Government, Quebec. Contractor, Jos. Renaud, St. Paul, County of Joliette, steel and concrete.

Public Buildings, Churches, Schools, etc.

Barons, Alta.

Tenders received for school. Owner, Public School Board; secretary, C. W. Hansen; architect, Geo. E. Nobles, Room 7, Whitney Block. Barons has prepared plans for a 3-roomed school building. Tenders received until September 8th by secretary, to be accompanied by cheque equal to five per cent. of tender.

Clinton, Ont.

Tenders called for addition to school. Owner, Clinton Collegiate Board; secretary, J. W. Treleaven; chairman, M. D. McTaggart. Construction of a brick addition to the Clinton Collegiate Institute, 35 x 70 feet, 2-sty., with basement, also for the installation of furnace and closets in same. Plans, etc., at office of McTaggart Bros., Clinton. Tenders were received by the secretary until September 1st.

Dorval, Que.

Tenders to be called for school, \$10,000. Owner, Catholic School Commissioners; architect, L. J. J. Decary, 70 St. James street, Montreal; 3-sty., 70 x 50, brick. Tenders called after September 10th and close September 20th.

Dunnville, Ont.

Debentures for sale for high school. Town clerk, J. W. Holmes. Tenders received by town clerk until September 11th for purchase of \$10,000. High school debentures dated May 8th, five per cent., twenty equal annual payments.

London, Ont.

Work in progress for church and rectory. Owner, Parish of St. Martins, London; architects, Moore & Munroe, London; contractor, brick, Geo. Hammelt; carpentry, John Dodd. New seats, electric lighting equipment, heating apparatus for both church and rectory required shortly. Plans at office of architects.

Tenders to be called for wiring of hospital. Owner, Victoria Hospital Trustees; superintendent, T. H. Heard, chairman; Col. W. M. Gartshore, McClary Manufacturing Co. Wiring and equipment in connection with installation of hydro-power. New wire, lamps and equipment required.

Tenders to be called for interior finish and plumbing. Owner, Victoria Hospital Trustees; superintendent, T. H. Heard; chairman, Col. W. M. Gartshore.

McClary Mfg. Co. Tenders to be called shortly for new lavatory accommodation for the servants' quarters; also for finishing a number of rooms with Beaver board.

Lennoxville, Que.

Contemplated, church, \$15,000. Owner, Methodist Church of Canada; architect, P. H. Finney, 43 Victoria street, Toronto; 1-sty., 50 x 100, brick, brick foundation, cement work, cut stone, structural iron, hot air heating, electric lighting, shingle stain, art glass. Tenders will be called in Lennoxville.

Lloydminster, Sask.

Tenders called for public building. Owner, Department of Public Works, Ottawa; secretary, R. C. Desrochers. Construction of public building. Plans, etc., at office of J. E. Cyr, Superintendent of Public Buildings for Manitoba, Post Office Building, Winnipeg, Man., at the post office, Lloydminster, and at the department. Tenders to be accompanied by accepted cheque for ten per cent. of amount of tenders. Tenders received by secretary until 4 p.m., September 6th.

Olds, Alta.

The school board are considering the erection of a new school of either four or eight rooms. John Duff, chairman; Jas. F. Grant, secretary.

Penobsquis, N.B.

Tenders called for construction of school house at Penobsquis, N.B. Plans, etc., at the office of the secretary, Penobsquis. Tenders received until September 10th.

Point Grey, B.C.

Plans completed for church, Angus road. Architects, Smith & Goodfellow, 303½ Hastings street west, Vancouver; 1-sty. and basement, 30 x 54, seating capacity 200. Tenders were called after August 28th.

Princeton, B.C.

Tenders called for church, \$2,000. Owner, English Church Society; architect, T. Clark King, Princeton, B.C.; 1-sty., 22 x 34, frame, concrete foundation, stove heating, lamps, shingle roofing, pine finish, art glass. Tenders received until September 1st.

St. Vital, Man.

Tenders called for wiring administration buildings. Owner, Department of Public Works, Winnipeg; Minister, B. Rogers; provincial architect, S. Hooper, Fort Garry Court, Winnipeg. Electrical wiring. Plans, etc., at office of architect. Tenders were received until noon, September 2nd, by Minister of Public Works.

Swan River, Man.

Extension of time for school. Owner, Board of Education; secretary-treasurer, C. A. Lewis, Swan River; architect, E. D. Tuttle, 701 McArthur Bldg., Winnipeg. All trades except excavation and concrete work. Plans, etc., at offices of the sec.-treas., T. C. Silverton, Bowsman River, or at office of architect. Tenders were received until September 1st.

Toronto, Ont.

Contemplated, church, \$15,000, Perth ave. Owner, St. Martin's Church, Perth ave., Toronto; architect, P. H. Finney, 43 Victoria street, Toronto. One-sty., 50 x 90, brick construction, brick found-

ation, hot air heating, electric lighting, shingle roofing, cement work, cut stone, structural iron, art glass.

Vernon, B.C.

A by-law to raise \$5,000, for the purpose of erecting a municipal goal, was submitted on September 5th. D. G. Tate, city clerk.

Vancouver, B.C.

Tenders to be called for theatre, \$25,000, Main street. Architect, Perry & Nicolais, 324 Pacific Building, Vancouver; 30 x 120, brick, concrete foundation, hot water heating, cement work, marble, terra cotta, tile, ornamental iron, plastic relief work, Italian marble, seating capacity 500. Tenders received after September 1st.

Tenders to be called for hospital, \$400,000, Burrard & Comox. Owners, Sisters of Charity, Burrard and Comox, Vancouver; architect, Robt. T. Tegen, Portland, Ore; 5-stys., reinforced concrete, steel construction, concrete foundation, steam heating, electric lighting.

Tenders received after September 15th. First unit of large building.

Tenders called for moving picture theatre, \$3,000, Twenty-fifth ave. and Main street; architects, Jos. H. Bowman, 615 Pender street west, Vancouver; 1-sty., frame, concrete, 25 x 120 feet. Tenders received after August 28th.

Yarmouth, N.S.

Contemplated addition to post office. Owner, Dominion Government, Ottawa; secretary department of public works, R. C. Desrochers; 3-sty. brick building adjoining post office block has been purchased to provide additional accommodation.

CONTRACTS AWARDED

New Westminster, B.C.

School, Sapperton, \$33,350. Owner, New Westminster School Trustees; architects, Gardner & Mercer, New Westminster; general contractor, W. W. Forrester, New Westminster, B.C. 3-stys., 64 x 119, stone basement, library, dining room, fire escape. Information is being sought by the board as to the Buffalo Forge heating system and other improved systems of heating and ventilating.

Outremont, Que.

Addition to school, \$5,000. Owner, Catholic School Commissioners; architect, G. A. Monette, 97 St. James street, Montreal; general contractor, L. Beaudry, 2320 Hutchison street, Montreal. Brick and stone, six class rooms.

Ottawa, Ont.

The following contracts have been awarded by the Dominion Public Works Department: — Dundas, Ont., public building, to Nagle & Mills, of Ingersoll, at \$31,200; Calgary, Alta., alterations and additions to Customs House fittings, to J. T. Schell Co., of Alexandria, Ont., at \$1,091; Tilsonburg, Ont., public building, John Piggott & Son, contractors, Chatham, Ont., \$20,000; Amherst, N.S., dredging, to Ed. R. Reid, St. John, N.B., at 65 cents per cubic yard; Hillsboro, N.B., public building, to A. J. Dunham and P. N. Leblanc, \$20,225.

Ste. Anne de Lapocatiere, Que.

Jos. St. Hilaire, St. Komauld, P.Q., is the contractor for a college, stone and brick, hot water heating apparatus, electric light, complete sanitary arrange-

ments, hardwood interior, iron stairs, drain pipes, iron pillars and columns, etc.

Verdun, Que.

Church, \$122,000, Church ave. Owner, Fabrique Notre Dame de Sept. Douloureux; architect, Joseph Venne, 5 Beaver Hall Square, Montreal; general contractor, O. Rondeau, 310 St. Christophe st., stone, steel, concrete. Foundations this fall; stone cutting during the winter; walls and roof up next summer. Building to be completed November, 1913.

Vancouver, B.C.

Addition to high school, Britannia street. Owner, Board of Education; secretary, C. W. Murray; contractor, D. Matheson, 816 Victor Drive, \$123,799; Norton-Griffiths Steel Construction Co., Dominion Trust Building, tendered, at \$126,100.

Windsor, Ont.

Athletic Club, \$14,000. Owner, Windsor Athletic Club; architects, Jacques & Co., Windsor. Contracts awarded August 28th as follows: Mason work, Geo. Sewell; carpentry work, Victor Williamson; plastering, F. C. Poli; painting and glazing, T. W. Brooke; heating, James Purser; wiring, Gilbert Campeau; plumbing, roofing and metal work, Pennington & Brian.

Levis, Que.

Drill Shed. Owner, Department of Militia and Defence, Ottawa; contractor, Ideal Construction Co., Quebec City; stone and iron.

Residences

Eglinton, Ont.

Tenders called for two residences, \$6,000. Owner, R. C. Bustard, 29 Heath street, Toronto; architects, J. Hunt Stanford, 34 Yonge Street Arcade, Toronto; 2½-sty., 22 x 31, frame, brick foundation, hot air heating, gas and electric lighting, open plumbing, shingle roofing, interior finish pine and hardwood, cement work, mantels, tile, electrical work, electric bells, shingle stain, plate and art glass. Tenders received by owner.

Hamilton, Ont.

Buildings contemplated or in progress: J. Bradt, erection of frame dwellings, Hillyard street, for W. F. Condon, \$1,150; J. J. Hobson, 124 Argue st., owner and contractor, two brick dwellings, Burris street, \$4,100; J. Poag & Co., Westinghouse ave., brick dwelling, Garfield ave., for W. J. Orr, Norway ave., \$2,100; W. E. Beecraft, erection of frame dwelling, Beechwood ave., \$1,000; W. J. Kiehl, brick veneer dwelling, Sherman ave., \$1,000; P. Creek, a brick dwelling, Homewood ave., \$1,500; D. A. Culp, brick dwelling, Main street, for J. Walter Gage, \$2,000; L. A. Dawson, Greenway ave., two frame dwellings, Cannon street, \$2,500.

Montreal, Que.

C. J. Brown, 4263 St. Catharine street west, will erect two 3-sty. brick and concrete residences on Clark ave., to cost \$10,000 each.

Alphonse Gevieux, 118 Bourbonniere street, is planning to erect a \$6,500 apartment house, 45 x 45, on Bourbonniere street, with stone front, gravel roof and cement foundation.

Contemplated, residence, \$100,000, Westmount Heights. Owner, H. Tim-

mins, 631 Coristine Building, Montreal; architect, E. & W. Maxwell, Beaver Hall Square, Montreal. Tenders have not been called yet.

Ottawa, Ont.

Contemplated, four residences, Carling avenue. Owner, J. W. Nimmo, Ottawa. 2½-storeys, hot air, electric light, shingle roof, hardwood interior finish. The four dwellings will cost from four to six thousand each. The owner will let contracts.

Toronto, Ont.

Tenders called for residence, \$6,500, Rowanwood ave. Owner, R. A. Stappells, 47 Simcoe street; architect, S. B. Coon, 1106 Temple Bldg.; 2-sty., 38 ft. 9 in. x 26 ft. 3 in., stone and brick, shingle roofing, cement work, cut stone, hardwood flooring, sheet metal work, tile, mantels, plate and art glass, speaking tube. Tenders received September 6th.

Tenders called for detached house, \$2,500, Dufferin street. Owner, J. Drury, 102 Baker ave., Toronto, Ont; architect, J. Hunt Stanford, 34 Yonge Street Arcade. 2½-stys., 22 x 34, brick construction, brick front, cement work, cut stone, tile, mantels, hot air heating, combination lighting, slate roofing, interior finish pine, electrical work, electric bells, plate and art glass. Tenders received by owner.

Residence, \$4,500, S. S. Pleasant ave. Owner, C. G. Scott, Charles and Yonge street, Toronto; architect, J. A. McKenzie, Lumsden Building, Toronto. Two and one-half stys., 23 x 35 ft. 4 in., brick construction, brick foundation, cement work, tile, mantels, hot water heating, electric lighting, slate roofing, hardwood floors. work will be done by day labor.

Tenders called for pair of dwellings, \$5,000, east side Shaw street. Owner, Samuel Loveday, 477 Clinton street, Toronto; architect, Wm. S. Thompson, 686 Bloor street west, Toronto. Two stys., 43 x 32, brick, brick foundation, hot air heating, electric lighting, slate or shingle roofing. Tenders called by owner.

Residence, \$2,700, east side Oakmount Boulevard. Owner, Bailey & Cummings, 77 Fermanagh ave., Toronto. 2-stys., 30 x 28, stone and brick, stone foundation, hot air heating, electric lighting, shingle stain. Work will be done by day labor.

Tenders called for residence, \$4,000, 755 Dufferin street. Owner, A. Cavers, 755 Dufferin street, Toronto; architect, A. M. Brydon, 12 Queen street east, Toronto. 2-sty., 30 x 16 ft. 6 in., brick, concrete foundation, cement work, hot water heating, shingle roof, shingle stain, mantels, electric lighting. Tenders received by owner.

Tenders called for pair of dwellings, \$3,850, 165-7 Leslie street. Owner, H. A. Farthing & Bro., 39 Doel ave., Toronto; architect, W. Gwynne, 40 Hazelwood ave., Toronto. 2½-stys., 40 x 33, brick construction, brick foundation, hot air heating, electric light, shingle roofing. Tenders called by owners.

Residence, \$3,000, Beech ave. Owner, W. Powell, 839 College street, Toronto; architect, Ellis & Connery, 7½ Queen st. west, Toronto; general contractor, John Calder, 217 Brunswick ave., Toronto. 2-sty., 26 x 28, concrete foundation, brick, cement work, cut stone, steel beams, hot water heating, electric lighting, shingle roof, plate glass.

Fifteen residences, Coady ave. Owner, W. N. McEachren & Son, Ltd., 43 Victoria street, 2-stys., 32 x 37, brick and roughcast, brick foundation, cement work, tile mantels, hot air heating, combination lighting, slate roofing, interior finish hardwood floors, electric work. Work will be done by day labor.

Tenders called for residence, \$5,000, Summerhill ave. Owner, H. B. Reesor, 14 Summerhill ave; architect, J. Hunt Stanford, 34 Yonge Street Arcade, Toronto. 2½-stys., 23 x 36, stone foundation, brick, cement work, cut stone, metallic lath, shingle stain, weather strips, slate roof, gas and electric lighting, hot water heating, mantels, plate and art glass. Tenders received until August 31st.

Tenders called for three dwellings, \$5,500, Brock ave. Owners, Smith & Sellers, 417 Dovercourt road, Toronto. 2½-stys., 44 x 46, brick and stone, stone foundation, hot air heating, electric lighting, slate, felt and gravel roofing, cement work, tile, mantels. Tenders will be open for three days on plumbing, painting, plastering and wiring.

Tenders called for addition to residence, \$3,000, 91 Marion street, Toronto; architect, J. Hunt Stanford, 34 Yonge Street Arcade, Toronto. 2½-sty., 18 ft. 3 in. x 46 ft., brick, stone foundation, hot water heating, gas and electric lighting, open plumbing, slate roofing, interior finish pine and hardwood, cement work, cut stone, tile, mantels, pipe covering, electrical work, electric bells, shingle stain, plate and art glass. Tenders received by owner until August 31.

Tenders called for residence, \$2,800. Architect, J. Hunt Stanford, 34 Yonge Street Arcade, Toronto. 2-sty., 20 ft. 6 in. x 32, brick, stone foundation, hot air heating, combination lighting, open plumbing, shingle roofing, cement work, cut stone, tile, mantels, electrical work, electric bells, shingle stain, plate and art glass. Tenders received by owner.

Work in progress for residence, \$3,500, Rusholme Crescent. Architect, J. Hunt Stanford, 34 Yonge Street Arcade, Toronto; general contractor, S. Willcock, 438 Shaw street, Toronto. 2½-sty., 22 x 34, brick, stone foundation, slate roofing, cut stone, cement work, metallic lath, gas and electric lighting, pine and hardwood finish, tile mantels, shingle stain. Tenders received by S. Willcock.

Tenders called for two dwellings, \$8,000, 142 and 144 Rusholme road. Owner, R. S. Hambleton, 74 Wellesley street, Toronto. 2-sty., 39 x 22, brick and stone foundation, hot water heating, electric lighting, shingle roofing, interior finish hardwood, cement work, cut stone, brick, tile, mantels, sheet metal work, electrical work, electric bells, shingle stain. Tenders will be open for about two weeks.

Vancouver, B.C.

Herbert M. Barker, 429 Pender street west, is working on plans for a fine stone residence on Lonsdale ave., North Vancouver, to cost about \$10,000.

Specifications changed for apartment house, Fourth ave. Architect, G. B. Kaufman, Pender and Burrard streets, Vancouver. Brick will probably be used instead of frame. Calling for tenders delayed. Construction will probably not start till next year.

Tenders called for residence, \$8,000, Vancouver Island. Owner, H. J. Stanford, Montreal. Architects, G. B. Kaufman, Pender and Burrard, Vancouver. 2-stys., frame, hot air heating, stone foundation.

Plans prepared by architects Parr & Fee, 570 Granville street, Vancouver, for erection of a 3-sty. brick apartment house to cost \$25,000. Tenders called shortly.

Westmount, Que.

Contemplated, residence, \$50,000. West Crescent Heights. Owner, H. J. Allison, Bank of Ottawa Bldg.; architect, R. Montgomery Rodden, Board of Trade Bldg., Montreal. Fireproof, brick, concrete and stone trimmings. Heating not decided. Work not to start until spring.

Windsor, Ont.

Plans being prepared for apartment house, \$4,000, for J. O. Peck, Windsor, Ont. Architects, Jacques & Co., Windsor. Large frame house on Chatham street to be remodelled into five family apartment house, cost \$4,000. Steam heating, electric lighting, oak finish, building 54 x 46 feet in dimensions.

Winnipeg, Man.

Tenders called for boarding house, \$10,000, Euclid ave. Owner, H. Fine-silver, Euclid ave., Winnipeg; architect, D. Abramovich, 505 McIntyre Block, Winnipeg. 3-sty., 28 ft. 6 in. x 39, solid brick, stone foundation, cement work, structural iron, metal ceiling, iron columns, sheet metal work, steel beams, roof flat ruberoid, steam heating, electric lighting, fire escapes, sprinkler system, plate and prismatic glass, cornice.

CONTRACTS AWARDED

Brantford, Ont.

Apartments, \$6,000, Colborne street. Owner, Frank Cockshutt, Brantford; architects, Chapman, McGiffin & Scott, 59 Yonge street, Toronto; general contractor, J. C. O'Neil, 232 Park ave., Brantford. Heating and plumbing, Anguish & Whitfield, Brantford. Contracts awarded August 30. Building to be completed November 28, 1911. Electric wiring not yet awarded.

Ottawa, Ont.

The contract for the residence of J. Angus MacKenzie, on Clemow ave., has been awarded to Shuttleworth and Black for about \$10,000, A. Leb. Weeks is the architect.

Port Arthur, Ont.

Residence, \$7,000. Owner, Mrs. J. M. Sills, Fort William; architect, Hood & Scott, Port Arthur; general contractor, Geo. Otto, Port Arthur. 2½-stys., brick veneer. Contracts for plastering, heating and plumbing to be sub-let.

Sherbrooke, Que.

Four residences, \$9,000. Owner, Fuller and Wiggitt, private plan. General contractor, A. Jonas & Co., Sherbrooke. 2-sty., brick and stone, hot air heating, electric lighting. Building to be completed December 1st.

Toronto, Ont.

Residence, \$4,000, Oakmount road. Owner, Mrs. Geo. Constable, 468 Queen street west, Toronto; architect, S. Smith, Shannon street, Toronto; general contractor, J. P. Hamlyn, 895 Dovercourt road, Toronto. 2½-stys., 28 x 32, brick and stucco, brick foundation, hot water

heating, electric lighting, shingle roofing, hardwood floor, cement work, cut stone, mantels, electrical work, electric bells.

Residence, \$7,000, Russell Hill road. Owner, Robt. McKay, Traders Bank Bldg., Toronto; architect, J. Francis Brown, Board of Trade Building, Toronto; contractor, Jas. Hicks, 144 Montrose ave., Toronto; carpentry, Walter Nash, 79 Gore Vale ave., Toronto; 2½-stys., 42 x 44, brick and stone, cement work, cut stone, stone foundation, tile, mantels, sheet metal work, plate glass.

Residence, \$9,000, North Rosedale; architects, Curry & Sparling, Toronto; masonry contractor, Smallwood Bros., 97 Clinton street, Toronto; carpentry, P. Miles, 450 Manning avenue, Toronto. 2½-sty. brick and stone, 86 x 38, brick foundation, hot water heating, gas and electric lighting, slate roof, interior finish hardwood.

Vancouver, B.C.

R. Mackey Fripp, 419 Pender street west, has awarded the contract for a residence for Mr. Dickie on Shaughnessy Heights, to Robertson & Hunter. Approximate cost \$12,000.

Business Buildings and Industrial Plants

Amherstburg, Ont.

Plans being prepared for garage, \$3,000. Owner, V. L. Price, Amherstburg; architects, Jacques & Co., Windsor. 2-sty. frame, shingle roof, pine finish, concrete floor. Upper floor to be fitted up for sleeping quarters.

Edmonton, Alta.

W. C. Heinrichs, representing the Mueller Manufacturing Co., of Decatur, N.Y., visited the city recently with a view of selecting a site for a factory. They manufacture waterworks, brass tapping machines and brass supplies for plumbers.

Eglinton, Ont.

Plans being prepared by architect M. H. Bryan Gilbert, 47 Wellington street east, Toronto, for erection of new building, corner of Yonge street and Sherwood ave., for Union Bank of Canada. Tenders will be called for as soon as plans are finished and work will be commenced at once.

Fredericton, N.B.

Contemplated, factory building, \$25,000. Owner, John Palmer Co., Ltd., Fredericton, N.B.; 3-sty., brick and stone, to be used as larrigan factory.

Lake Annis, N.S.

D. R. Saunders, Yarmouth, N.S., plans to rebuild the sawmill and workmen's dwellings recently destroyed by fire.

London, Ont.

Tenders to be called for addition to factory. Owner, J. Darch & Son, harness makers, 377 Talbot street, London. 5-sty., 55 x 110, brick, steam heating, electric lighting. Tenders to be called at once. New machinery will be bought later.

Mr. John Forristal, president of the London and Petrolia Barrel Company, states that next year the firm will build a big addition to their present factory.

Work in progress for store, 247 Dundas street. Owner, John Mann & Sons, Clarence street, London; architect, H.

C. McBride. 3-stys., brick and stone, 16 x 150. Tearing down of present building commenced. Contracts to be let shortly for brick and stone work, heating and lighting.

Addition to factory of the Hobbs Manufacturing Co., manufacturers of plate and stained glass. Contractor, T. Copp, London, Ont. 1-sty., brick and cement warehouse, 50 x 100. Heating and lighting required.

Equipment required for addition to factory, south end. Owner, McClary Manufacturing Co., London; contractor for brick work, T. H. Martyn, London; 3-stys., 100 x 120, heating and electric lighting apparatus and new machinery required.

Montreal, Que.

O. Tremblay, 519 Centre street, will erect stores and dwellings, \$7,500, 3-sty., 48 x 42, cement foundation, flat gravel roof.

Work in progress for erection of stores and offices, \$100,000, 517 St. Catherine street west, for G. A. Holland & Son, 46 Beaver Hall Hill; general contractor, C. E. Deakin, 11 Sacramento street; 7-stys., fireproof, stone, brick and reinforced concrete. No sub-contracts let yet, old buildings being demolished.

New Westminster, B.C.

A representative of the Tacoma Match Co., of Tacoma, Wash., states that in the near future they will build a match factory in this city to cost about \$25,000. Machinery will be brought from the east.

Niagara Falls, Ont.

Competitive plans called for store and office building. Owner, Geo. Badger, Queen street, Niagara Falls; 2-sty., cost about \$8,000.

Contemplated, cold storage plant. Owner, Niagara Ice Co., Niagara Falls Centre; manager, M. H. Parker. The erection of a cold storage and ice making plant.

Ottawa, Ont.

Tenders to be called for stable and carriage house, \$9,000; architect, W. E. Noffke, Central Chambers, Ottawa; 2-sty., concrete and brick, concrete foundation, concrete floors, tar and gravel roof. Tenders received after September 6th. Date for closing of tenders not set yet.

Revelstoke, B.C.

Tenders called for warehouse, \$20,000. Owner, F. H. Bairne, Revelstoke; architects, W. King, Revelstoke; 2-sty. and basement, 45 x 80, concrete foundation, concrete and brick, reinforced concrete, cement work, structural iron, sheet metal work, metal ceiling, metal roof, steam elevator, plate and prismatic glass. Tenders closed August 28th.

St. John, N.B.

Work in progress for store, Dundas street. Owner, Harry McKenna; architects, Moore and Munroe; builders, Jones Bros.; 2-sty., brick, electric light, steam heating. Excavation has commenced.

Contemplated, store, \$15,000, Dundas street. Owner, Jas. Duffield, City Gas Co., St. John, N.B.; architects, Moore & Munroe; 3-sty. brick.

(Continued on page 66)

Tenders and For Sale Department

For Sale

One R. McDougal engine lathe, new, swing over bed 30-in., distance between centers 20 ft., with motor drive; also one set of 3-in. raising blocks. Price \$2,050. Address, The Canadian Pipe Company, Limited, 550 Pacific street, Vancouver, B.C. 35-37

Trench Machines

Parsons—Cuts trench 27 in. to 60 in., to 20 ft. deep, fine order.

Parsons—With Mattes Back Filler, cuts trench 28 in. to 78 in. to 20 ft. deep. Overhauled and first class. Write us if you have anything to sell, or if in want of anything.

THE MALES CO.

No. 82 Perin Building, Cincinnati, O.

CITY OF TORONTO CANADA

Underground Subway Construction

It is the intention of the City of Toronto to call for tender for construction of double track underground subways, approximately three miles in length, on or about September 15th.

Intending bidders please be governed accordingly.

G. R. GEARY, Mayor.

City Hall, Toronto,
August 25th, 1911. 35-36

Tenders Wanted

Sealed proposals for an Intake Pipe and Screen Wall for the City of Windsor, Ont., addressed to the Secretary of the Water Commissioners, Windsor, Ont., and endorsed "Proposals for Intake Pipe and Screen Wall for Windsor Waterworks," will be received at the office of the Water Commissioners of the City of Windsor, Ont., until 12 o'clock noon, Tuesday, September 12, 1911.

Proposals shall be made in accordance with the specifications and requirements on file in the office of the Water Commissioners.

Each proposal shall be accompanied by a certified cheque equal to ten per cent. of the amount of tender as surety for the acceptance of the contract, payable on its face to the Water Commissioners of the City of Windsor, Ont.

The accepted contractor will be required to furnish an approved Guaranty or Surety Bond in the sum of 50 per cent. of the full amount of his contract.

The Commissioners reserve the right to reject any or all proposals.

Copies of plans and specifications are on file at the Water Office, Windsor, and also at the office of Smith, Hinchman & Grylls, Detroit, Mich.

By order of the Commissioners,

34 35 W. A. HANRAHAN,
Secretary.

MACHINERY BARGAINS

We have for sale for quick shipment from point near Montreal in Canada, several 18-ton saddle back four-wheel contractors' locomotives, and four dozen 4-yard two-way side dump contractors' cars, all 36-in. gauge.

Also one No. 4 Austin gyratory stone crusher with elevator and screen for same.

These items in good condition for immediate service and at attractive prices. For particulars, address—

WILLIS SHAW MACHINERY CO.,
39 South LaSalle Street, Chicago, Ill.



Department of Railways and Canals, Canada

Intercolonial Railway Passenger Station, Truro, Nova Scotia

Extension of Time

The time for receiving tenders for the construction of a "Stone Passenger Station" at Truro, Nova Scotia, has been further extended from Thursday, the 31st August until 12 o'clock noon on Friday, the 15th September, 1911.

By order,

L. K. JONES,
Secretary.

Department of Railways and Canals,
Ottawa, August 24th, 1911.

Newspapers inserting this advertisement without authority from the Department will not be paid for it. 35-36

Toronto Main Drainage Works

Sealed tenders for the construction of the following sewers will be received by registered post only, addressed to the Chairman of the Board of Control, City Hall, Toronto, up to noon of Tuesday, September 12th, 1911.

Storm Overflow Sewers—Sorauren Division.

Total length 8,897 linear feet, including the laying of 30 and 36 inch concrete pipe and the supplying and laying of 24-inch cast iron pipe, and 15, 18 and 24 inch vitrified pipe.

Storm Overflow Sewers—Manchester Division

906 linear feet of 3 ft. 4 in. x 3 ft. 8 in. concrete culvert, in open cut.

High Level Interceptor—Section No. 14

985 linear feet of 3 ft. 0 in. x 4 ft. 6 in. egg-shape, brick, in tunnel.

Plans, specifications, forms of tender and conditions relating to tendering as prescribed in City By-laws may be obtained from the Main Drainage Works, Office of City Engineer, Toronto.

The lowest or any tender not necessarily accepted.

G. R. GEARY, Mayor,
Chairman, Board of Control.

City Hall, Toronto,
August 18th, 1911. 34-35

Tenders Wanted

Sealed tenders, marked "Tenders for Tile Drains," will be received by the undersigned up to September 11th, for the construction of a system of tile drains, consisting of approximately 29,000 feet of tile. Plans and specifications may be seen at the office of the undersigned, Bell Telephone Building, Guelph, and at the office of the Canadian Engineer, 62 Church Street, Toronto.

The lowest or any tender not necessarily accepted.

35-35 J. W. LYON, President,
Guelph Radial Railway Co.

FOR SALE

Complete Electric Generating Set, consisting of Leonard Peerless steam engine direct connected to 150 k.w. Canadian General Electric generator, 2,300 volts, 60 cycles; also condenser, switchboard, steam and exhaust piping, spare parts for engine and generator, and everything constituting the complete set as at present installed in the Thomas street lighting station of the Town of Brockville. This machine is in first-class order, having only been used on peak loads. It is now being replaced by a larger Belliss & Morcom engine with Swedish G. E. generator. Full particulars and price can be obtained from Laurie & Lamb, Consulting Engineers, Board of Trade Building, Montreal. 35-36

Town of Scott

Sealed tenders will be received by G. M. Phillips, Secretary-treasurer, of the Town of Scott, Sask., until noon of Monday, September 25, 1911, for supply and delivery of the following machinery and materials, and for the performance of certain works.

Tender A.—Supply and Delivery of—
Generator and exciter and switchboard.
Transformers and meters.
Series tungsten street lighting system.
Pumping machinery.

Tender B.—Supply and Delivery of—
Two pneumatic storage tanks.

Tender C.—Supply and Delivery of—
Approximately 2,200 ft. of 8-inch steel wire pipe.
Approximately 7,000 feet of 6-inch steel water pipe.
Approximately 5,400 feet of 4-inch steel water pipe.
Approximately 15 hydrants and 22 valves.

Tender D.—
Trenching and laying steel water pipe, setting hydrants, valves, etc., and back filling.

Tender E.—
Erection of a power house and construction of a reservoir.

Plans and specifications may be seen at the offices of the Canadian Engineer, Winnipeg, Toronto and Montreal, and at the Consulting Engineer's office, Bottomly Block, Saskatoon.

A marked cheque for five per cent. of amount of the tender must accompany each bid.

The lowest or any tender not necessarily accepted.

McARTHUR & MURPHY, Engineers,
Bottomly Block, Saskatoon.

G. M. PHILLIPS, Sec.-Treasurer,
Scott, Sask.

Debentures For Sale

Sealed tenders addressed to the undersigned and marked "Tenders for High School Debentures," will be received up to 9 o'clock p.m., Monday, September 11th, 1911, for the purchase of \$10,000, High School Debentures dated May 8th, 1911, bearing interest at five per cent. per annum to be repaid in twenty equal annual payments of principal and interest.

J. W. HOLMES,
Town Clerk,
Dunnville, Ont.

36-36

Notice to Contractors

Sealed tenders will be received by the undersigned up to and including September 25th, 1911, for the erection and completion of the several trades in connection with a Masonic Temple to be erected on West street in the Town of Goderich, according to the plans and specifications, copies of which may be seen at the office of Dr. Turnbull, president.

Lowest or any tender not necessarily accepted.

DR. TURNBULL,
President.

36-36

Miscellaneous

Advertisements under this heading two cents per word per insertion.

An experienced man with executive ability to take position of Superintendent of Operation of extensive high tension transmission system. Ability to handle men necessary. State fully training and experience, whether married, age, salary required, and other particulars. Apply Box 323, Contract Record, Toronto, Ont.

36-36

Notice to Contractors

Water Works Supplies

Sealed tenders addressed to the Chairman of the Waterworks Committee, endorsed "Tender for Valves," will be received at the City Hall, Ottawa, up to 5 p.m., Tuesday, September 12th, 1911, for 30-in., 36-in., 40-in. and 42-in. valves. Any tender received after the above stated time will be declared informal.

Specifications and full particulars may be obtained on application at the City Engineer's office, City Hall.

The Corporation does not bind itself to accept the lowest or any tender.

NEWTON J. KER,

City Engineer.

Ottawa. August 30th, 1911.

36-36

City Engineer Kingston, Ont.

Sealed applications, marked "Position of City Engineer," stating qualifications and experience of applicant and salary required, will be received by the undersigned up to noon, Saturday, September 30th, 1911, for the position of city engineer.

W. W. SANDS,
City Clerk.
36-37

September 1st, 1911.



Sealed tenders addressed to the undersigned, and endorsed "Tender for Renewing Wharfs and Construction of Boat House at Kingston, Ont., will be received at this office until 4.00 p.m. on Monday, September 25, 1911, for the construction of a Boat House and the renewal of Wharfs at Kingston, Royal Military College, Frontenac County, Ont.

Plans, specifications and form of contract can be seen and forms of tender obtained at this Department and at the offices of J. G. Sing, Esq., District Engineer, Confederation Life Building, Toronto, Ont., and on application to the Postmaster at Kingston, Ont.

Persons tendering are notified that tenders will not be considered unless made on the printed forms supplied, and signed with their actual signatures, stating their occupations and places of residence. In the case of firms, the actual signature, the nature of the occupation, and place of residence of each member of the firm must be given.

Each tender must be accompanied by an accepted cheque on a chartered bank, payable to the order of the Honorable the Minister of Public Works, equal to ten per cent. (10 p.c.) of the amount of the tender, which will be forfeited if the person tendering decline to enter into a contract when called on to do so, or fail to complete the work contracted for. If the tender be not accepted the cheque will be returned.

The Department does not bind itself to accept the lowest or any tender.

By order,

R. C. DESROCHERS,
Secretary.

Department of Public Works,
Ottawa, August 25, 1911.

Newspapers will not be paid for this advertisement if they insert it without authority from the Department.

36-36

Positions Vacant

Advertisements under this heading two cents a word per insertion. Minimum charge 50 cents

Draughtsman having good general experience in civil draughting and design. Must be able to produce neat and speedy work. Permanent position for suitable man. Apply, stating experience and salary expected, to J. M. Wilson, City Engineer, Moose Jaw.

35-36

Miscellaneous

Brooklyn, N.S.

Tenders called for supply of cement. Owner, Department of Public Works, Ottawa; secretary, R. C. Desrochers. Supply of 20,000 bbls. cement at the railway station, Brooklyn, Queen's County. Specifications at the department and at the offices of the District Engineers at Montreal, Toronto, Halifax, North Sydney and St. John. Tenders to be accompanied by accepted cheque for ten per cent. of amount of tender. Tenders received by secretary until 4 p.m., September 13th.

Guelph, Ont.

Tenders for purchase of assets and property. Owner, Standard Fitting and Valve Co., Ltd., Guelph; liquidator, J. M. Taylor, Guelph; solicitors, Dunbar & Dunbar, Guelph; (1) real estate; (2) machinery, plant and equipment, office fixtures and stock. Full particulars at office of liquidator and solicitors. Tenders received by liquidator until September 17th.

Medicine Hat, Alta.

Tenders called for debentures for sale. Owners, city of Medicine Hat; secretary-treasurer, A. R. Perry; motor fire engine, \$10,500; general grading, \$8,000; cement walks, local improvement, \$33,500; plank sidewalks, \$4,000; curbs and gutter boulevards, \$17,500; loan to Agriculture Society, \$6,000. Site for the Alberta Linseed Oil & Paint Co., \$3,500; debentures dated October 1st, to bear interest at five per cent. Full particulars with sec.-treas. Tenders received until 4 p.m., September 4th.

Scott, Sask.

Tenders called for supply of machinery; sec.-treas., G. M. Phillips, Scott; engineers, McArthur & Murphy, Bottomly Block, Saskatoon. A.—Supply of generator exciter and switchboard; transformers and meters; series tungsten street lighting system; pumping machinery; B.—Two pneumatic storage tanks; C.—About 2200 ft. of 8-in. steel water pipe; 7,000 ft. of 6-in. and 5,400 ft. of 4-in.; 15 hydrants and 22 valves. D.—Trenching and laying steel water pipe, setting hydrants, valves, etc., and back filling. E.—Erection of power house and construction of reservoir. Plans, etc., at office of Canadian Engineer, Winnipeg, Toronto and Montreal, and with engineers, Saskatoon. Tenders received until noon, September 25th.

Port Arthur, Ont.

The Electric Light Department has recently awarded to Canada Wire & Cable Co., Ltd., contract for the supply of a large quantity of weatherproof wire and cable.

Department of Railways and Canals

Notice to Contractors

ST. PETERS CANAL

Sealed tenders addressed to the undersigned and endorsed "Tender for St. Peters Canal Improvements," will be received at this office until 3 o'clock on Tuesday, September 12th.

Plans, specifications and form of contract to be entered into can be seen on and after August 21st at the office of the Chief Engineer of the Department of Railways and Canals, Ottawa, at the office of the Resident Engineer, Ontario St. Lawrence Canals, Cornwall, Ont., and at the office of the Resident Engineer, St. Peters Canal, St. Peters, Cape Breton, at which places forms of tender may be obtained.

Parties tendering will be required to accept the fair wages schedule prepared or to be prepared by the Department of Labor, which schedule will form part of the contract.

Contractors are requested to bear in mind that tenders will not be considered unless made strictly in accordance with the printed forms, and in the case of firms, unless there are attached the actual signature, the nature of the occupation, and place of residence of each member of the firm.

An accepted bank cheque for the sum of \$25,000, made payable to the order of the Minister of Railways and Canals, must accompany each tender, which sum will be forfeited if the party tendering declines entering into contract for the work, at the rates stated in the offer submitted.

The cheque thus sent in will be returned to the respective contractors whose tenders are not accepted.

The cheque of the successful tenderer will be held as security, or part security, for the due fulfillment of the contract to be entered into. The lowest or any tender not necessarily accepted.

By order,

L. K. JONES,
Secretary.

Department of Railways and Canals,
Ottawa, August 18th, 1911.

Newspapers inserting this advertisement without authority from the Department will not be paid for it.

35-36

Business Buildings and Industrial Plants

(continued from page 63)

Toronto, Ont.

Addition to store and apartment, \$5,000, Jarvis & Carlton. Owner, J. H. Hallett, Jarvis & Carlton streets, Toronto; architect, W. H. Bradley, 298 Roxton road, Toronto; 3-sty., 72 x 16, brick, stone foundation, felt and gravel roof, interior finish hardwood, electric lighting, hot water heating, cut stone, tiles, mantels, structural iron, skylights, steel beams, plate glass. Store to be used as drug store.

Preliminary plans prepared for office and lodge rooms on Gerrard street east, for Riverdale Masonic Hall, Ltd.; secretary, A. M. Miskelly, 174 Victor ave., Toronto. Building to be 3-sty., brick, 40 x 110.

Contemplated, factory, Christie street and C. P. R. tracks. Owner, National Cash Register, 100 Lombard street, Toronto; architect not appointed yet. Fireproof, brick and steel. Site of about 7½ acres has been purchased and two buildings similar to the factory at Dayton will be erected. Building operations to commence next spring.

Tenders called for store and dwelling, \$3,000, Pape and Maplewood. Owner, J. P. Jones, 78 Dagmar ave., Toronto; architect, P. H. Finney, 43 Victoria st., Toronto; 2-sty., 50 x 19, brick construction, stone foundation, hot water heating, electric lighting, felt and gravel roofing.

Tenders called for laundry equipment. Owner, Toronto General Hospital; engineers, William & Cole, 36 Toronto street, Toronto. Installation of laundry equipment for General Hospital. Plans, etc., at office of engineers. Tenders received by engineers until 5 p.m., September 5th.

Contemplated, factory, \$30,000, Adelaide street west; architects, A. G. Strathy, Ltd., 123 Simcoe street, Toronto; 3-sty. and basement, 64 x 90, brick construction, stone foundation, electric lighting, cement work, cut stone, brick fire escape, freight elevators, sheet metal work, steel beams, Roman stone, wire glass.

Tenders called for warehouse, 55 Bay street. Owner, A. A. Allan & Co., 51-53 Bay street; architect, Gordon & Helliwell, Confederation Life Building, Toronto; 7-sty., 130 x 32, brick and concrete, reinforced concrete foundation, cement work, cut stone, artificial stone, structural iron, ornamental iron, sheet metal work, fireproof doors, steel beams, plate and prismatic glass, freight and passenger elevators, wire glass. Tenders received until September 5th.

Tenders to be called for offices, \$3,000, River street. Owner, Canadian Ornamental Iron Co., Sumach street, Toronto, Ont.; architect, G. M. Miller & Co., 59 Yonge street, Toronto; 2-sty., 32 ft. 6 in. x 20 ft. 3 in., cement, brick and iron, brick foundation, cut stone, ornamental iron, skylights, galvanized iron roofing, electric lighting, hardwood flooring, hot air heating, plate glass, vaults. Tenders called shortly.

Victoria, B.C.

Tenders called for store and office for McPherson & Fullerton Bros., 618 Trounce ave., Victoria; architect, J. M. Warren, 416 Sayward Bldg., Victoria; 4-sty. Tenders on general contract

closes September 6th. Tenders for elevators, hardware, plumbing, heating, electrical work, called shortly.

Vancouver, B.C.

Tenders called for hotel, \$300,000, Pender and Vernon streets. Owner, M. Conlin, Pender street, Vancouver; architects, P. J. Donohue, Union Trust Building, Vancouver; 10-sty., 320 rooms, reinforced concrete, concrete foundation, steam heating, fire escapes, passenger elevator, roof garden. Tenders called on the 28th. No date given for closing.

Equipment required for lumber mill. Owner, British Canadian Lumber Mill, Engineer, A. B. Pracna, 821 Pender st. west, Vancouver. Electric band-saws, planing box and door machinery. Estimated expenditure, \$400,000. Specifications at office of engineer. Apparatus required December 1st, 1911.

Westmount, Que.

Work in progress for garage and stable, \$12,000, West Crescent Heights. Owner, H. J. Allison, Bank of Ottawa Building, Montreal; architect, R. M. Rodden, Board of Trade Bldg., Montreal; general contractor, H. C. Hitch & Co., Coristine Bldg., Montreal. Two-sty., 40 x 40, brick and concrete, fireproof.

CONTRACTS AWARDED

Brantford, Ont.

Iron storage building, Mohawk street. Owner, Cockshutt Plow Co., Brantford; general contractor, A. E. Faulkner, Brantford; 1-sty. and basement, 96 x 100, brick, concrete foundation. Heating, plumbing contracts not let yet. Building to be finished November 1st, 1911.

Fredericton, N.B.

Factory building, \$15,000. Owner, Smith Foundry Co., Ltd., Fredericton, N.B.; architect, Wm. E. Minue, Fredericton, N.B.; contractor, Thos. Myles, St. Mary's, N.B., \$15,000; stone and brick, 174 ft. x 94 ft., to replace foundry building destroyed by fire. Heating apparatus not included in contract. Construction to begin as soon as site is cleared of ruins.

Sherbrooke, Que.

Store, \$10,000. Owner, P. Legaru & Son, Ltd., Sherbrooke, Que.; architect, J. W. Gregoire, Sherbrooke; general contractor, Pipin & Michaud, Victoriaville, Que.; 3-sty., brick and stone, 84 x 60. Heating and plumbing contract not yet awarded.

Toronto, Ont.

Office building, \$900,000, corner King and Yonge streets. Owner, Canadian Pacific Railway, Montreal; architects, Darling & Pearson, 2 Leader Lane, Toronto; general contractor, Geo. Fuller & Co., 208-14 King street east, Toronto, or Jacobs Building, Montreal.

Store, \$5,500, 492 Bloor street west. Owner, H. C. MacKenzie, Toronto; architect, A. G. Strathy, 123 Simcoe st., Toronto; general contractor, W. Waters, 3 Glenfern ave., Toronto; 3-sty., 34 x 16, brick construction, hot water heating, electric lighting, slate roofing, maple flooring, steel beams.

Warehouse, \$25,000. Owner, John Sloan & Co., Front street east, Toronto; architect, J. Francis Brown, Board of Trade Bldg., Toronto; masonry, Elgie & Page, 21 Havelock street; carpentry, Brown Cooper, 277 Carlton street; 3-sty., 116 x 67, mill construction, stone

foundation, hot water heating, electric lighting, felt and gravel roofing. Other contract not let yet.

Warehouse, \$75,000, Front street; architects, Curry & Sparling; contractor for excavation, J. McLeod & Co., Macpherson ave., Toronto; 6-sty., 60 x 20. Tenders on excavation will be called in about ten days.

Vancouver, B.C.

S. B. Birds, architect, Loo Bldg., has awarded the general contract for the store and apartment building for Capt. Pybus, for Richards street, to the Provincial Construction Co., 334 Hastings street west, at \$29,980. Four-sty. reinforced concrete, faced with Denman Island stone. All sub-contracts have been arranged for.

Winnipeg, Man.

Hotel, \$1,500,000. Owner, Grand Trunk Pacific Railway, Montreal, Que.; architects, Ross & McFarlane, 1 Belmont st., Montreal, H. B. Rugh, Winnipeg, representative; general contractors, Geo. A. Fuller Co., Ltd., Jacobs Bldg., Montreal. Ten-stys. and basement, 180 x 120, concrete and pile, stone and brick, steel frame, copper roof, electric lighting. Contract awarded August 30th.

Power Plants, Electricity and Telephones

London, Ont.

Contract for new dynamo and complete hydro-electric equipment awarded by trustees of Victoria Hospital to Canadian General Electric Company for \$4,400.

New Westminster, B.C.

The B. C. Telephone Co. propose building a 2-sty. addition to their present quarters and to instal an up-to-date system in the city.

Prince Albert, Sask.

The following equipment for transmission station and line for power development will be required: (a) 3 main units, 3-phase, 937½ kv.a. at 2200 volts, 60 cycle; turbines, 1300 h.p. vertical shaft, 138½ r.p.m.; (b) two exciter units, 125 volts, 150 kw., sheet wound, vertical shaft type, turbines, 250 h.p., 250 r.p.m., vertical shaft; (c) two transformers, 3-phase, 1875 kv.a., 2200-33000 volts, water cooled; (d) 20-ton crane, about 34-ft. span; (e) one set steel winches for moving stop logs; (f) small pumps. Transmission line—27 miles No. 00 aluminum cable (no alternatives), 2 steel towers, 80 feet high; select cedar poles, 35 feet in length (some 45 feet); city will supply insulators; estimated cost of line, including erection and clearing of ground, \$32,500.

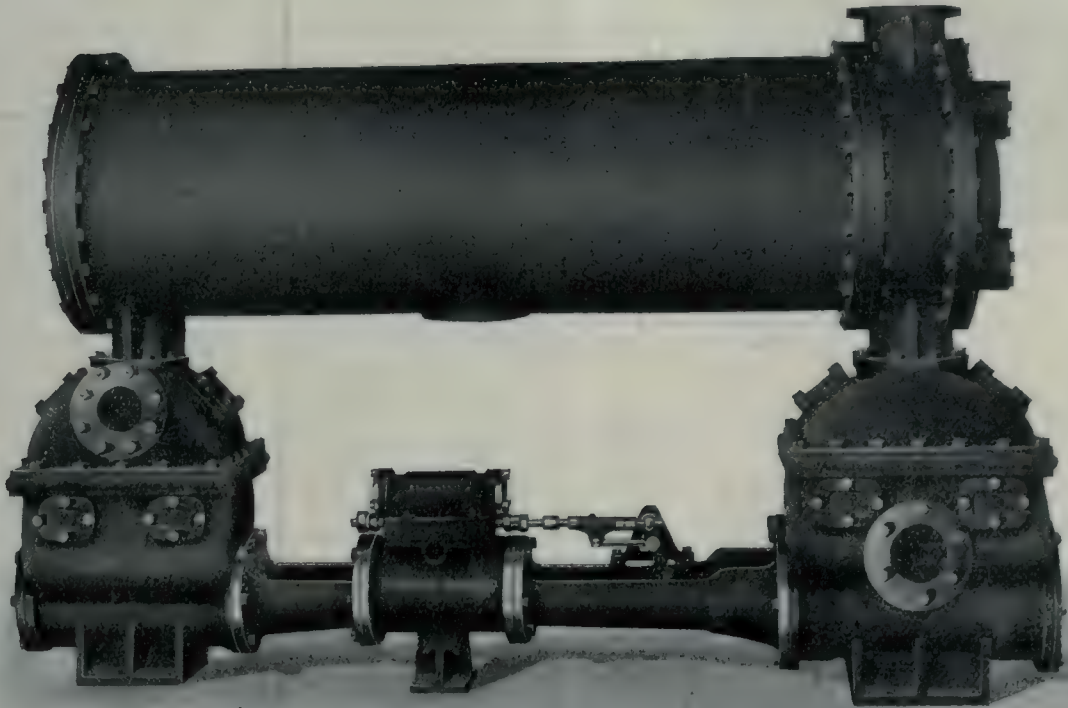
The city of Toronto is about to apply for approval of plans for erection of steel towers to carry a 13,200 volt line across eastern entrance to harbor. W. A. Littlejohn, city clerk.

Business Notes

Vancouver, B.C.

The Canadian Pipe Co., Ltd., 550 Pacific street, Vancouver, have for sale the following machinery: One R. McDougal engine lathe, new swing over bed 30 in., distance between centres, 20 ft., with motor drive, also one set of 3-in. raising blocks, price \$2,050. Advertisement in "Tenders and For Sale" department of this issue.

CONDENSORS



Condensor built by The John Inglis Co., Limited

BOILERS, ENGINES, PENSTOCKS,
Water Towers, Steel Tanks, Heavy Plate
Work, Condensers, Air Compressors, Pump-
ing Machinery, Special Machinery of all kinds

Let us Submit Prices.

The **John Inglis Company**

Engineers and Boilermakers

Limited

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The Best Bucket for Excavating



SIZES
1 to 8
Cu. Yds.

FOR
2, 3 or 4
Line
Operation

ANDRESEN-EVANS GRAB BUCKET

BEST DIGGER BECAUSE:

- 1st—Path of cutting edges and inclination of trays are such as to cause scoops to dig into the material.
- 2nd—Direction of pull on closing chains pulls scoops down into the material.
- 3rd—Wide opening, 50% greater than clam shells. Therefore actions 1 and 2 take place over a stroke one-half longer and is therefore a better filler.

Simple and Rigid Construction. No Small Sheaves to Wear Cables.
No Sliding Frictions. No Complicated Machinery.

FOR EXCAVATING, DREDGING AND HANDLING ORE,
COAL, CRUSHED STONE, GRAVEL, SAND, ETC.

H. P. ANDRESEN 112 St. James St.
MONTREAL

Municipal Contracts Should be Let at the Lowest Possible Figure

You cannot secure low bids unless you place your proposition before a large number of contractors. The larger the number, the greater the competition and consequent saving on your contract.

More contractors look for proposed work in the



than in any other publication. A moderate expenditure in the advertising of proposals will convince you of the service that the CONTRACT RECORD can give you. When you have "Tender" advertising to place do not forget that this paper carries more advertising of this sort than any other journal. CONTRACT RECORD, 220 King St. West, Toronto.

Waterproof Paints

A recent issue of the Scientific American contained an article on the problem of waterproofing, and the author (Mr. Ralph C. Davidson, consulting engineer) made special reference to the damp-proofing of exposed walls and the proper paint to use for coating concrete. He writes to this effect:—

A word in regard to the proper paint to use for coating concrete may not be amiss. If linseed oil paint is to be used great care should be taken to see that the concrete or cement which is to be painted is at least one year old. This will give it ample time to thoroughly cure and dry out. Then, before painting, the surface should be well washed with a weak solution of muriatic acid followed by a thoroughly good washing with clean water. This will not only clean the surface, but will help to neutralize the alkali in the cement, which if left there will saponify the oil and cause the paint to crack and peel off. Care must be taken to see that the wall is entirely dry before painting is started, if good results are desired.

A number of special coatings for cement have recently been placed on the market, the makers of which all claim that they will successfully withstand the action of the alkali in the cement. It is the action of the alkali in the cement which causes the destruction of an ordinary linseed oil paint, especially when applied to a new concrete surface. The waterproofing qualities of a number of these special cement coatings are in many cases greatly overdrawn. Therefore, in selecting a paint the purchaser will do well to test it for himself. The simplest way to do this is to procure a fairly porous brick and give it as many coats of paint as are intended to be given to the wall which is to be painted. (Two coats are always better than one, especially if a light color is to be used).

After the coating on the test brick is thoroughly dry, have it weighed and make a note of the exact weight. Then put the brick in a pan or pail, in which there is just enough water to completely cover it. Allow it to remain submerged for at least twelve hours, and then remove it; after wiping off all of the surface water again weigh it, and compare its weight with the weight before it was submerged. The difference in weight will show just how much water went through the coating and was absorbed by the brick.

Make a number of tests as described above with various paints, keeping careful notes of all results. The paint which shows the greatest water-resisting qualities will be the one to use. In making the above tests be sure to see that the bricks are thoroughly coated, and that plenty of time is given for the paint to cure or harden before they are submerged in the water.

Aside from the colored coatings mentioned above there are a large number of so-called colorless waterproof coatings on the market. These are intended for use where one wishes to retain the natural color of the concrete. They are also largely used as a preservative for limestone, sandstone, etc. Probably one of the oldest materials used for this purpose is the ordinary commercial paraffin. This is applied to the surface hot with a brush. Then the surface thus treated is subjected to heat, which opens the pores in the stone or cement, and allows the paraffin to enter into all of the small crevices and voids, thus sealing them up and preventing any further moisture from entering into the mass.

Contract Record

ESTABLISHED 1886

A Weekly Journal of
Building, Contracting, Engineering, Public Works
Municipal Progress, Advance Information

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SUBSCRIPTION RATES

Canada and Great Britain, \$2.00. U. S. and Foreign, \$2.50

Vol. 25

September 13, 1911

No. 37

The Great Transportation Link

In this issue another article appears relating to the progress which is being made in the construction of the new Quebec bridge. This bridge forms a part of the great enterprise now being carried on by the Dominion Government for a continuous line of railways between the two oceans. The section east of Quebec has been under construction by the Government for several years and when finished will be leased to the Grand Trunk Railway Company for 99 years on a 3 per cent. basis. The Government is also building the middle section from Quebec to Winnipeg, which will likewise be leased to the Grand Trunk Pacific on similar terms. The line which the Grand Trunk Pacific is building from Winnipeg to Prince Rupert will be completed before the end of next year. With the completion of the Quebec bridge it will then be possible to run trains from Moncton, N. B., to Prince Rupert, B. C., without change.

A comparison with the famous bridge of the Firth of Forth near Edinburgh, Scotland, which is at present the largest bridge in the world, shows the Quebec bridge to be designed to carry 2.98 times as great a load as the Scottish structure. The total weight of the bridge when completed will be 72,000 tons, with a weight per lineal foot of 49,150 tons.

The Problem of Contract Getting

In any mercantile business the most important part is what is generally termed "the selling end." Without sales a business cannot live. It is very true that if materials for manufacturing or goods for sale are not purchased properly, the most competent salesman cannot make a business pay. If the manufacturing end of a business is not run properly, even should the selling end be efficient, the business cannot be made profitable, says Municipal Engineering; but almost any business man will tell you the hard part of his business is to keep the sales up to a standard and

improve on that standard. A contractor is to some extent a manufacturer and a seller of a certain class of goods. He is the builder or manufacturer of engineering structures; he is a buyer of materials, machinery, and supplies; and these, with the labor hired, are made into structures. A contractor does not have these completed structures—except in a few cases of some classes of buildings—for sale; but he is always anxious to sell his ability to make them and the organization that will produce any kind of an engineering structure for which he can contract. Thus there is a selling end to the contracting business, yet few contractors have conducted their businesses in the past as though this feature merited much consideration. Very few contractors have ever advertised their business or attempted any systematic methods of obtaining contracts. The practice has been to give close attention to any contracts obtained so as to do satisfactory work and make money on the job. Then, when any new jobs were heard of, every effort is put forth to obtain some of them. These jobs are heard of either by chance or through the technical papers or possibly through some reporting company. In most cases the contractors are unknown to the owners. On public work this is seldom of importance, but for private work it may mean much. Most public work is advertised. Most of this advertising is through the local newspapers and the technical journals. The law governing public lettings generally provides that the contract must go to the lowest possible tenderer, or all tenders must be rejected. Many private corporations keep lists of contractors from whom they solicit tenders. Others, who may not do much construction, make up special lists from whom tenders are asked, or they allow any contractor asking permission to estimate to submit a proposal. Some few corporations call upon a contractor and by a simple agreement as to general terms and prices, allow the contractor to do their work. Some contractors seem to secure a large number of contracts by these haphazard methods, but many contractors are frequently out of work or seldom have more than one job on hand. There should be few contractors who cannot run more than one job. Even if their capital is limited it is possible to do several jobs at one time, as every contract obtained is an additional asset. Thus it is seen that most contractors pay but little attention to the selling end of contracting; yet there is no reason why it should not be considered as much as the operating part of contracting. There are several ways that a department organized for this purpose could obtain results. First, all information gathered from the various technical and contractors' papers could be indexed and followed up by letters and personal calls. Then a judicious campaign of advertisement could be carried on. Advertisements could be placed in the engineering and contracting papers, and also in the daily papers when work is to be confined to given localities. In such advertisements, just to publish the company's name and address with a photograph of some work done will hardly do much good. Tell something of the contracting company, the class of work they do, the fact that contracts are finished without disputes, and that they are completed on time. Show how money has been saved to clients. If certain classes of work are made a specialty, enlarge on the ability to do this work better than other contractors. If a certain form of contract is used, explain it and its merits. From time to time give lists of various contracts satisfac-

torily completed. In other words, say something in the "ads." that will attract special attention to the company. It may not be possible to trace direct results to all such "ads," but the publicity will make the company well known and materially assist in obtaining contracts. Another method of advertising is to issue attractive books or pamphlets, well illustrated, descriptive of work done in the past. These can be distributed among engineers and others who have construction work to carry out. A third method of advertising is to send circulars through the post to those who may have jobs to let. This, if consistently followed up, brings returns. Another method is to employ a man who acts as a canvasser or agent. This man, who need not necessarily have engineering or contracting experience, should be able to put up good sensible talk and to impress those to whom he talks. This agent has nothing to do except to obtain business, and he is paid a drawing account and a commission on the profit made on all jobs he obtains. Therefore, the successful contractor must have his construction department, his engineering department, and his selling department working harmoniously, thereby ensuring success.

Shop Buildings

In buildings of moderate height for factories, warehouses and the like, the old-fashioned mill construction or slow-burning type is now largely superseded by the non-burning type, which may either be all steel or of reinforced concrete masonry. All-steel construction is adapted to long spans and is able to carry impact and vibration loads and reverse stresses. It can be fabricated entirely in the shops and erected with great rapidity. Accurately designed, strongly made connections are possible with it, and the high-grade, uniform material has a fairly well-known strength and life. It is not fireproof nor inherently permanent. It is not easily modified in the field; it requires special erection plant; it must have costly protection against fire and corrosion, and it probably costs more, maintenance included, than an equivalent, well-designed reinforced concrete structure. Reinforced concrete is most advantageous for massive construction under compression loads and with moderate spans. It is well adapted to varied and elaborate details and to effective architectural treatment. The designs can be modified to any extent in the field and can be executed by ordinary labor with simple tools and plant. The principal materials are usually locally abundant and a well-designed and built structure has great endurance, involving practically no maintenance charge. A great amount of delay, expense, waste, fire risks and obstruction are often involved in the wooden forms and falsework. The strength of the structure is gradually developed from zero at first, and is susceptible to injury by incompetent design, careless or defective workmanship and poor materials, and there may be many defects which can be detected with difficulty, if at all.

While each type is superior for certain conditions, there are causes in which neither type is wholly satisfactory, and cases in which various features of both types are desirable. It is, therefore, the duty of the engineer or architect to modify both types according to the requirements of the work and often combine important features of both in one structure. Usually the most important points to be considered

in a mill building are general economy; strength, durability and low maintenance. These call for accurate determination of the strengths of principal members and their certain development by the connection details and also for facility of construction so that one operation does not unduly impede other important operations.—Engineering Record.

Some Rudimentary Ideas on Town Planning

The author does not pretend to put forward the following ideas as the result of extended experience acquired whilst seeking to apply the principles of town planning to work actually in progress. Such experience as he has had, has resulted from his having had to lay out new building ground and streets in circumstances which have often greatly interfered with planning as he would have liked to do it. His main object in submitting these ideas to the ordeal of friendly criticism is to elicit the opinions of others well qualified by past experience to speak on some points which, to him, do not appear to have been prominently, if at all, noticed in previous utterances or writings on the subject of town planning.

Demand may be made on the surveyor to develop ground in situations having many variations between two extremely opposite conditions—i.e., the one in which the site of his labors will be so close to existing streets and roadways, and his employers such pronounced utilitarians that his main object must be to get so much return out of the work, as an industrial investment, as he can, consistently with due attention to proper sanitation and municipal requirement; the other, and by far the more satisfactory, extreme being where the whole locality is, so to speak, at his disposal, as in the case of a garden city or some such scheme as a new suburb.

Between these two extremes there may, and do, occur such very variable conditions that it is manifest that even a very long treatise could not exhaust their possibilities; and therefore the author proposes to deal with only a few points arising out of the latter supposed situation, believing that, in discussing the general, ideas will be brought out in ways which may be usefully modified (and as found necessary) when dealing with the particular. Let us, therefore, proceed to consider the following points as being amongst those likely to arise in laying out a town or city in a situation hitherto unbuilt on, save for the needs of ordinary rural life, viz:—(a) character of building lots to be laid out; (b) width and arrangement of roads and streets; (c) aspect. Of course such details as those of sanitation, road construction, etc., form vital items in the execution of the work, but do not appear to the author to be essential to the consideration of the three items as above mentioned.

To take up section (a) and its requirements. The conditions of life of those for whose residence any town or city is laid out will, of necessity, so greatly influence the apportioning of ground to each separate household as to demand a good deal of discrimination in allotment. If we (arbitrarily for the moment) divide out attention amongst the following, viz., premises to be occupied by (1) laboring classes, (2) artisans, (3) shopkeepers, (4) residents in terraces, and (5) residents in villas, we shall not have exhausted all the varieties of residential life, but we shall have a fair idea of those for whom, in the main, provision has to be made. We may further think of the house

* By H. Shillington, M.A.M.E., Town Surveyor, Lurgan.

of the villa residents as seen in their two well-defined groups, i.e., semi-detached villas, the propriety of such sub-division being more apparent in considering items (b) and (c) of our primary grouping.

Let us begin with item (1) of our arbitrary sub-division, and here comes up the question, Are we to provide just for existing conditions of things, or are we to proceed also in an educational manner, and, if so, to what extent? The author's experience of providing garden ground in a town, for the ordinary laborer, has been much as follows. Only a minority of them are found to keep the ground in a neat and cleanly or even insanitary. Then we are apt to accept it is as much as they can be got to do to keep their yards and street fronts in satisfactory case. Even with small front gardens, how frequently are these neglected and allowed to be overrun with weeds or covered with debris, so that, whilst unsightly, an inspector could not readily allege them to be unsanitary. Then are we apt to accept it as the inevitable, or are we to make provision for attaining a practical ideal, and labor and wait for its realization in educating the slovenly ones? May we not combine both objects in our scheming, and provide some streets of houses, having sufficient air-space—but without gardens—for the housing of those to whom the care of a garden would be an undesirable burden, and then see to the accommodation of those to whom the keeping of a garden would be a pleasure, and its attainment a reasonable certainty? The author believes this can be done, and ground kept in reserve for ultimate allotment to some houses which had been left without gardens, so soon as a tenant of a gardenless house would have his desire for one stimulated by seeing the advantages of others. Even in providing for class (2) of our section (a), the same conditions would not infrequently be found to exist, and should be met in the planning, in relatively similar manner.

For residents contemplated under item (3), gardens might be generally arranged for in the rear. The dwellers in villas would, of course, have sufficient garden ground in the curtilage of their own premises. In the case of laborers, a depth of allotment which would give sufficient air space may be taken as 50 ft.—this to include all outhouses and yard space. It should be exclusive of a 10 ft. wide cleaning passage in rear, which could serve also for rear exit from a row of houses facing the other way. Other details were then considered.

Change in Building Construction

The sum of £1,203,004 was spent by China last year on the purchase of foreign building materials, cement, timber, furniture, window glass, &c., is indicative of another far-reaching change which is coming over the habits of the Chinese people. The dilapidated rows of one-storied houses of lathe and plaster, dark, unsanitary and comfortless, which formerly did duty as government offices, schools, barracks, &c., are rapidly disappearing before buildings in foreign style of brick and stone, fitted with such up-to-date conveniences as electric light and steam heat; while in all the large cities and trading centres merchants and shopkeepers are replacing the shanties of former days with modern construction in which the yanklou or foreign upper storey, and the plate-glass window, are usually conspicuous features. The style is more often than not atrocious and work shoddy, but in

places like Shanghai and Peking, where the erection of business buildings and government offices has been entrusted to foreign architects, the results are not unworthy of a European city. As regards such materials as stone and bricks, China is already well supplied, and she is beginning to manufacture her own cement; but good timber, owing to the reckless disregard of elementary principles of afforestation during the past fifty years is, except in remote and inaccessible parts of the country, entirely lacking. For such articles as steel joists and plates, ironmongry and tools, corrugated iron roofing, paints and distempers, window glass, electric accessories, water and heating plant, &c., China should be a good customer for many years to come.

Chipping of retaining wall faces along horizontal construction joints was avoided in the Bloomfield, N. J., improvements of the Delaware, Lackawanna & Western Railroad by fastening a thin strip along the inside of the form at such an elevation that its bottom edge was about $\frac{3}{4}$ in. below the surface of the day's run of concrete, and removing this strip before the next day's run. The general improvements were so conducted that nearly the entire length of the wall was constructed in sections of full height in open cut, each section constituting a day's run, but it was necessary to build several short lengths in sheeted trench, and in that case special care was exercised to get a clean, uniform finish to correspond with that of the full-height sections. The service performed by the strip was to bring the face edge of the construction joint to a straight line, with a clean, sharp corner. By setting it down in concrete $\frac{3}{4}$ in. this edge was brought into good material, below the surface scum, thus eliminating one of the great sources of chipping. When the strip was removed the next day a clean surface was presented for a good bond with the new concrete, and a tight, even joint was made, which did not chip when the forms were removed.

A Novel Engineering Feat

The United States army engineers are making steady progress with their work of removing the wreck of the Maine from Havana harbor. This project was started in November and has been pursued throughout the summer. The scheme involves the isolation of the wreck by means of an elliptical cofferdam with major and minor axes respectively 399 and 219 feet in length, composed of a series of twenty 50-foot cylinders of interlocking sheet metal piling, filled with clay dredged from the harbor. The water enclosed by the cofferdam has just been removed and the actual labor of the wreck begun.

A great many unexpected difficulties have arisen during the progress of this work, which has already exceeded the original estimates in both time and cost. An additional appropriation of \$250,000 has been asked, which will bring the total sum appropriated up to \$900,000. It is expected that the work will be completed early next spring.

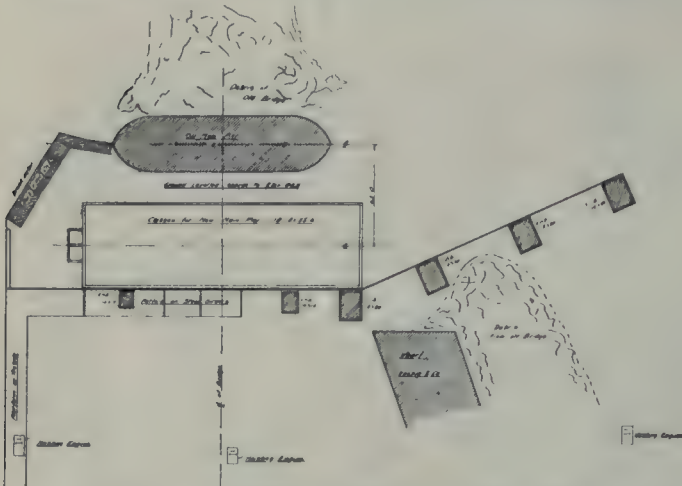
A good asphaltic road oil should be not less than .92 specific gravity, should have at least 35 per cent. asphalt base, should not flash lower than 300° F., and upon heating for 5 hours at 325° F., should not lose more than 5 per cent.

Progress on Quebec Bridge Foundations

Satisfactory Advance has been made — Caissons being Sunk — General Description of Equipment and Operation

Special to the Contract Record

The contract for the foundations of the Quebec bridge includes the tearing down of the four large granite piers previously erected, the building of two main piers by the pneumatic caisson process, the building of the two anchor piers and of one small in-



Location of temporary cribs for placing caisson

termediate pier on the North shore. The work for the season of 1911 is being carried on simultaneously on both sides of the river.

On the North side the old main pier and anchor pier have been demolished and the stone stored for building the new piers. At present the two large huge caissons are being sunk for the new main pier.

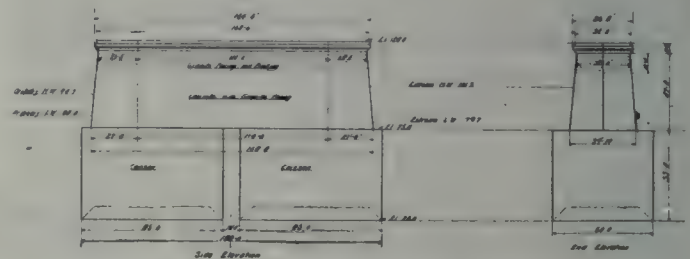
On the south side the old main pier has been cut down to low water this summer and the old anchor pier is being taken down.

The work has been mentioned in former numbers of the Contract Record and this article is mainly a description of the pneumatic work on the north side of

the work more than ordinarily difficult. The St. Lawrence river at this point has a current attaining a maximum velocity of about 8 or 9 miles per hour and a maximum tide of about 21 feet. The material of the river bed is a glacial drift containing about 40 per cent. of boulders, some of which are 8 feet in diameter. The short season for work adds another difficulty as the river is not free from ice until May 1st, and no part of the plant below high water is safe from the ice in the spring. This means that the plant required must be much larger than usual, that the work on one pier may be entirely completed in the short working season.

The work on the north main pier was begun early in the spring of 1911 and at time of writing has been advanced very satisfactory.

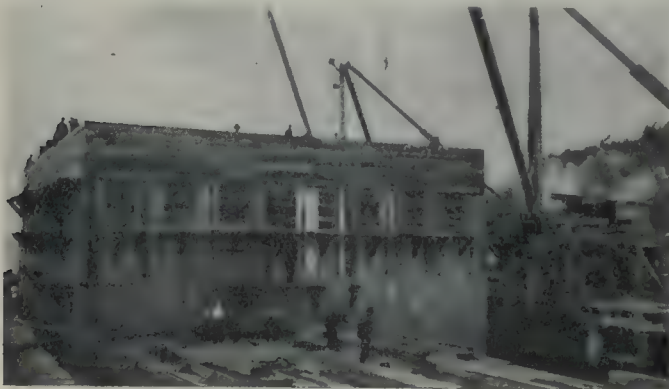
The construction and placing of the two pneumatic caissons which form the foundation for this pier have been described in former numbers of the Contract Record. At present both caissons are being sunk: The first caisson known as No. 2 has penetrated into the river bed about 30 feet while the second



The north main pier of Quebec bridge

caisson which was begun about a month later has penetrated 15 feet. The intention is to carry both caissons to rock, a distance of 99 feet below highest water which involves approximately 21,500 cubic yards of pneumatic excavation through the extremely hard soil.

The sinking of No. 2 caisson has been carried on continuously since June 28. At present about 50 sand hogs work in the air chamber at one time in 4 shifts of 6 hours each. The 6-hour shift is divided into two halves of three hours each, with a 3-hour rest between. The sinking of No. 3 caisson began on July 29 and at present about 40 men work in the chamber in 3 shifts of 8 hours each. The caissons are identical in the main points of construction and have been described in previous articles. Each caisson has six shafts 3 ft. 0 in. diameter, 4 for material and 2 ladder shafts for the men. The excavation is done by use of 4 bucket locks and six 4-in. blow pipes. The sand and gravel being loosened by water jets and



Caisson No. 2 ready to receive concrete

the river which will be completed this season. Next year the caisson for the south main pier will be sunk.

Pneumatic Caisson Work at North Main Pier

In the construction of the river piers for the Quebec bridge, several problems are met with which make

forced through the blow pipes by the pressure in the air chamber while the boulders are hoisted to the surface in cylindrical buckets of about $2/3$ of a cu. yd. capacity each.

The large number of boulders met with necessitates a great deal of blasting in the chamber. The boulders are drilled by high pressure air drills or hand



The sinking of caissons Nos. 2 and 3 in progress.

drills and blasted with dynamite. The working chamber being divided by bulkheads into four parts allows the men to retreat into a different compartment when a blast is to be fired.

The concreting of the caissons is carried on by a day shift only and is run intermittently as weight is needed to sink the caissons. Owing to the hard nature of the soil the cutting edge is not permitted to

This method is somewhat slow but saved the cutting edge from being crushed and destroyed.

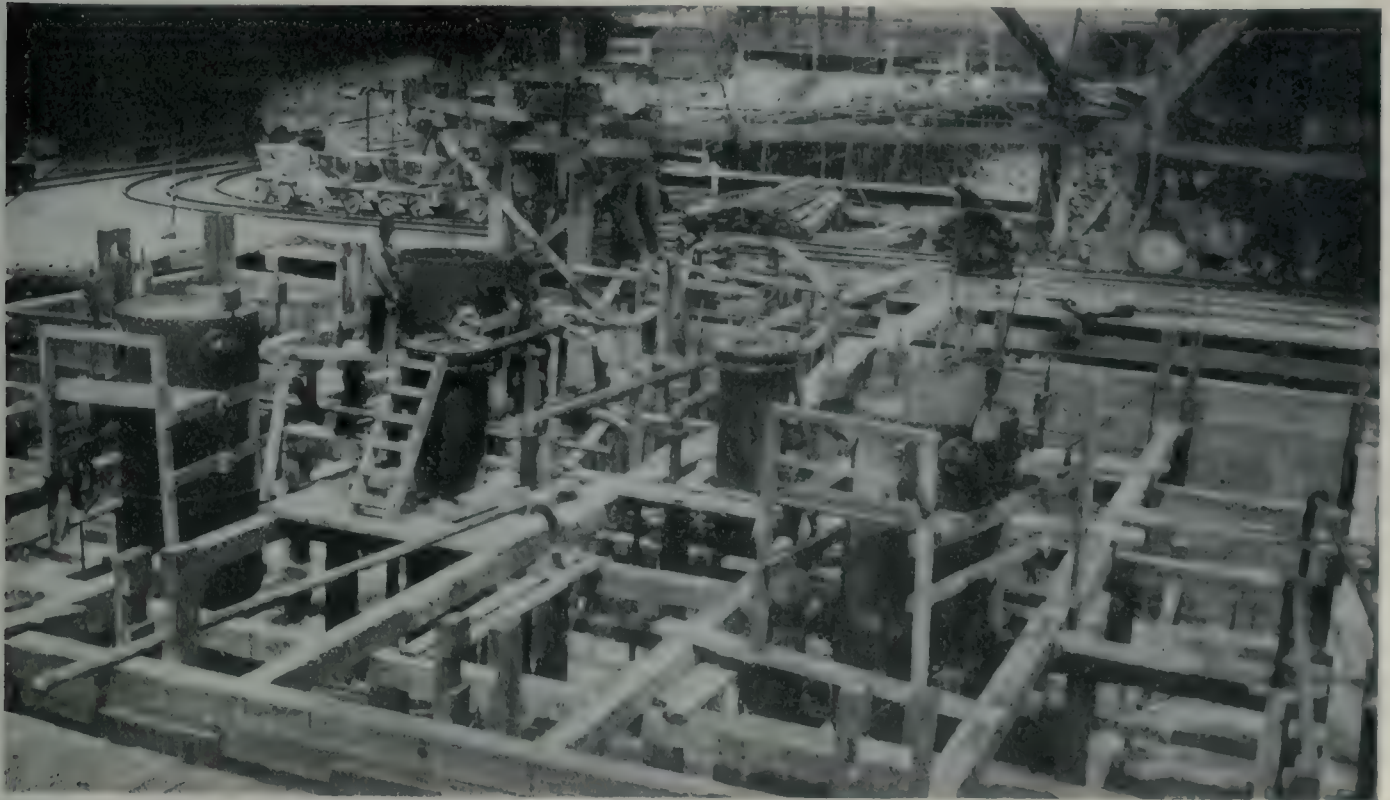
On the platform near the caissons is a large building for the use of the "sand hogs" containing baths and dressing rooms. Hot coffee is served here to



Coal, cement, sand and stone chutes of shore plant.

the men at all times. Just to the west of the coffee house is the doctor's office where anyone of the men requiring medical attendance can be treated.

The contractor has also installed a medical air lock, a huge steel cylinder of two chambers where any one suffering from the "bends" can be treated under compressed air. This lock is supplied with cots, telephones, steam heat, and electric light and is the most



Caisson No. 2, showing three material locks in place.

carry the entire weight of the caisson. Nine timber towers are placed beneath the bulkheads to ease the weight off the cutting edge and when the cutting edge has been cleared the caisson is lowered by washing out the sand bed beneath the towers with a water jet.

modern device for treating the "caisson disease or 'bends'" as it is commonly known.

The Plant

As shown in the accompanying diagram a platform has been built around the caissons on piles and

connected with the shore by two trestles each carrying a double track for materials. This platform carries the derricks, store houses, coffee house and temporary offices while the concrete plant and the compressor plant are on shore at the base of the cliff, which at this point is 150 ft. high. The main part of the materials are delivered on top of the cliff on standard gauge tracks and sent down below either by chutes or by the two incline gravity railways and delivered to the service tracks on the platforms.

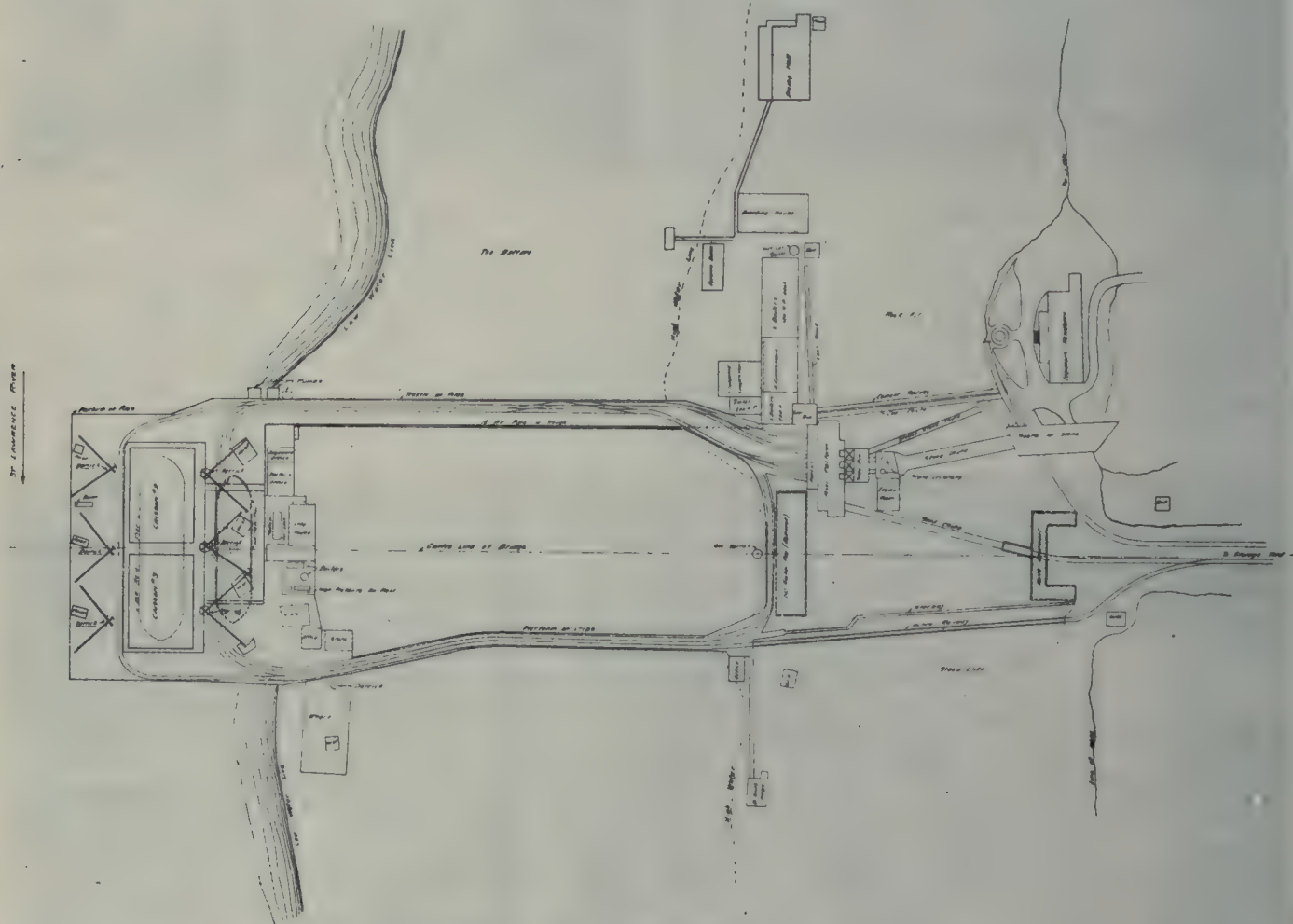
The main power plant is on the shore above the high water line. It consists of 6 horizontal locomotive boilers of 100 h.p. each, "John McDougall Co., Montreal;" 3 horizontal boilers of 75 h.p. each, one vertical boiler of 100 h.p. and a Heine water tube boiler of 200

platform near the caissons is a small compressor which supplies high pressure air for the "Jap" drills used in the working chamber.

The water supply for the tanks, boilers, mixers, and caisson jets is taken from the river by a battery of 3 Worthington double acting pumps a 3-in.-4-in.-12-in. placed on a concrete fill at the west side of the working platform.

Near the boilers is the dynamo house and machine shop, 2 dynamos are used; one continuously to supply the light to the 2 caissons and the other a larger machine to light the entire plant, platform, yard elevators, etc., at night.

The incline railway to the east of the centre line is used for hoisting the granite removed from the



General view of site showing location of equipment

h.p. In addition to this there are on the platform near the caissons one vertical boiler of 100 h.p. and 2 of 50 h.p. each, making a total boiler capacity of 1325 h.p.

These boilers furnish steam for the pumps, derricks, concrete mixers, stone crushers, dynamos, and air compressors.

The air plant which is near the main steam plant on shore consists of four 24-in. x 30-in. single compressors and one Duplex 22 x 28 x 30 x 24 compressor all Ingersoll Sergeant. These five compressors discharge into a 12-in. pipe line which in turn feeds both caissons through four 7-in. branch lines. The 12-in. pipe runs for its entire length through a wooden box 3 ft. square which is kept full of cold water to cool the air before entering the chamber. On the

main pier and anchor pier to the storage yard in the upper level and also for lowering all the material required by the plant which is not shot down the chutes. This elevator is run by a large hoisting engine at the top using a double steel cable.

The concrete plant is made up of 3 gyratory stone crushers "Allis-Chalmers and 3 Ransome mixers. One stone crusher is in the yard a mile from the bridge and the crushed stone is brought in dump cars and sent down a chute to the stone bin. The other two crushers are on the side of the cliff receiving their stone from the top of the hill by a chute and discharging directly into the bin over a screen.

The sand which is clean river sand and does not require screening is brought to the top of the hill in dump bottom cars and shot down to a mixing plat-

form in a chute, while the cement is lowered by an incline gravity railway, the full car raising the empty one.

The mixing platform is built over the top of the mixers and flush with the tops of the hoppers. The broken stone is allowed to run into the hopper until it reaches the measurement mark, then the sand and cement are added and the entire batch dropped into the mixer below. The water is regulated by a tank with a float at each mixer. For one batch of 1-2½-5 concrete, four bags of cement, 8 cu. ft. of sand and 16 cu. ft. of stone are used. This gives a batch of 2/3 cu. yd. to each of the smaller mixers while the large mixer takes a double batch of 1 1/3 cu. yd.

The mixers then discharge into 1½ yd. Steubner dump bottom buckets or lorry cars. Each bucket receives two batches from a small mixer or one from the larger mixer. The cars are hauled by horses to the pier and the bucket delivered to the derricks on either side of the caissons. The output of the concrete plant is about 400 cu. yds. in 10 hours.

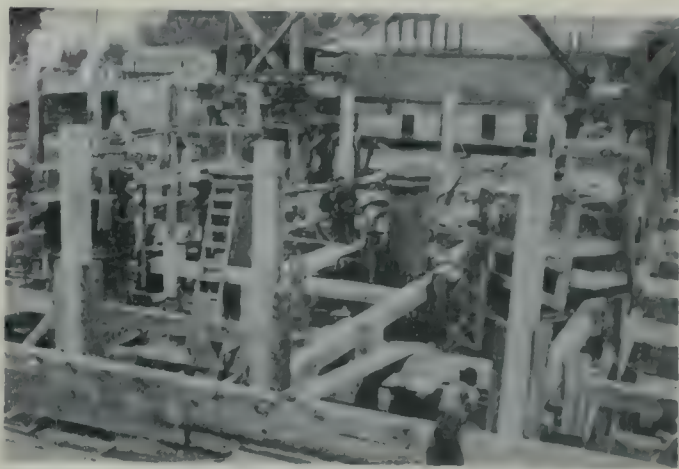
The entire platform is double tracked to allow the full buckets to go out with no interference from the empty ones returning.

At the pier are six stiff leg derricks mounted on towers about 10 feet above the platform to give clearance underneath for the tracks. These derricks are used for placing concrete in the caisson and for hoisting the excavated material from the bucket locks.

They are also used in the building up of the caisson wall which goes on as the caissons are sunk. The timber is sawn and prepared by the contractor's plant at Point a' Pizeau and shipped to the bridge on scows from which it is removed and placed on the caisson by the derricks.

Over 600 men are employed on the different parts of the plant, and the number will be increased as the sinking of caissons call for shorter hours and more shifts under the increased air pressure.

The plant is under the supervision of Mr. W. C. Ritner, engineer for the contractors, Messrs. M. P.



Caisson No. 2, showing locks for men and buckets

& J. T. Davis. Mr. M. P. Davis is also very active on the work.

The Board of Engineers who have charge of the entire bridge are represented by a staff under Mr. J. D. Wilkens, resident engineer, late of New York City Bridge Department, and Engineer-in-charge of the Blackwells Island Bridge.

Effect of Embedded Metal Upon Masonry

Cracking Due to Eccentric Pressure—Failures from Several Causes—Suggested Remedies

The cracking of masonry structures due to the undue expansion or eccentric pressure of embedded or attached metal is a common experience. Such cracking does not as a rule endanger the structural safety of the masonry, for it generally is in some minor portion of the structure which is not called upon to resist much strain, but on the other hand it is very unsightly and is apt to occur in prominent places, such as guard rails, bridge railings, etc., where its appearance may be noted by every passerby. A recent issue of the "Annales des Travaux Publics de Belgique"* contains a voluminous article by Mr. G. Denil, an engineer in the Belgian roads and canals service, reporting the results of a most extensive study into these cracks, in the course of which many hundreds of structures were examined. The paper itself contains views of some 50 cases of cracking, carefully selected from a mass of others as showing specific types of failure. From these cases, which the author calls "clinical study," certain conclusions for safe work have been drawn. Although the space at our disposal will not allow of a complete translation of the paper, we have prepared a short abstract which presents the salient features of Mr. Denil's study.

In nearly every case of masonry construction provision has to be made for the attachment in one form or another of some steel or other metallic structure for which the masonry forms a base, or which is needed to complement the main masonry itself. These conditions vary little from the straight piece of metal, embedded by means of a mechanical or chemical bond, or both, into a cylindrical hole drilled into the masonry bed. The shape of the hole may be changed somewhat to prevent easy withdrawal of the metal or to provide more effective mechanical bond for an expansion end and the cementing material may be lead, sulphur or cement, but in general the type remains the same.

When first placed these fastenings do not appear to affect the integrity of the masonry, but very often at the base of the metal rod or pipe there appear in time the familiar radial cracks in the stone indicating that some expansive action has occurred, forcing the stone apart.

Three general types of failure of masonry due strictly to embedded iron are recognized by Mr. Denil; those induced by too hard preliminary drilling or subsequent driving, those caused by the expansion in freezing of water standing in the grooves or drill

holes in which the iron is set and, in by far the greater number of instances, those caused by the rusting and consequent expanding of the embedded iron or steel. In addition to these the author notes several instances of masonry cracking under a too concentrated load of the superposed metal and from the force exerted by the expansive force of a metal structure butting against it.

Failures from Workmanship

The drill holes in which iron is embedded are often made carelessly by workmen anxious to raise their working capacity and who, therefore, use too large drills and sledges or mallets. In certain kinds of stone this induces minute crevices invisible when the masonry is laid, but which increase rapidly with exposure to the weather and under stress. Especially when the anchored rod is near a face, as is very often the case, these cracks soon spread to this face and a slab of stone is spalled off.

Failures from Ice

These failures are infrequent, but several photographs are given by Mr. Denil showing their occurrence. They may be expected only when the drill holes or the grooves into which the iron fits are not completely filled by the iron, in which case water may enter and, in freezing, expand with such force as to shear off the stone. In most places where water may enter it has room for expansion, if it freezes, which accounts for the rarity of the failures due to this cause.

Failures by Rust

As noted before, most of these fastenings are made by wedging a bar of iron into a hole drilled into the stone and then filling the remaining voids with hot lead, sulphur or cement of some sort. It so happens that the filling material generally shrinks away from the iron leaving it open to the attacks of the atmosphere and rust begins to form on the embedded bar. This increases very slowly, but very surely, until in time the space which it occupied is too small and it forces the masonry apart and the characteristic cracks appear. When lead is used as the filling agent an electrolytic action is set up and the oxidation of the iron is carried on more rapidly than when some other filler, not electro-negative to the iron, is used, but in any case the adherence of the filler to the iron is rarely close enough to prevent a slow oxidation and consequent cracking.

The paper shows a great number of views of such failures, mainly in slender stone pilasters to the top of which some iron attachment is fixed, such a post, for instance, as is commonly used to carry a bridge railing. In all of these views cracks appear radiating out from the embedded iron, in some instances of such an extent as to cause spalling of the stone. After his examination of many such structures Mr. Denil comes to the conclusion that "most of the structures, in which iron is fastened to stone will finally be ruined and the cause of the ruin may be attributed to the spontaneous expansion of the fastenings, on account of the oxidation of the iron."

Remedies

The author suggests a number of precautions which will reduce this trouble.

(1) The number of such fastenings may often be materially reduced without damaging the design, and the fewer the fastenings the fewer the failures.

(2) Iron wedges should be prohibited. Many failures are due to these wedges, which form a rigid,

unyielding connection between the iron rod and the stone so that when the rust begins to form, its expanding force is transmitted directly. If only lead is used between the iron and the stone, the lead can take up some of the expansion.

(3) The embedded rods should be plain and round so as to permit of the even distribution of the filler.

(4) Galvanization of the iron rods, so as to prevent rusting, is good practice.

(5) Wherever possible bronze, which will not rust, should be placed next the stone, and the iron be set in this bronze socket, leaving room for expansion between the two.

(6) The greatest care should be taken in the execution of the work so as to ensure a perfect drilling of the hole and its complete filling by the filler.

(7) Sulphur and cement are better than lead for fillers as they do not cause electrolytic action. When lead is used it should be of the very best quality so that its complete penetration into all of the crevices of the hole will be assured.—Engineering News.

Economy of Concrete Bridges

A municipality in New Hampshire recently obtained a satisfactory concrete bridge for less than \$75,000 after being told it would cost them from \$150,000 to \$225,000. It is altogether likely, says Cement Age, that many individuals, if not communities, have been deceived by superficial cost estimates of this character. Had these New Hampshire taxpayers accepted the first statements without question, they would have had a steel bridge costing almost as much as concrete, plus an annual maintenance tax that would soon exceed the difference in the first cost of the two types, and a tax that would continue indefinitely, or during the life of the bridge. It is the popular impression that concrete always costs more than other materials, but the situation has been entirely reversed in more than one instance. Especially has this been the case in bridge construction. In the case of a certain bridge in Philadelphia, concrete was substituted for steel at half the cost of the steel. This was an unusual case, perhaps; but even at anything like equal first cost, concrete has the advantage of low maintenance charges. Furthermore, the labor and materials, except perhaps cement, are usually obtained in the locality, thus keeping in the community a large share of the money expended. Therefore, as a matter of precaution, cost estimates on concrete should never be accepted as final, unless made by an engineer or contractor thoroughly conversant with the subject and entirely free from all prejudice against concrete.

During the season in which asphalt is laid, careful attention should be given to the mixing and laying of the asphalt pavements. An asphalt pavement surface consists of about 80 per cent. sand, 10 per cent. pulverized limestone or Portland cement, and 10 per cent. asphalt cement. Upon the correct proportioning of these ingredients, as much as upon their quality, depends the success of the pavement. If the sand is too coarse and not properly graded, the pavement will be unstable; if too fine, the surface will lack sufficient strength and be too slippery.

If the asphalt cement is too soft, the pavement will cut up too badly in warm weather; if too hard it will crack in winter.

Practical Methods of Sand Filtration

Particulars to be observed in Filter Construction— American versus German Methods—Tests for Efficiency

The pollution of water sources and water supply by mineral and organic impurities forms a subject of a paper by Wm. Ransome, C. E., reproduced from the Contract Journal in our issue of last week. The various means of water purification were fully dealt with and the theoretical functions of the sand filtered discussed.

A continuation of the subject leads to the practical methods of construction and operation of filtration plants for the removal of a sufficient number of bacteria per c.c. to render the supply suitable for safe usage for domestic purposes. The efficiency of sand filtration is usually calculated from results ascertained by examination in bacteriological laboratories and in featuring a design it is first necessary to ascertain the rate of filtration compatible with efficiency. The average rate is about 2,500,000 gallons per acre per day, equal to $4\frac{1}{2}$ in. per hour. As a general rule increased rate of filtration implies decreased efficiency, and careful experience and frequent examination are necessary to ascertain the exact rate at which filters should be worked to obtain the maximum economical efficiency. The filtering speed should never be fast enough to carry or wash away particles of sand. The standard rate having been established, the filtering area provided should always be in excess of the demand, so as to allow for emergencies, and to have a standby when cleansing operations are in hand. The net working capacity is easily calculated by dividing the hourly maximum rate of delivery which is required by the assumed hourly rate of filtration and expressing the answer in superficial feet. The size of the filters varies from half an acre upwards, and according to the site and design of the waterworks. When the beds are very large a disadvantage is experienced when they are thrown out of action during cleansing operations, because a greater demand has to be made upon the reserve, necessitating the provision of a greater standby. The number of beds required in small works is relatively greater than the number required in large works, to prevent dislocation when cleansing is in progress. Filters are usually designed to be rectangular in form, and arranged in series or rows. The filters are simply rectangular watertight tanks, constructed of brickwork, masonry, concrete, etc., and are generally about 9 to 10 ft. deep. If the filters were not waterproof it would be possible for the ground water, at times, to obtain entrance into the filters and pollute the filtered water. In this country it is unusual for the filter beds to be covered, but in cold countries roofs are provided to prevent the frost impeding the action of the filters. When tanks are covered the cost is increased by about one-third, because, in addition to the roof, a working space has to be provided between the top of the sand and the underside of the roof. Covers prevent the growth of algae, and thereby diminish the frequency of cleansing or scraping. Cold weather is found to render filters less efficient, and, as a rule, it is noticed that water-borne diseases are more prevalent during the winter months, so that in cold countries the covering of filters becomes almost a necessity. In

Berlin all the filters are covered, and many American cities have also adopted the practice.

The Quality of the Sand

Filters should be constructed with a floor designed to drain or intercept the filtered water. Upon the floor should be laid a system of drains or channels for the collection of the water which has percolated through the filter. A layer of large gravel should cover the under drains, and this should be succeeded by layers of gravel of decreasing mesh until fine enough to support the filtering sand. Each layer of finer gravel should be large enough not to close up the interstices of the preceding layer. The sand should be selected for size and uniformity of grain. It should be firm and not liable to disintegrate, and should be freed from any matter likely to affect the water. The presence of lime, for instance, would increase the hardness of the water. The sand should be clean, and not mixed with clay, and as near to pure silica as possible. It should be washed before use if the particles of sand are dirty.

The American standard of uniformity coefficient for the size of the grains of sand is expressed in figures representing the ratio of the size of grain which has 60 per cent. finer than itself to the size which has 10 per cent. finer. The smaller this ratio the more uniform will be the sand. The "effective size" is such a size of grain that 10 per cent. by weight of the sand is finer than this size, and 90 per cent. is coarser. The effective size of sand is stated in millimeters, and the size used varies from 0.2 to 0.4 m.m. It is found that very fine sand is the most efficient, and that less disturbance is caused when scraping has to be done to clean filters in which fine sand is used. It is more uniform in action, but becomes more quickly clogged, and therefore has the disadvantage of requiring more frequent cleansing. On the other hand, a coarse sand with large pores admits sediment to too great a depth, and therefore makes the subsequent cleansing more expensive.

A certain amount of friction is caused as the water percolates through the filter, and this implies a loss of head. This increases as the filter gradually becomes clogged, and while the efficiency also becomes gradually greater, yet it is accompanied by such an increasing loss of head that there comes a time when for practical working it becomes economical to cleanse the filter. Otherwise the diminished quantity of water percolating through the clogged filter must be made good by bringing a greater filtering area into operation. The head upon a filter is calculated by taking the difference of the level of the water in the filter and the level of the filtered water in the pump well or pure water reservoir. This head for practical working should not exceed 2 ft., for when it is exceeded the water is passed through the filter too quickly, and there is the danger of the sand being fissured or compacted. The amount of filtered water delivered from a filter can be maintained within certain limits at an uniform rate by increasing the head to correspond to the loss caused

by the increased friction of clogging. This may be done by increasing the working head or by lowering the level of the water in the pure water reservoir.

The thickness of the bed of sand varies in different waterworks. The average depth of filtering materials is 2 to 3 ft. of sand laid upon 2 to 3 ft. of gravel, with sufficient provision for 3 to 4 ft. of water. Within certain limits an increased depth of sand improves the efficiency of the filter, because of the increased work which may be done in the body of the filter by the development of bacterial life. An increased depth also minimises the loss of efficiency which occurs after scraping, and therefore renders filtration more uniform. The minimum depth of sand should be 2 ft. and with an initial allowance of 1 ft. for subsequent loss by scraping we obtain the first total depth of 3 ft.

Provision for Drainage

The system of underdraining which is provided to catch the percolating water requires careful consideration so as to avoid much loss of head, and to throw upon all parts of the filter an equal amount of work. The drains being placed at the bottom of the filter, and, therefore, very inaccessible for inspection, should be so designed as never to require examination. There are two common methods of underdrains. In the first a central drain is provided into which branch drains at every 8 to 12 ft. enter at right angles; while in the other method the branch drains enter the central drain at an acute angle. The drains are made of agricultural pipes in unglazed earthenware and are open jointed, while the pipes are covered with coarse gravel. The velocity of flow in the underdrains should never exceed 2 to 3 ft. per second. In more recent practice a central channel or chamber is constructed in the floor of the filter, and partly sunk below the level of the floor, which falls toward the channel. The side drains discharge into the channel. In some cases the whole of the floor is practically covered with branch drains, so as to afford the fullest opportunity for the percolating water to escape. Special stoneware rectangular channels are now made for the purpose of the underdrains, and besides forming a better collecting agent, give an improved support for the superincumbent gravel. The underdrains are usually ventilated by pipes connected with the air to allow an exit for the air when filling the filter; but such precaution is not necessary if filters are filled from below. The depth of gravel upon the underdrains need not be greater than is sufficient to contain the percolating water in the interstices of the gravel. The gravel should be clean and washed from all impurities, and should be screened to proper sizes. The largest gravel should not exceed a 3-in. mesh, while the smallest should be about 3/16 in. mesh. Each succeeding layer should be about half the size of the preceding layer.

The arrangements for the incoming and outgoing water require careful consideration so that the necessary pipes may be designed so as to carry out the work as economically and efficiently as possible. The inlet pipes to the filters may be so arranged as to keep the water at a permanent level, and this can be accomplished by means of a balanced valve regulating the amount of incoming water. The water as it enters the filter should not unduly disturb the sand, but should be distributed as gently as possible. This can easily be done by providing a broad weir over which the water may quietly enter the filter. In some cases the inlets are arranged to deliver automatically

at a fixed rate. The head on the filter gradually increases until the water reaches the overflow level, when it will be necessary to skim the filter. The rate at which filtration is taking place should be automatically indicated by means of a float upon which can be read the inches per hour at which the water is passing through the filter. Such a gauge can easily be designed if care be exercised in obtaining the necessary preliminary data.

Mechanical Regulation of Flow

When the depth of water upon the filter is always maintained at the same level, some arrangement has to be adopted to help the filter, when it becomes clogged, if the rate of delivery is to be rendered as nearly constant as possible. This can be done by reducing the pressure at the outlet where it enters the pump well; or by having a movable weir at the outlet of each filter which can be regulated to increase the head of water, by increasing the difference between the level of the water in the filter and the level of the outgoing filtered water. It is therefore necessary for efficient working that each filter should be separately regulated, so that uniformity of action may be obtained throughout the whole system. The outlet pipe is connected with the central chamber or drain, and can be combined with a weir, regulating valve, and also an indicator for ascertaining the rate of filtration. The head of the water may be regulated by raising or dropping the weir so as to vary the level of the outlet; or by regulating a valve to increase or decrease the discharge of the filtered water. The water may be delivered at a constant or varying rate by hand regulation of the above appliances, or by contrivances which are automatically regulated. These are generally made with some form of telescopic or tubular weir, which is balanced by means of a float in a specially formed chamber connected with the filtered water. If the float be adjusted by means of weight the weir can be regulated so as to always keep at a fixed distance from the water surface. The telescopic weir will rise or fall with the rise or fall of the water, and therefore the amount of escaping water will always remain constant.

In addition to the inlet and outlet pipes an overflow pipe should be provided in case anything should go wrong with the regulation of the water. A waste pipe should always be provided for running water to waste while a filter is ripening, and until the filtered water is sufficiently purified by its passage through the sand. The waste pipe is also useful for emptying the filter tank prior to the commencement of cleansing operations. The system of distribution to each filter should allow, by the provision of suitable bye-passes, for each filter to be cut off without interfering with the work of the other filters, and facilities should be provided at each filter to enable samples to be readily taken of the filtered water before uniting with the water from the other filters. The filtered water should be collected into a pure water reservoir or tank which allows for variations in the rate of filtration and prevents fluctuations of supply to the pumping plant. Filters work best when they are worked regularly, and the provision of a pure water reservoir obviates the necessity of altering the rate of filtration from hour to hour. The highest level in the reservoir should be lower than the level of the discharge from the filters, so that each filter may be separately regulated.

In Germany filter beds are reduced by scraping to a minimum depth of 12 in., but in England this is thought to be too small. When a filter is refilled with water the water should enter from below to a few inches above the top, so as to cause as little disturbance to the surface sand as possible. The upward flow of water is sometimes adopted for cleansing purposes, and the water is, of course, run to waste. In cold countries frost renders the operation of cleansing more difficult. In some waterworks when ice forms upon the filters it has been found possible to scrape the sand by means of dredgers working under the ice; while in others the filter is cleansed in sections by floating the ice from one side to another. In cold countries the proper remedy is, of course, to provide covers for the filter beds, which will prevent the formation of ice. The time which elapses between two scrapings depends upon the character of the water, the fineness of the sand, and the rate of filtration. The time will vary from days to months. The more quickly a filter is worked the more quickly will it become clogged, and require scraping so as to regain its economical rate of filtration. Much depends upon the margin of filtering area provided to make up for the decreasing yield of water. If this margin be small it would be unwise to risk a shortage of water by allowing the filters to work for too long a period. If the margin be large an increased efficiency may be obtained by giving the filters a longer life. The average amount of sand removed per million gallons of water filtered is approximately $1\frac{1}{2}$ to 2 cu. yards, and the amount of water filtered between two scrapings varies from forty to eighty million gallons per acre. The clogged or dirty sand may be washed by various means, and made fit for re-use. The ejector washer uses about 4,000 gallons of water per cu. yard of sand washed, and washes about 3 to 5 cu. yards per hour. In Germany sand is washed by means of revolving drums, and about 2,000 gallons of water used for cu. yard of sand. Sand washers constructed upon the principle of the Archimedean screw are very effectual and economical.

Systematic Tests of Filters

We have now followed the work of purification as affected in the sand filter, and can understand that the value of sand filtration depends upon the scientific or bacterial control of the filter. Bacterial examinations should be made systematically, and frequently enough so as to detect in time and change in the action of the filters. The importance of this bacterial control can be illustrated by a case that occurred in Worcester a few years ago. An outbreak of typhoid caused special attention to be given to the bacterial condition of the public water supply. The water from each filter was examined, and it was found that the water from one filter was very unsatisfactory. The filter was thrown out of action and carefully examined, when it was discovered that a portion of the central drain had collapsed, and had caused a settlement in the sand, through which unfiltered water was obtaining entrance into the drains collecting the filtered water. In Germany purification by means of sand filtration is carried on very systematically, and the following rules are carefully observed. A sample is taken daily from each filter-drain. The rate of filtration is not allowed to exceed 2.57 million gallons per acre per day, or 100 m.m. per hour. An arbitrary standard of purification is laid down that no sample of water should contain more than 100 bacteria per c.c. after it has

been exposed to a gelatine cultivation for a period of two days and a temperature of 22° C. The cost of filters depends upon local conditions, site, depth and method of construction, and relatively the larger the filter the smaller the cost per acre of filtering area. The average cost for uncovered filters is about £10,000 per acre. The average cost of working the London filters is just over 4s. per million gallons.

Intermittent Filters

In America a system of intermittent filtration has been tried upon a small scale. This allows filters to be alternately in use, and at rest when the sand is exposed to the action of the atmosphere. The system is difficult to put into operation, and its advantages are very few. In waters, however, which are deficient in oxygen a more favorable opportunity is given for the nitrification of organic matter. Such nitrification appears to prevent the development of the ordinary or normal forms of water bacteria, so that the filtered water from intermittent filters may actually contain less bacteria than water from continuous filters. The yield is of course less because of the time lost by the period of rest given to each filter. Double filtration has been proposed for the purification of specially bad waters. In experiments that have been made difficulties were experienced in the secondary filters owing to the slowness with which biological changes came into operation. This was of course due to the water from the primary filters being so freed from bacterial life that it took a long time for a scum layer to form upon the secondary filters. It would seem that if double filtration is required or would be beneficial, that it should be carried out by filtering through the same filters again instead of through a duplicate series. The secondary filters could also be put into efficient operation by first passing through them a quantity of unfiltered water for a sufficient period to encourage the growth of the surface layer. Mechanical aids of filtration have been adopted in some waterworks, chiefly in America. Machinery is used for raking and agitating the sand for the purpose of cleansing, so as to enable filtration to be carried on more rapidly than in the case of ordinary sand filters. The same results are obtained, but with a greatly reduced sand area. Water is filtered through a bed of 2 to 4 ft. of sand or crushed quartz at the rate of 100 to 125 million gallons per acre per day. The sand is placed upon screens contained in wooden or steel tanks, and is periodically agitated by the rotation of rakes or by the admission of compressed air. It is necessary to add to the unfiltered water a coagulant to encourage the rapid formation of the surface layer upon the sand. Sulphate of alumina and sometimes common alum have been used for this purpose. With mechanical filters high heads can be used because of the frequent washing and agitating of the sand. This is usually done at least once in every twenty-four hours and occupies about fifteen minutes. This method of filtration is still in its experimental stage, and has chiefly been used for the removal of turbidity and color. The rapidity of its operation necessitates increased care in its manipulation, but with careful attention there seems no reason why the use of mechanical filters should not be extended very largely in the future.

A German process of filtration has been invented by M. Fischer, and has been found more especially suitable for small waterworks. The filters consist

of a series of hollow cells composed of sand, glass, and silica burnt at a temperature of about 2,000° F. These cells are 8 in. thick, and are placed vertically in the tank or reservoir at a distance of a few inches apart. The water percolates or filters through the cells into the central space, and is there collected by a series of pipes. The impurities are arrested upon the outside of the cells, and can be removed by reversing the flow of water, and if necessary the filtering material can be sterilized by means of steam. Good results have been obtained from the Fischer filters at several continental waterworks. The rate of filtration is about 3 million gallons per acre per day. Such filters occupy about one-fourth of the space of sand filters, and are not so costly in construction.

Aeration was formerly thought to have a much greater effect in the filtration of water than recent experiments have demonstrated in America. Oxygen is needed for the nitrifying bacteria, and artificial aeration will be beneficial to a limited extent, but it is found that if oxygen is added in larger quantities there is not a corresponding increased effect. Aeration certainly improves stagnant water, and by getting rid of its dissolved gases gradually removes its bad smell and taste. Rivers and streams are naturally aerated by means of waterfalls and weirs, and the broken water is brought sufficiently in contact with the atmosphere to absorb the requisite amount of oxygen. In waterworks it is seldom necessary to make very special provision for the supply of oxygen to the water. Where water is pumped it generally absorbs sufficient air for the purpose of aeration. The water again is usually discharged over fountain heads or weirs, and thus broken up, and as large a surface as possible exposed to the atmosphere, so that absorption of oxygen can easily be made by the discharging water. Waters which are very deficient in oxygen, of course, require more aeration, but, as a rule, it is not found advantageous to use waters requiring special provision to be made for the forcing of oxygen into the water. The oxygen which is contained in the interstices of the sand and gravel of filter beds has an oxidizing effect, but, of course, it is soon absorbed, and can only be restored by giving the filter a complete rest for re-aeration. Recent experiments in America have established the fact that the addition of hypochlorite in the proportion of 5 lb. to a million gallons has reduced the typhoid case rate from sewage infected water. It has recently been found within the range of practical engineering to sterilize water on a large scale by means of ultra violet rays. The water must, however, have all its turbidity removed before treatment. The water is subjected to the rays of electric lamps which are provided with quartz globes which readily allow the ultra rays to act upon the water with a germicidal effect.

Removal of Hardness

We have now seen how water can be freed from a large proportion of its organic impurities, but have yet to deal with the removal of its mineral impurities. The hardness of water is due to the presence of mineral impurities, and to make the water soft enough for drinking and for manufacturing purposes a large proportion of the mineral impurities has to be removed by a softening process. The minerals which are the chief cause of hardness are calcium carbonate, calcium sulphate, and magnesia. The wastefulness of hard water is caused by the fact that until the

mineral imparting the hardness is neutralized by a certain amount of soap no lather can be formed. It is estimated that 2 oz. of soap are wasted for each 110 gallons of water, for each grain per gallon of calcium carbonate. A certain degree of hardness is an advantage in domestic supplies passing through lead pipes, because soft waters have a greater dissolving action upon the lead. Upon a large scale water softening is accomplished by chemical precipitation. A substance is added to the water which causes the mineral creating the hardness to be precipitated. It has been found that during this process of precipitation a considerable degree of bacterial purification is effected, by reason of some of the bacteria being carried down with the precipitant. The removal of temporary hardness is chiefly effected by Dr. Clark's process, which consists in the addition of lime to the water. The mineral causing the hardness is in the form of a bicarbonate which is held in solution in the water. The addition of lime reduces the bicarbonate to a carbonate, which being insoluble is precipitated, and therefore leaves a softened water. The quantity of lime required is about 1 oz. for each degree of hardness for every 700 gallons of water. Permanent hardness may be removed by the addition of other chemicals such as soda, alum, etc.

The conditions necessary for the effectual softening of water have been summarized as follows:—

- (1) The added chemical or substance should be perfectly dissolved before being added to the water, so as to ensure the maximum chemical action.
- (2) The added chemical or substance should be in exact proportions to the hardness of the water.
- (3) It is important that the softening agent should be placed in the tank where the process is to be carried out before the water is added; because it is found that by thus having an excess of the lime or other agent up till the time the tank is filled, that the process of precipitation is thereby rendered more easy.
- (4) The insoluble compounds resulting from chemical reaction must be removed by subsidence or filtration.

It is sometimes necessary to make special provision for the removal of iron from water. Ground waters are very liable to contain iron, and if present to a greater extent than 0.4 to 0.5 parts per million will impart a bad taste to the water and render the water very objectionable for laundry purposes. Ground water takes up iron from the soil. Sand and gravel generally contains a proportion of iron in the form of ferric oxide (Fe_2O_3). When surface water is passing through ground containing organic matter the free oxygen is gradually absorbed, and then the organic matter attacks the ferric oxide and reduces it to ferrous oxide (FeO). This compound is then able to unite with the CO_2 to form ferrous carbonate (FeCO_3), which is soluble in slightly acid waters, and is therefore gradually taken up by the percolating water. In such water the iron-bacterium (*Crenothrix*) is able to develop, and as it can thrive without light it is able to exist even in the distributing mains. It lives upon the soluble iron, and subsequently precipitates it as ferric oxide, and thus causes an accumulation of flocculent matter in the mains. When the organism dies an unpleasant smell and taste are imparted to the water. Iron waters are free from turbidity at first, but after standing for some time become cloudy as oxygen is absorbed from the air and a rusty precipitate is found.

The necessary treatment for such waters is to provide plenty of aeration, to enable the iron to be precipitated, and subsequently retained by the sand filter. In America coke filters have been found to have a beneficial effect upon waters contaminated by iron. Various iron ores have an appreciable purifying effect upon water, by causing the rapid oxidation of organic matter. Magnetic iron oxide made up as polarite, etc., metallic iron, and spongy iron can all be used for the purpose. In the Anderson revolving purifiers iron is used as a coagulating agent previous to the processes of subsidence and filtration. Iron is taken up by the water in a revolving drum by means of the presence of CO_2 . When exposed to air this is oxidized and a coagulant is formed which is an aid to subsequent filtration. This system, while not largely adopted, has been found to have a good bacterial effect. The claim that the water is improved in color by the process has not been established.

Sand filtration is the best method of purifying water, and reducing to a minimum the risk from water-borne diseases. While river and surface waters naturally require most purification, spring and well waters would benefit from sand filtration. Some authorities even go so far as to assert that it is safer and wiser to use a river or surface water that has been sand filtered in preference to a spring or well water which apparently has not needed and has not received sand filtration. Certainly statistics have proved that the typhoid case rate is lower in towns and cities where the water has received sand filtration. In judging a water for domestic and public supply five points require consideration. The source of supply, the total solid matter held in solution, the total organic matter in solution, the number of bacteria, and the action of the water upon the means of distribution. Where water is required for public purposes it would be wise to assume that sand filtration is always necessary. It is the best safeguard against water-borne diseases, and against fluctuations in the purity of the source of water supply.

On the subject of concrete surface painting, a writer in *Concrete* states:—

Does concrete require painting? To protect it from the elements, possibly no; to beautify it, to prevent unsightly discoloration, and to check absorption of moisture, most decidedly yes. It is none too soon for the enterprising painter to begin studying cement and concrete work with a view to its painting.

A properly mixed white lead paint adheres as firmly to a cement surface as it does to wood, provided the surface is properly treated beforehand.

The presence of alkali and the tendency to hold moisture an exceedingly long time are the causes of the special difficulties in the way of the successful painting of concrete. Otherwise the service is just as adaptable to paint as brick or plaster.

The alkali acts on the linseed oil chemically and destroys it, while the moisture coming out causes blistering and peeling, just the same as it does when present in wood or brick. Some have leaped to the conclusion that linseed oil must therefore be abandoned—a peculiar notion when it is considered that scarcely anyone is ignorant of the fact that linseed oil is the only vehicle which will make good paint for outside wear.

The thing to do is to kill the alkali in the cement so that linseed oil can be used. This is easily done by any one of three methods: First, let the concrete stand and weather a year or eighteen months before painting. There are instances in which the concrete has properly weathered much sooner. A house built of cement plaster over wood by a Chicago architect seven years ago was painted with pure white lead and oil only four months after its erection. The paint film is still perfect. Nevertheless, it is unsafe to allow less than a year for drying.

The second method is to wash the surface with zinc sulphate, commonly known as white vitriol. It is inexpensive, and may be purchased at almost any drug store. Make a 10 per cent. solution (10 parts zinc sulphate to 90 parts water) and apply.

The other method is to wash the cement with carbonic acid water, which may be purchased in siphons or cylinders at drug stores or from dealers in soda water fountain supplies. It is ready to apply as purchased, and may be brushed on or sprayed on. Paint as soon as the walls are dry. The latter is really Nature's method, hurried. The alkali is killed by the absorption of carbonic acid. In natural ageing the carbonic acid is supplied by the air and rainwater.

Water Outlets for Fire-Resisting Buildings

It is a well-known fact that the damage by water in a modern fire-resisting building is often much greater than that caused by the fire extinguished. In some cases much injury is caused by the flow of water into floors below that where an outbreak has taken place, lift wells and other openings forming ready means of communication between all the storeys. In other cases damage is caused by the retention of water on fire-resisting floors where perishable goods are stored. There is no difficulty in guarding against both of these contributory causes. All floor openings can be protected by water-tight curbs a few inches high, and outlets can be inserted in the exterior walls for the escape of water. The outer end may be closed by an automatically operating door, preventing the ingress of cold air in winter, but which may easily be opened for ventilation purposes in summer if required. This idea is one that will doubtless be welcomed by many architects.

The Montreal Water & Power Company's Extension Work.

Work is going ahead so well on the filtration plant and reservoir construction of the Montreal Water & Power Company that the undertaking is likely to be completed some months before the time specified in the contract. The contractors are Messrs. Laurin & Leitch. The contract called for the completion of the filtration plant by June next, but the present prospects are that it will be ready in February next. In addition to this work the Company has under construction 6000 feet of water mains, 3 feet and 4 feet in diameter leading from the reservoir in a northeasterly direction across the city through Outremont, Laurier ward, St. Denis ward and other sections to Maisonneuve. This will greatly increase the volume of water for fire and domestic purposes in the important district lying north of Mount Royal avenue, and in the municipality of Maisonneuve. It is expected that this work will be finished in about six weeks.

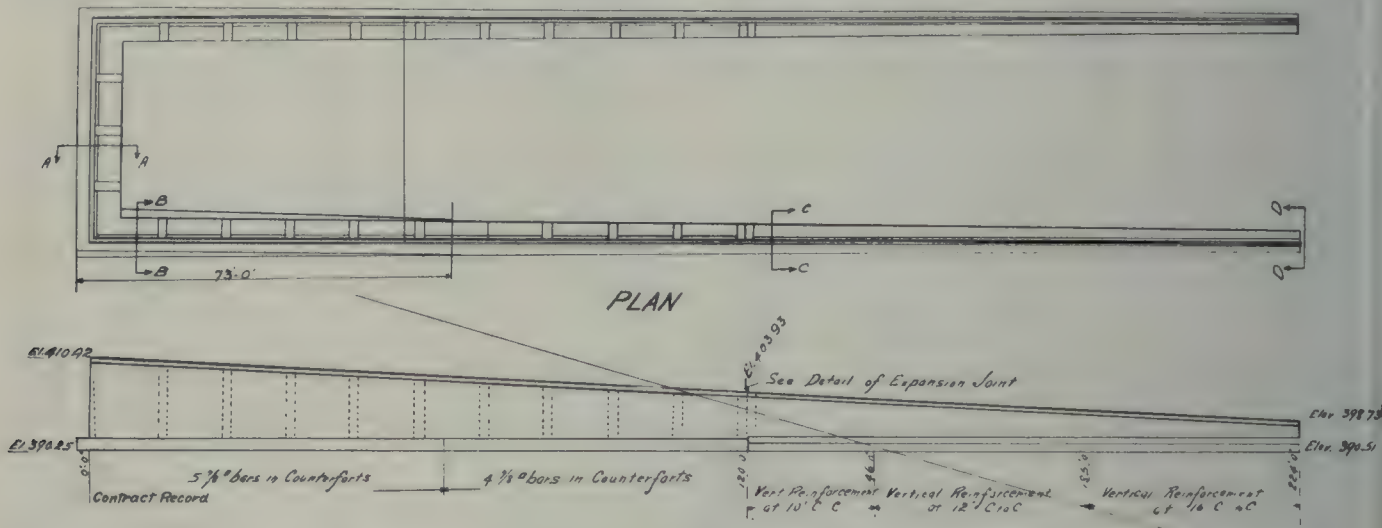
Weston Road Viaduct in West Toronto

New Structure Nearing Completion — Points of Interest in Design and Workmanship

Special to the Contract Record

A project which has been under contemplation for a number of years, as the result of having been badly needed, is the erection of a viaduct for public thoroughfare over the tracks of the Canadian Pacific Railway adjacent to, and north of, the company's

vertically, placed 12 in. centre to centre. At section C-C the base has been gradually increased to 7 ft. 4 in. in width, while section B-B shows a width of base of 10 ft., a height of 2 ft. 4 in. and a maximum retaining wall height of 19.68 ft. as is shown. An



General plant and elevation of approach.

station at West Toronto, Ont. The old wooden structure, which has for many years occupied the site, was removed some time ago and construction on the present structure commenced on Nov. 10th of last year.

The south approach consists of a fill between retaining walls 42 ft. apart and 224 ft. long. Fig. 1

expansion joint is placed in the wall 120 ft. from southern extremity on either side of the roadway from the expansion joint to the abutment. The re-



Vertical reinforcing rods for retaining wall in position.

shows a drawing of this retaining wall, while sections taken at A-A and B-B are also reproduced. At the lower end of the embankment the retaining wall rests upon a base 5 ft. wide and 1 ft. 6 in. deep, and is reinforced longitudinally by $\frac{5}{8}$ -in. square steel bars, while reinforcing of similar strength is used

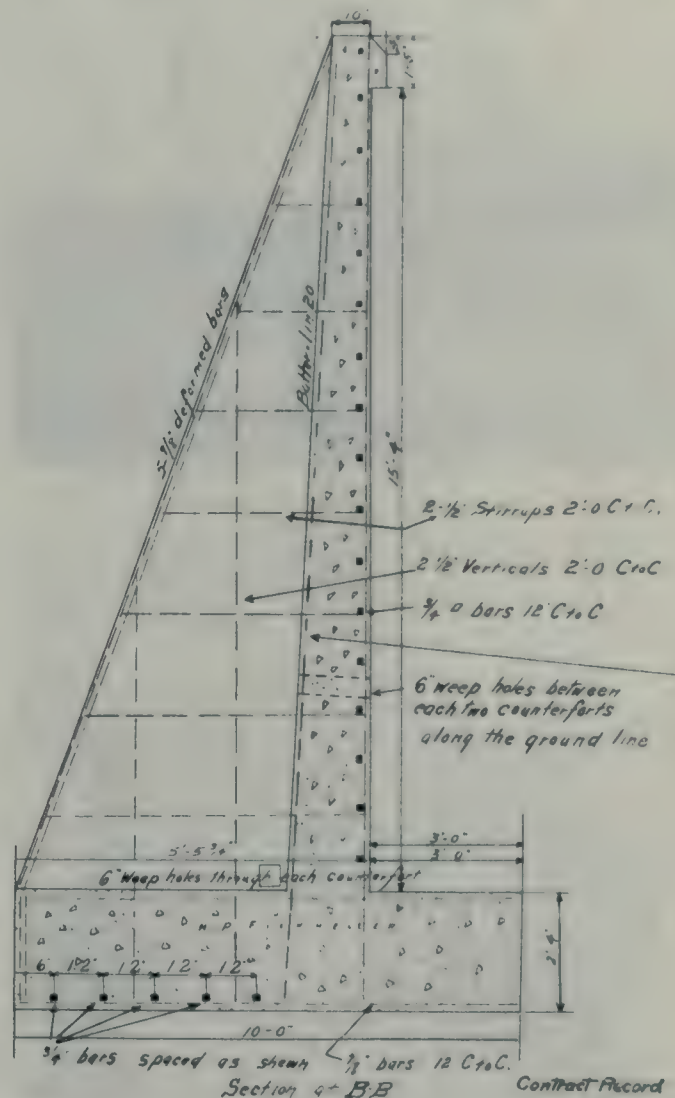
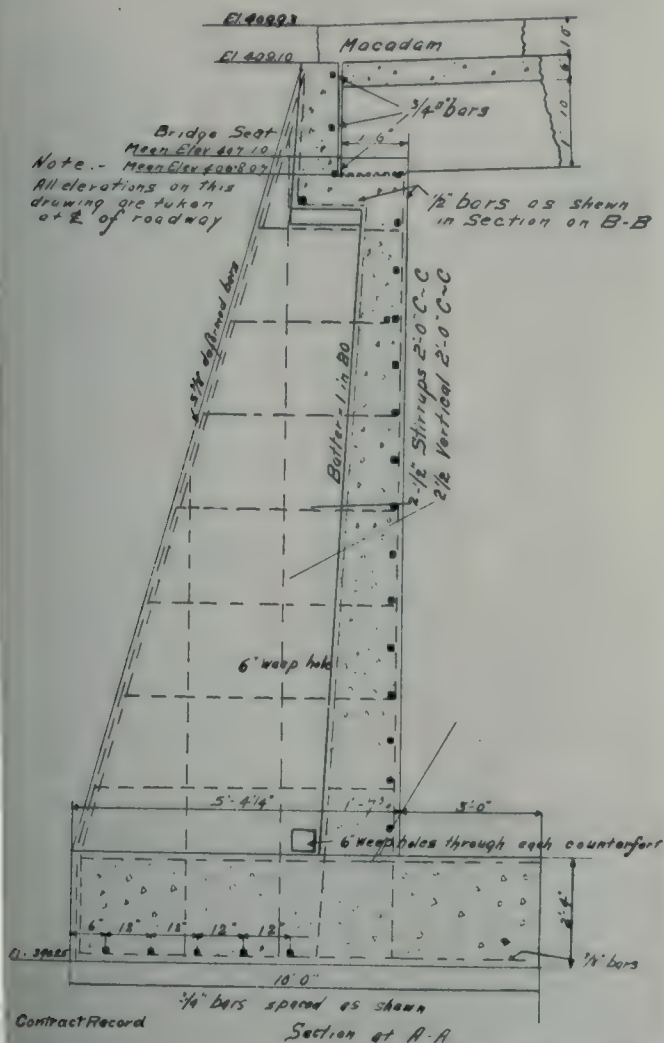


Form work for beams, stringers and supports.

taining wall is strengthened with counterforts 12 ft. centre to centre. The roadway proper is 30 ft. in

width and is bordered on either side by sidewalks each 6 ft. wide. From the end of the retaining wall, and for a distance of 160.92 ft., the viaduct is supported by 30 pillars. The pillars are 20 in. by 16 in., with 28 in. by 28 in. bases resting upon double foundations 6 and 8 ft. square respectively. They are reinforced in the usual way with $\frac{3}{4}$ -in. steel bars. The viaduct is on a five per cent. grade rising from elevation 378.73 at the south end of retaining wall to elevation

shown in the figure, are 30 ft. centre to centre and are constructed upon concrete foundations, the bottom footing being ten feet square by two feet deep bearing another 8 ft. square and 2 ft. deep which support the base of the pillars 6 ft. square and 3 ft. deep, the top of the latter rising 2 ft. above the rail elevation. The reinforcing for the 2 out-

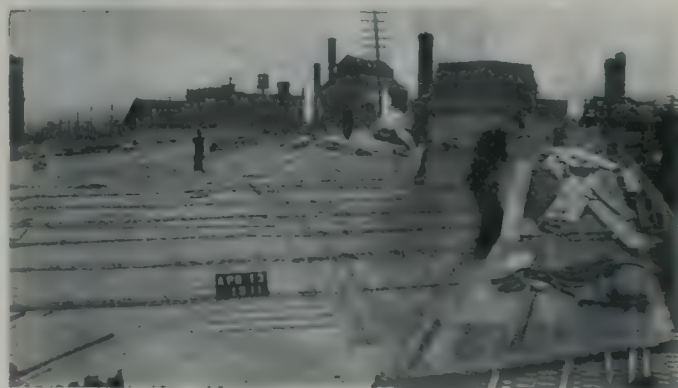


Sectional views of retaining wall at and near abutment.

tion 421.58 at the steel span, with a 22-ft. 6-in. clearance over C. P. R. tracks.

The viaduct extends northward from the retaining wall abutment in a straight line for a distance of 152 ft. 8 in. measured along the centre line of the right of way. There begins at this point a deflection of 24 degrees 7 1/2 minutes with the centre line of the steel construction over the tracks, through a length of 73 ft. 3 in. measured along the arc of the circle described by this centre line.

The steel truss has a length of 113 ft. 9 in. centre to centre on piers or 115 ft. 2 in. over all. At the southern extremity the steel will form an angle of 54 degrees, 7 1/2 minutes with the supporting concrete beam and the centre line of pedestals. At the north end the angle between the centre line of pedestals and the centre line of truss will be 107 degrees, 35 1/2 minutes. The width of the bridge will be 30 ft. here also, together with an overhanging 6 ft. on either side for sidewalks. At the northern end the piers, as



Dock forms in place, note overhanging sidewalk reinforcement.

side piers is ably shown in the diagram. The centre pier is 20 in. square resting on a similar series of

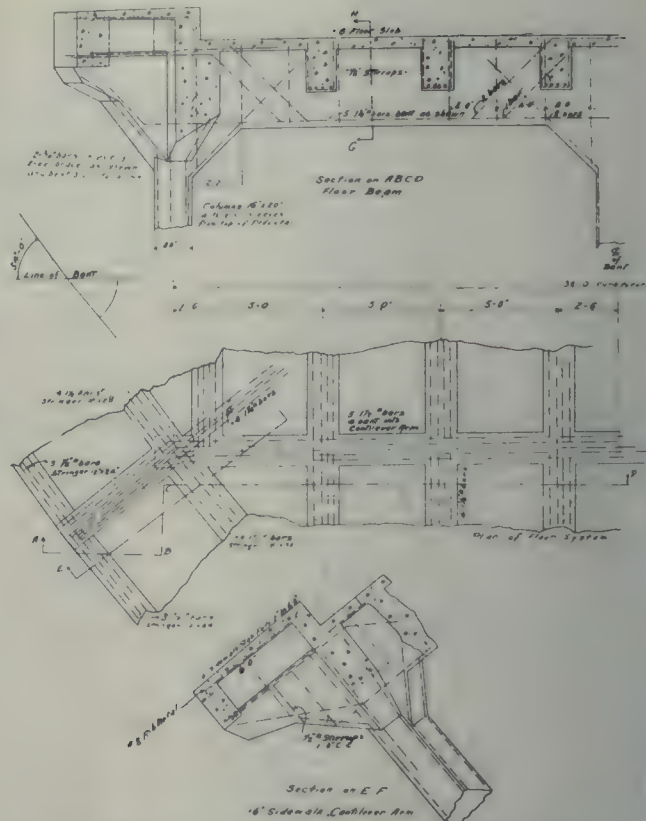
foundations, the lowest one being 5 ft. square. The design and reinforcing of the beam are also explicitly shown in the figure, the latter consisting of a series of seven $\frac{3}{4}$ -in. square rods placed longitudinally throughout the 20 in. of width of beam, each alternate rod being bent upwards as shown.

The stringers are placed 5 ft. centre to centre and are 16 in. wide, varying in depth according to the



Removal of forms in progress.

length of span. The beams vary in width from 16 in. to 36 in. and vary in depth from 36 in. to 50 in. There are 2 expansion joints in the viaduct, one located at the abutment, and the other at the bent "F."



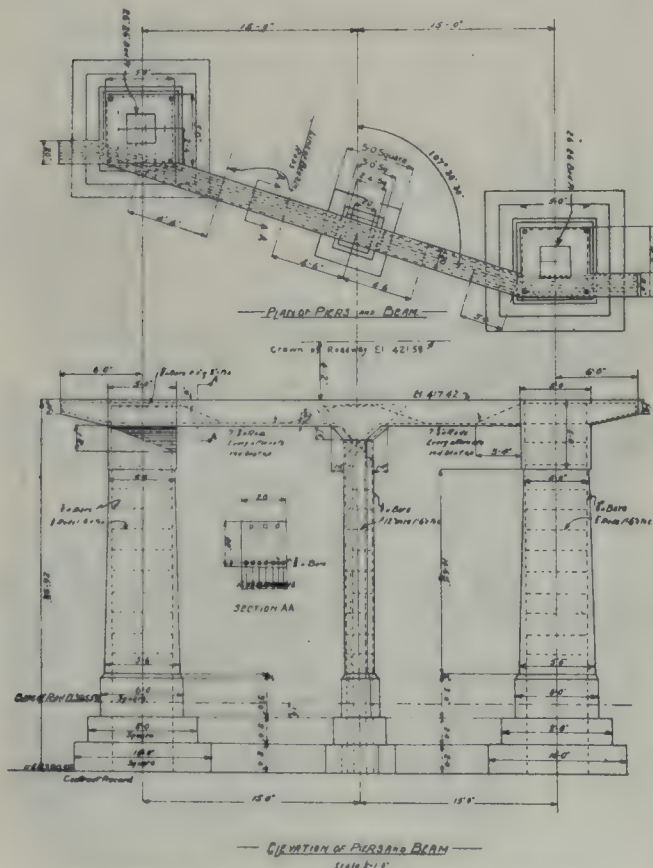
Details of floor beam and sidewalk cantilever arm.

floor slabs are 6 in. thick reinforced transversely by $\frac{1}{2}$ -in. square bars placed 12 in. centre to centre, and longitudinally along the centre line of floor beam with $\frac{5}{8}$ -in. square bars placed 18 in. centre to centre, arched at the columns. The knee braces are reinforced with



General view beneath structure showing finished design.

$\frac{3}{4}$ -in. bars bent 3 ft. into the column. The overhanging sidewalk slabs are 4 in. in thickness falling 1 in. in 6 ft. of width and are reinforced by No. 8 rib metal. The sidewalks on either side are supported by 16-in. cantilever arms, which have a reinforcing of five $1\frac{1}{4}$ -in. square bars, bent as shown in the accompanying detail sketch. The stringers run parallel to the centre line of the viaduct as far as



Details of piers and beam supporting steel.

which is 126 ft. $8\frac{1}{2}$ in. from the abutment, the beam at the expansion joint being 36 in. wide and 50 in. in depth. At the expansion joints each stringer rests upon a $\frac{1}{4}$ -in. bearing plate to facilitate in sliding. The

the end of the second bent, and deflect thence through an angle of 54 degrees, until the steel supporting beam is reached.

The retaining wall contains, throughout its length, a total of 38,214 pound of reinforcing steel, while in the viaduct 120,952 pounds of steel have been used. A concrete mix of 1:2½:5 was used in the retaining wall and all below elevation 394.59, while



Junction of steel and concrete in progress.

above this elevation the proportions were 1:2:4. The sidewalks are 1:2:4 mix and were finished off with 1 in. of 1:1 cement and sand. The sidewalks are to be protected by pipe railings.

At the present time, as the accompanying photographs show, the concrete is ready for the steel span which is being erected by the Canada Foundry Co. of Toronto. The reconstruction of the wooden trestle that will constitute the northern approach to the bridge, is being rushed and it is expected that operations will be completed, and that the thoroughfare will be in use again in a short time.

The bridge was designed by the railway and bridge department, office of City Engineer, Toronto. The retaining wall and concrete portion of the viaduct were built by E. C. Lewis & Co., Toronto.

Graphics in Engineering Design and Construction

The work of the engineer has to do with the construction, manufacture and production of material things that are shaped or produced by man; the building of bridges and making the rails that are laid over them; the construction of dams and machines to utilize the water that is conserved thereby; the building of ships and the engines that drive them; the production of cars and the locomotives that haul

them; the erection of power plants and the machines to be operated by and through them. In fact, may it not be said that the engineer's work is, of all work, constructive, creative? Whatever branches of engineering be considered, the work in general may be divided into that of design, construction, and operation.

Designing may be considered as planning, determining, or deciding upon the construction, whether it be of a bridge or a bolt, by mentally building up the work, step by step. It includes, therefore, weighing various considerations in the light of the knowledge of the laws of mechanics and economics, of practical experience and precedent. Moreover, it is also to decide upon what is best in methods of work and in materials, from the standpoint of economy in construction or manufacture, as well as that of the end to be gained or purpose to be served. Since considerations of construction and operation primarily influence design, these two features are thus involved in every design, than which there is no higher class of engineering work.

The result of the solution, of an engineering problem in design "materializes" in some physical shape, of something manufactured, built, or constructed. In the end, therefore, the physical structure or the geometric form of the object (or the space relation of the elements of its construction), and the arrangement of the parts, will determine its successful operation, or the degree of success attained in accomplishing the result desired.



View showing curvature of viaduct above tracks.

It is easy to understand how the physical design of a material thing could be affected by constructing it in miniature, building it as a model, so to say; and step by step, shaping each part and putting it in place. As the construction progresses, new ideas present themselves; better methods are suggested by the work already done; changes are made; parts are discarded; unsuccessful construction is scrapped and a new arrangement substituted. Many old designs have been worked out in such a manner.

Designing depends upon correct determinations from principles that apply in each case, and decisions based on practical knowledge. Hence, designing engineers must have a broad training in theory and a wide experience with practice. To be commercially successful, a design must include considerations of

methods of manufacture, construction, or erection. The design of a large work involves indirectly, at least, the design of any small part of it. The designer should be acquainted with modern shop operations, practice, and precedent; and with the best methods of detail work, assembling, inspecting, etc.

To construct something as nearly ideal as possible each part should be made of the best material for the purpose. A successful designer must therefore have a good working knowledge of materials. He must be familiar with such characteristics as strength, and the causes of its variation; elasticity, brittleness, and ductility; ability to withstand shocks and impact, fatigue and wear; frictional properties; the ease or difficulty of being worked; cost, etc.

From a commercial standpoint, "good enough is best." The material that will serve the purpose, that is cheapest, and that is easiest to work, the cost of which in its finished state is the lowest, will be best, if nothing else is sacrificed by its use. Decision, in many cases, is between opposing influences and often the best is a compromise.

A design has its beginning, its inception, in the mind of man. Hence, the imagination, the power of mental conception, is of the greatest value. The following, from the bulletin of the Stevens Institute of Technology, sets forth this idea:

"In the accomplishment of undertakings incident to the practice of his profession, the engineer is expected to plan to meet requirements, and to devise ways of carrying out such plans; in other words, he must be able to take the initiative. He must be able to put these plans and methods, in so far as they consist of geometrical magnitudes, at least, in such permanent form as to permit of the most efficient performance of the work involved. Before he can record a plan he must first conceive of it himself. His conception of it, however, is not the result of an instantaneous act of the mind, but of a constructive mental process.

"The engineer must therefore be able to conceive of any geometrical magnitudes and their relations whether given by dictation, suggestion, or illustration; and mentally to experiment with them, by rearranging, reshaping, or combining them with additional magnitudes, in order to discover ways of obtaining the desired geometrical magnitudes and relations. The training which tends to develop that faculty of the mind which enables it to perform this function, is the special province of the subject of Descriptive Geometry, which treats of the graphical representation of the solution of problems relating to geometrical magnitudes in space. The intelligent comprehension of facts and of explanation of phenomena relating to geometrical magnitudes, is dependent upon the students' ability to conceive of the geometrical magnitudes and conditions involved; and, consequently, instruction in the branches of science which involve such mental effort is seriously impeded if the student has not been previously so trained as to make this mental effort readily. For this reason, some subject in which this condition does not prevail is best adopted to develop this special faculty of the mind."

Many who take technical training fail to realize the importance of developing this special faculty of the mind, lack of which prevents them from receiving the benefit of courses in engineering education, or becoming real engineers. It must be evident that a designing engineer should have the power of imagination, of forming mental conceptions, strongly de-

veloped, in order that he may see a thing as to its shape and structure, or arrangement of parts before it takes material form. This power to conceive, to form mental pictures, is invaluable. It is only by such intellectual processes that a design can be developed, and the effects of modifications noted and compared.

Needless to say, it is not the usual engineering practice or custom to make, and work from, models. Some particular designs are developed in this way. As before noted, many improvements in design result from experience in actual building and operation. The model is supplanted by drawings.

One who can read drawings can get, in general, more information about the design, construction, and manner of operation, of any work from rightly made drawings of that work from the work itself. It may thus be realized that making the drawings is doing the work on paper. It is understood that the form, shape, and position of all parts of construction may be exactly represented by drawings; each part placed line for line; any changes made; one design compared with another; the effect of any modification noted, and the methods of manufacture considered. It is thus readily seen how the design may be worked over by making the drawings, which, being completely representative, are something tangible with which to work, a perfect graphic record, in fact. To those who can read drawings, they are a complete letter of information or instructions.

It may be stated without contradiction that the importance of that which is called language is so great as hardly to be realized. The importance to constructive work, of drawing or graphics, is that of a language, a language which is written and read, so to speak, the universal language of the engineer. Language is the means by which ideas and information are conveyed. Engineering correspondence, textbooks of technical subjects, catalogs, etc., contain many illustrations of the use of graphics as an aid in making information accurate and complete, more easy of comprehension, which otherwise it would be either impossible to do, or possible to do with difficulty.

Beginning with an original design which is first a conception of the mind, drawing affords the designer a means of expression. It enables him to work out and record with mathematical exactness, the constructive features in outline and minute detail. Each step in the constructive mental process is aided in its development by the visible record on which changes may be made, and by which effects may be noted and weighed. This use of the drawing may easily be shown by example without going into the multiplicity of details and conditions by which the design may be affected.

Complete sets of drawings convey information to the field, erecting, or construction force. They make possible a common understanding, and ensure the co-operation necessary in any large work. By expressing design, or giving instructions, in graphics, one master mind can have any number of men all working together and in harmony, constructing, not something similar or along the lines of that conceived by the engineer, but the exact thing intended; so that drawing is thus an invaluable means of expression, of conveying information, and of showing exactly what is to be done. It proves of the very greatest value in all engineering work.

The trained and experienced designer dictates, by sketches or otherwise, to the draftsman the subject matter to be put in form. Copies are sent to the shop and field, or contracting or construction company. Copies on file in the office form a record of the work to which reference may be made at any time. From purely an engineering point of view the drawings form the principal part of the specifications covering any work of construction. The value of graphics or drawing lies in its inherent accuracy and completeness as a branch of mathematics and its universal application to problems involving space relation.

Besides aiding in the development of design and conveying the information necessary for the work of construction, the principles of graphics afford simple solutions to otherwise complicated problems in mechanics. Involved abstract reasoning is often more readily carried out, and the real meaning better understood where possible graphic construction can be employed as an aid. The operations of algebra, trigonometry, and of the differential and integral calculus may frequently be performed graphically; and simple graphic construction will often replace complicated algebraic work.

Extensive Paving

One of the most extensive contracts for pavement, drainage and permanent sidewalks ever undertaken by a private corporation for a single group of real estate owners in or around Montreal is that now in progress under the direction of Messrs. Brennan & Cairnie of West Crescent Heights, Westmount, for Messrs. Holt & Gordon, who are the proprietors of the tract of land known as Hampstead, containing 456 acres, and Monklands, containing 80 acres situated a little to the west of Montreal and beyond the mountain. They also own a considerable tract of land on the upper level of Westmount which they have named "West Crescent Heights." It is the improvement of this latter property that has been undertaken by Messrs. Brennan & Cairnie who last November started work on a contract to put in tile drains, concrete sidewalks and Tarvia street paving throughout a length of $2\frac{1}{2}$ miles. The contractors have two years in which to complete the work, the grading is all done, most of the drains are in and the sidewalk laying is well advanced. Gas and water mains have also been put in so that when people build on the properties facing these streets all the necessary services will be available. The system adopted to connect the residences with the water mains and sewage mains is to have one water and sewage service pipe between every two lots. From a point between the two houses direct pipes will branch to each house. As in other parts of Westmount the gutters are made of concrete of a piece with the sidewalk and the gullies are set into the gutters at the usual intervals. Surface water and all other impurities from the roads are washed into the gutters and pass on to the gullies and sewers with the minimum of wear or damage to the serpentine. West Crescent Heights has been laid out with supertine streets which allow easy grades in making the ascent from the lower level to the summit. The street on the brow of the eminence is called "Edge Hill Road," the next higher "Bellevue Crescent," the third "Summer Crescent;" the fourth will be a double roadway 108 feet wide with a 38-foot boulevard in the centre. Messrs. Brennan & Cairnie have their own crushers, rollers and concrete plant. They have had as many as 400 men on the job at a time; 200 men worked all last winter blasting the sewers out of the rock. Two hundred and fifty men are

now employed rushing the work forward so that as much as possible may be done before the frost sets in. The whole of this part of the mountain is of rock formation covered with but a few inches of earth. As a consequence earth is a valuable commodity, contractors and proprietors alike are very careful not to waste it; in fact, the tendency has been observed on the part of some lot owners who wished to have a nice garden or lawn around their residence to "appropriate" the coveted loam from their neighbor's plots. The amount involved in the Brennan & Cairnie contract will run over a quarter of a million. It is expected that Messrs. Holt & Gordon will make similar improvements to the Monklands and Hampstead properties.

New Montreal Factory

The Canadian Consolidated Rubber Company of Montreal, Limited, is having a very extensive addition made to their factory premises at the corner of Notre Dame street and Papineau avenue. The area of the new extension has a frontage of 237 feet on Papineau avenue, is 125 feet deep, and five storeys in height. The purpose of this addition is the manufacture of mechanical rubber goods. The building stands on concrete piers 4 by 4 feet with 9-foot spread footings strengthened with the Kahn system of reinforcement. These piers rise to a height of within 15 inches of the ground floor. The steel superstructure is very heavy, especially the main girders, which weigh 158 pounds to the foot with a 12-inch flange 24 inches deep. The columns are 16 feet apart and are surmounted by girders having a 25-foot span. The fire-proofing consists of 2 inches of cement worked into the metal lath around the girders. All the interior steel columns are covered with "Hyrib" and plastered with two inches of cement. The floor beams are "haunched." The flooring consists of $4\frac{1}{2}$ -inch reinforced concrete slabs with two inch cinder filling and $\frac{3}{4}$ hard-wood. The first and second floors are capable of supporting a weight of 200 lbs. to the foot; the third and fourth floors, 150 lbs. to the foot. Supporting the roof for the three bays on the Westerly side of the building are 75-foot span trusses, giving the top floor an area of 200 by 75 feet clear of columns. The roof consists of Barrett's specification tar and gravel and 2 by 5 spruce on edge with one inch tongue-and-grooved boards. The stairs and freight elevators are enclosed in brick towers and are situated outside of the main building. "Fenestra" steel sash are used for the windows on the river front elevation. The work was started in August a year ago. The two bays were put up and occupied four months ago. Work is now going on on the three west bays where the steel frame is up to the roof trusses. The old factory in the rear was pulled down in June to make room for these three bays. The structure will be faced with Laprairie plastic brick. Mr. E. G. M. Cape is the general contractor and Messrs. T. Pringle & Son, Limited, are the architects. The work is to be finished by the first of next January and will cost about \$250,000.

We have received a sample of Solvay Granulated Calcium Chloride, a clean, white, odorless, non-corrosive, chemical salt, which, when applied to roads, renders them dustless and sanitary, and preserves them from wearing. Upon being applied the preparation absorbs sufficient moisture from the atmosphere to bind the road and keep it moist. It is very economical, easy to apply and efficient in dry or wet weather and as a permanent road treatment it should meet with the approval of Canadian road builders. The Solvay Construction Company, of Syracuse, N. Y., are the manufacturers.

A Bridge Collapse in Manitoba

In the year 1909, the town of St. Boniface, Manitoba, made the plans for and started the construction of a bridge of reinforced concrete across the Seine river at the eastern end of the town. The difficulties which have been encountered in connection with the work, and the unlooked-for circumstances which have arisen have been the subject of much study and conjecture on the part of engineers and contractors. A number of prominent engineers have made a report in connection. At present writing the solution of the difficulties which have been encountered does not seem to have been reached.

The bridge had been in use less than a year when it showed signs of instability. Cracks appeared in several places and in the spring of 1910 one of the wing-walls fell. Investigation showed that this was due to the sliding in of a body of soil which by actual measurement was 450 feet long and 250 feet wide. This mass of soil slid inward against the bridge a distance of ten feet in forty-eight hours. It broke through the invert and came up in sections in the middle of the stream beneath the bridge.

An endeavor was then made to stop the sliding of the land by changing the channel of the river. A new channel was made 75 feet away from the first one, the distance being governed by the limit of the company's property. The new channel was strengthened with piling and the bank was made a two-and-one-half to one slope. The fallen wing-wall was rebuilt and the invert was strengthened by reinforcing it with 60 pound steel. The wing-wall on the other side then started, and, from an angle of 15 degrees from the straight line, shifted until it was practically parallel with the other.

The foundation of the bridge is on piles driven to the rock. It is stated that piles and foundation moved somewhat from their original position following the slide. Action started on the main body of the bridge at a distance of five feet from the point where the wing-wall begins.

The two abutment walls were then reinforced with two 15-inch I beams. Each of these I beams was reinforced with another 15-inch I beam, which was riveted to it at the bottom. These three beams were braced together with two 6-inch I beams. The moving of the walls bent this steel work three inches and crushed the ends of the beams (which were supported against the walls by 20-inch plates) through the concrete wall at a point where the thickness was 24 inches. The abutments of the main structure were forced from their position, and the full weight of the moving earth pressed against the side wall.

The bridge in question had a 24-foot opening. It stands at a point where the land is flat and is said to be under the surface somewhat of the nature of muskeg. The river at this point follows a winding course, which fact would doubtless tend to make the land less stable. During the spring of the year for a few weeks the run of water is swift and in considerable volume. At other times the flow is not heavy and is by no means rapid.

In the summer of 1910 the bridge had reached such a stage that the city council of St. Boniface decided to build another bridge.

The work on the second bridge was carried on during the winter and under great difficulties, chiefly due to the moving earth. On one occasion the bottom of the excavation rose eighteen inches between the time work ceased on Saturday evening and the resumption of operations on Monday morning. The contractors overcame this difficulty by making the excavation wider. The frosty weather also relieved the situation somewhat in this respect. Piles

were driven to the rock covering the entire foundation at two-and-one-half-foot centres. The excavation was made between the piles to the required depth and the excavation was filled with concrete.

The bridge was completed in March. The refilling was then commenced and was finished in early July. About this time a small crack was noticed in the wing-wall on the north-eastern side. Two days later the wing-wall fell, having sheared off at a point where it was about nine feet thick.

An examination of the condition leads to the conclusion that there is probably no fault with the construction of the bridge or of the material used therein. The mistake was made in the beginning of operations without a knowledge of conditions having to do with the probability of such a contingency as has arisen. It would seem as if the second attempt, in the face of the failure which marked the first project was a still greater mistake. It is understood that the council of St. Boniface was advised that the bridge should have a larger opening even than was the case in either of the structures which have been erected. The solution of the difficulty may yet be found in a structure which will reach from the solid ground on one side to the solid ground on the other. It may be that it will be necessary to build a bridge of twice the length of either of the others, but it is probable that there will be no alternative.

The experience in connection will contain a lesson for the engineers and builders of the west, and will emphasize the necessity for careful study of soil conditions as the initial step of any project.

Proposed Model City

A syndicate, of which Mr. U. H. Dandurand, of Montreal is one of the principals, has a project in hand for the construction of a model municipality which they have christened "Rapid City." The land which would be the site of this city comprises 363 acres on the Lower Lachine Road near the Lachine Rapids Hydraulic and Power Company's plant a few miles up the river from Montreal. Plans have been prepared which show a frontage on the river of 4,000 feet. The town would have 4,000 building lots and 13 miles of streets in it. The intention of the promoters has been to construct sewers, permanent sidewalks and provide other utilities before the population arrives. It would be a residential community and as soon as houses were erected water, light and drainage would be already available. But it is possible either that this scheme will be dropped or that it will be carried on by a syndicate, the personnel of which may be somewhat different from the present membership. Certain members of the present syndicate, and some outsiders as well, have got a high opinion of the value of this property and are trying to secure control of it. A number of offers have been made, running up to over \$250,000, which is regarded as a tempting offer by a number of those at present interested. As a result sealed tenders will be called for and if the upset price is obtained the transfer may be expected to take place. It is interesting to know that up to the present there is not a single house on the property, but if the model city scheme is carried out there is money enough behind it to start a very nice building boom as soon as the water and drainage could be provided.

The city of Windsor has awarded to Elliott & Reid, of Brantford, Ont., the contract for a concrete and iron sewer outlet to be 120 feet in length and 7 feet by 4 feet sectional dimensions.

Developments in Chilliwack, B. C.

In view of the extensive public works under way and to be made in Chilliwack, British Columbia, the city council is considering the purchase and erection of a concrete-pipe building plant. The city engineer has been instructed to estimate the amount of pipe that will be required, and it is stated that if a reasonable saving can be made a plant will be purchased. Chilliwack is a growing town of 6,000 people or more, 70 miles from Vancouver on the Fraser river. It is understood the installation of a sewerage system in Chilliwack awaits only the permission of the provincial health officer to empty sewage into the Fraser river. An engineer is to be sent as soon as possible to investigate the proposed system for the public health office of the Province. In the meantime, interested American firms can investigate the project, and perhaps learn the approximate date when tenders will be called for.

To Welcome the Governor-General

The City Council of Montreal has decided to spend \$10,000 for special furnishings to the City Hall and other outlays in preparation for the contemplated visit of H. R. H., the Duke of Connaught, our next Governor General.

The death is reported by drowning in the Lake of Two Mountains near Montreal recently of Mr. Andrew Farquharson Murray who was employed in the architectural department of the Canadian Pacific Railway under Mr. W. S. Painter in Montreal. Mr. Murray was visiting some friends and went for a swim in the lake. The boat that he was using drifted away from him and before assistance could reach him he disappeared. He was 28 years of age and had been one year in the Montreal office of the C. P. R., coming here from Toronto where he was employed by Messrs. Darling & Pierson. The late Mr. Murray was a son of a former architect of the City of London, England, and his relatives reside here.

News Notes and Items of Interest

To bind the grain of Alberta's 1911 crop, sufficient twine to go round the world 154 times would be required.

The city engineers report recommending the laying of water mains and pipes at an estimated cost of \$17,690 in Vancouver has been adopted.

The American Cyanide Company, of Niagara Falls, Ont., will duplicate their reinforced concrete main building at a cost of about \$225,000.

A new viaduct estimated to cost \$550,000 has been proposed for Vancouver, B. C., and a by-law will be placed before the ratepayers in January.

During August the number of permits issued for building in Montreal amounted to \$1,808,715, which is an increase of over \$400,000 over August, 1910.

The Hudson Bay Company announce that they propose to rush the construction of their buildings at Victoria, Calgary, Regina, and other towns in the west.

Messrs. Geo. White and Son, manufacturers of agricultural machinery, are constructing a new \$10,000 building in Brandon with a view of making their implements there.

A contract for the laying of 44 miles of steel pipe required for the new water system that is being installed in South Vancouver was awarded to Mr. W. A. Kennedy.

Mr. J. Frank Cameron, a well-known railroad man, and a son of the late Jno. Cameron, of Trickey & Cameron, public works contractors, died recently at Cornwall, Ont.

Building permits for the City of North Vancouver for the month of August this year, amount to \$75,950.00, while the total to August 31st for the year 1911 is \$562,739.00.

Edmonton, Alta., reports that the issue of building permits since the beginning of the year amounts to \$2,706,705 and places an estimate for the whole year at a \$3,500,000 mark.

Calgary has appointed Mr. Everton Brown, who has had nearly 30 years' experience in asphalt street work, to supervise all paving and inspection of all material put into the city's contract work.

In order to accommodate the increased traffic brought by the C. N. R., the British Columbia Electrical Railway Company propose building a new bridge across the Fraser river at Fraser Mills, B. C.

It is announced that Mr. A. N. Molesworth, district engineer upon the Transcontinental Railway, with headquarters at Cochrane, Ont., has resigned. A successor has not yet been appointed.

Building in the city of Guelph, Ont., for the year 1911 to date is estimated to attain the value of \$500,000. The city has never experienced a more prosperous year for both laboring men and mechanics.

A contract is about to be let at Saskatoon, Sask., for a new intake gravity pipe, for their waterworks plant. The plant will consist of 1,000,000 gallon rotary pumps, and will have a capacity of 4,000,000 gallons per day.

The sandstone quarries owned by Mr. Wade, Edmonton, Alta., along the banks of the Brazeau river are about to be developed by eastern capitalists. The necessary plant equipment is estimated to cost in the neighborhood of \$25,000.

The city of Edmonton, Alberta, in addition to the waterworks pump already ordered, have under consideration the ordering of a 10,000,000 gal. pump to be used as a reserve. Installation will not be made, however, until next spring.

It has been officially announced that the C. P. R. propose building \$1,000,000 worth of new bridges in the vicinity of London, Ont., during the next few months. Plans have been prepared for replacing all wooden bridges with steel and cement.

A contract has been awarded to Messrs. Secord & Sons, of Brantford, Ont., for the erection of a reinforced concrete factory building in Guelph for the Independent Tire Company. The dimensions of the building are 250 ft. by 60 ft., 3 storeys high, boiler house detached.

Building permits for the city of Winnipeg for August, 1911, amount to \$1,913,000, as against \$1,457,800 for the same month last year. The total for the eight months has now reached \$13,281,650, as against \$12,419,500 of 1910. The number of buildings covered by this amount are 3,318.

The Ceresit Waterproofing Company made a shipment recently of 10,000 pounds of their waterproofer to Los Angeles, to be used for waterproofing foundations of the new Times Building, which is to replace the old building blown up, presumably by striking laboring men, some time ago.

An approximate value of the new buildings erected in Toronto in the first eight months of this year is \$16,603,845, which is an increase of \$3,116,872 over the value of the buildings constructed in the corresponding period of last year. There were 6,967 buildings erected in the past eight months.

Hitherto owners of Canadian zinc properties have been compelled to restrict their output owing to almost pro-

hibited duty on zinc ores shipped to the United States. It is now reported, however, that a smelter is about to be built near Medicine Hat for the treatment of these ores by natural gas product.

The Montreal Terra Cotta Lumber Company are building a terra cotta plant to cost in the neighborhood of \$200,000 near Lakeside, Montreal. D. G. Loomis & Sons are the contractors, and are building the kilns, driers, and machinery buildings. The American Clay-Working Machinery Company is supplying the machinery.

It is stated that a construction company which will engage in all branches of engineering and construction work and which consists of a large number of builders and engineers, is in formation in Vancouver. The company is said to be capitalized for \$7,000,000 and intends the erection of a large number of works throughout Canada.

Something new in the removal of concrete forms has come to light in Vancouver, in connection with the Saturday Sunset Building. The forms had become so hardened into the concrete, never having been removed owing to lack of space between buildings, that fire was resorted to to bring them down. The procedure met with complete success, and no damage was done to the concrete wall.

Messrs. Foley, Welch & Stewart have been awarded the contract by the Grant Trunk Pacific to build 410 miles of main line between Aldermere and Tete Jaume Catche, a point 50 miles of the Yellow Stone Pass. This is the last gap in British Columbia. The work will be pushed from the east and west ends with all possible speed, according to an announcement made by Chas. M. Hays, president of the road.

It is stated that the sites of all the wharves and buildings in connection with the Grand Trunk Pacific floating dry-dock and shipbuilding and repairing yards at Prince Rupert, British Columbia, have been staked out, the work of boring to determine the nature of the ground where the foundations are to be laid is being rapidly pushed, and it is expected that construction work will be commenced very soon.

Catalogue No. 30 of the Chapman Valve Manufacturing Company, Indian Orchard, Mass., is an extremely up-to-date publication covering in a most modern fashion their many products, including valves, fire hydrants, indicator posts, sluice gates, floor stains, shear gates, etc. The publication contains innumerable tables of sizes and capacity, details of design, together with a considerable quantity of valuable information for the engineer and contractor.

The B. C. Electric Railway Company is making considerable extensions to its auxiliary steam power plant in Vancouver, at an approximate cost of \$250,000, with a view to increasing the available power from the steam plant to 12,000 horse-power, providing for cases of emergency, in case of accident to transmission lines or hydro-electric plant. 4 B. & W. boilers, each of 500 horse-power capacity, and a 2000 kw. Allis-Chalmers-Bullock turbo generator, form the new equipment.

Tenders have been called for the storm overflow sewers for the main drainage system of Toronto, a total length of 10,788 feet, being under consideration, including section 14 of the high level interceptor, a length of 985 feet of 3 ft. by 4½ ft. egg-shape brick sewer, in tunnel; 906 ft. of 3 1/3 ft. by 3 2/3 ft. concrete culvert in open cut; and a length of 8,897 linear ft., including the laying of 30 and 36-in. concrete pipe and the supplying and laying of 24-in. cast iron pipe and 15, 18 and 24-in. vitrified pipe.

When Vancouver was incorporated in 1886 it had a population of only 1,000. Five years later, in 1891, the census showed a population of 13,685, and ten years later

26,133. Since 1901 the greatest growth has been made, and it is probable that the census of 1911, when the results are made known, will show a population well over 100,000, possibly as high as 125,000. It is well to remember, too, in considering these figures that outside the technical boundaries of the city there are living probably 30,000 persons who are properly citizens of Vancouver, but who will not be counted to the credit of the city.

The assessment roll of the city of Westmount for 1911-1912 presented to the city council recently showed an increase of \$5,177,980 over the total valuation of taxable property for the previous year. The valuation of taxable property for the coming year was set down at \$28,618,900, the increase is said to be the largest ever recorded in Westmount in one year. Adding to this the value of property exempt from taxation the total valuation of property in Westmount reaches the sum of \$33,240,610. In spite of the great increase only five protests were entered against the homologation of the revised roll. Of these one was withdrawn, two were dismissed, and two were set aside for further consideration.

The Parsons Construction & Engineering Company, Limited, with headquarters at Regina, Sask., have recently been awarded the contract for the construction of the Broad street subway, Regina, which will be a very interesting bit of work, entailing the supporting of some 20 tracks during construction. In addition to their numerous bridge contracts the company have some \$500,000 worth of building under construction in the city of Regina, including the Kerr Block, 5 storeys and basement, 50 ft. by 110 ft.; the B. F. Ackerman Sons & Co., a 5-storey warehouse 50 ft. by 180 ft.; the Western Trust Co., a 50-ft. by 50-ft. fireproof office building, containing 5 storeys and basement; the Leader Block, 64 x 108 ft. with 6 storeys and basement.

The Laurentian Construction and Engineering Company, Limited, 103 St. Francois Xavier street, Montreal, of which Mr. S. W. Hamilton is president, is making good progress with the sewage construction work which they are doing for the town of Outremont. Their contract called for the construction of 1800 feet of brick sewers 2 in. by 3 in. in Ducharme street. The laying of these sewers involved the blasting out of the solid rock of a trench averaging ten feet in depth and 14 feet in some sections. The same company has the contract for all the new concrete sidewalks being constructed in the town this summer amounting to 80,000 square feet, the price being about \$25,000. Already 32,000 feet have been laid and the rest will be finished before the frost sets in. The method employed is: First, to lay a foundation of big stones; 3 inches of smaller filling stone is worked into this; next 3 inches of concrete is laid to form the sub-base. The finishing coat consists of 1½ inches of surface concrete.

The City of Boston is now sprinkling the entire city with an emulsion of asphaltic oil made by dissolving 25 pounds soap in 100 gallons of hot water and mixing this with 200 gallons oil. One hundred gallons of this emulsion is diluted with 500 gallons of water in the wagon and spread, using an ordinary Studebaker watering cart. The first application is followed by a second in four days, after which the street is gone over again once in from 15 to 35 days, depending upon the weather and conditions. This was found to give excellent results both as to laying the dust and preserving the roads. Last year the amount of dust swept from the streets was reduced 50 per cent. The only objectionable feature is the condition of the road for the first two or three days after sprinkling, as the heavy black oil forms clots which are picked up by carriage wheels, etc. After it is beaten down, however, the roads have a smooth, hard, and clean surface.

Contracts Department

News of Special Interest to Contractors, Engineers, Manufacturers and Dealers in Building Supplies.

Information for insertion in these columns is invited from Architects, Contractors, Engineers, etc.

Waterworks, Sewerage and Roadways

Edmonds, B.C.

Tenders called for tanks (water supply) until October 2, for municipality of Burnaby; clerk, W. Griffiths; engineer, Cleveland & Cameron, 505 Winch Bldg., Vancouver. Supply and erection of three tanks of 60,000 gallons.

Edmonton, Alta.

City Engineer, A. Latornell, C. E. In addition to the pump already ordered the city commissioners have under consideration the ordering of a 10,000,000 gal. pump as a reserve. The pump to be installed next spring.

Lytton, B.C.

The Provincial Department will be approached with reference to the installation of a water system and fire protection.

London, Ont.

The city council have authorized the construction of tile sewers on Simcoe street between Burwell and Maitland streets and on Waterloo street between Simcoe and Horton streets, and tenders will be called for same at once. G. W. Wright, city engineer.

Tenders for the construction of new cement walks on North Caroline street west London, west Argyle street, west Adelaide streets, will be called for at once. G. W. Wright, city engineer.

The city council has authorized the laying of sheet asphalt pavements with cement curbs and gutters on Waterloo street, Colborne street and Maitland street, between Queen's avenue and King street (two blocks) and on Queen's avenue from Maitland to Adelaide st., (two blocks).

Point Grey, B. C.

Contemplated sewer (D. L. 472). Owner, Corporation of Point Grey. Municipal clerk, H. Floyd. It is expected that tenders will be called shortly. Negotiations with city of Vancouver have been completed regarding outlet.

Richmond, B. C.

A by-law will be submitted to the ratepayers for the raising of \$50,000 for the purchase, construction and maintenance of waterworks system.

Regina, Sask.

By-laws being prepared for waterworks, sewerage, etc. City Engineer, Jas. T. Child. \$120,000 to pay proportion of cost of construction of Broad street subway; \$150,000 for trunk sewer work; \$150,000 or \$200,000 (amount not definitely ascertained) for paving extensions; a sum of money (not yet ascertained) for laying of concrete sidewalks; \$400,000 for construction of street railway system and \$150,000 for waterworks extensions.

Saskatoon, Sask.

Specifications being prepared for waterworks plant. City Engineer, G. T. Clark. Consulting Engineer, Mr. Moley, New York. As soon as plans reach here the contract will be let for a new intake gravity pipe. The plant will consist of 1,000,000 gal. rotary pumps and will have a capacity of 4,000,000 gals. per day.

Sombra, Ont.

On September 25th a by-law to raise \$6,000 for drainage purposes will be considered by the township council. W. H. McGhee, township clerk.

St. Rose, Que.

Bids for the construction of the St. Rose aqueduct will be received by J. E. David, village sec.-treas., until Sept. 15.

Toronto, Ont.

Tenders were called until Sept. 12 for storm overflow sewers. Sorauren Division—Length, 8,897 lin. ft., including the laying of 30 and 36-inch concrete pipe and the supplying and laying of 24-inch cast-iron pipe, and 15, 18 and 24-inch vitrified pipe. Manchester Division—906 lin. ft. of 3-ft. 4-in. x 3-ft. 8-in. concrete culvert, in open cut. High Level Interceptor—Section No. 14—985 lin. ft. of 3-ft. x 4-ft. 6-in. egg-shape, brick, in tunnel.

Victoria, B. C.

Tenders will be called immediately for the laying of some 75,000 square yards of asphalt paving, costing about \$150,000.

Vancouver, B. C.

Contemplated viaduct (False Creek to Harris Street). Owner, City of Vancouver. Chairman Bridge Committee, Ald. Campbell. Proposed new viaduct estimated to cost \$550,000. If the plans are approved by committee, a money by-law will be placed before the ratepayers in January.

Waterford, Ont.

In the near future the ratepayers will vote on the establishment of an electric light and waterworks system.

CONTRACTS AWARDED

Winnipeg, Man.

The contract for paving of King st., from James to Higgins, was let to C. W. Sharp & Son, local agents for Westumite Company, \$15,000. Figures for grading, 18 cents per yard; construction engineer, 30 cents; concrete base, 78c.; engineer, \$1.07.

Railroads, Bridges and Wharves

Appleby's Wharf, N. B.

Tenders called for wharf (Riverside). Owners, Department of Public Works, Ottawa. Secretary, R. C. Desrochers. Plans, etc., at offices of J. K. Scammell, District Engineer, St. John, and on application to the postmaster at Rothesay,

N. B. Tenders received by secretary until Sept. 26th.

Boswell, B. C.

Tenders called until Sept. 25 for construction of pile bent wharf. Plans, etc., at offices of G. A. Keefer, district engineer, New Westminster, and on application to postmaster at Victoria. Secretary, R. C. Desrochers, Dept. of Public Works, Ottawa.

Black Creek, Ont.

Work in progress for bridge for Queen Victoria Niagara Falls Park Commission; engineer, J. H. Jackson, Niagara Falls; contractors, Rutherford & Patten, St. Catharines, reinforced concrete arch, the abutments are completed and work will be rushed on superstructure.

Calgary, Alta.

The outline for street railway extensions for next year as submitted to council is as follows: Inside extensions, \$114,140; outside extensions, \$40,980; equipment, \$160,500; double tracking of Fourth street; loop to serve St. George's Island and new athletic grounds; 18 new cars are suggested as well as scenic car.

Cochrane, Ont.

Tenders called until Oct. 2nd for erection of trainmen's houses. Plans, etc., at office of Gordon Grant, chief engineer, Ottawa, and at office of district engineer, H. M. Balkam, Cochrane, Ont. Secretary, P. E. Ryan. Commissioners Transcontinental Railway, Ottawa.

Craigmore, N. S.

Tenders called for extension to breakwater until Sept. 27 by Department of Public Works, Ottawa; secretary, R. C. Desrochers, Ottawa. Plans, etc., at office of District Engineer at Halifax, Antigonish and on application to postmaster at Long Point, Craigmore.

Fredericton, N. B.

Department of Railways and Canals plan to erect a new freight shed. Brick, metal roof, concrete platform and ramps, 200 x 25. Probable cost, about \$5,000. Construction to begin within next two months.

Fourchue, N. S.

Tenders called until Sept. 27 for extension to wharf and repairs. Plans, etc., at Department and at offices of District Engineers, at North Sydney, N. S., Halifax, and on application to local post master. Secretary, R. C. Desrochers, Department of Public Works, Ottawa.

Fort William, Ont.

Tenders called for supply of steel rails, angle bars, spikes, bolts, ties, etc. Particulars from superintendent. Tenders received by chairman, public utilities committee until September 14th. Construction superintendent, A. L. Farquharson.

Hampton Village, N. B.

Tenders called for Hampton spur line until Sept. 20. Plans, etc., at office of chief engineer of the Department, chief engineer, Intercolonial Railway, Moncton, and at office of Intercolonial Terminal Agent, St. John, N. B. Secretary, L. K. Jones, Department of Railways & canals.

Leamington, Ont.

Tenders have been called for construction of a bridge on 6th concession over Lebo Creek. Address James Drummond, Reeve.

London, Ont.

It is officially announced that the C. P. R. will build \$1,000,000 worth of new bridges in this vicinity in the next few months. Plans are being prepared for replacing all wooden bridges with steel and cement. Plans at offices of Engineer Cooper, London. C. P. R. bridge department will do a great deal of the work with its own men. Very large quantities of steel and cement, however, will be needed. Tenders are now open for a new steel bridge over the Thames at Chatham to cost \$75,000.

Moncton, N. B.

Provincial Government, Fredericton, N. B. Structural Superintendent, Mr. Forbes. The following bridges are to be repaired or renewed. McLean bridge, Scotch Settlement, Parish of Moncton, repairs. School Road bridge, Parish of Shediac, repairs. Wisner Brook bridge, Parish of Shediac, new. John street No. 1 east bridge, in the Parish of Moncton, extension to Berry's Mills, new. John street No. 2 West, Parish of Moncton, new.

Montreal, Que.

Contemplated enlargement of subway, \$150,000. (Wellington street). Owner, City of Montreal. City Engineer, Geo. Janin. Tenders may be called next spring.

Needles, B. C.

Tenders called until Sept. 25 for construction of pile bent wharf. (Kootenay district). Plans, etc., at Department, at offices of G. A. Keefer, district engineer, New Westminster and on application to postmaster at Needles and Victoria. Department of Public Works, Ottawa; Secretary, R. C. Desrochers.

Owen Sound, Ont.

Tenders called for construction of retaining wall. Plans, etc., at department and at offices of J. G. Sing, district engineer, Confederation Life Bldg., Toronto; H. J. Lamb, London, and on application to local postmaster. Tenders received by secretary until September 26th. Department of Public Works, Ottawa; secretary, R. C. Desrochers, Ottawa.

O'Leary, P. E. I.

Tenders called until Sept. 20 for construction of a branch line to West Point, P. E. I. Plans, etc., office of chief engineers and at Department, Intercolonial Railway, Moncton, and at office of station master at O'Leary. Secretary, L. K. Jones, Dept. of Railways and Canals.

Port Arthur, Ont.

The Canadian Northern Railway are contemplating the enlargement of their storage plant here. It is stated that work may be started this fall, if not, it will be commenced early in the spring.

Port Hope, Ont.

Tenders are called for dredging until Sept. 18th. Specifications on application to R. C. Desrochers, Sec. Dept. of Public Works, Ottawa.

St. Johns, Que.

The C. P. R. are about to construct double track from Adirondack Junction to Farnham, P. Q., via St. Johns, necessitating the widening of concrete pillars of bridge crossing Richelieu River, also some additional steel superstructure, etc.

St. Joseph, N. S.

Tenders called until Sept. 25th for construction of breakwater. Plans, etc., at Department, at offices of the District Engineers at Halifax, N. S., North Sydney, N. S., and on application to postmaster at Grand Etang, Inverness Co., N. S. Secretary, R. C. Desrochers, Department of Public Works, Ottawa.

Truro, N. S.

Tenders have been called for construction of freight shed. Plans, etc., at station master's office, Truro, and at the office of the chief engineer, Moncton, N. B. Chairman, A. W. Campbell, Government Railways Managing Board, Ottawa.

Trenton, Ont.

A by-law has been carried granting a fixed taxation for ten years and a small bonus to the Canadian Northern Railway.

CONTRACTS AWARDED**Aldermere, B. C.**

Railroad (as far as Jaune Cache). Owner, Grand Trunk Pacific Railway, Montreal. Contractor, Foley, Welsh & Stewart, 739 Hastings, W. Vancouver. 410 mile section.

Brandon, Man.

The contract for grading on the Grand Trunk Pacific from Harte to Brandon has been awarded to Rigby, Hyland & Plummer, 125 Phoenix Building, Winnipeg, 23 miles. Work will be commenced at once.

Winnipeg, Man.

Annex to Main street station. Canadian Pacific Railway, Montreal. Architects, Woodman & Carey, Free Press Building, Winnipeg. Contractors, John Gunn & Son, Bank of Nova Scotia, Building, Winnipeg. 300 x 80, 4 storeys, brick, reinforced concrete. Building will include plant, laundry, etc. W. M. Kellogg & Co., will construct a concrete stack.

Public Buildings, Churches, Schools, etc.**Alvinston, Ont.**

A by-law will be voted on to provide \$3,900 for a town hall.

Carlisle, Ont.

The Township of Flamboro have under consideration the erection of a school house. Tp. clerk, Geo. Church, Carlisle, Ont.

Chesley, Ont.

Tenders called until Sept. 20 for erection of public building. Plans, etc., on application to T. A. Hastings, Clerk of Works, Postal Station F., Yonge street, Toronto, at the local post office, and at office of the architects. Secretary, R. C. Desrochers, Department of Public Works, Ottawa.

Canora, Sask.

Tenders called for erection of a town hall. Secretary-treasurer, Wm. Sharp, Canora. Architect, J. H. Bossons, Dauphin. Plans, etc., at office of secretary-treasurer, and at office of the architects, Dauphin, Man.

Carson, B. C.

Tenders are called for erection of a frame school by Department of Public Works, Victoria, until Sept. 13. Public Works Engineer, J. E. Griffith. Plans, etc., at Department and with secretary School Board, James Rooke, and with Government Agent at Grand Forks.

Calgary, Alta.

Tenders called for church (Sixth ave. and Fourth street West). Owner, Knox Presbyterian Congregation. Architect, F. J. Lawson, Norman Block, Calgary. Plans, etc., at office of architect, by whom tenders will be received until Sept. 21st.

Hamilton, Ont.

First Methodist Church, King street East, Hamilton, plan to erect a new church to cost about \$100,000. Secretary Quarterly Board, Col. Davis, c/o "The Times" Hamilton. Architect, not chosen.

London, Ont.

The council will shortly consider the erection of new lavatories and also a new weigh scales office, the two to be in one building. Ald. Donnelly, chairman No. 3 committee.

Montreal, Que.

Permit granted to Institute des Freres de St. Gabriel, Sault-au-Recollet, for erection of an orphanage. Architect, Venne & Labelle, 5 Beaver Hall Sq., Montreal. Masonry contractor, Jos. Faille, 1144 Wellington street. Glazing and Ptg., H. Gauthier, 396 Amherst St. Heating and plumbing, N. Belanger, 1349 Notre Dame W. Iron work, Dominion Bridge Co., Lachine. 3 storeys, 250 x 58, terra cotta, solid brick and steel. Building to be completed Sept. 1912. Cost \$73,026.

New Westminster, B. C.

Tenders are called for erection of a school (6th avenue and 2nd street) by Board of Education. 8 rooms, basement, concrete or brick. Plans, etc., with architects, Gardner & Mercer.

Niagara Falls, Ont.

City council has voted \$4,000 for 2-room addition to Barker street school. If no protest is lodged before November 7th work will be proceeded with.

Nanaimo, B.C.

Site has been purchased for theatre, to cost \$25,000. Commercial street. Party interested, A. E. Planta, manager of British Columbia Securities Co., Nanaimo. Building to be 2½-sty., concrete, 40 x 80, ready by November 15.

Ottawa, Ont.

Tenders to be called for annex to stock building (Lansdowne Park). Owner, Central Canada Exhibition Association. Architect, W. E. Noffke, Central Chambers. 3 storeys, 50 x 150, structural steel and concrete, concrete foundation, electric lighting, extension of hot blast heating system. Tenders received after this month.

Sarnia, Ont.

Tenders called until Sept. 20 for erection of armory. Plans, etc., on application to T. A. Hastings, Clerk of Works, Postal Station F, Yonge street, Toronto, and at the local post office and at the Department. Secretary, R. C. Desrochers, Department of Public Works, Ottawa.

Saskatoon, Sask.

Plans submitted for new church for Congregation of Knox Church.—Architect, Brown & Vallance, 1006 McArthur Building, Winnipeg. Official in charge, J. R. O'Leary, Saskatoon. As soon as plans are approved it is expected that tenders will be called for and foundation laid this fall.

Stettler, Alta.

Contemplated town hall. Secretary-treasurer, David Mitchell. Town Engineer, Chas. Donovan. The town has voted supply for a new town hall. Plans will be asked for shortly.

St. Lambert, Que.

Work in progress for post office, \$25,000. Owner, Dominion Government, Ottawa. Architect, A. Venne, 15 St. Lawrence Boulevard, Montreal. General contractor, E. Patenaud, 1289 St. Denis street, Montreal. 3 storey brick with stone trimmings. Work starts this at once.

Toronto, Ont.

Tenders have been called for lodge rooms (Euclid and College), for Loyal Orange Association, Toronto. Architect, G. M. Miller & So., 59 Yonge street Toronto. 3 storeys, 132 x 50, brick and stone, steel beams, steam heating, sheet metal, tile, ornamental iron, plate glass, metallic lath.

Tenders to be called for alterations to theatre, Ryerson and Queen streets. Owners, W. Forbes, Ryerson and Queen, Toronto; architect, C. J. Read, 404 Confederation Life Bldg., Toronto. Remodelling moving picture theatre for Vaudeville. Tenders received after September 15th for about ten days.

Vancouver, B.C.

Permit granted for 3-sty. stone wing to general hospital, \$125,000; architects, Grant & Henderson, 413 Granville st.; contractors, Macdonald & Wilson, Hastings and Carrall streets.

Acting Mayor Ramsay is in favor of a by-law being submitted in January to provide three-quarters of a million for a new city hall.

Contemplated theatre. Owner, Pantages Vaudeville Co. Architect, B. M. Pretica, San Francisco and Seattle. A. Pantages, Seattle, has been negotiating for a site for a proposed new theatre here to equal the one in San Francisco. It is stated that the building here will be erected before the end of next year.

Winnipeg, Man.

Plans are being prepared for erection of an isolation hospital, and tenders are to be called as soon as they are approved. Architect, H. B. Rugb, Union Bank Building, Winnipeg.

Victoria, B. C.

Tenders are called until September 13th for alterations and repairs to Upper and Lower Extension schools in Newcastle Electoral District. Plans, etc., at offices of the Government agent at Nanaimo, and at the Department.

Virden, Man.

Plans being prepared for church. Owner, First Church of Christ Congregation. Architects, Jordan & Over, 47 Canada Life Building, Winnipeg. Plans to be completed shortly.

CONTRACTS AWARDED**Brockville, Ont.**

The contracts for erection of Nurses' Home, \$10,000, have been awarded as follows: Masonry, Pattison & Fox, carpentry, B. Dillon; plastering, B. Dillon; heating, Brown & Semple; plumbing, Brown & Semple; sheet metal, Sheridan & Power, all of Brockville.

Cranbrook, B. C.

Hospital, \$350,000. Owner, St. Eugene Hospital Board. Architect, J. J. O'Gara, Calgary. General contractor, G. R. Leask, Cranbrook; 3 storeys, 63 x 36, brick, tile and hardwood floors, hot water heating, hard wall plaster, steel fire escapes, enamelled walls, fire doors between the new building and the old. It is understood that the contracts for much of these materials are still open. Building will contain chapel, offices, etc.

Dauphin, Man.

Dept. of Public Works, Winnipeg, have awarded general contract for erection of new land titles office to Chas. Jeffries, Portage la Prairie, Man.

Edmonton, Alta.

The contract for erection of Detention Home has been awarded to G. C. Porter, \$28,400.

Halifax, N. S.

Trinity Church, Cogswell street, has awarded general contract to Maxmer & Dunlop, Halifax, for a new brick church with concrete foundation, electric lighting, etc., to be installed. Estimated cost, \$6,700.

Montreal, Que.

Mr. Gustave Gilbert, 479 Huntly St., Montreal, has been awarded the contract for drainage and all concrete work for Postal Station "C," corner St. Catherine and Plessis streets. Mr. Joseph Perrault, architect, 2106 Park avenue.

Hardieville, Alta.

The contract for erection of school was awarded to Matsen & Carlson, \$7,416.

Haileybury, Ont.

Hospital, \$5,500. Owners, Sisters of Providence, Haileybury, have awarded general contract to V. Ladouceur, 107 Augusta ave., Ottawa, for erection of a hospital to cost \$5,500.

Moose Jaw, Sask.

Alterations to post office, Main street. Owner, Dominion Government, Ottawa; successful contractor, Western Mfg. Co., Moose Jaw. Rearrangement of boxes and erection of stamp vendor's office.

Victoria, B. C.

Central Block and two wings, (Parliament Square). Owner, Department of Public Works, Victoria. Architect, F. M. Rattenburg, Victoria. General contractor, McDonald & Wilson, Hastings and Carrall streets. Contract includes the complete construction with the exception of printing shop and museum. Library building will be started first. Total cost, \$750,000.

Residences**Coaticook, Que.**

Work in progress for residence, \$25,000. Owner, A. O. Norton, Coaticook. Architect, James Murray, 101 Tremont street, Boston. 3 storeys, wood and frame, cement foundation, slate roof, hot air heating, electricity, interior finish natural wood; mantels, vaults, dumb waiter, telephone system, electric bells, electric work, steel beams, plate and art glass. Cellar and cement foundation built. Work to be done by day labor.

Hamilton, Ont.

Tenders are called for erection of residence, to cost \$18,000. (Mountain Brow) for G. H. Southam, c/o "Spectator," Hamilton. Architects, Mills & Hutton, Bank of Hamilton, Hamilton. 2 1/2 storeys, 65 x 32, stone foundation, brick, stucco, and stone, cement work, cut stone, artificial stone, sheet metal work, weather strips, metallic lath, plate and art glass, plastic relief work, hot water heating, electric lighting, tile roofing, interior finish mahogany and oak. Tenders close in about two weeks.

Montreal, Que.

Buildings contemplated or in progress: Three dwellings, \$6,000, owner, Wilfrid Durivage, 2211 St. Hubert, brick and wood, 45 x 50, 3-sty., cement foundation. Six dwellings, \$7,000, Agnes st.; owner, Leon Laframboise, Dorval P.O.; architect, Alphonse Piche; pressed brick, 36 x 42, 3-sty., stone foundation, flat and gravel roof; general contractor, H. Martin, 438 St. Antoine street. Three dwellings, \$2,500, 1254 Messier; owner, P. Poulin, 290c Lasalle ave.; brick and wood, 16 x 45, 3-sty.; general contractor, L. Letourneau, 290c Lasalle ave. Two dwellings, \$2,000, Rosemount; owner, J. A. Brosseau, 53 Boyer street; brick, 20 x 30, 2-sty., flat gravel roof, stone foundation, stove heat. Six dwellings, \$5,000, St. Ferdinand street; owner, Mrs. Alphonse Lacasse, 2027 St. James; architect, M. Charbonneau, Cartier Park; pressed brick, 35 x 33, 3-sty., gravel roof, stove heating. Nine flats, \$6,000, Hypolite Lane; owner, G. Zudick, 1047 Dufferin; brick encased, 59 x 26, 3-sty., gravel roof, stove heating. Dwelling, \$3,000, Highland ave.; owner, C. O. Girard, 1233 St. Hubert street; brick and wood, 23 x 32, 3-sty., general contractor, A. Gregoire, 559 Rivard street. Residences, \$6,000, Papineau ave.; owner, Arthur Laurent, 1072 Dorion; architect, S. Frapping, 2238 Park ave.; pressed brick, 19 x 70, 3-sty.

Orillia, Ont.

Orillia Building and Realty Co., Orillia, will build shortly six residences to cost \$30,000, to be 2-sty. frame and concrete construction. W. G. Thompson, of Orillia, will put in foundations. Work will be pushed at once.

Ottawa, Ont.

Plans being prepared for apartments to cost \$15,000, for O. Higman, Metcalfe & McLeod. Architect, A. Leb. Weeks, Sparks street, Ottawa. 3 storeys, brick, stone foundation, hot water heating, electric lighting, tar and gravel roofing, interior finish hardwood, cement work, cut stone, mantels. Tenders to be called soon.

Buildings contemplated or in progress: Robert Crane and J. A. Bangs,

Tenders and For Sale Department

Are You On ?

If not, get on our mailing list and be one of the 14,000 who receive SHAW'S BOOKLET as issued. The September number is now ready for mailing. Contains 44 pages of attractive offerings in released machinery and contractors' plant. Gives price, make, size, capacity, condition, etc. It's worth having. It's free. Send for it.

WILLIS SHAW MACHINERY CO.,
39 South LaSalle Street,
Chicago, Ill.

City Engineer

Kingston, Ont.

Sealed applications, marked "Position of City Engineer," stating qualifications and experience of applicant and salary required, will be received by the undersigned up to noon, Saturday, September 30th, 1911, for the position of city engineer.

W. W. SANDS,
City Clerk.
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September 1st, 1911.

Town of Scott

Sealed tenders will be received by G. M. Phillips, Secretary-treasurer, of the Town of Scott, Sask., until noon of Monday, September 25, 1911, for supply and delivery of the following machinery and materials, and for the performance of certain works.

Tender A.—Supply and Delivery of—

Generator and exciter and switchboard.
Transformers and meters.
Series tungsten street lighting system.
Pumping machinery.

Tender B.—Supply and Delivery of—

Two pneumatic storage tanks.

Tender C.—Supply and Delivery of—

Approximately 2,200 ft. of 8-inch steel wire pipe.
Approximately 7,000 feet of 6-inch steel water pipe.
Approximately 5,400 feet of 4-inch steel water pipe.
Approximately 15 hydrants and 22 valves.

Tender D.—

Trenching and laying steel water pipe, setting hydrants, valves, etc., and back filling.

Tender E.—

Erection of a power house and construction of a reservoir.

Plans and specifications may be seen at the offices of the Canadian Engineer, Winnipeg, Toronto and Montreal, and at the Consulting Engineer's office, Bottomly Block, Saskatoon.

A marked cheque for five per cent. of amount of the tender must accompany each bid.

The lowest or any tender not necessarily accepted.

McARTHUR & MURPHY, Engineers,
Bottomly Block, Saskatoon.

G. M. PHILLIPS, Sec.-Treasurer,
Scott, Sask.

Trench Machines

Parsons—Cuts trench 27 in. to 60 in., to 20 ft. deep, fine order.

Parsons—With Mattes Back Filler, cuts trench 28 in. to 78 in. to 20 ft. deep. Overhauled and first class. Write us if you have anything to sell, or if in want of anything.

THE MALES CO.

No. 82 Perin Building, Cincinnati, O.

Gravenhurst Water Works

Tenders will be received up to September 20th next for a Steel Water Tower, cast iron pipe, etc., required to extend the Gravenhurst Waterworks. For all information apply to

BOWMAN & CONNOR,
Consulting Engineers,
Berlin, Ont.

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Department of Railways and Canals, Canada

INTERCOLONIAL RAILWAY

Baddeck Branch Line

Sealed tenders addressed to the undersigned and endorsed "Tender for Alba-Baddeck Branch," will be received at this office until sixteen o'clock on Thursday, October 12th, 1911, for the construction of a branch line of railway from a point on the Intercolonial Railway near Alba to the town of Baddeck, a distance of 22.7 miles.

Plans, specifications and form of contract to be entered into may be seen and full information obtained on and after 15th inst., 1911, at the office of the Chief Engineer of the Department of Railways and Canals, Ottawa, and at the office of the Chief Engineer of the Intercolonial Railway at Moncton, N.B.

Parties tendering will be required to accept the fair wage schedule prepared or to be prepared by the Department of Labor, which schedule will form part of the contract.

Contractors are requested to bear in mind that tenders will not be considered, unless made strictly in accordance with the printed forms, and in the case of firms, unless there are attached the actual signature, the nature of the occupation and place of residence of each member of the firm.

An accepted bank cheque for the sum of \$30,000, made payable to the order of the Minister of Railways and Canals must accompany each tender, which sum will be forfeited if the party tendering declines entering into contract for the work, at the rates stated in the offer submitted.

The cheque thus sent in will be returned to the respective contractors whose tenders are not accepted.

The cheque of the successful tenderer will be held as security, or part security, for the due fulfilment of the contract to be entered into.

The lowest or any tender not necessarily accepted.

By order,
L. K. JONES,
Secretary.

Department of Railways and Canals,
Ottawa, September 9th, 1911.

Newspapers inserting this advertisement without authority from the Department will not be paid for it. 37-38

For Sale

One R. McDougal engine lathe, new, swing over bed 30-in., distance between centers 20 ft., with motor drive; also one set of 3-in. raising blocks. Price \$2,050. Address, The Canadian Pipe Company, Limited, 550 Pacific street, Vancouver, B.C. 35-37

TENDERS

Toronto General Hospital

Tenders addressed to the Chairman of the Building Committee will be received by the undersigned up till noon, Saturday, September 23rd inst., for all the various trades required in the erection and completion of the Private Patients' and Obstetrics Buildings in connection with the General Hospital.

Plans and specifications and all other information can be obtained at the office of the Architects,

DARLING & PEARSON,
2 Leader Lane, Toronto.

The lowest or any tender not necessarily accepted. 37-37



Department of Railways and Canals

HUDSON BAY RAILWAY

Notice to Contractors

Sealed tenders for the following supplies addressed to the undersigned and endorsed "Tender for Track Materials for the Hudson Bay Railway," will be received at this office until 16 o'clock on Monday, the 16th day of October, 1911.

30,000 gross tons steel rails 80 lbs. per yard.
1,700 gross tons splice bars.
2,100 kegs track bolts and nuts, 200 lbs. per keg.

8,000 kegs track spikes, 200 lbs. per keg.

Specifications, drawings, forms of tender, and form of contract to be entered into can be seen on and after Tuesday, August 22nd, at the office of the Chief Engineer of the Department of Railways and Canals, Ottawa and at the office of the Chief Engineer of the Hudson Bay Railway, Winnipeg, at which places forms of tender may be obtained.

Contractors are requested to bear in mind that tenders will not be considered, unless made strictly in accordance with the printed forms, and in the case of firms, unless there are attached the actual signature, the nature of the occupation, and place of residence of each member of the firm.

An accepted bank cheque equal to five per cent. of the tender made payable to the order of the Minister of Railways and Canals must accompany each tender, which sum will be forfeited if the party tendering declines entering into contract for the work, at the rates stated in the offer submitted.

The cheque thus sent in will be returned to the respective contractors whose tenders are not accepted.

The cheque of the successful tenderer will be held as security, or part security, for the due fulfilment of the contract to be entered into.

The lowest or any tender not necessarily accepted.

By order,
L. K. JONES,
Secretary.

Department of Railways and Canals,
Ottawa, September 6, 1911.

Newspapers inserting this advertisement without authority from the Department will not be paid for it. 37-38

**Intercolonial Railway
Passenger Station, Truro,
Nova Scotia**

Extension of Time

The time for receiving tenders for the construction of a "Stone Passenger Station" at Truro, Nova Scotia, has been further extended from Thursday, the 31st August until 12 o'clock noon on Friday, the 15th September, 1911.

By order,

L. K. JONES,
Secretary.

Department of Railways and Canals,
Ottawa, August 24th, 1911.

Newspapers inserting this advertisement without authority from the Department will not be paid for it. 35-36



Sealed tenders addressed to the undersigned, and endorsed "Tender for Renewing Wharfs and Construction of Boat House at Kingston, Ont., will be received at this office until 4.00 p.m. on Monday, September 25, 1911, for the construction of a Boat House and the renewal of Wharfs at Kingston, Royal Military College, Frontenac County, Ont.

Plans, specifications and form of contract can be seen and forms of tender obtained at this Department and at the offices of J. G. Sing, Esq., District Engineer, Confederation Life Building, Toronto, Ont., and on application to the Postmaster at Kingston, Ont.

Persons tendering are notified that tenders will not be considered unless made on the printed forms supplied, and signed with their actual signatures, stating their occupations and places of residence. In the case of firms, the actual signature, the nature of the occupation, and place of residence of each member of the firm must be given.

Each tender must be accompanied by an accepted cheque on a chartered bank, payable to the order of the Honorable the Minister of Public Works, equal to ten per cent. (10 p.c.) of the amount of the tender, which will be forfeited if the person tendering decline to enter into a contract when called on to do so, or fail to complete the work contracted for. If the tender be not accepted the cheque will be returned.

The Department does not bind itself to accept the lowest or any tender.

By order,

R. C. DESROCHERS,
Secretary.

Department of Public Works,

Ottawa, August 25, 1911.

Newspapers will not be paid for this advertisement if they insert it without authority from the Department. 36-36

Residences

(Continued from page 59.)

garage, Bank street. A. Tracy, architect; Geo. Bourgeson, builder, \$1,500. H. G. Stanley, dwelling, Flora street; J. W. Stanley, builder, \$2,000. A. Dewar, alterations to residence, Florence street, McDiarmid & Tyndall, builders, \$1,300. W. D. Morris, garage, Allan Keefer, architect; McDiarmid & Tyndall, builders, \$1,650. Simon Ritchie, dwelling, Murray street, \$2,900. John Robertson, warehouse, Albert street, McDiarmid & Tyndall, builders. P. J. MacNamara, dwelling, Bronson ave., \$2,500.

Toronto, Ont.

Tenders are called for residence, to cost \$4,500, Bedford road, for Alexander & Son, 143 Adelaide street, Toronto. 2-sty., 62 x 22, brick and stone, hot water

heating, felt and gravel roof, hardwood floors, electric lighting.

Tenders are called for apartments to cost \$25,000, on Jarvis street, for J. Plewes and J. H. Carter, 25 McMaster ave., Toronto; architect, Wm. Fraser, 59 Yonge street. 3-sty., 103 x 50, steam heating, electric lighting, felt and gravel roofing, interior finish white pine, plate glass.

Addition to residence, \$3,000. (29-31 Rolyat street) for H. Buie, 372 Crawford street, Toronto. Architect, P. H. Finney, 43 Victoria street, Toronto. 2 storeys, 44 x 32, brick construction, brick foundation, hot air heating, electric lighting shingle roofing. Work to be done by day labor.

Tenders called for residence on Pauline avenue, to cost \$25,000, for Knifton & Poultney, 266 Symington avenue, Toronto. Architect, J. Hunt Stanford, Yonge street Arcade, Toronto. 2 storeys, 22 x 33, brick, stone foundation, hot air heating, combination lighting, open plumbing, shingle roof, interior finish pine, cement work, cut stone, brick tile, mantels, electrical work, electric bells, shingle stain, plate glass, art glass.

Tenders called for two par dwellings, \$6,000, by Phillip Wyatt, 82 Dagmar street, Toronto. Architect, P. H. Finney, 43 Victoria street, Toronto. 2-storey, 16 ft. 4 in. x 44, rough-cast, brick front, concrete foundation, hot air heating, electric lighting, shingle, felt and gravel roofing, cement work, brick.

Tenders called for apartments, \$8,000 (W. S. Close avenue) by G. P. Hughes, 81 Portland street, Toronto. Architect, F. R. Berry, 1107 College street, Toronto. 2 storey, 27 x 37, brick, brick foundation, hot water or steam heating, electric lighting, felt and gravel roofing, hardwood floors, cement work cut stone, tile, mantels, electrical work, telephone system, steel beams.

Tenders called for apartments, \$12,000 (Wilson avenue). Owner, J. Arent, 77 Wilson avenue, Toronto. Architect, J. Feldman, 199 Yonge street; 2 storeys, 55 ft. x 42 ft., brick, stone foundation, felt and gravel roofing, steam heating, electric lighting, hardwood floors, cut stone, artificial stone, metallic lath, sheet metal work, telephone system, electric bells, steel beams, speaking tubes. Tenders called by owner.

Tenders called for residence, \$3,000. Architect, W. H. Mallory, 31 Queen W. Toronto. 2½ storeys, 50 ft. 6 in. x 13 ft., brick, stone foundation, shingle roofing, hot air heating, electric lighting, cement work, brick, tile, mantels, electric work, electric bells, shingle stain. Tenders close September 9th.

CONTRACTS AWARDED

Halifax, N. S.

Residence, \$6,000 (Connaught ave.). Owner, J. W. Regan, 39 Victoria road. Halifax. Contractors, Thompson & Theakston, 3 storeys, concrete foundation, electric light, electric bells.

Montreal, Que.

Domina Cusson, 171 Cartier Park, has been awarded the contract for four flats, \$7,000, being erected by Philippe Blais, 296 Prud'homme ave., 2-sty., 25 x 63, pressed brick construction, gravel roofing, cement foundation, hot water heating. R. Charbonneau, 52 St. James st., architect.

Toronto, Ont.

Residence, \$3,000. Owner, F. Guscott, 60 Gormley avenue, Toronto. Architect, P. H. Finney, 43 Victoria street, Toronto. General contractor, G. Harron, Lawton avenue, Toronto. 2 storeys, 32 x 22, brick, stone foundation, hot water heating, shingle roof, elec. light.

Westmount, Que.

J. H. Scott, 242 Sherbrooke street, W. will erect a residence, \$12,000, on Roslyn avenue, brick and concrete, 3 storeys, general contractor, John Allan, 300 Atwater avenue.

Vancouver, B. C.

Residence, \$100,000, for E. P. Davis, K. C., 1117 Seaton Street, Vancouver. Architects, Maclure & Fox, Pacific Building, Vancouver. General contractor, J. J. Disethe, 570 Granville St., Vancouver. 3 storeys, 60 x 130, stone and plaster panels on metal lath, hot water heating, hard wall plaster, ornamental brick work, walnut mantels, interior finish Circassian walnut; masonry and excavation contracts let at once. Other contracts called in three weeks.

Business Buildings and Industrial Plants

Alliston, Ont.

Work in progress for erection of a factory for F. M. Brown, Alliston. 2 storeys and basement, 42 x 120, brick, cement foundation, electric lighting, interior finish wood, artificial stone, 60 windows, 7x8, 160,000 bricks required. Tenders for superstructure to be in by Sept. 15th. Roman stone, bricks and glass to be purchased.

Contemplated smokestack for the Alliston Electric Light Co. Manager, W. J. Fletcher, Alliston. Contractor who can advise as to requirements will likely get contract.

Brampton, Ont.

A by-law will be submitted on September 25th to guarantee bonds of a company planning to erect a plant here to manufacture shoes, etc. W. H. McFadden, clerk.

Calgary, Alta.

Permit has been granted to the Herald Western Co. for building, 2 storeys, 75 x 192, cost \$30,000.

Canora, Sask.

Tenders called for hotel. Owner, S. Cohen, Canora, Sask. Architect, J. H. Bossons, Dauphin, Man. 4 storeys, brick, cement foundation, cut stone, steam heating, oak interior finish, fire escapes, iron columns, skylights, cement work, cut stone, metal ceiling, electric bells. No date set for receiving of tenders.

Coaticook, Que.

Equipment required for mill. Owner, A. H. Cummings & Son, Ltd. Required, saw mill engine, 125 h.p., Dec. 1st or before. Expenditure to be made, \$1,000. The plant consists of saw, shingle and clapboard mill.

Chilliwack, B. C.

R. V. Winch, 739 Hastings W. Vancouver, acting for an English syndicate has purchased the water rights of the Paterson-Eckert Lumber Co. and 110 acres of land with options on more. It

is understood that a cement plant will be erected to cost \$500,000.

Campbellton, N. B.

Plans being prepared for business block for B. A. Mowat Company. Architect, F. Neil Brodie, St. John. N. B. 3 storeys, 80x35, pressed brick, concrete foundation, steam heating, electric elevators.

Comox, B. C.

Contemplated lumber mill, \$60,000, for Canadian West Lumber Co., 16 Hastings W. Vancouver. A. B. Pracna, 821 Pender street W. Vancouver, has been instructed to prepare plans for a mill near here. Plant will consist of 1 band mill, 60,000 ft. daily; planing mill, but no dry kilns.

Edmonton, Alta.

A four-sty. warehouse will be erected at the northwest corner of Fourth and Athabasca streets, by Foley Bros. & Lawson.

The sandstone quarries, owned by W. Wade, Edmonton, along the banks of the Brazeau river, are about to be developed by eastern capitalists. The necessary plant equipment is estimated to cost about \$25,000. Geo. E. Turner, commissioner on school buildings, is interested.

Fernie, B. C.

John Todhunter, Fernie, is financing a plant to manufacture fire brick, much fire clay being located in the vicinity.

Gilbert Plains, Man.

Tenders called for store, \$10,000. Owner, Richard Green, Gilbert Plains, Man. Architect, J. H. Bossons, Dauphin; brick, cement foundation, plate glass, steam heating. No date for receiving of tenders set.

Hamilton, Ont.

Factory, \$1,000,000 (Gage's Inlet). Owner, Grasselli Chemical Co., Cleveland, Ohio. Architect, Company's. This company has announced its intention to locate in Hamilton. Company manufactures chemicals and will require machinery.

Halifax, N. S.

Union Bank of Canada, Halifax, will make extensive alterations to their building to cost \$20,000. Contractor, S. M. Brookfield, Halifax. Permit granted Aug. 30th.

Indian Head, Sask.

Work in progress for erection of a garage for E. W. Williamson, Indian Head. This building when completed will be used for the repairing of automobiles, being equipped with all the latest machinery, and supplied with the necessary automobile supplies, tires, oil, etc.

London, Ont.

The Jose Gaste Cigar Company will build a new brick garage at their factory, 19 King street. All information at the company's office.

Architects Moore & Henry, London, have plans for a 3 storey brick warehouse on Piccadilly street, 40x100, electric lighting, and probably steam heating. Tenders will be called at once.

Extension to warehouse for W. E. Saunders, wholesale druggist. Contractor for brick work, Geo. Hayman. Contractor for carpentry, Tambling &

Jones. Heating and lighting not let yet.

Montreal, Que.

The city is planning the erection of a fireproof machine shop to cost \$60,000. Site not selected. Machinery worth \$20,000 for iron working for fire department will be required.

Montreal, Que.

Plans are being prepared for bakery, \$40,000 (Mance and Laurier avenue) for The Stuart Company, 611 Rivard street. President, E. J. Stuart. Architect, L. R. Montbriand, 230 St. Andre street. Tenders called in about a month.

Ottawa, Ont.

Tenders called for stores, \$14,000. (York street). Architect, W. E. Noffke, Central Chambers, Ottawa. 2 storeys, 50x50, brick, concrete foundation, hot air heating, (four furnaces) electric lighting, steel beams, pressed brick fronts, tar and gravel roof, plate glass.

Red Deer, Alta.

Plans being prepared for garage for Red Deer Garage Co. Building to be of brick with steam heating system.

Tenders to be called for addition to factory, \$8,000. Owner, The Gaetz manufacturing Co. Architect, C. A. J. Sharman, Red Deer. 2 storeys and basement, 60x25, concrete and brick, steam heating. Tenders to be called shortly.

Regina, Sask.

Work in progress for warehouse, \$55,000, for The Regina Cartage Company. Contractor, Wascana Construction Company, Regina. Manager, W. G. Bishop. Building is expected to be finished this fall.

Simcoe, Ont.

The ratepayers will vote on the granting of \$30,000 for the establishment of lithographing plant, on September 12th. Town clerk, W. C. McCall.

South Vancouver, B.C.

Machinery required, rock crusher and roller. Crusher must have daily capacity of 400 tons of 2-in. crushed rock; 12-ton roller. Tenders for crusher now being called. Tenders for roller to be called at once.

St. John, N.B.

Twelve city lots were sold recently to interest understood to represent Ganong Bros., candy manufacturers, of St. Stephen, N.B. Belief is general they are soon to establish their plant or a branch here. The same firm have been negotiating for the purchase of the plant of T. S. Simms Co., brush manufacturers. In the absence of President L. W. Simms, officials of the latter company will neither confirm or deny report of purchase.

J. M. Robert, St. Blaise, Que., is about to build a large warehouse at the Grand Trunk Railway station, wood and iron, metal roof and elevator, iron blinds etc. Work will be done by day labor.

Toronto, Ont.

The Devonshire Mfg. Co., of 65 St. Nicholas street, will erect a \$3,000 factory at 50 Davenport road, 2-sty., 34 x 60, brick and concrete, concrete founda-

tion, felt and gravel roofing. F. J. Bird, 115 Ashdale ave., architect.

Material required for grain elevator and feed mill, \$100,000, West Market st. pier. Owners, J. L. Dennison-Taylor, Standard Stock Exchange, Toronto; engineer, C. B. Foster, West Market street pier, Toronto, and Buffalo, N.Y. 7-sty., 80 x 94 ft. 4 in., reinforced concrete, felt and gravel roofing, freight elevator, wire glass. Peter Arnot, foot of Berkeley street, Toronto, contractor for crib work.

Tenders called for store and dwellings to cost \$4,000, Royce ave. Owner, W. O. McTaggart (in trust) 972 Bloor st. west, Toronto; architect, W. G. Hunt, Dovercourt road, Toronto. Two-stys., 30 ft. 11 in. x 57 ft., brick and stone, stone foundation, hot water heating, electric light, felt and gravel roof.

Tenders to be called for alterations to hotel, from September 15 until September 25. Owner, M. J. Clancy, 1150 Queen street west, Toronto; architect, C. J. Read, 404 Confederation Life Bldg., Toronto. Brick, steam heating.

Vancouver, B.C.

The Marshall-Wells Hardware Co., headquarters in San Francisco, are considering the location of a branch here. This firm handle heavy and shelf hardware.

A Vancouver syndicate will erect a \$300,000 to \$500,000 hotel at Hong Kong, China. Perry & Nicholais, 324 Pacific Bldg., Vancouver, are the architects.

Kwong Wo Yuen & Co. are contemplating the erection of a new hotel on Powell street with concrete foundation, steam heating, hard wall plaster. Tenders will not be called for some time, operations having been delayed for about five weeks. Estimated cost, \$20,000.

Permits granted for four stores and rooming houses, (Chinese quarter) for Chung Hing & Co., 527 Carrall street, Vancouver. Architect, E. Stanley Mitton, 413 Granville street, Vancouver. 3 storeys (each) brick. Proposed expenditure, one, \$49,000, one, \$77,000, two at \$14,000 each, one at \$27,000, and others totalling \$140,000. Final arrangements for erection not complete.

Winnipeg, Man.

Contemplated, factory, for the Canada Cement Company. General Manager, F. P. Jones, Montreal. Application for power and light has been made to the city, and a site selected in the city limits, south of the Assiniboine river.

Yarmouth, N.S.

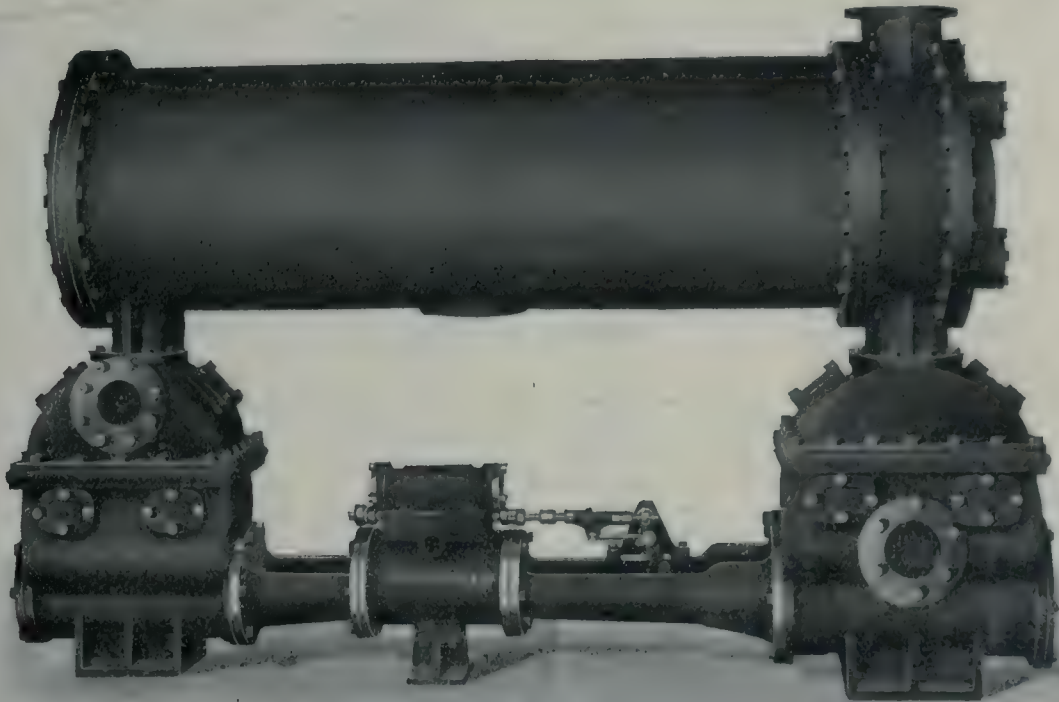
Tenders called for telephone building until September 18, Central street, for Nova Scotia Telephone Co., Ltd.; general manager, J. H. Winfield, 90 Hollis street, Halifax; architect, H. E. Gates, Halifax. Erection of 2-sty. concrete building. Plans, etc., at office of Yarmouth Amalgamated Telephone Co., Yarmouth, or at office of architect.

CONTRACTS AWARDED

Brockville, Ont.

Stores, \$6,000. Owner, F. J. Kincaid, Brockville, Ont. Architect, A. Stuart Allaster, Brockville, Ont. Masonry contractor, Pattison & Fox. Plumbing, Brown & Semple, both of Brockville. Heating contract not yet let.

CONDENSORS



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BOILERS, ENGINES, PENSTOCKS,
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ing Machinery, Special Machinery of all kinds

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The **John Inglis Company**

Engineers and Boilermakers

Limited

14 Strachan Ave., TORONTO, Canada

Continued from page 62.

Fort William, Ont.

Stores, \$5,500. Owner, Geo. A. Graham, Fort William; architect, Carl Wirth, Fort William; general contractor, R. E. Wright, Fort William. 1-sty. 66 x 100, Soho brick.

Fredericton, N. B.

Foundry for Messrs. Smith Bros., to cost \$15,000. Architect, W. E. Minue. General contractor, Thos. Myles, St. Mary's, N. B. 2 storeys, 94x174, concrete floor, monitor roof supported by wooden trusses, brick, fire walls.

Hamilton, Ont.

The contract for erection of store-rooms for Sawyer Massey Co., was awarded on Sept. 1st to Geo. Mills, 614 King street east, \$15,000; mill construction, 300x75, 1 storey. No other contracts to be let.

Montreal, Que.

Bank, \$19,000 (Fairmont avenue) for Bank of Ottawa. Architect, H. C. Stone, 84 St. Francois Xavier street, Montreal. General contractor, E. G. W. Cape, Beardmore Building, Montreal. 2 storeys, 29x71, cement work, cut stone, steel beams, marble, vaults, reinforced concrete, plate glass, metallic lath. No sub-contracts let as yet.

The contracts for a \$6,000 garage on Ontario ave., for Senator J. M. Wilson, 35 Ontario ave., have been awarded as follows: Masonry, M. Huberdeau, 633 Demontigny; carpentry, the W. Pauze & Son Co., corner Notre Dame west and Green ave.; 2-sty., stone and brick; Saxe & Archibald, architects.

Toronto, Ont.

Warehouse to cost \$100,000, for Steele Briggs Seed Co., Ltd.; architect, Sproatt & Rolph, 90 Yonge street. Following contracts awarded: Masonry, J. A. Wickett, Ltd., 678 Broadview ave.; roofing, C. H. Williams & Co., 23 Toronto street; painting, Faircloth Art Glass & Decorating Co., 64 Richmond street E., all of Toronto.

**Power Plants, Electricity and
Telephones****Victoria, B.C.**

The council have decided to have 35 arc lights placed in the residential districts. Tenders will be called for 10,000 lbs. of line wire.

Hamilton, Ont.

Engineer, E. I. Sifton, London, Ont. Specifications are now being prepared for supply of Municipal power plant. Public buildings to be wired this year. Plant to be started next year.

London, Ont.

Plans being prepared for new brick shops, 30x100, (adjoining Horton street sub-station), for City Electrical Dept. Plans, etc., at office of Superintendent, Mr. Glaubitz.

Winnipeg, Man.

Tenders received by the Chairman, Board of Control, until 11 a.m. Sept. 12th, for manufacture and delivery f.o.b. Winnipeg, of the following: Section "A" D. C. and A. C. meters; Section "B" transformers and cutouts; Section "C" line oil switches. Specifications at office of the general manager, City Light & Power Department, 449 Main street, Winnipeg.

Building Permits**Montreal, Que.**

Four dwellings, \$3,000, Jobelle street; owner, Lambert Freres, 324 Prefontaine; brick and wood, 23 x 38, 3-sty. Three dwellings, \$6,000, Delorimer street, Z. Martet, 1306 Bordeaux street; brick and stone, 25 x 90, 3-stys. Two dwellings, \$5,500, Waverley; Paul Dewers, 115 Van Horne ave.; A. Pampalon, architect, 607 Frontenac; brick and wood, 50 x 40, 3-stys. Two flats, \$2,000, Dufferin street; owner, Alphonse Garipey, 2270 St. Hubert; wood and brick, 25 x 50, 2-stys. Three flats, \$3,500, Mance street; A. Lamontagne, 2313 St. Lawrence street; pressed brick, 25 x 40, 3-stys. Two dwellings, \$3,000, Dufferin street; Gideon Dumouchel, 1190 Dufferin street; wood and brick, 25 x 40, 2-stys.

Vancouver, B.C.

Recent permits include: 1½-sty. frame residence, \$2,000; owner, David Main, P.O. Box 890. 2-sty. frame residence, \$6,000; owner, W. W. Stewart, 1825 Robson street. 3-sty. brick and hotel annex, \$15,900; owner, Sam Kee. Two 2-sty. frame residences, \$4,400, Smith & Buchanan; contractor, John Buchanan, 827 8th ave. 2-sty. frame stable, \$3,000; owner, Brooks & Windipp, 1533 Main street; contractor, Edward Marfleet, 228 Columbia. 2-sty. furniture factory, \$3,-

000; owner, M. & J. Westwood, Nanaimo, B.C.; contractor, H. O. Hatt & Co., 2331 Albert a street. 6-sty. brick warehouse, \$50,000; owner, Western Warehouse Co., Ltd.; contractor, Adams Construction Co., Ltd., 441 Seymour street, 5-sty. brick warehouse, \$27,000; owner, Buckley & Baker; contractor, Geo. B. Baker, 835 10th ave. west. 2-sty. frame residence, \$2,250; owner, J. W. Winter, care Champion & White; contractor, F. C. King, 1942 2nd ave. west. 1½-sty. residence, \$3,000; owner, J. S. Skeffington, 1741 Bismark.

Winnipeg, Man.

Dwelling, \$6,000, Dorchester ave., for H. J. Greenfield; two dwellings, \$6,600, Lenore street, for A. J. Anderson, 247 Lipton street; two dwellings, \$6,000, Jubilee ave., for A. G. Davidson, 306 McIntyre Block; three dwellings, \$7,800, Weatherdon ave., for J. Levin, 482 Selkirk ave., for J. Levin, 482 Selkirk ave.; four dwellings, \$4,000, Wolfe street, for G. Baskin, 517 Castle ave.; dwelling, \$2,300, St. Johns ave., for P. Schivien, 390 Albert street; dwelling, \$2,000, Ross ave., south side, for W. Gell, 1516 Ross ave.; dwelling, \$15,000, Kingsway ave., N. S. Harrow and Stafford, for N. T. McMullan; P. N. Keller & Sons, builders; C. A. L. Fisher, 301 N. Crown Bank, stores and offices, \$10,000, work to be done by day work; six dwellings, \$16,800, Home street, for W. Gray & Co., 216 Rugby street; dwelling, \$4,500, Arlington street, for Arnie Eggerton, 204 McIntyre Blk.; two dwellings, \$4,400, Machray ave., N. S. Salter and Powers, for Greenberg Bros., 217 Jarvis ave.; dwelling, \$4,500, Home street, W. S. Wolseley and Ida, for W. McIntosh, 413 Agnes street; dwelling, \$3,000, Aikins street, E. S. St. Johns and Mountain, for H. F. Wilson, 685 Agnes street; dwelling, \$3,000, Evanston street, W. S. Wolseley and Ida, for J. W. Phillipson, 54 London Block; two dwellings, \$2,400, Martin ave., S. S. Brazier and Rock, for P. Callighan, 28 Leslie ave.; two stys. on hospital building, \$10,000, River ave., S. W. corner Rose street, for D. T. Beath, 775 Bannatyne ave.

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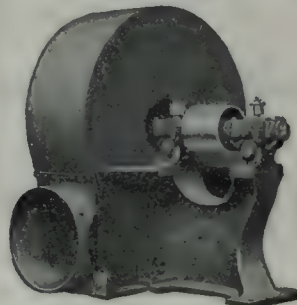
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We have built many of these in Canada the United States and Mexico. Estimates cheerfully furnished.

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Polson Iron Works Ltd., Toronto Eadie-Douglas Ltd., Montreal

Contract Record

ESTABLISHED 1886

A Weekly Journal of
Building, Contracting, Engineering, Public Works
Municipal Progress, Advance Information

PUBLISHED EACH WEDNESDAY BY

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SUBSCRIPTION RATES

Canada and Great Britain, \$2.00. U. S. and Foreign, \$2.50

Vol. 25 September 20, 1911 No. 38

Get the Best Man and Pay Him

The engineering branch of municipal officials is the prime source of the expenditure of local authorities. It is they who, at any rate in the first place, have to advise. Even if later a consultant be employed, it is they who in many cases have to design and to carry out, to maintain and to work. The expenditure incurred under their responsibility runs to millions, and this expenditure may be economic or wasteful according as the engineer is capable or incapable. The more deeply the position of the engineer is examined, the more forcibly is driven home the conclusion that the authority is wrong if it does not engage the very best man available and pay him proportionally to his responsibility. An incompetent engineer can waste many times the amount of his salary most years because of his incompetence, and only the highest expert can recognize that such waste is going on. With all due respect to the average member of city councils, he is not an expert, and he does not know, hence his utter dependency upon the ability and honesty of his professional adviser. The fault of the city council is historic—a legacy from the Dutch, who, we know, were fond of "giving too little and taking too much."

Alien Labor on Railroad Construction

The decision handed down at Victoria, B. C., last week, in which a firm of contractors for the Canadian Northern Railway on Vancouver Island were fined \$100 for having brought in alien labor from Seattle to work on railway construction, is perhaps worthy of more than passing note. For the defence it was contended that the contractors were not responsible inasmuch as the men were taken on by sub-contractors. The magistrate, however, was unable to accept this explanation and found there to be a direct connection between contractors and sub-contractors in regard to the hiring of labor. The offence was a

breach of the Immigration Act, under which enactment the local immigration officers were instructed.

Between the Immigration Act and the Alien Labor Act contractors would seem to be unnecessarily hampered in Western Canada, and some modification of the regulations governing the employment of labor is surely a matter worthy of some consideration. The greatest need of the western section is labor. The country is expanding at a far greater rate than it is being peopled and long after our day the demand for those who handle the pick and shovel will exceed the supply. We do not object to the fine of \$100, for legislation is made to be observed, but we do object to the stringency of the regulations under which such a fine is levied.

The Engineer's Estimate

What is an engineer's estimate? For years it has been little more than a guess at the cost of the proposed work, even when the actual quantities of the work to be done were known and changes in the construction not found necessary. To a more or less extent this has been caused by engineers using prices of other construction work when preparing estimates, rather than arriving by proper means at the actual costs. Therefore such an estimate was practically guesswork, and if the quantities were subject to change, and the prices guesswork, it is evident that the total estimate would vary exceedingly. There have been numerous examples of this character. A long list of great undertakings which have cost many times the estimated cost could be cited. The most recent example is that of the Panama Canal.

However, a great improvement has been made in this connection during the last decade. Engineers are learning much about costs, and much has been written on the subject, so that in some cases engineers are more proficient in such matters than contractors, many of whom still guess at construction costs. Nor are engineers always to blame for incomplete surveys and low estimates. Frequently tentative estimates are used on purpose by officials of corporations and promoters, as complete estimates on underground exploration and surveys have in the past, in many cases, been poorly made, with the result that from lack of knowledge the work has cost much more than the estimated figure. Then, too, sweeping and decided changes in the plans, which the engineers may have advocated from the start, are ordered after the estimate has been made. It has been stated that a competent engineer, knowing as he does that these things will affect his estimate and throw discredit on his work, does wrong in submitting himself to such criticism, but it should be borne in mind that engineering positions are difficult to obtain, and if an engineer resigns, another would doubtless soon take his place and do the same things.

When it Hits the Contractor

Contractors often suffer from the discrepancies and blunders in estimates. Should the work be of a public nature, the ultimate contract price may exceed the appropriation and the contractor may be held up on his work, or on his final payments, or it may also happen that the contractor cannot recover for all the work which he has carried out. If the contract is a private one, the extra cost may mean the financial ruin of the enterprise, with the conse-

quent stoppage of the work, and a possible heavy money loss to the contractor. Another manner in which contractors are affected by engineers' estimates is in the letting of work, and the use of engineers' estimates in accepting and rejecting tenders. For instance, an engineer's estimate for a proposed sewer may be much too low, and after a number of contractors have each spent considerable time in making investigations and estimates and in submitting proposals, they are informed that their tenders are rejected. This may happen several times for the same job.

Should Be Made Public

There are some people who believe that when an engineer's estimate is to be used as a basis for accepting or rejecting tenders this estimate should be made public before the tenders are submitted, so that the contractor can have the estimate verified, and if it is found too low, need not waste time and money in tendering. This has been done in some instances. To make public the engineer's estimate is to show confidence in contractors, and, inasmuch as the engineer and his assistants have spent considerable time and money in getting up the estimate, it would be a vast assistance to the contractor who may have but a few days to prepare an estimate. If the estimated quantities are made public, and as a rule they are, then there is every reason why the estimated price of the engineer should be made public. In public contracts the proposal is often made a part of the contract, so it would seem advisable to make the engineer's estimate a part of the contract. This would serve several purposes. It would fix upon the engineer the responsibility of making a correct estimate. It would serve to fix the cost of the work, and to show prospective profits, in case a contractor, after understanding the work and obtaining the contract, finds he is losing money and, by picking a flaw in the contract or specifications, throws up the job and brings suit for prospective profits. Then the engineer's estimate, being a part of the contract, could be introduced as the work of an expert, showing the cost of the construction with a reasonable profit, as made up before the contract was let.

An Important Opinion on the Comparative Economy of Day Labor and Contract Work.

In their report on the sewerage and sewage disposal of New Bedford, Mass., the engineers, Metcalf & Eddy of Boston, predicate their estimates of cost "upon the assumption that the work will be done by contract under competitive bidding." Continuing, the engineers say:

"We assume that such portions of the work as might be done by the city in preference to contract work would be likely to cost 25 per cent. or thereabouts, more than if built by contract under competitive bidding, unless the conditions in New Bedford are very different from those to be found in the majority of our New England cities—even where the standard of public work is good."

The report mentioned contains several conclusions of interest which we abstract, but there is none of them which is more significant to us than the statements quoted, says Engineering and Contracting. These statements are not based on general impressions but upon ascertained facts; they do not express theories but conditions. It is because this difference

is so easily overlooked that we have advocates among engineers of the general policy of constructing public works by day labor instead of by contract, and for this reason the difference deserves emphasizing frequently.

The assumption of the engineers who report on the New Bedford sewerage work that day labor construction is likely to cost more than construction by contract is based on a more than usually exact knowledge of facts. In their work for the Boston Finance Commission these engineers in 1908 made a careful investigation of day labor and contract work costs in New England cities. Incidentally they found that the policy of day labor construction was especially prevalent among New England cities. Speaking precisely they obtained statements from about one-half of the cities of the United States of over 30,000 population as to the method generally employed by them. These statements showed that work was done by contract in 71 per cent. of all cities; in 94 per cent. of all cities outside of New England; in 67 per cent. of all New England cities, and in only 6 per cent. of the New England cities of Massachusetts. Contract and day labor work cost comparisons were made for 16 New England cities only, since their records were more important for the purpose in hand. In investigating the experience of these 16 cities, the engineers were not content with the book records alone. A competent assistant visited each city, studied the local conditions, and verified the records by evidence collected on the ground. The details of these studies are referred to here solely to demonstrate that the conclusions reached were not based on cursory investigation. These conclusions are summarized as follows: "The average contract price for labor is \$1.17 per foot of 12-in. sewer as compared with \$1.79 for day labor, showing a saving of 62 per cent. per foot, or about 34 per cent. in favor of contract labor."

These figures fully warrant the statements quoted from the New Bedford sewerage report in the opening paragraph of this discussion. If such differences prevail between contract and day labor costs of municipal work in New England may we not assume that they prevail elsewhere? Certainly the standards of public work and of city management are not less high in New England than in other sections. But one is not limited to general reasoning for proof. Wherever a careful investigation has been made of the cost of day labor work on public works it has been found to exceed the prevailing costs of contract work. A dozen such records can be cited from the columns of this journal during the past two years.

These are the conditions. Strangely enough, they are not sufficient to dull the glamour of theoretical possibilities. One has only to mention the possibility of saving the contractor's profit and the cost of inspection to get attention, despite the often proved fact that inspection cannot safely be omitted under any condition and the fact that the contractor's profit is simply the charge made for skilled management and the use of plant and money which must be met in one way or another however the work is done. One might name in sequence all the other advantages claimed for day labor and answer them quite as conclusively. There is not a single reason ordinarily presented for doing work by day labor that cannot be successfully combated. On the other hand the fundamental reason for efficiency, namely payment in proportion to work done, which is an absolutely con-

trolling principle in contract work, does not hold in day labor work, as it is universally conducted.

In pointing out that their estimates of the cost of sewerage at New Bedford are based on contract costs and that a percentage of increase must be added if day labor work is adopted, the engineers have introduced a unique feature in presenting estimates.

In connection with these remarks it is of significance to note the article on The Railway as a Manufacturer, which we publish elsewhere in this issue. We commend the author's reasoning to those who cannot see why a city is not able to crush its own stone or cast its own valves and hydrants as cheaply as can commercial plants. Referring to railways as manufacturers the article says:

It is true that the railroads can buy just as good machinery as the manufacturer; that they can employ just as good workmen; that they can procure equally as good materials. There seems to be no reason why they cannot produce just as good an article, and at no greater cost than the commercial manufacturer, but, so far as my observation goes, they do not do so except in occasional instances, and in drawing any conclusions we must deal with conditions as they are, and not as they might be or should be.

Referring again to costs the article in another place says:

It is seldom that on any work of this kind performed at a railroad shop all of the items of actual cost are included in the accounts, and it frequently happens that such operations are reported to be a good deal cheaper than is actually the case when all of the proper charges are included in the figures.

We have quoted these two paragraphs because by changing the word "railroad" to "city" they could be printed word for word in an article on "The City as a Manufacturer." If these statements are true of railways they are doubly true of a city. As a business organization the average city is not managed with a tithe of the skill and care that a railway is. This may appear a drastic criticism but analyze it and see if it is not true. Again we commend the article on "The Railway as a Manufacturer" to any who believes that a city can economically compete with the contractor or the commercial plant as a builder or manufacturer.

Effect of Good Crop Prospects in the West

The lowest estimate of the wheat crop places it at 177,400,000 bushels, with 182,250,000 bushels of oats, 34,313,000 bushels of barley, and 7,465,000 bushels of flax. Comparison of acreages under crop show that where there were 5,911,500 acres in 1905, there were 14,041,187 acres in 1910, and 16,052,710 this year. Excellent weather for plowing and the splendid crop have caused much new breaking, and it will not be surprising if the spring of 1912 sees nearly twenty million acres under crop in Manitoba, Saskatchewan and Alberta. All of this has brought a volume of business never before approached in the west. The case of Winnipeg is a fair example—enlarged beyond the ordinary of course—of business conditions in the west. There has not been a dull month, or even a dull week, since the opening of the year. At that time it was prophesied that Winnipeg bank clearings would go to the billion-dollar mark this year. Eight months' figures show that January optimism has been justified by subsequent occurrence.

es. The bank clearings for eight months and a week, amounted to \$680,473,834, or well over the two-thirds of a billion dollars required to make the going for an even billion on December 31st.

An Excellent Report from the C. P. R.

A glance at the report of the Canadian Pacific Railway for the year ending June 30, 1911, shows how rapidly this railway is covering Canada with its network of steel rails. The report of the road for the year 1910, puts the actual C. P. R. mileage at 10,270.6, and the mileage under construction at 471.4 miles. This year's report shows that the actual mileage of the company has advanced to 10,480.9 miles and that it has 983.3 miles of new track under construction. While most of the new track is, of course, being laid west of Winnipeg, there are also a number of new extensions being built in eastern Canada. The new grain route from Victoria Harbor to Bothany is the largest of these extensions under construction in Western Canada, the Saskatchewan division of the road will provide the greatest amount of new track. Here the C. P. R. has under construction 525.5 miles of lines.

Clay Products Exposition at Chicago

An exposition covering the clay-products industries will be held in Chicago March 7 to 12 of next year, and the early plans promise the most complete display of the various lines comprised in this industry that ever has been provided.

At the time of the exposition there will be a number of conventions of organizations which are allied with the clay-products industries. Among those which, according to the Construction News, will meet at this time are the National Brick Manufacturers' Association, the National Paving Brick Manufacturers' Association, the Building Brick Association of America, the Clay Machinery Manufacturers' Association, the American Ceramic Society, the Illinois Clay Workers' Association, and the Middle West Clay Workers' Association.

Building expenditures for ninety-nine United States cities in August, as reported to Bradstreet's, aggregate \$70,083,293, an increase of 16.6 per cent. over July and of 24.2 per cent. over August, 1910. This gain is explained as due largely to the taking out of a considerable number of permits for all buildings at Chicago in August in anticipation of the going into effect of a law limiting their size in the future. If the Chicago totals are excluded the building permits at ninety-eight cities aggregate \$43,882,793, a decrease of 10.5 per cent. from July and of 11.6 per cent. from August a year ago. Of the ninety-nine cities, forty-seven show gains and fifty-two decreases from August a year ago. For eight months building expenditures are 2.4 per cent. below last year.

All municipal building records were broken at Victoria last month when the total for permits ran up to \$429,960. The returns for August, 1910, were \$212,814. For the eight months period of 1911 the figures were \$2,197,920, compared with \$1,637,939 for 1910.

Work on this section of the tunnel was carried on at the same time as that on the approaches. The operations were conducted continuously from the point of connection with the Detroit approach to a connection with the Windsor approach.

Excavation

The greater part of the excavation for the trench was made with a clam-shell bucket, having a capacity of 3 cu. yds. The bucket was swung by a steel cable from a 60-ft. steel boom, and was operated by a double-drum hoisting machine. The plant was installed on a large scow equipped with two 24x24-in. steel spuds, 86 ft. long, placed aft for anchoring. This dredge removed an average of 600 cu. yds. of clay per day of 10 hours; the maximum quantity taken out in one day was 1,400 cu. yds. and the maximum for one month was 25,000 cu. yds. place measurement.

It was thought at first that the work might be done by a dipper dredge with a specially designed boom. This was tried, but without success. An ordinary dipper dredge was provided with an 80-ft. steel boom and especially large engines. About two-thirds of the first three sections of trench were excavated with this dredge, but to a depth of only 45 ft. At greater depths the strain on the anchoring spuds was excessive, causing very expensive breakages. After several months' work the dipper dredge was replaced by the clam-shell, which operated successfully throughout the remainder of the work. This dredge would undoubtedly work equally well in 100 ft. of water.

The clay from the trench was used as back-filling along the line of the tunnel outside the sheathing, after two sections of tubes had been placed and concreted. Prior to the sinking of the first two sections of tubes, all excavated material was towed in scows a distance of 6 miles down the river from the tunnel, and dumped at a point inshore from the harbor line. It might be interesting to note that great care had to be exercised not to waste any clay taken from Canadian waters across the boundary line into the United States waters, unless for use as back-filling along the line of the tunnel. A violation of this restriction would undoubtedly have resulted in an imposed customs duty.

Sinking the Tubes

In advance of the sinking of a section of tubes, and before placing the grillage for the temporary end support, it was necessary to determine the condition of the trench as to the depth and width. This was accomplished with a 24-in. I-beam, 48 ft. long, suspended by cables under a derrick scow, and dragged along the bottom of the trench. The line of the sweep was regulated by noting the position of the suspending cables with relation to range on shore. An encroachment of any consequence would retard the sweep and was readily detected. As a further verification of the record, two divers followed the sweep and reported general conditions, such as depth of trench below the sweep and nearness of slopes of the cut to the ends of the sweep. This latter information was interesting, but not absolutely necessary for the determination of clearances in the trench.

At intervals, marking the points between the different sections of tubes, a steel grillage of I-beams was placed at the required level, under which concrete was deposited until the beams were engaged by the concrete. These grillages formed temporary supports for the ends of the sections, until the foundation

concrete could be deposited. A plan of the grillage is shown by Fig. 2. Each grillage was placed by suspending it on steel cables, handled by derricks on the large scow which formed part of the floating equipment. At each of the four corners of the grillage was attached a 10x10-in. timber leg, or spud, about 10 ft. long, which was driven into the clay by an ordinary pile-driver drop-hammer, swung from one of the derricks, until the grillage was brought to grade. The grade was determined with a steel mast, 80 ft. long, which was used as a level rod, the leveling instrument being stationed on shore. The mast was handled by a derrick, and the lower end was placed on the corners of the grillage by a driver.

For sinking, the ends of the tubes were fitted with water-tight bulkheads. Each of these bulkheads was equipped with a 14-in. gate-valve, which could be opened from the outside. Each valve was just below the water-line when the section of tubes was floating empty. The sections were sunk by opening these valves and permitting the tubes to fill with water.

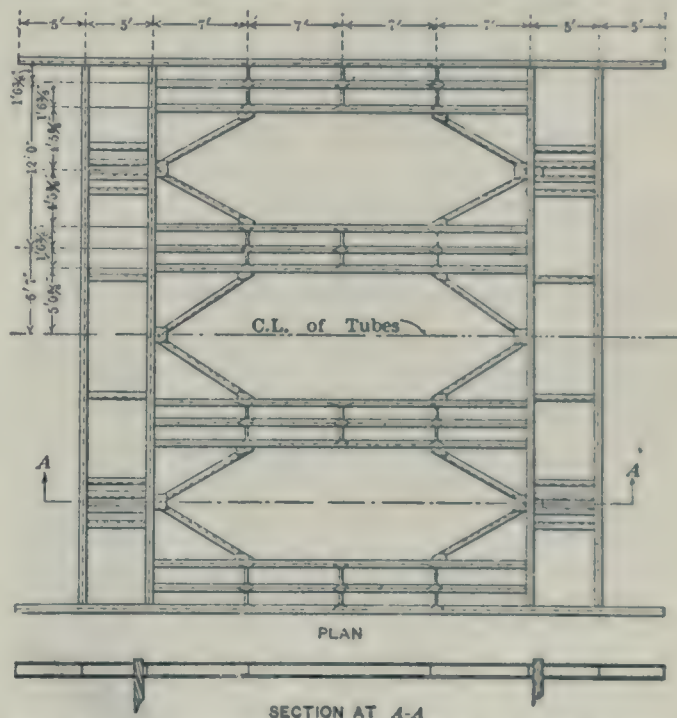


Fig. 2—Steel Grillage Supporting Ends of Steel Tubes at Connections.

The bulkheads were fitted at the top with a 2-in. air-escape valve, to which was connected a 2-in. hose of sufficient length to permit the loose end to extend above the surface of the water when the section of tubes was in its final position. To the end of the hose above water was attached a 2-in. valve for controlling the escape of air. The tubes were equipped on the inside with two semi-bulkheads, placed 48 ft. from the end bulkheads. These semi-bulkheads had a maximum depth of 7 ft., and when engaged by the water inside the tubes served to form, in connection with the end bulkheads, an air-chamber regulating the sinking of the section as a whole on even keel. In this manner the section was held in check and controlled in sinking until completely submerged. This control was established by valve-regulated air-escape pipes through the end bulkheads. When filling with water, the air in the tubes was permitted to escape through two 4-in. pipes, one back of each semi-bulkhead toward the middle of the tubes. These air-

escape pipes were capped by divers after the tubes were in position in the bottom of the trench. The time required for submerging a section of tubes was approximately 2 hours.

Four air cylinders, or buoys, were used for floating the tubes to correct position, two being placed over each tube and connected to the diaphragms. These cylinders were of $\frac{1}{4}$ -in. steel, and were 10 ft. 2 ins. in diameter and 60 ft. long. Each cylinder was divided into three compartments; the length of the middle compartment was 13 ft., and that of the end ones was 23 ft. 6 ins. Each compartment was fitted at the top with a valve for admitting water, also with an air-escape valve. The middle compartment was also equipped with a valve at the bottom, which

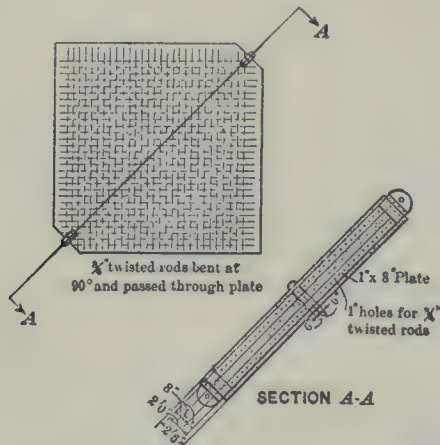


Fig. 3—Reinforced Concrete Anchors or Steel Tube Sections.

was controlled from the top of the cylinder and used for the rapid admission of water, this compartment only being used in regulating the sinking of the tubes. The air cylinders were proportioned so that, with the end compartments empty, the tubes filled with water and were completely submerged, the entire section being held in suspension with about $1\frac{1}{2}$ ft. of the top of each of the cylinders visible above the surface of the water. The middle compartment was then permitted to fill with water, and the whole mass was lowered to its final position in the bottom of the trench. Further and more refined control of the section was obtained with two 5-ton counterweights, built of I-beams and handled by derricks mounted on a scow alongside. One counterweight was permitted to rest on top of each pair of air cylinders, and with sufficient water in the centre compartment to overcome buoyancy, the additional load thus imposed produced a downward movement, which could be arrested at will. The cylinders were placed on the section of tubes, just before sinking, with a large A-frame on one of the scows, which was built as part of the plant to be used in connection with the sinking of the tubes. After a section of the tubes was in proper position in the bottom of the trench and sufficiently anchored by concrete, the air cylinders were detached by a diver, brought to the surface, and held in readiness for use on the next section. One set of cylinders was used for all the sections.

The total weight of the material in a section of tubes 262 ft. 6 ins. long, with four air cylinders, was 900 tons, the metal weighing 550 tons; the wooden sheathing and bulkheads 240 tons, and the air cylinders 110 tons. The weight of the mass in water when entirely submerged was approximately 516 tons.

For holding the tubes in position against the current during sinking, two concrete anchors, weighing in water 22 tons each, were buried in the bottom of the river 700 ft. up stream from the line of the tunnel and opposite the ends of the section which was being lowered. The large derrick scow, 35 by 120 ft., equipped with large hoisting engines of the Lidgerwood type, in addition to the two derricks mentioned, was anchored up stream from the permanent location of the section and close enough for the derricks to handle the counterweights on the air cylinders. On the up-stream side of the tunnel section, attached to the diaphragms, were four large shackles, two at each end, one at the top and one at the bottom. To each of these four shackles was attached a set of tackles, consisting of 2-in. manila line, run through two sets of quadruple blocks. One of the blocks was attached to the shackle and the other to a $1\frac{3}{8}$ -in. cable leading to one of the anchors. The lines from the tackles were run to the drums of the engines on the scow, from which the whole system was controlled. Figure 3 is a sketch of the concrete anchor.

Operations on the river were conducted from Detroit, toward Windsor, so that the west end of each section of tubes following Section No. 1 was connected to the east end of the preceding section. The connection was made by a specially designed joint, Fig. 4. On top of each tube at the west end was attached a pilot pin, so-called, 6 ft. long and 6 ins. in diameter, slightly tapered at the end, which fitted into a socket, $6\frac{1}{2}$ ins. in diameter, on the east end of the preceding section. The pin near the end was slotted to receive a steel wedge, or key. This key, when driven home and locked, fitted tightly against the socket casting, thus holding securely in position the west end of the section of tubes which was being placed. With the pilot pins in place in the sockets, a tight joint was made between the connecting sections with the abutting ends of the tubes coinciding. The special joint provided an exterior annular pocket enclosing the connection, 4 ins. deep and 8 ins. long, which was made practically water-tight by an arrangement of rubber gaskets. After the tube was unwatered, this pocket was filled from the inside with neat cement grout. In addition to the pilot

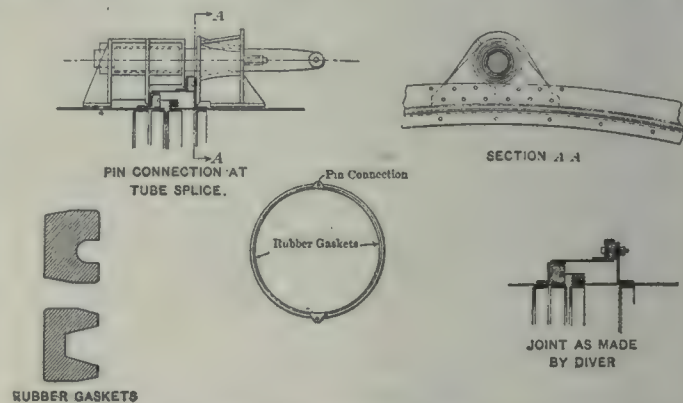


Fig. 4—Details of Joints Connecting Sections of Steel Tubes.

pins, the connection was further strengthened by bolts on the outside, which were placed by divers. To make the joint in the manner described, it was, of course, necessary that the east end of the section being placed should be in its final position.

The position of the section with respect to line and grade was determined by steel masts, one on each

tube at the east end and one on the west-bound tube at the west end. These masts consisted of two channel-beams, 10 ins. wide set back to back 10 ins. apart, and connected with lattice bars. On each face was marked the centre line, and the mast was graduated in feet, the numbering being referred to the centre of the tube. Each mast was carefully set with its centre line at right angles to the horizontal diameter of the tube and on center. Lines and grades were given by instruments on shore, and the tubes were adjusted by manipulating the holding lines.

The grillage was usually set several inches below the established grade of the bottoms of the diaphragms, in order to guard against its becoming too high, and shims were inserted between the bottom of the diaphragm and the beams of the grillage. This work was done by divers. The grillage was designed to engage four diaphragms, the two end ones of each section, but shims were placed under the end diaphragm only. It will be remembered that the tubes were carried almost in suspension by the air cylinders until the section was anchored by the exterior concrete deposit. When a section was finally adjusted, it was anchored temporarily to the grillage by a turnbuckle arrangement, Fig. 5, which was placed and made secure by divers. A remarkable feature in connection with the adjusting of the sections to final position was the perfect control which was obtained at all times, resulting from the use of the air cylinders. It was possible to raise or lower the tubes a fraction of an inch with the greatest ease and precision by regulating the quantity of water in the cylinders. The time consumed in sinking a section of tubes, adjusting, bolting, and making ready for the concrete, ranged from 3 to 7 days.

Exterior Concrete

For depositing concrete, an especially large and well-equipped scow was built by the contractor. It was 36x155 ft., and was fitted with 20x20-in. timber spuds 90 ft. long. It carried a two-storey structure which housed the concrete mixers, hoisting engines, and dynamo for lighting purposes, all of which were on the lower deck or floor of the scow. In addition to these there were two large derricks on the lower deck, which, when concrete was being deposited, were used for transferring gravel from the barges to the scows, gravel having been used on this work exclusively. The upper storey of the superstructure contained three screening hoppers, above which were two bins, each with a capacity of 75 cu. yds. for receiving the gravel. The gravel was drawn from these bins and screened into the three hoppers. On the floor of the second deck, immediately under the screening hoppers, were three small hoppers just above the mixers, for proportioning the materials. On one side the scow was provided with three leads, each carrying a tremie pipe. These pipes were 26 ft. 4 ins. from center to center, and extended to a height of 89 ft. above the surface of the water. These leads also carried the buckets for elevating the concrete to the upper ends of the pipes. At the top of each pipe there was a hopper for receiving the concrete, the connection of the hopper with the pipe being such that the pipe was free to swing laterally. The hopper carried a cage in which a man was stationed to direct the handling of the pipe when concrete was being deposited. The pipes were 12 ins. in diameter, of spiral-riveted wrought iron, in 16-ft. lengths, with flange connections. The buckets for elevating the

concrete were designed to dump automatically into the hoppers at the tops of the tremies. Figure 6 is a sketch of the scow.

With a section of tubes in place, ready for depositing the exterior concrete, the scow was floated to position, the tremie pipes being placed directly over one of the pockets formed by the diaphragms where it was desired to work. The tremies were then lowered until the bottom ends were about 1 ft. above the bottom of the trench, with the middle tremie in the center between the two tubes and the side tremies between the outside of the tubes and the sheathing. To avoid delay the tremie pipes were generally located in the pockets by divers. The pipes were left open at the bottom and filled with concrete to the exclusion of the water. To accomplish this the first two or three batches of concrete were mixed very dry, and the first two batches seldom failed to be effective. After the lower end of the pipe was sealed against the inflow of water by the initial deposit of the dry mixture, the concrete was mixed wet, as compared with the usual consistency of that placed in air, thus admitting of easy flow through the pipe. Under good working conditions, the rate of deposit through one of the tremies averaged about 30 batches per hour. The lower end of the pipe was generally held from 3 to 5 ft. in the concrete, and the concrete was discharged by raising the pipe slightly as each batch was dumped in the hopper at

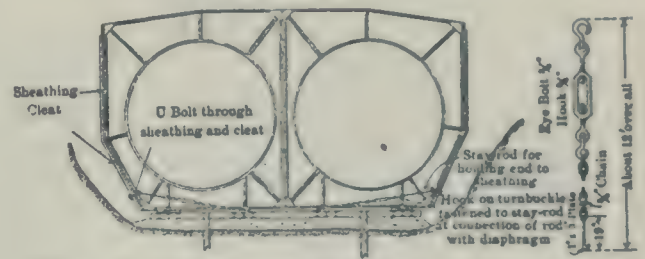


Fig. 5—Sketch Showing Method of Anchoring Tubes to Grillage.

the upper end. The flow was carefully regulated, so that the pipe was filled with concrete from the beginning to the end of a run.

Due to the absence of any reliable data or records of experience in depositing large quantities of concrete in water of such depth as was found on this work, the contractors conducted numerous experiments with the tremies in the open trench before the actual work was started. Some very valuable information was gained through these experiments, resulting in the continuously successful operations of the tremies. In the early experiments it was found very troublesome to secure a slow discharge of the concrete. At times the pipe would be raised 8 or 10 ft. for the purpose of starting the flow, which would usually result in a rapid discharge of the concrete and the pipe filling with water. This action was found to be caused by the bottom of the pipe becoming clogged with clay when first lowered into the trench. The wad of clay was dislodged only after considerable jarring of the pipe, by raising and lowering it, and the charge of concrete was usually lost in the operation. This difficulty was the only one of importance encountered in depositing the concrete with the tremies, and, of course, was readily overcome after the cause was discovered. It was found, however, that the best results could be ob-

tained only by observing the utmost care in the manipulation of the pipes.

Each side tremie, when depositing in the sections with sloping sides, was provided with a knuckle-joint near the lower end, so that the lower section of the pipe was free to swing laterally and was thus directed under the tube. This lower section was of sufficient length to reach the bottom of the trench. When the concrete had been carried up to the top of the sloping side, the lower section of pipe, together with the knuckle, was removed.

The usual order of procedure, in concreting under and around the tubes, was to fill one of the pockets near the easterly end of a section as soon as possible after the section was in position; thus forming a positive anchorage against lateral movement due to the action of the current in the river. After this pocket was filled, foundation concrete was deposited in the bottom of the trench under the entire length and width of the section. The concrete for the foundation, up to the bottoms of the diaphragms, consisted of 1 part cement, 4 parts of sand, and 8 parts of gravel. The concrete above the bottoms of the diaphragms was a 1:3:6 mixture. The foundation concrete, deposited as it was under the entire section

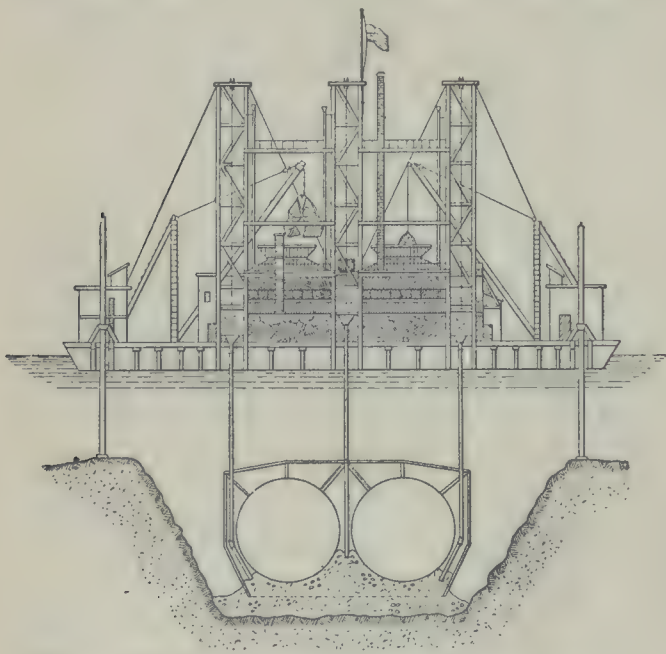


Fig. 6—Sketch Showing Method of Placing Concrete by Tremies.

directly after the tubes were placed, sealed the bottom of the section against an inflow of clay from possible slides along the slopes of the cut and from any other foreign matter which might be carried into the trench. It also gave a bearing to the tubes over the entire length.

After the foundation concrete had been deposited, a pocket near the middle of the section was filled, thus securing an intermediate bearing. It will be remembered that the air cylinders were not removed until the tubes had been anchored and given a bearing as described. After the removal of the cylinders, the remaining pockets in the section were filled, the work being carried on continuously, as nearly as possible, from end to end of the section. Concreting operations in any one pocket were carried on continuously, or as nearly so as possible, from bottom to top, thus forming a monolithic block the size of the pocket. It will be noted that the

plans show the concrete 6 ins. above the top of the diaphragm, or 4 ft. 6 ins. above the top of the tube. No attempt was made to finish off the top of the concrete; it was not distributed when once deposited. The placing of the concrete was inspected by a diver, whose duty it was to see that it was carried to at least 6 ins. above the top of the diaphragm at all points. The elevation of the concrete was afterward verified by soundings. The depth of the foundation concrete under the entire tunnel varies from 1 to 6 ft., according to the depth of trench left by the dredge.

The total quantity of concrete deposited under and around the tubes was 101,900 cu. yds. and it was placed in a working period of 18 months. The maximum quantity placed in one day of 16 hours was 1,069 cu. yds., and the maximum for any one month was 10,287 cu. yds. The average number of yards per day deposited around the tubes above the foundation, for the days on which work was done, was 349. The average cost per cu. yd. of the 1:3:6 concrete was about \$4, and the average cost of the 1:4:8 foundation concrete was about \$3.75. These figures include all costs for material, labor, and equipment.

It may be interesting to know something of the character of the 1:3:6 tremie-deposited concrete, as developed on this work. A large number of cores, about 5 ins. in diameter, were taken from one of the pockets by a 6-in. Davis calyx shot drill, operated from the surface of the river. These cores were tested in compression and developed a strength as high as 4,000 lbs. per sq. in., the lowest being 2,740 lbs. from a series of six cores chosen at random. The specimens were broken one year from the date of deposit. At one point borings were made through a depth of 35 ft. of concrete, from which 92 per cent. of the cores were obtained, ranging in length from 6 to 20 ins. The remarkable character of the tremie-deposited concrete was later disclosed in two concrete bulkheads, formed by depositing the concrete inside of the tubes between the wooden bulkheads in two adjoining sections. The tremie pipe entered the tubes through a manhole (provided for other purposes) from which the cover was removed by a diver. These concrete bulkheads, by way of explanation, were placed as additional protection to the workings in the tubes previously sunk, until succeeding sections could be placed. It required the continuous use of explosives and three weeks' constant labor to remove each of these bulkheads. This concrete was a 1:2:4 mixture, and was particularly dense, as were all the other samples of the subaqueous concrete. Some 6-in. cubes cut from the bulkhead concrete, developed a strength of from 1,800 to 3,040 lbs. per sq. in. in compression. Probably the strength of these specimens was somewhat impaired by the work involved in shaping.

At two special joints the tubes were surrounded by a 1:2:4 mixture of concrete, and, after the tubes were unwatered, it was found that these joints were nearly water-tight. This is a development which must be considered in connection with the hydrostatic pressure, found to be about 30 lbs. per sq. in. at the bottom of the tubes.

Back Fill

The work of back-filling the trench outside the sheathing was started immediately after two sections of tubes had been lowered and concreted. For the most part gravel was used to a height of 11 ft. above

the foundation concrete, and the remainder of the trench was filled with clay as excavated by the dredge. Where the top of the tunnel projects above the original river bottom, the back-filling was carried up to the level of the concrete. Later, the clay back-fill was covered with rip-rap, deposited to a depth of about 2 ft., as a protection against the possible scouring action of the current. Where gravel was used as back-filling, it was deposited through 12-in. wrought-iron pipes, lowered into the trench from the gravel barges. The clay was dumped directly from the drop bottom scows, in which it was loaded by the dredge, to a height determined from time to time by soundings. The rip-rap was dropped by a clam-shell from the surface of the water, the position of the scow carrying it being determined by ranges on shore.

Unwatering the Tubes

The west end of first section of tubes and the east ends of Sections Nos. 1, 3, 5, 7, 9, and 10, were each provided with a heavy bulkhead, of 10x10-in. oak timbers, heavily braced, and of sufficient strength to withstand the full hydrostatic pressure when the tubes were unwatered. The east ends of other sections and the west ends of all sections, except Section No. 1, were provided with 4-in. bulkheads, useful only in connection with the sinking. In addition to the 14-in. inlet-valve, already referred to in connection with the sinking as being located outside the bulkhead, each bulkhead was fitted on the inside with a 10-in. valve for unwatering. It was found expedient during the progress of the work to use the 10-in. valves in the heavy bulkheads only, leaving the 14-in. valves on all the light ones open at all times, thus giving a continuous opening through two sections of tubes between two heavy bulkheads. The 13-in. valves on all heavy bulkheads were closed by the divers directly after the tubes were sunk. With this arrangement it was possible to unwater Section No. 1 before drawing the water from Sections Nos. 2 and 3, and likewise Sections Nos. 2 and 3 were unwatered through Section No. 1 without opening Sections Nos. 4 and 5, and so on across the river. In this manner it was possible to begin the placing of the interior lining of concrete before all the sections had been sunk.

The water was pumped from the first five sections of tubes by an 8-in. centrifugal pump, placed in the bottom of Section No. 1 in advance of its sinking. This pump was also used in unwatering all sections east of No. 5, being assisted by a similar pump placed at the east end of the latter. For carrying the water to the pump, a 12-in. wrought-iron pipe was laid through each of the first five sections in advance of sinking, that in Section No. 1 being connected with the pump. An access pipe, 4 ft. in diameter, designed to extend above the surface of the water with the tubes in place, was provided for each tube at the west end of Section No. 1, also a 12-in. discharge pipe. All these pipes were built as a part of the tubes before the section was lowered. The pumps were placed directly under the access pipes, and the pump shafts led up through these pipes.

After five sections of tubes were in position, and before the cofferdam connection with the shore work was completed. Sections Nos. 1, 2, and 3 were unwatered, and preparations were made for placing the concrete lining. Sections Nos. 4 and 5 were next unwatered, and this work was continued progressively

in pairs to the Canadian connection. Work on the concrete lining was started in Section No. 5, after seven sections of tubes had been placed outside, and before the water was drawn from sections of Nos. 6 and 7. This was directly after the cofferdam connection was made between the Detroit shaft and the first section of tubes, and all material, except concrete, was handled through the shaft.

It may be of interest to note that when the different sections of tubes were unwatered, they were slight peepage at some of the rivets, and at the slight seepage at some of the rivets and at the lap-joints between the plates, where they may have been strained in launching. These small leakages were stopped by caulking with steel caulking iron and by the application, in a few cases, of red lead forced into the lap-joints by a small pump commonly used for such work.

Concrete Lining

The cross-section of the concrete lining in the subaqueous section is shown by Fig. 1, which also shows

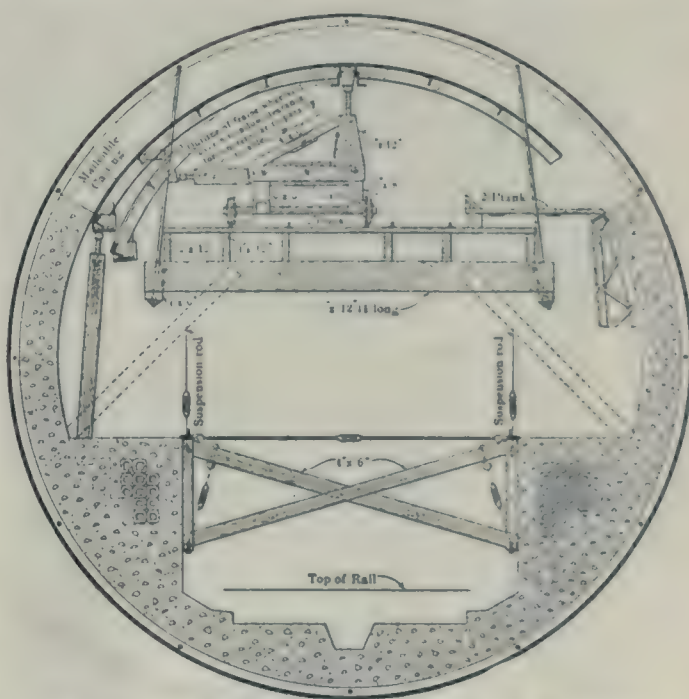


Fig. 7—Forms for Lining Steel Tubes with Concrete.

the location and size of the reinforcing rods used throughout this section, and the invert reinforcement in the approach tunnels. The concrete for the full section, from invert to arch, except that over the ducts, was placed in four runs, namely, the invert, to 12 ins. below the top of the bench-walls; the two side-walls, to 8 ft. above the top of the bench; and, finally, the arch. The ducts were laid and concreted after the inverts, side-walls, and arch had been placed throughout the tubes. All concrete for inverts, side-walls, and arches was delivered in the tunnel over a platform suspended from the top of the tube at about the level of the top of the side-walls. Figure 7 shows the details of this platform. Steel forms were used for the concrete lining, 24 ft. long for inverts and side-walls, and 12 ft. for the arch. The placing of concrete for inverts and side-walls was simple, but the arch work required an end handling with shovels, followed by a ramming to place. All concrete for lining the subaqueous tunnel was mixed

on the surface and delivered through chutes placed in the access pipes, previously mentioned. As the work of placing the lining progressed, the suspended platform was moved from the rear and placed in advance of the work as rapidly as the tubes were opened up, the narrow-gage material tracks being shifted from the platform to the complete invert. Cars of material were handled from the low-level tracks to tracks on the swinging platform by an elevator. As all concrete for the tubes was mixed at the Detroit end, there was a haul of more than 2,700 ft. for the concrete placed near the Windsor connection. The cars were drawn by cables, and 30 minutes was the longest time required for delivering a batch of concrete from the mixer to the farthest point of deposit. The concrete lining was completed in exactly 12 months from the time of starting.

Town Planning Suggestions for Canadian Municipalities*

By J. P. Hynes, Toronto

Municipal government throughout this continent has long been a reproach upon the ability of a democratic people for self-government. Canadian municipalities may not have experienced organized graft to the same degree as their neighbors in the Republic to the south, but the congratulation is purely a negative one, for the possibilities of municipal development have not been availed of in Canada any more than they have been in the United States. These years of wasted opportunity have been contemporaneous with the virtual reconstruction of Paris, Vienna and Berlin, which have respectively lead the cities of their nations in active rejuvenation.

Perhaps the causes for this state of affairs are too numerous and varied to all be traced, but a few from which perhaps all the others grow may be here stated.

First, the lack of a proper civic sentiment. While the most extravagant bragging is done by the citizens of every municipality on the continent, the single purposed personal service necessary to procure capable and efficient civic government is a duty that they have not yet begun to discharge. Second, the lack of proper civic ideal. "Big" is the one civic ideal constantly heard of by business, no matter what degradation follows it; big buildings no matter how humanity suffers for light and air; big population no matter how inadequately housed. In fact in civic matters it is only in regard to a big tax rate that this ideal fails to hold good. Third, the lack of a proper civic foresight. Individuals are permitted to lay out property in city lots for a speculative game and the city accepts them provided the streets are 66 feet wide, but the lack of foresight has lost the opportunity to plan the best possible for the growing municipality. Corporations obtain franchises without being forced to cooperate with each other and discharge their duties without disfiguring the city with a constant breaking and repairing of street pavements and the planting of poles and poles and poles, not to mention their accompanying wires.

Municipal councils use false economy and show a lack of faith in their town by making temporary instead of permanent improvements, and last, but not least, fail to recognize the financial value of beauty, despite the fact that it is one of the chief revenue-producing assets of European cities.

The basic unit considered in city planning is the family, and it is the aim of civic improvement to provide every facility in its power for that unit's best development. The success of civic improvement may be judged by the measure in which it provides such facilities to the units with least means to procure them for themselves. After providing water and sewers, the most pressing requirement is transportation, both freight and passenger, and it is here that city planning plays a large part, for this requirement is more a matter of plan than of equipment.

The next important measure is for the municipality to procure for itself, as far as possible, the increased value of property and franchise created by its growth. This is effected considerably in Europe by the municipality being a large landlord and having the powers of excess condemnation.

The wave of agitation for civic improvement which has swept the continent since the Chicago World's Fair has had two developments; first, for an economic and artistic physical development of cities, and second a more responsible executive administration.

The first is exemplified to a greater or less degree in innumerable places, notably in Harrisburg, Des Moines, Philadelphia and Cleveland, while more than a hundred American cities have adopted commission government, and St. John, N.B., in our own country, in an endeavor to procure more efficient civic administration.

In conclusion may I recommend to your association the advisability of urging upon this province of Ontario to take a leaf from our sister province of Saskatchewan and establish a municipal department that will act as a clearing house for the diffusion of the tried and proven ideas in civic improvement, both in physical development and executive administration as a Town Planning Commission—to insist on private property being developed to the best advantage of the municipality as a whole and on public service corporations performing their services without either temporarily or permanently disfiguring the city they are chartered to serve.

In England this work is now largely done by the local government board and it is for such bodies as yours to urge our provincial government to do its duty in regard to municipalities. The manner in which the government now promotes good roads is an evidence of what it could accomplish on behalf of municipalities.

Reinforced concrete railway ties with asbestos fibers soaked in water and mixed thoroughly with cement as one of the parts have been used on the Bavarian railways and in the first five months of service showed no defects, according to "Zement und Beton." The mixture is nearly as strong as concrete and after setting it can be drilled and hammered like wood, retaining its hold upon other materials better than wood, it is stated. The concrete used consists of 1 part cement, 1 part rubble and 2 parts coarse sand. The ties are about 9 feet long, 8½ inches wide and 7 inches thick, having the asbestos only below the actual seat of the rail. Concrete is used for the rail seat, which lessens the cost materially, for the asbestos is quite expensive. Reinforcement of round rods is placed in both the top and bottom of the tie and stirrups are set at regular intervals. The ties weigh about three times as much as wooden ties and cost about \$1.50 each.

* From a lantern slide talk before the Ontario Municipal Association, August 31, 1911.

Noteworthy Building Construction

Activities of the Season—Interesting Work at Montreal, Ottawa, Regina—Features of Design and Erection—The Contracting Firms

The accompanying illustration is from the design of the front elevation of the new library to be built on St. Denis street, Montreal, for the Grand Seminary. The building will have a frontage of 100 feet with a depth of 150 and will stand on a lot 135 by 163 feet. The greatest height will be 70 feet. The ground is valued at \$125,000 and the building will cost at least \$150,000. The design is by Eugene Payette, architect, and won from eleven competitors a prize of \$1500. The front will be of stone and granite in the Roman style of architecture. The outer portion of the rear and side walls will be of fire brick and the inner surface of the walls will be of pressed brick with air space between the two sections. The flooring will be composed of marble slabs 1½ inch resting on iron supports.

A large lecture hall 52 by 96 ft. with galleries on three sides will occupy a large portion of this central space of the basement and ground floor levels. The ceiling of this hall will be 24 feet high. In the basement section between the hall and the front wall will be the toilet rooms; in the rear will be the coal cellar, boiler room, machine room, janitor's apartments, goods entrance, and unpacking room. There will be six entrances to the lecture hall—two on each side of the building and one in front near each end. There will also be a dressing room off the stage. The front portion of the ground floor will be occupied by two rooms, each 40 by 18 feet. In the rear of this section will be the first floor of the stock room, of which there are four. All the ceilings in the stock rooms are seven feet high.

The main reading room is on the level of the second floor of the stock room. From the main entrance to the library one reaches a large hall. To the right is the ladies' section; to the left the men's section, and in the centre the circulating department. In the front of this floor there is a small lecture room capable of seating about sixty persons which

will be used when it would not be desirable to open the large hall. On this floor is also situated the board room of the library. The floors of the reading room will be covered with cork tiling to ensure quietude. The window frames and sashes will be of iron filled with wired glass. The corridors and stairways will



Prize Library Design, Montreal

be of marble. The entire building will be as near fireproof as modern invention and architectural designing and construction can make it.

The Grey Nuns' Hospital, Regina

This is a second class structure, substantially built of brick with concrete foundations. Both in design and construction it is well adapted to the purposes for which it was intended and is fully equipped with operating rooms, laundry, bright and airy dormitories, and all modern appliances required in an



Grey Nuns' Hospital, Regina, Sask.—Contractors: Peter Lyall & Sons, Montreal

up-to-date hygienic institution of this character. The building cost \$200,000 and was erected by Messrs. P. Lyall & Sons from designs prepared by Messrs. E. & W. S. Maxwell of Montreal.

The New Hope Building at Ottawa

The new fireproof building of James Hope & Sons, on Sparks street, Ottawa, is nearing completion. It has nine storeys and basement, a frontage of 33 feet and is 99 feet deep. The basement is in rock excavation, which was taken out to the depth of 15 feet. The foundation is of concrete and the construction is fireproofed steel. The steel goes down through the concrete foundation to rock. The steel work was done by the Dominion Bridge Company. Holbrooke



Hope Building, Ottawa.
Contractors, Holbrooke & Sutherland, Ottawa.

& Sutherland, of Ottawa, were the contractors for the masonry, brick, excavation, concrete work and fireproofing. The front of the building is of Stanstead granite up to the eighth storey and the remainder is terra cotta. The granite came from the Stanstead Granite Quarries, Limited, of Beebe, Que., and the terra cotta from the Doulton Potteries, Limited, Leeds, Eng. The metal fronts are of solid bronze and are the work of the Modern Machine Company, Ottawa, sub-contractors for Holbrooke & Sutherland. The brick of which the remaining walls are composed is from the Silicate Brick Company, of Ottawa. The window frames are all fireproof and were furnished by Wragge & Company.

The interior finish is in ash from the first floor up, and on the main floor mahogany. Alex. Christie

was the contractor for the carpentering. The show windows are in bronze frames furnished by the Dennis Wire and Iron Company, London, Ont. The stairs throughout are cast iron, for which the Canadian Ornamental Iron Company, of Toronto, were the contractors. The plastering was done by Charles Hunt, of Ottawa, and the flooring by the Terrano Flooring Company, of Montreal. The tile and mosaic marble were provided by A. K. Mills & Sons, Ottawa, and the Missisquoi Marble Company, Philipsburg, Que. The vault doors are from J. & J. Taylor. The building is equipped with a high speed Otis-Fensom elevator.

McKinley & Northwood were the contractors for the plumbing, heating and ventilation systems. The heating is the Webster Modulation System.

The building was designed by W. E. Noffke, architect, Ottawa.

Ottawa Union Railway Station

One of the million-dollar class of buildings built by Messrs. P. Lyall & Sons of Montreal is the Union Railway Station at Ottawa. It is of cut stone construction and occupies a ground space of about 150 by 250 feet. There are four departments in this



Central Union Station, Ottawa
Contractors: Peter Lyall & Sons, Montreal

building. One contains the head offices of the Railway Commission, another the ticket office and lunch room, and still another the divisional offices of the Grand Trunk Railway. In connection with the ticket office are beautiful waiting rooms for the public. Special attention has been given to the governmental waiting room designed for the convenience of the vice-regal and government authorities. The ceiling of the main waiting room is 70 feet high, and this together with the concourse and corridors is elegantly finished in "Travertine" and natural marbles. The architects are Messrs. Ross & McFarlane, of Montreal.

A Mill Building of Rather Unusual Design

A most unusual problem in mill design was involved in the carrying out of some recent extensions and additions in connection with a textile plant at Dover, N. H., there being situated on the west bank of the Cocheco River what is known as Mill No. 3, which extends from its junction with Mill No. 4 on the south to a bend in the river opposite and separating it from the southern end of Mill No. 2. The width of the river separating the two mills at this point

is 60 ft. and it was desired by the owners to extend the No. 3 mill across the river to join Mill 2 on the north bank.

Aside from the difficulties naturally arising from the necessity of carrying the entire building, six storeys in height, over such a distance, was the added danger arising from the fact that the water to be bridged was a running stream and subject to tidal effect and at times of high water in the spring was likely to rise rapidly. Another consideration was the possible formation of an ice jamb in the river. After carefully considering the facts and studying the situation, Lockwood, Greene & Co., the engineers, of Boston, Mass., recommended that the mill building be carried across the river on four Gustavino tile arches. Their suggestion was carried out, and four 56 ft. 1½ in. spans were constructed on concrete piers built against the end foundation walls of the two mills

from No. 2 mill through the new extension and on into No. 3 mill.

Eastern Townships Bank Head Offices, Montreal

The head offices of the Eastern Townships Bank are situated in their new building at the corner of Victoria Square and St. James street, Montreal. This is a stone structure on a steel frame and is ten storeys in height. It was built in nine months by Messrs. P. Lyall & Sons four years ago at a cost of \$600,000. It has a complete modern equipment as an office building and the interior is finished in first class workmanship and material. Messrs. Cox & Amos, of Montreal, were the architects.

Willis Building, Montreal

The Willis building on St. Catherine street West, Montreal, erected for Willis & Co., Limited, the well-known piano firm, is a fireproof structure having a



Willis Building, Montreal



Eastern Townships Bank, Montreal

Contractors: Peter Lyall & Sons

on the river banks. The two outer spans are 4 ft. thick and carry the outside building walls of the mill addition. The two inner spans are used as foundations for the two runs of building columns. The distance between spans is roughly 23 ft., the entire width of the mill building being 69 ft. inside.

It was a necessity to construct the arches high enough above the water line of the river to provide for floods, and this height was made 26 ft. so that the top of the arch came a short distance below the first floor of No. 2 and above the second floor line of No. 3 mill. The total length of the extension thus added to No. 3 mill is 64 ft. 10¾ in. and the total added floor area available is 22,000 sq. ft. The end wall of No. 2 mill serves as a fire wall, but the end of No. 3 mill was demolished and replaced by columns conforming to the general design of both structures so that there is not a clear and continuous floor space

steel frame, concrete floors, cut stone and ornamental iron front, and was erected at a cost of \$150,000. The sub-basement reaches a depth of 30 feet below street level and the underground apartments were water-proofed with hydro-lithic coating. The interior is beautifully finished and provided with elevators and power equipment. Messrs. Ross & Macfarlane are the architects and Peter Lyall & Sons the contractors.

The City of Moose Jaw has in progress now or about to be started works which will cost nearly one million dollars. The exact figure is \$929,750. The sewer and water system, for which an appropriation of \$400,000 has been made, figures largely in this total. The development of the city is also indicated by the building permits, which for the first eight months of the year total \$1,924,325, three times the total for the corresponding period of 1910.

Hypochlorite Plant at Strathcona, Alta.

Arrangement and Design of Powdering and Sieving Box, Mixing and Storage Tanks, etc.—Tests Show Highly Satisfactory Sterilization*

By W. Muir Edwards

Strathcona is a city with a population of 5,000 situated on the south bank of the Saskatchewan River, directly opposite the city of Edmonton. The public water-supply is drawn from wells sunk in the river bank, and when this source is not sufficient, it is augmented by water taken directly from the river. The water from the wells or river, as the case may be, is pumped into a circular steel tank, into which the suction pipes of the high-lift pumps dip. The water is then forced into the distributing system.

Towards the end of November, 1910, an increase in the number of typhoid cases was noted, and at the request of the Board of Health, the Medical Health Officer and the writer made a systematic study of the cases then in existence. At the same time it was deemed advisable that the water-supply

through $\frac{3}{4}$ -in. pipes, controlled by valves, into the overflow tubs. From these overflow tubs the solution discharged freely through a curved brass tube of $\frac{1}{8}$ -in. bore. An overflow pipe was placed so that a head of $6\frac{1}{2}$ ins. was obtained over the orifice. The orifice tubes delivered the solution into the bell mouth of a $\frac{3}{4}$ -in. pipe, which delivered the dosing solution at the center of the mouth of the suction pipe of the high-lift pump.

Certain difficulties in operation became apparent during the use of this emergency plant. In the first place, it was found that the method of mixing the solution was unsatisfactory. Secondly, as the flow from the storage tanks is necessarily of a variable nature, and is comparatively small, it was found that the valves became constantly blocked, and at times the flow stopped altogether. The curved tube was also too small, and became clogged and was not easily cleaned out. In fact, it early became apparent that it would be necessary to provide a man to look after the running of the emergency plant alone and this was done. In the emergency plant the flow of the dosing solution to each of the two suction pipes was received by one pipe, the distribution to either suction pipe being controlled by valves. This was found unsatisfactory, also due to clogging. In fact, our experiment proved the necessity of avoiding valves, flat grades, or angles, all of which are apt to aid the formation of a deposit, thereby interfering with a uniform flow in the pipe.

A study of the outbreak having demonstrated that the epidemic was due to contaminated water, the city council authorized the installation of a permanent plant. This consists of a powdering and sieving box; a rising-current conical mixing tank; three reinforced-concrete storage tanks; two small boiler-feed pumps; drain pipes, water pipes, etc.

Powdering and Sieving Box

As will be seen from Fig. 1, the arrangement consists of an oblong box divided into two compartments, the first half being used as a pulverizing surface and the second half as a sieve, through which the powder passes to a compartment below. The framework supporting the sieve is hinged, and can be turned back to rest on the pulverizing surface. By this means the unsieved portion of the powder can be replaced on the pulverizing plate, and when the sieving is complete the sieve may be placed out of the way in order that the mixing of the powder into a paste may be easily done. It may be noted that the front of the lower mixing box can be raised, thus aiding in the working of the paste, and, after being replaced to provide a box in which the paste may be made more fluid, can be again raised to allow the fluid paste to wash into the rising current of the conical mixing tank.

Bleaching powder does not go into complete chemical solution in water; when the powder is

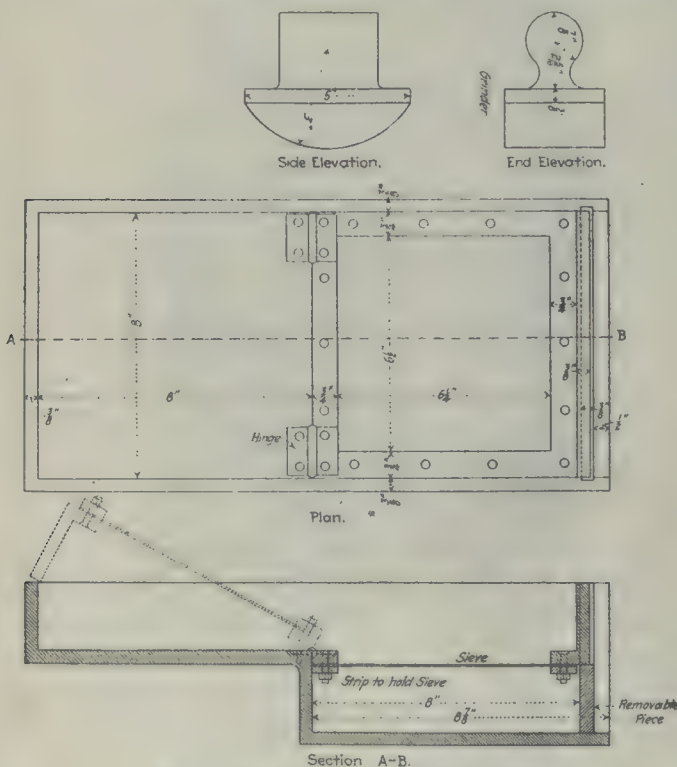


Fig. 1—Powdering and Sieving Box

be treated, and an emergency sterilizing plant was therefore installed. Work was started at 10 a.m. Nov. 28, and the sterilizing solution was turned into the supply at 10 minutes past 2 the following morning, a little over 16 hours later.

The materials used for the plant were a candy pail, two 50-gal. bbls., two tubs made by sawing the tops off two other barrels, and the necessary piping, valves, etc. Commercial bleaching powder, after being pulverized and passed through a sieve, was mixed into a smooth paste in the candy pail. Water was then turned on, and the solution allowed to overflow into the barrels which formed the storage tanks. From these barrels the solution flowed

* Before the Canadian Society of Civil Engineers.

mixed with water, part is dissolved, but a portion is insoluble. A certain percentage of this insoluble matter has chemical efficiency, and must be retained in the solution if the total strength of available chlorine is desired. In the commercial powder, however, there is a large proportion of inert, insoluble material, and it is advisable to eliminate this as early as possible in the process. The mixing tank shown by Fig. 2 is designed to accomplish this result.

In the design the principle of a rising current of water of varying intensity is used. The arrangement consists of an outer cone, into the side of which two feed-water pipes are led, and from the bottom of which a drain pipe takes away the wasted portion of the powder. Screwed into this cone, and co-axial with it, is a second cone, the opening at the bottom being 1 in., and the diameter of the upper length of pipe being 12 ins., the area of cross-section having therefore the ratio of 1 to 144. When the drain pipe of the lower cone is closed and the feed water turned on, water is forced through the 1-in. opening, and rises in the upper cone. In the face of this upper cone a 2-in. pipe is inserted which connects with the storage tanks. At a point in this overflow pipe a connection is made through which a strong flow of water may be maintained into the storage tanks, the overflow from the upper cone mixing and being carried with it. Thus the rising current in the upper cone can be set to take out as much or as little of the insoluble portion of the bleaching powder as is desired, this part remaining suspended in the lower portion of the cone and being thoroughly washed by the rising water overflowing into the storage tank. It is an easy matter to arrange the two water feeds so that the water in the overflow cone will be quite clear by the time the tank is filled. After the tank is filled the drain cock is opened, and all the insoluble material not carried over in the overflow is washed into the drain and is no further trouble. So far as the author knows this method of treatment is original.

Storage Tanks

These are reinforced-concrete tanks 3 ft. 8 ins. in internal diameter, 5 ins. in thickness, and 5 ft. 8 ins. in depth. A suction pipe for the feed of the pump is inserted 2 ins. from the bottom of the tank, a 2-in. drain pipe is inserted level with the bottom; a 2-in. overflow pipe returns the unused solution from the orifice box to the top of the tank, and a 2-in. pipe enters the top of the tank opposite the overflow pipe and is connected with the conical mixing tank. The tanks are filled within 2 ins. of the top. A single pipe brings the return overflow from the orifice box to a point adjacent to the tanks, and from these three pipes, controlled by three valves set side by side, convey the solution into each of the three storage tanks. A similar arrangement is used for the feed from the conical mixing tank, and for the suction feed of the pumps which lift the solution and deliver it to the orifice box. The fact that the solution is pumped from the bottom of the tank and the surplus returned to the top is relied upon to maintain a uniform strength of solution.

The solution tanks are set below the pump-house floor. The solution is raised from there to the orifice box by means of a small boiler-feed pump. The capacity of the pump, 5 gals. per min., is much greater than the orifice flow, and thus a good circulation of

the solution is maintained. Two pumps are provided, as their size introduces an uncertainty of operation.

Orifice Box

A steady uniform dosing of the raw water is obtained by orifice flow under constant head. The constant head is maintained by the overflow pipes leading the surplus solution back to the tank from which it is pumped. As a variation occurs in the pumping of the raw water, it was necessary to obtain an adjustable feed of the dosing solution. This is provided for by two brass plates faced and held together by a spring. Centered on an arc of the inner plate are $3/16$, $3/8$ and $7/16$ -in. holes, suitably spaced. A rotation of the inner plate brings these holes in turn on a line with a $5/8$ -in. hole in the outer plate. An orifice flow of three degrees of intensity can thus be obtained. The outer brass plate is screwed into an iron plate which is bolted to the face of the overflow box. This box is of reinforced concrete, 3 ins. in thickness. The feed from the solution pumps enters at one end, and the overflow pipe is placed at the opposite end. The details of this box are shown by Fig. 3. Screwed into the outer brass plate is a curved brass tube through which the solution, escap-

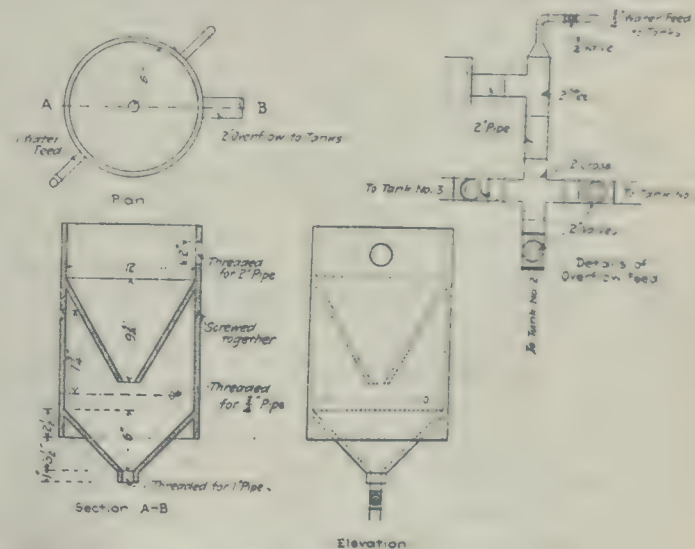


Fig. 2—Hypochlorite Mixing Tank

ing from the orifice, flows to the bell mouth of a $3/4$ -in. pipe by which it is delivered at the center of the suction pipe of the pump. This $3/4$ -in. pipe is curved and is set with a continuous slope, all elbows and horizontal length of pipe being omitted. The solution is taken up the suction-pipe with the raw water and there and in the passage through the pump is thoroughly mixed with it.

The question of requiring the engine staff to exercise an oversight over the sterilizing plant is, of course, important. The effort in design has been to eliminate so far as possible the need for careful oversight, and to make the essential features such as will be readily noticed if there is anything wrong. The three tanks hold a supply of solution sufficient for about a 24-hour run. This means that 20 to 25 minutes is required each shift in filling a tank, and with the rising-current mixer and separator the powder in liquid paste form can be placed therein and in 20 minutes all that is required is a closing of the valves when the tank is full. Too much emphasis cannot be put on the proper sieving, and especially the pro-

per mixing of the powder before it is placed in the rising-current mixer. With the pulverizing and sieving box as shown, this part of the operation can be done thoroughly in five minutes. After the tank is connected to feed the pump and the overflow valves properly set, there is nothing but the stoppage of the pump to be guarded against. The orifice cannot block up, nor is the pipe leading the solution from the orifice to the suction pipe of the pump likely to become clogged. If it does the results are apparent immediately. The pump is in a prominent place and its stoppage would be noticed by the engineman in passing through the engine room. Floats indicate the level of the solution in the tanks, and, in fact, the installation of the plant is such that it does not add materially to the work of the engineer, and there is nothing in the treatment that he cannot do satisfactorily if he so desires. The average engineman does not take kindly to an addition to the routine to which he has become accustomed, but there is nothing in the process itself to give him a legitimate ground for objecting.

Experimental Tests.—There are two or three matters in regard to the treatment that are of interest and subject to experiment. The author endeavored to obtain some data on these matters that might be of assistance in a study of the subject. In the first place it is interesting to note just how much of the insoluble material can be separated out at the mixing box without interfering with the efficiency of the solution. The possibility of a simple chemical test by which to regulate the dosing is also of interest and likewise to what degree the dosing may be reduced in strength and still act satisfactorily as a sterilizing agent.

As regards the separation of the insoluble matter at the mixing tank two tests were made. In the first place the current in the mixing cone was set so that only the flocculent part of the precipitate was carried over, and all of the rest of the insoluble portion of the powder was allowed to settle out and go to waste. Then the same amount of powder was mixed and a strong current turned on the separator so that practically all of the insoluble portion was carried over into the tank. Samples from each of these tanks were taken and analyzed for available chlorine. It was found that there was no difference in the result, the amount of available chlorine being 110 parts per 1,000,000 in each case.

A test was also made to obtain the efficiency of the overflow and pumping as a mixing device. This did not give results showing a uniform solution, there being a decrease of fifteen per cent. in the strength of the solution during the emptying of the tank.

Tests as to the possibility of a chemical reaction by which the dosing might be regulated were also carried out. Starch solution, a few drops of weak acetic acid, and two or three small crystals of potassium iodide were added to the treated water, and the latter thoroughly shaken. As has been pointed out, should there be any free chloride present there will result a blue color reaction that is very marked. Tests were carried on at three points on the system, the pump being run at a constant rate and the tower being shut off from that portion of the system upon which the test was being made. The water was tested just after passing through the pumps, at a point at which the water arrived one hour after treatment, and at a point at which the water arrived approximately two hours after treatment. A strong

chemical reaction was obtained at the 1-hour station when the water was being dosed at the rate of 22 lbs. per 1,000,000 gallons, and a faint reaction was noticeable at 16 lbs. per 1,000,000 gallons at the same station. At the pump house there was a faint blue reaction obtainable when dosing was at the rate of 8 lbs. per 1,000,000, and a marked blue reaction when the rate was 11 lbs. per 1,000,000. The time factor in the reaction is important, but there seems to be no reason why a chemical control of the dosing should not be feasible. It was noticeable that at the tap in the pump house when the dosing was 7 lbs. per 1,000,000 gallons, and the pumps were running at 600 gallons per minute, a faint violet reaction might be obtained, but at 200 gallons per minute and the same

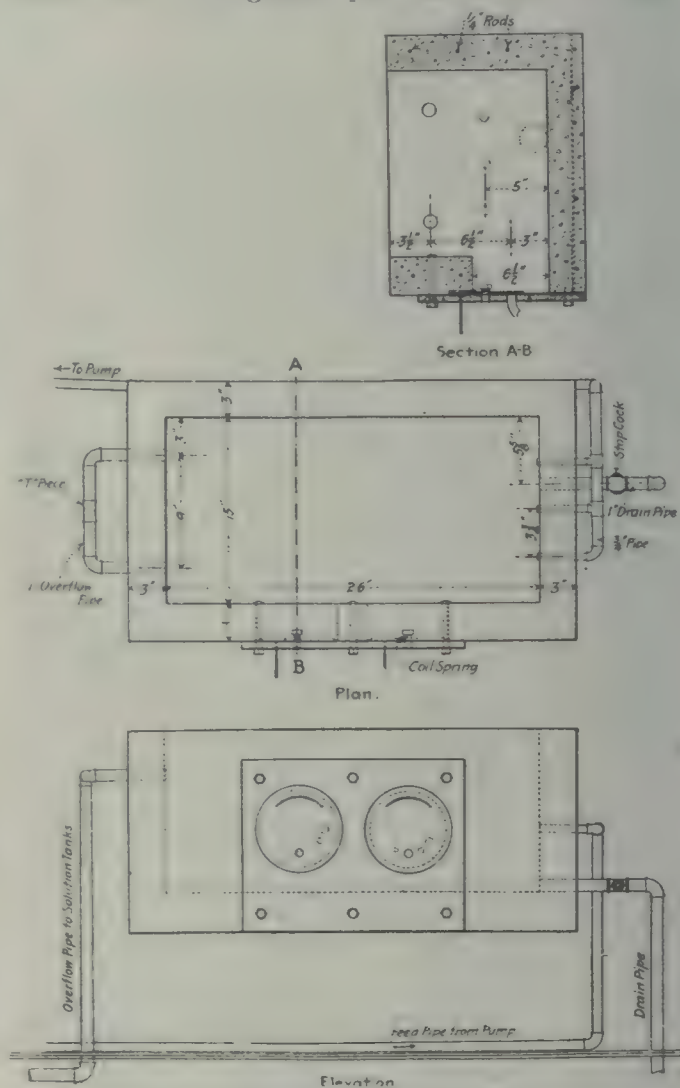


Fig. 3—Hypochlorite Orifice Box.

rate of dosing, the reaction would not be apparent. There is, of course, a difference in time of 1 to 3, the first sample being taken about $1\frac{1}{2}$ minutes after the dosing solution was added to the raw water, whilst in the second sample $4\frac{1}{2}$ minutes would elapse between treatment and test.

The third point of interest was as to the possibility that the elimination of the pathogenic bacteria would take place with a smaller dosing than would give the chemical reactions. To test this, samples of raw water and of the treated water were taken, the rate of dosing being $1\frac{1}{4}$, $3\frac{1}{2}$, $5\frac{1}{2}$, $7\frac{1}{2}$, 11 and $14\frac{1}{2}$ lbs. per 1,000,000 gallons.

The bacterial content of the raw water was so

low at the same that these tests were made that reliable differential results of the line during were not obtainable. It was clearly demonstrated, however, that the chemical reaction might be relied upon as an indication of satisfactory sterilization. It is the intention of the author to repeat these tests during times of higher bacterial content in the raw water.

In conclusion, it might be said that the sterilization of the water supply eliminated all new cases of typhoid except three or four which could be traced directly to individuals, the patients coming from homes in which typhoid cases were being treated. That circumstance has given a feeling of safety to the citizens, and that the physical changes in the water are so little important that the author has been frequently asked if the treatment is still going on. The chemical characteristics of the raw water possibly plays a part in these satisfactory results. The water is naturally hard, and it is possible that it is thus not so susceptible to any slight taste introduced by the treatment.

Trunk Highway from Nelson to Calgary

It is announced that the provincial minister of public works, who has returned from an extended trip into the interior, promises that, unless something unforeseen arises, the Nelson-Ballour section of the trunk highway being constructed from Nelson, British Columbia, to Calgary, Alberta, will be completed this season.

Ballour is at the outlet of the main lake into the West Arm and is where the Canadian Pacific Railway has just established its tourist hotel. The Nelson-Ballour section of the trunk highway runs through some twenty miles of first-class scenery and is expected to be of great value to the fruit industry of the region.

This highway is to be a colonization and development road, as well as a tourist highway. The Wandermere-Kootenay road, the Shewan road, and the Nelson-Spokane road will all meet at Nelson, the last named connecting with and crossing the inter-provincial road now being constructed across the southern part of the province.

The Nelson-Calgary road from Ballour is expected to run via Alonsworth and Kaslo. The next link will be to Larder and thence around the head of the lake to Argenta. From Argenta the road will follow the route of the present trail, via Hannell Creek, Earl Grey's Pass (in the Petrell Range), Junction of Toby Creek, and on to join the main road which traverses the full length, north and south of the Columbia-Kootenay Valley, into which the Canadian Pacific Railway is now running the Kootenay Central Railway from both ends. The main-line end of the road is stated to be largely in existence, as is also the eastern and connecting link with Calgary.

Tunnel linings of hard shale brick laid in Portland cement mortar have a considerably longer period of life than stone or concrete linings when exposed to radioactive gases and dampness, according to the observations of Mr. M. J. Corrigan, general inspector of tunnels of the Baltimore & Ohio Railroad. Salt sandstone in some tunnels has been found to deteriorate in places to depths of 2 inches or more in a year and low-grade concrete also to be rapidly attacked. Coal-mine drainage coming in contact with the lining is observed to be a further source of disintegration.

Road Building in Fernie Riding, B. C.

Considerable activity in road building in Fernie Riding, Kootenay, B. C., is indicated by a report in the "Daily Consultant and Trade Reports" from Consul Frank C. Denison, stationed at Fernie.

The system in that district, he writes, is similar to that in the rest of the province and is under the direction of the minister of public works of the provincial government. Until about two years ago there was no systematic road building carried on in the district. Such work as was done was in the construction of temporary roads where they were necessary, and much of the money appropriated for this purpose was, therefore, not used to the best advantage. Two years ago, however, the provincial government decided to carry on the work under a systematic plan, and in 1908 appropriated \$25,000 for road construction in Fernie Riding. This amount was found inadequate, and the amount, according to Consul Denison, was slightly overdrawn in order to complete the work laid out. For 1911 the appropriation amounts to \$85,000, a part of which is to be used for the improvement of the existing roads.

The largest portion, however, will be devoted to the construction of a 75-mile east and west trunk road, from Wandermere on the Kootenay river at the western boundary of the Riding to the boundary line of Alberta at Crow's Nest Pass, at which point it will connect with the road system of Alberta. Improvements are being made on another through route which begins at the international boundary at Gateway on the east bank of the Kootenay and runs northward to the intersection of the east and west road at Wandermere.

In addition to the amounts mentioned, \$15,000 has been appropriated for the extension of a wagon road from Carleton, the terminus of the Eastern British Columbia railway, near the summit of the main range of the Rocky mountains, southward to the international boundary on the Flathead river where it connects with a highway from Beacon, Mont.

The government agent at Fernie has charge of all expenditures for public works in the Riding. The appropriation is voted by the provincial parliament, acting on the advice of the minister of public works, who, in turn, consults with the member of parliament from the district. Under the government agent is a road superintendent, who has direct charge of all road building and repairing. The work is all done by day labor.

The east and west trunk line road is being built with a maximum grade of 8 per cent., which, according to Consul Denison, will later be reduced to 5 per cent. This road is a link in the through road which is being constructed from the coast on the west to the Alberta line on the east. Another trunk line is being planned which will extend from some point on the Canadian Pacific railway east of the Rocky Mountains to an intersection of the road already built up the Kootenay river and down the Columbia river. This is designed to form a loop line over the mountains and will be available for automobile traffic.

All the bridge work in the district is carried on with appropriations independent of those voted for road work, and it is reported that a considerable sum has been spent for this work. The most expensive bridge recently constructed in the Riding is one across the Elk river near its junction with the Kootenay, about 50 miles south of Fernie.

Electrolysis in Chicago

It has been estimated that at least two-thirds of the water pumped into the mains of the city of Chicago is lost, a large part through leaks in the water pipes, both mains and service pipes. It is believed that a great deal of this leakage is due to electrolysis in the water mains, although this, apparently, is largely supposition. The city engineer, desiring definite information on this point, has endeavored to have an electrolytic survey made covering the entire city. The city budget of 1910 contained an appropriation of \$10,000 for this purpose, but this was not used and a similar appropriation was made in the budget for 1911, but no definite action has been taken toward using this appropriation for an electrolytic survey. Last year the pitometer surveys showed that long stretches of 6-inch and 8-inch water pipe were leaking badly, and these were removed and found to be seriously corroded from electrolytic action. One sample of 8-inch pipe was found to be so affected that it was possible to cut a hole entirely through the pipe with an ordinary pocket knife. A large department store had an investigation made to determine the cause of a leak in a 6-inch water main in the basement and it was found that current from an electric railway was entering the buildings on the water and gas service pipes and following the piping and structural steel of the building until it found its way to the rails of the Illinois Tunnel Company's track.

In view of conditions which are but partially indicated by the above instances, the Bureau of Public Efficiency made a survey of electrolytic conditions over a small part of the city, this survey having been made by its engineers, A. J. Hammond and H. J. McDargh. It was not the intention to secure anything approximating a complete survey, but merely to obtain sufficient accurate data to back the Bureau in its appeal to Council for immediate action on the subject. The volt meter and ammeter were employed, frequent use being made of fire hydrants, but advantage being taken also of street excavations and other opportunities for securing direct contact with the mains. Most of the Bureau's readings were taken during light traffic hours, and it is believed therefore that the conclusions are conservative. In general it may be said that conditions were found in many districts widely scattered, which point to almost certain deterioration of the mains through electrolysis.

Concerning the means of relief of such conditions, which were available, the report of the Bureau of Public Efficiency, which has just been published, contains the following:

There is but one certain method of preventing electrolysis, and that is to insulate all conductors from the earth. This requires the adoption of a double overhead trolley or double underground wire in an insulated conduit.

In Cincinnati, Ohio, the double trolley system is employed, requiring the use of two trolley wires, spaced about eight inches apart. One of these wires conducts the current from the station and the other returns it to the station. Each car has two trolley poles. One is used to conduct the current to the motor and the other from the motor. By this method no current reaches the rail, and hence there is no ground leakage. As a result, the city of Cincinnati is entirely free from electrolysis.

In Washington, D. C., also, no trouble is experienced from electrolysis. Within the city limits un-

derground insulated conduits are employed for wires carrying the outgoing and returning currents, while outside the city limits the double trolley system is used.

In New York City, the borough of Manhattan also uses the two-conductor conduit system on the surface railway lines. Although some electrolysis has been noticed in Manhattan, it was found to be caused by stray currents from the elevated lines; also by currents coming from Brooklyn through the Brooklyn bridge, entering the pipe lines and returning through the rives and the Williamsburg bridge.

To change the system of single overhead trolleys in Chicago to either the double overhead or double underground would involve the expenditure of such a large sum of money as to preclude consideration of the plan at the present time. Although, therefore, the local damage cannot be prevented, except at very great cost, means can be taken to reduce the damage to a minimum.

While it is generally conceded that no practicable method has been determined as yet for making water pipes proof against electrolysis when there are stray currents in the surrounding soil, numerous means, nevertheless, have been suggested to reduce electrolysis action to a minimum, and many have been adopted. The plans put forth by several American cities, and also such action as has been taken by the Chicago Board of Supervising Engineers, have already been described.

The Electrolysis Commission of Germany issued regulations in 1904 for guarding against corrosion. One of the requirements was that the maximum permissible potential difference between a point on the rail return and a point on the rail connected to an independent insulated return feeder should be limited to one volt. Similar official action was taken by Great Britain by limiting the difference of potential between any two points of the rail return to seven volts.

Another method is to connect the rail return at predetermined points to an insulated copper cable carried on the trolley poles, which in turn is connected to the negative bus bar at the station. If a sufficient quantity of copper is used, a greater part of the leakage into the earth will be stopped.

Task Work on Construction

The ultimate aim of scientific management in construction work, says Sanford K. Thompson, is the introduction of task work or some similar method of laying out the work so that men will be paid in proportion to the amount of work that he accomplishes.

Piece work consists in paying a man a certain price for the performance of a given job. Differential piece rates are arranged so that a man who does an extra large day's labor receives pay not only for the total number of pieces, but it given a larger rate per piece.

In task work the time which a man ought to take to do a job when working hard and to the best advantage is fixed in advance, and if he accomplishes the work in a fixed time he receives a bonus.

Suppose, for example, it has been found from time study and a combination of the unit times that a carpenter, allowing, say, thirty per cent, for unavoidable delays and necessary rest, should make by working hard, a section of form in 9.5 minutes. If he accomplishes the work in this time or less, he

should be given for the period, say, 35 per cent. more pay than if he were working simply by the day. If his day rate is 50 cents per hour, his regular pay for nine and one-half minutes would be 7.9 cents. Adding 35 per cent. would give him a price per form of 10.7 cents, provided he made an acceptable lot of forms in the specified time. In case he failed to make them within the time, he would receive his ordinary day's pay. If he completed ten sections in eighty minutes instead of 95 minutes he would be paid his 35 per cent. bonus on the full 95 minutes and would at once begin on the next task so that he would receive even higher than the figured rate, and he would have an incentive to work as fast as possible. If any of the forms were imperfect he would receive a smaller rate or else he would be required to repair them in his own time.

For satisfactory task work exact knowledge is necessary of the time required to do each branch of the work and scientific methods must be employed in fixing the tasks.

Great care must be used in setting a rate to be sure that the men can accomplish the work in the given time. If they fail to earn their bonus, they immediately become discouraged. On the other hand, if the time given is longer than necessary, the men will earn more than was planned for them and will probably start soldiering so as to prevent their employer from knowing that a wrong task has been set. Accurate fixing of tasks and rates of experienced men is absolutely essential to success.

Tar Macadam Roads in Scotland

Writing in the "Daily Consular and Trade Reports," J. N. McCunn, of Glasgow Scotland, states that roads built with tar macadam in that part of Scotland several years ago have fulfilled all expectations as regards durability and cleanliness. It is noticeable, he writes, that while the ordinary macadam roads have deteriorated under the increasing use of the automobile, the tar macadam roads have remained practically intact.

In regard to sidewalks, he states that the cement or so-called granolithic walks have been found more satisfactory than those of tar macadam. Certain parts of the sidewalk, such as those close to store fronts and at corners, are used more than the other portions, and the effect of this upon tar macadam is to wear the more traveled portions down below the level of the rest. This necessitates patching, which spoils the appearance of the walk. The dripping of water from the eaves of buildings also appears to disintegrate the tar macadam, he states.

An Unusual Concrete Plant

Charging a concrete mixer from freight cars on a siding is being done on the masonry work for the St. Clair Avenue bridge of the Cleveland Short Line Railway by the use of small wooden hoppers supported on the sides of the cars and a narrow-gauge track parallel and close to the siding. The narrow-gauge track is on an incline, continuously past all of the cars and up to a point above the mixer which is located at the end of the siding. A cable from a hoisting engine near the latter point is attached to a small steel charging car of the hopper type, with a dumping gate at one side. Its capacity is equal to

one charge for the mixer. The hoppers hung on the sand and stone cars have bottom gates over the narrow-gauge track and are large enough for two men inside the cars to shovel into them continuously. The hopper for cement is supported on a light staging beside the point where a box car loaded with cement is placed. In the operation of the plant freight cars are placed on the siding with the cement car nearest the mixer, then a car of sand and a car of stone. A man in the cement car takes sacks of cement to the staging immediately in front of the door and dumps them in the hopper, one at a charge, while the shovellers in the gondola cars keep the side hoppers filled. The small charging car is allowed to run down by gravity to the stone car on the end, a man riding it to open the car-hopper gates. It is then drawn ahead by the cable, the rider tripping the gate latches as it is stopped at each hopper to receive its charge. It then proceeds to the mixer, where the rider opens the car gate and discharges the load.

Sanitation Works in Japan

Before the opening of the World Exposition to be held in Tokyo in commemoration of the fiftieth anniversary of the crowning of the Mikado, the Japanese authorities decided to install a complete system of modern sanitary sewerage, modelled after that of modern Western cities. As the area of Tokyo is one of the largest of the cities of the world, such a complete scheme of sewerage would require many thousand feet of sewer pipe. The mayor of Tokyo, Y. Ozaki, states that approximately \$17,000,000 to \$20,000,000 will be spent in this improvement, and that the Tokyo system will be composite in nature, embodying the most suitable features of many cities. It is probable that the Tokyo system, however, will resemble the Berlin sewerage system in many essential features.

The proper authorities to address regarding the introduction of articles for the sanitation enterprise are K. Inuzuka, Chief of the Bureau of Public Works, Home Department, Tokyo, and the Department of Public Works, City Office, Tokyo.

Before attempting to introduce products into Japan suitable for sanitation of cities, patents should be properly registered according to Japanese law. The Chief of the Patent Bureau at Tokyo will furnish all desired information in this respect.

Architects are not giving their clients buildings that are the most economical in the end, because they either ignore or neglect the details that help to prevent serious fires. There is a growing tendency to diminish the height of those outside wall sections of buildings that extend from the top of one row of windows to the bottom of the row above. This tendency is being fostered by the manufacturers of large-area window sash. Reducing this wall section shortens the distance that flames must leap in passing out of one floor and into the one above by way of unprotected window openings. A safe minimum height for these wall sections is about six feet, but it is essential that one-half or more of this height should be between the top of each row of windows and the ceiling of the same floor, in order to provide a fire-barrier at the top of the room. Another remedy would be to use standard metal frames and sash, and glaze the upper sash with wireglass.

C. P. R. Irrigation Work

The Ambursen Hydraulic Construction Company of Canada, Limited, with offices at 405 Dorchester street West, Montreal, is making good headway with the irrigation dam which is being constructed at Bassano, Alta., for the C. P. R. This will be one of the largest works of its kind in the world when completed. The same company has the contract for the construction of a dam for the Lake Superior Power Co. at Michipocoton. Work will be started at once and it is expected that it will be completed within five months. Another contract recently placed with this company is the construction of a dam for the Deschambault Power Co. at St. Marc, Port Neuf county, Quebec.

The Ambursen Hydraulic Construction Company of Canada, Limited, is carrying on considerable work at Porto Rico for the Porto Rico Railway Company and is also building two power development plants for the United States government on that island.

Stefar Bricks to be Made at Winnipeg

The organization of the Manitoba White Granite Pressed Brick Company, Limited, has been completed. At a meeting of the company held recently in Winnipeg the following directors were elected: Edward Burdett, J. A. Gowler, S. H. Smith, Stanley W. Burdett, and John Smith. At a subsequent meeting of the directors Edward Burdett was elected president, J. A. Gowler vice-president, and S. H. Smith secretary-treasurer. L. F. Willan was appointed fiscal agent. He has successfully promoted companies in Vancouver, B. C.; Houston, Texas; Fort Smith, Arkansas; Kansas City, Kansas; San Antonio, Texas; Memphis, Tennessee; Jackson, Mississippi; Tampa, Florida; Tampico, Mexico; and many others under the Stefars system. The company is capitalized at \$125,000, issued in shares of \$1 each par value. Its purpose is to manufacture a brick equal in quality to any on the market, but as a much lower cost, and so dispense with the importation of brick at high prices. On an average one hundred millions of bricks are being imported every year from the United States to the city of Winnipeg. The Stefars bricks have been in use for many years, and have stood repeated tests, and have been heartily endorsed by leading contractors. The U. S. A. government has adopted these bricks for all government buildings.

Hamilton Bridge Works Busy Season

The Hamilton Bridge Works Company, Limited, are to be congratulated not only upon the number of contracts with which they have been entrusted this season, but also upon the enterprising and expeditious manner in which they have carried on their several operations which have been distributed, as usual, over a large territory. The principal work upon which they are engaged at present is a large number of important bridges on the C. P. R. in British Columbia. These structures comprise some of the most important, and also some of the most difficult, in point of erection, ever built in that section. In addition to this work in the far west the company are erecting a considerable number of bridges on the C. N. R. between Toronto and Ottawa, principally at Cobourg, Trenton, Belleville, Yarker, and other points. They are also erecting a 4-track subway on the G. T. R. at Cobourg and on the Transcontinental Railway they are commencing the erection of a large bridge over the Missinabi River, besides less important bridges at Wellington Creek, Poplar Rapids and Brule Creek. The operations of the company have been notably

active in the building line. At Hamilton they are putting up a large foundry for the Canadian Westinghouse Company; a building of a similar character for the International Harvester Company; a large crane runway for the Steel Company of Canada; a large crane runway for the Oliver Chilled Plow Works of Canada; several buildings for the Standard Underground Cable Company, as well as the steel for the I. O. O. F. Temple and new public schools on Trolley street and Maple avenue. They have recently completed a large foundry building for the Waterous Engine Works Company, Brantford, and a large addition to the gas producer building of the Algoma Steel Company at Sault Ste. Marie, Ont.; also additions to the power house and transformer house of the Dominion Power & Transmission Company at Decew Falls and a large addition to the power house of the Canadian Niagara Power Company, Queen Victoria Park, Niagara Falls, Ont. In the city of Toronto they are at present furnishing and erecting steel for Sir Henry Pellatt's new mansion on Gad's Hill as well as structural steel for the new Western Hospital. Mr. W. C. Greenfield is Superintendent of Construction for the Hamilton Bridge Works.

Edmonton's Building Record

At Edmonton, Alta., last month 207 permits were issued for buildings aggregating in value \$611,440. During August, 1910, the number of permits issued was 108 and the value \$133,900. For the current year to the end of August 1,169 permits were issued, valued at \$2,606,780, compared with the 1910 record for the same period of 691 permits and a total value of \$1,648,442. Mr. J. W. Drabble, Inspector of Buildings at Edmonton, writing to the Contract Record, states that the outlook is exceedingly bright. Business blocks are coming in every day and the activity in house building is unprecedented. In many cases the structures are sold long before completion.

Vancouver Will Spend Fifteen Millions

"According to present indications," writes S. H. Jarrett, Building Inspector of Vancouver, to the Contract Record, "the estimate of \$15,000,000 made for Vancouver at the beginning of the year is going to be realized." For the eight months of the present year ending August 31st, the permits issued, totalled \$11,822,702, compared with \$8,269,475 for the corresponding period of 1910. The total for last month, \$1,525,918, was nearly \$800,000 in excess of that for August, 1910.

Vancouver, B. C., is training her suburbs in the way they should go. Point Grey is a notable example; that is if building permits count for anything. During August in this thriving municipality permits for new buildings were taken out to the value of \$329,100. This record leaves in the shade such important cities as Victoria, Spokane and Tacoma.

Work is under way on the dam and headgates in connection with the water power development by the Chicoutimi Water & Electric Company at Chicoutimi, P.Q. The plans by H. S. Ferguson, consulting engineer, New York City, provide for a dam of about 55 feet head and a maximum of about 6,000 horse power which will be electrically transmitted to the village of Chicoutimi, three miles away, where it will be used for town lighting, industrial purposes, and the operation of the local railway.

Building Progress in Winnipeg

Good progress is reported on the larger building contracts at Winnipeg. The Hudson's Bay store, the permit for which ran into more than \$136,000, is now up three storeys and the work is being pushed forward rapidly. The Carter-Halls-Aldinger firm are the contractors and the Mushroom system of reinforced concrete is being used. A good start has been made on the Leslie warehouse and factory by Geo. H. Archibald Co., who are using the Kahn system of reinforced concrete.

The big store and office building of Gowans Kent Western, Limited, is another building for which Carter-Halls-Aldinger are the contractors, and James Chisholm & Son, the architects. This building has eight storeys and the work of construction has been going along so smoothly that the structure is now ready for the roof. The estimated cost of this building is \$137,000.

Efforts are being made to push forward the construction of the Canadian Bank of Commerce building on Main street as far as possible this season, but the builders have been hampered by delay in the supply of building stone, with the result that while the rear two-thirds of the building is three storeys high, the front third, with the stone front, is only up one storey.

Immediately at the side of the Canadian Bank of Commerce building will be erected the Union Trust building, for which excavations have been made.

On Lombard street the interior of the handsome four storey office building of the Great West Assurance Company is receiving its finishing touches and the offices will be ready for occupation in about three weeks' time.

On Portage avenue east the Trust and Loan Company of Canada is putting up a large office building which is eight storeys in height and will cost over \$100,000.

A good force of men is employed at the new Sterling Bank at the northwest corner of Smith street and Portage avenue, but as yet only the steel frame is up.

This corner of the city is one in which there is great activity in building, and an eight-storey block is to be erected at the rear of the Oxford hotel at a cost of \$175,000.

The Bank of Montreal, which has been for many months in process of construction at the intersection of Main street and Portage avenue, is getting much nearer completion.

At the corner of Edmonton street and Portage avenue the Boyd block will be erected. The Kelly-Simpson Company has secured the contract for the construction of this block which will be a very large one, its cost being estimated at \$230,000.

Numerous other buildings are being constructed in central Winnipeg and helping to make this district thoroughly built-up. Among these are the two-storey addition being put on the Somerset block by J. A. M. Aikens at a cost of \$70,000; the police patrol and signal station which is approaching completion at a cost to the city of over \$60,000 and a new fire hall which will cost \$20,000.

Forthcoming Cement Shows

Practically all arrangements have been completed for the allotment of space at the three big Cement Shows to be held by the Cement Products Exhibition Company during 1912. The first show will be in Madison Square Garden, New York City, January 29 to February 3, 1912; the second at the Coliseum in Chicago, February 21 to 28, 1912, and the third at Convention Hall, Kansas City, March 14 to 21, 1912. Allotment of space, by drawing, for the three shows will take place at the offices of the Cement Products Exhibition

Company, 72 West Adams street, Chicago, Friday, October 6. All applications should be filed on or before noon, Tuesday, October 3. The services of M. E. Gordon, of Chicago, have been retained as installation manager for the three shows. Mr. Gordon has been identified with practically all the cement exhibitions held in the United States during the past six years, and is well known to many of the exhibitors.

News, Notes and Items of Interest

Permits issued at Nelson, B. C., up to the end of last month totalled \$122,460, compared with \$88,305 for the corresponding period of 1910.

The Canadian Inspection Company have submitted a report upon the collapse of the Fairbanks building in Winnipeg, according to Mr. E. H. Rodgers, city building inspector.

Of the noteworthy contracts of recent date may be mentioned that for the \$350,000 addition to St. Eugene's Hospital, Cranbrook, B. C., awarded to G. R. Leask, of Cranbrook.

Much interest is being taken in Toronto's proposed tube system. Among the contractors who have been particularly active are Messrs. Jacob & Davis, of New York. Specifications for the work will be completed about September 22.

City Engineer Macallum, of Hamilton, who with Mr. Willis Chipman, of Toronto, is reporting on the water-works system of that city, is of the opinion that the expenditure of \$600,000 will be necessary, exclusive of the cost of a new reservoir.

Building permits issued at Montreal last month aggregated in value \$1,897,757, as against \$1,537,766 for August, 1910. The advance is all the more notable, seeing that the figures for August last year were padded by about 150 permits issued for stands for the Eucharistic Congress Parade.

The construction of the Hedley-Shaw Milling Company's large flour mill at Port Colborne, Ont., has just been completed. The new mill is 7 storeys high and is built of reinforced concrete. It has a capacity of 1,000,000 bushels and is one of the most modern structures of the kind in the Dominion.

The resurrection of Kingston, Ont., is clearly proven by the fact that the building permits last month exceeded in value those of August, 1910, by nearly 140 per cent. The figures are not large, \$44,060 and \$18,788, but the ratio holds good. The announcement is causing no little excitement in the Limestone City.

Excellent progress has been made upon the Toronto filtration plant this season. The finishing touches are now being put upon the filtration beds and generally the work is in such an advanced stage that the contractors, Messrs. Dill, Russell & Chambers, hope to hand the plant over to the city by the end of October.

According to Dr. Pugsley, Minister of Public Works, the contract for the improvements to the harbor at St. John, N. B., estimated to cost between \$3,000,000 and \$4,000,000, will be awarded shortly by the Government. The lowest tenderers are Messrs. Norton Griffiths Company, a British firm who have carried out many important contracts in England, South America, Africa, and Russia. The proposed work at St. John, includes the construction of one of the largest dry docks in the world.

In order to meet the demand which is being caused by the large increase in the grain output of the west, the

Canadian Northern Railway company will in the near future increase the storage plant to their elevators at Port Arthur. This statement was made recently in Winnipeg by Hugh Sutherland, executive agent of the Canadian Northern railway company. When asked if the construction would be commenced this year, Mr. Sutherland stated that it would not on account of its being too late in the year.

The laying of the first invert block of the Rat Creek sewer at Edmonton, Alta., was recently the occasion of an interesting ceremony. Mayor Armstrong laid the invert with a silver trowel appropriately engraved and decorated. When the block was put in place the Mayor deposited in the receptacle under the invert a document containing the names of past and present city officials and a tin box containing a full series of Canadian stamps. The system is to cost \$180,000 and the city engineer, Mr. A. J. Latornel, anticipates the best results.

The Canadian Fairbanks Company, Limited, has been authorized to change its corporate name to the Canadian Fairbanks-Morse Company, Limited, it having acquired the entire capital stock of the latter concern. The capital is increased from \$900,000 to \$2,600,000. The above changes have evolved from a greatly increased business, the further development of which will now be much facilitated. The officers of the Canadian Fairbanks-Morse Company, Limited, are Henry J. Fuller, president; Thos. McMillan and T. C. Brooks, vice-presidents; E. R. Whithead, treasurer.

The building and equipment of the new Wentworth Institute of Boston is about completed and everything will shortly be in readiness for the opening at the end of September. The technical education offered by the Wentworth Institute will embody the latest developments in industrial teaching. Practical training in mechanical arts will be furnished at rates within the resources of the average workman. Special courses will be provided in carpentry and building. Full particulars may be obtained of Mr. Arthur L. Williston, principal, Wentworth Institute, 27 Kilsyth Road, Brookline, Mass.

The Pedlar People, Limited, are having an exceedingly busy season. They report an ever-increasing demand for their corrugated metal pipe. Since last March they have consumed over 1,000 tons of material in the execution of contracts for the C.P.R., G.T.R., G.T.P., Quebec Central and Canadian Northern Railway, and they are now working their staff in two shifts, night and day, in order to cope with the work on hand. They have just completed the erection of a new factory, 100 ft. by 200 ft., which is to be used exclusively for the manufacture of metal culverts. This building will be in operation within a few weeks.

The annual convention of the Ontario Association of Architects was held at Ottawa last week under the presidency of Mr. A. F. Wickson, of Toronto. Among the Toronto members present were Messrs. J. F. Brown, A. H. Gregg, A. E. Nicholson, Grant Helliwell and Murray A. White. One of the subjects which came up for discussion was the proposal of the Toronto School Board to institute a competition for plans for the new Technical School. It is suggested that certain prizes be offered and that the winning drawing be turned over to the School Board and the work carried out without further reference to the architect. This proposal formed the subject of a resolution from the convention.

It is rumored in Edmonton that the C. P. R. is at last taking a decisive step towards the extension of a line to

the Peace river country and thence through one of the northern passes of the Rockies to the Pacific coast. An office of the Edmonton, Dunvegan & B. C. Railway has recently been opened at Edmonton and placed in charge of T. Turnbull, who is stated to have received his instructions from J. D. McArthur to direct the field work of surveyors mapping out a line under the charter granted to the above railroad. In Edmonton it is not considered feasible that J. D. McArthur, who has a number of outside contracts on his hands, would commence the construction of a road northwest from Edmonton having no connection with any other roads running into the city, and the C. P. R. is considered the only reasonable solution.

The Toronto sewage disposal works are well advanced and City Engineer Rust expects to complete the undertaking by November. With the completion of the high-level sewer by the end of the year all the sewage north of the high-level, comprising more than two-thirds of the total sewage of the city, will be taken to the disposal works and discharged into the lake opposite the Woodbine. The high-level interceptor has a total length of 29,880 feet, of which 26,819 feet have been constructed, leaving 3,061 feet yet to be built. Fifteen of the twenty-four tanks comprising the sewage disposal works are finished, and the other nine are well towards completion. Mr. Rust states that the whole work should be finished by the end of November. Of the low-level sewer, which has a total length of 26,693 feet, 6,772 feet have been completed. This sewer, Mr. Rust says, should be completely laid at the end of 1912. Some difficulty was encountered by the depression of the sewer on the east side of the Don River, near the Wilton avenue bridge, owing to the soft nature of the earth, but the contractors are now engaged in making the necessary repairs. These sewers are designed of sufficient capacity to provide for a population of 750,000 people.

Unprecedented Railroad Development

Approximately three thousand miles of new railroad lines have been put under contract this year in the Dominion of Canada, which is more than ever before in the history of the country. Up to July, 1,400 miles of new lines had been put under contract during 1910, and since that time another 1,518 miles have been added. The following contracts have been let since the beginning of July.

Alberta Central Railway, from Red Deer, west, 100 miles to D. F. Macarthur, Winnipeg. Forty miles of the grading is now completed.

Canadian Northern, from Hope to Kamloops, B. C., 163 miles to the Northern Construction Company and Foley, Welch & Stewart. From Kamloops to the Yellowhead Pass, about 270 miles, to the Northern Construction Company.

Canadian Northern Ontario Railway, from near Sellwood Junction to Port Arthur, 550 miles, to Foley Bros., and Northern Construction Company, Nipigon, Ont.

Grand Trunk Pacific, from Tete Jaune Cache to Aldermere, B. C., 410 miles, to Foley, Welch & Stewart.

Hudson Bay (Dominion government), from Pas Mission to Thicket Portage, about 185 miles, to the J. D. McArthur Company, Winnipeg.

Algoma Central and Hudson Bay Railway, from Hobon, Ont., to junction with the National Transcontinental Railway, about 115 miles, to the Superior Construction Company, Sault Ste. Marie, Ont.

James Bay and Eastern Railway—Roberval, Que., west-erly for 30 miles, to J. P. Mullarkey, of Montreal.

Personal Mention

Mr. E. Stanley Mitton, architect, Vancouver, has opened an office in the Board of Trade Building, Victoria. Mr. Herbert T. Whitehead is in charge.

Mr. H. B. R. Craig, the retiring city engineer of Kingston, Ont., has been appointed assistant district engineer for the Dominion Public Works Department.

City Engineer Rust will be one of the delegates to the convention of the American Society of Municipal Improvements, which is to be held at Grand Rapids, Mich., Sept. 26-29.

City Engineer Ker, of Ottawa, paid a visit to New York last week with Professor Edwards to confer with Mr. Allan Hazen over the plans for waterworks and sewage disposal.

Mr. F. H. McGuigan, who has the contract for the cement work of the filtration plant at Montreal, has arrived in that city and is beginning work on the undertaking. He is staying at the Windsor Hotel.

Mr. Cecil B. Case has been appointed engineer to supervise the building of the Ross Bay Cemetery sea wall at Victoria, B. C., the contract for which was recently awarded to Thos. Stedham for about \$70,000.

Mr. Carl Allen has been appointed resident engineer in charge of the new intake pipe laying at Toronto. The salary is \$175 a month. Mr. Allen had charge of the construction of the water tunnel under the bay.

Mr. J. C. Dufresne is operating an office at Penticton, B. C., as a general consulting engineer. Mr. Dufresne was formerly hydrographic engineer of the water branch of the Department of Lands for the province of British Columbia.

Messrs. Perry & Nicolais, architects, Vancouver, have completed plans for a reinforced concrete bank and office building to be erected in Hong Kong, China, by a Vancouver syndicate. The estimated cost of the new building is \$300,000.

Mr. J. D. Evans has been appointed resident engineer for J. G. White & Company on the Canadian Light and Power Company's works, and supervising engineer and superintendent of construction for the Montreal Street Railway Company.

Mr. A. T. Ker has been appointed by the Railway Commission Advisory Engineer for Alberta and British Columbia. Mr. Ker will leave Ottawa, where he has been engaged in the Department of Railways and Canals, and make his headquarters in Calgary.

Mr. H. M. Burwell, consulting engineer for the Vancouver waterworks department, estimates the cost of the new water supply for Point Grey at \$302,820. These figures were arrived at in a report which has been turned over to City Engineer Fellowes.

Mr. A. W. Farnsworth, consulting engineer, of London, England, visited London, Ont., last week in the interests of English capitalists, who are looking for a location for the erection of a \$5,000,000 steel plant. Mr. Farnsworth is visiting all the principal cities in Canada.

Mr. W. S. Lea, of McGill University, a brother of Mr. R. S. Lea, the well known consulting engineer of Montreal, is going to Vancouver this month to take charge of the city waterworks department. The salary is stated to be about \$3,250. Hitherto the engineering work in connection with the department has been carried on by the firm of Hermon & Burwell. It is of interest to note that Mr. R. S. Lea has charge of the Greater Vancouver sewerage scheme.

Mr. Bruce Harman, for many years a prominent member of the staff of the Linde British Refrigerator Company, Limited, of London, England, was recently appointed manager for that company in Canada and has taken up his new duties in the company's fine offices, rooms 628-629 Coristine Building, Montreal. The company has been doing business in this country for over fifteen years and its operations are well known in all parts of the Dominion. The company has shown its confidence in Mr. Harman's ability by placing him in charge of this large and important territory.

Messrs. MacDonald & Wilson, the well known Vancouver contractors, have been awarded a nice contract at Victoria, B. C., the work being an addition to Parliament Square, involving an expenditure of approximately \$250,000. The congestion in the Government Buildings is so acute that the contractors are required to have the new buildings ready for occupancy at the earliest possible date. Work will be started forthwith. Messrs. MacDonald & Wilson have erected many substantial structures in Vancouver and other cities. Among their recent contracts may be mentioned the new Court House at Vancouver, which is now about completed.

Mr. John J. Main, Vice-President and Managing Director of the Polson Iron Works, has relinquished the active supervision of the company's plant, which will now be in charge of Mr. John I. Conradi, a British engineer of wide experience. The new General Manager was for fourteen years connected with the great shipbuilding firm of Thornycroft & Company, and for the past four years with the firm of Vickers-Maxim Sons & Company. According to Mr. Main, who continues as Vice-President of the company, the work of construction the drydock will be proceeded with at once. The directors have received an assurance that a Dominion Order-in-Council has been passed providing for the payment to the company of the three per cent. bonus under the act relating to drydocks, and that their plans have been approved. The drydock will cost approximately nine hundred thousand dollars.

Big Contract Shortly at Montreal

Plans are being prepared at the City Hall, Montreal, for the widening of the old aqueduct to a considerably greater extent than was at first proposed. The original specifications prepared by Mr. Janin, Chief Engineer, called for a channel 60 feet wide at the bottom and 149 feet at the top. This scheme permitted earthen banks on each side of the stream with a very wide slope. The new plan specifies a trench 150 feet wide at the bottom and 172 feet wide at the top with concrete side walls. The floor of the aqueduct will be of natural rock. The total length of the water-way will be 27,000 feet, or about five miles. The depth has not been changed and will be about eight feet. The original plan of improvement was intended to provide 6,000 h.p. of electrical energy. The new plan, it is calculated, will furnish 10,000 h.p. Six thousand of this horse power is calculated to pump 100,000 gallons of water and 4,000 h.p. will be used to generate electricity for the lighting of the streets and other purposes for the benefit of the city or its citizens. It is calculated that it will require a million dollars' worth of cement to build the walls for this immense water-race. The contract for carrying out the original plan was awarded last year to Messrs. Haney, Quinlan, & Robertson. Good progress is being made with the undertaking but they have still about two years in which to complete the work. Tenders will probably be called this fall but it is not probable that operations will commence on it until next spring.

New Pier and Shed at Halifax

About \$9,000,000 is the estimated cost of the new pier and shed to be constructed at Halifax for the Federal Government by the Nova Scotia Construction Company, who were the successful tenderers. As designed by Mr. John Kennedy, C. E., of Montreal, the pier will be the widest although not the longest on the American Continent. It will be situated near the southern end of the deep water terminus of the I. C. R., at Halifax Harbour, and is to be completed by next fall. The plans show a pier 800 feet long and 235 feet wide, while the shed which will be erected thereon is to be 770 feet long by 199 feet wide. Of the two storeys, the lower end is designed for freight, mails, and heavy traffic, and the upper one for passengers. A railway track will run along each side of the pier.

The pier and shed are to be constructed entirely of reinforced concrete, supported on over 1700 concrete piles two feet wide and some 85 feet long. At the outer end of the pier there will be an average depth of water of 65 feet. Considerable dredging will have to be done.

Winnipeg to the Fore

There have been important industrial developments in Winnipeg of late. The new municipal power plant is nearly ready for service, and the prospect of cheap power in practically unlimited quantity is clearly an attractive proposition to manufacturers who see the desirability of getting near to the great market of the west. One of the largest of the new industries that have made definite choice of Winnipeg as a western location is the Anthes Foundry Company, Limited. This company has begun operations for building a \$150,000 plant in Winnipeg, to employ a hundred hands at the start and to develop into a duplicate of the company's Toronto works. To this end, the Anthes Company has secured a site of four acres, centrally located, and will begin the erection of the buildings at once. They will make soil pipe and sanitary supplies.

Another big firm to locate in Winnipeg is T. Mueller Manufacturing Company, of Decatur, Illinois. The Industrial Bureau reports that negotiations are practically completed for the establishment of a Winnipeg plant by this company. The T. Mueller Company makes brass goods and plumbers' supplies, and the west is a particularly rich field for operating such an enterprise. At the main plant the T. Mueller people employ nine hundred hands.

Winnipeg building records are climbing to new heights. Eight months' permits show a total of \$13,281,650, or within two million dollars of last year's total. The fall months are always extra busy and it is not likely that this year's figures will stop short of seventeen millions.

Publications Received

The Annual Financial Review.—Published by Houston's Standard Publications, 7-9 King street east, Toronto. The Annual Financial Review is a carefully revised summary of facts regarding securities listed on the Montreal and Toronto stock exchanges, and other prominent Canadian companies. It includes the current annual statements of companies; the highest and lowest prices of stocks and bonds on both exchanges, for each month, for ten years; number of shares sold each month for past fifteen months; rates of dividends paid for past years, and other important items in the history of the different companies, such as increases in capital stock, particulars of franchises, when bonds are redeemable, dividends payable, together with a mass of other facts. It comprises 700 pages of solid information, well printed in a clear and concise manner, and is neatly bound in full

cloth. The work is very valuable, not only to financial institutions, but also to the general investing public. Published half-yearly, April and November.

Exhibits of Note at Toronto Exhibition

Owing to pressure of space, we were unable to mention in our issue of September 6th, a number of interesting exhibits at the Canadian National Exhibition worthy of particular recognition. Prominent among these was that of the Pedlar People, Ltd., of Oshawa, Ont., who had an attractive display of corrugated metal culverts manufactured by them from "Toncan" Metal. The exhibit received much attention and there was abundant evidence of the increasing favor in which the corrugated metal culvert is coming to be held among engineers. It suffices to say that the Grand Trunk Railway are using them where conditions will permit on their whole system, and the Canadian Pacific Railway and the Canadian Northern Railway are doing the same thing on their western, main and branch lines. The Canadian Northern Railway also are using them exclusively on their Ottawa-Montreal line. This same class of culvert is being used on the National Transcontinental Railway. Of the types manufactured by the Pedlar People should be mentioned the nestable type and the rivetted type. The material from which the Pedlar culvert is made,—"Toncan" metal, is a pure iron product from which in the process of manufacture the phosphorus, manganese, sulphur carbon and other corrosive substances have been almost entirely eliminated, producing a point of purity which will analyze in every heat to a degree of 99.94 per cent. of purity. Civil and construction engineers will be well advised to obtain from this enterprising firm an interesting work, entitled, "A Lecture on Toncan Metal."

The Sawyer Massey Company of Hamilton had a very fine exhibit of road rollers and traction engines in charge of Mr. Brodie, sales manager. This well known company is making a big addition to its present factory, which will greatly facilitate a largely increased output.

The Corrugated Pipe Company, Limited, of Stratford, showed their pipe which they manufacture under the well known Moore patent. This pipe is proving very popular with municipalities throughout the country and it is used not only in every section of Canada but in every state of the union.

The Page Wire Fence Company, Limited, Walkerville, Ont., had an excellent display of their well known wire fences, in addition to a line of Page engines, for which there is a greatly increased demand for factory use. These engines can be operated with gasoline, kerosene or alcohol.

Arthur E. Nutter, city architect and inspector of buildings, of London, Ont., furnishes up with the following statement of building operations in the Forest City: value of permits for August, 1911, \$73,239, August, 1910, \$40,705; first eight months, 1911, \$625,388, first eight months, 1910, \$530,871.

A despatch from Fort William, Ont., contains the information that the Canadian Stewart Company have commenced work on the \$2,000,000 coal handling plant and freight terminal for the C. P. R. Several hundred men will be employed, but the completion of the plant is not expected before three or four years.

Mr. Jno. T. Hall, Lethbridge, Alta., Industrial Commissioner, and organizer of the Union of Canadian Municipalities, died last week. The deceased gentleman formerly resided at Hamilton, Ont.

Contracts Department

News of Special Interest to Contractors, Engineers, Manufacturers and Dealers in Building Supplies.

Information for insertion in these columns is invited from Architects, Contractors, Engineers, etc.

Waterworks, Sewerage and Roadways

Armstrong, B. C.

The municipality of Spallumcheen, district of Armstrong, will vote on a by-law to provide for \$5,800 extension to waterworks system.

Bracebridge, Ont.

The by-laws to allow Bracebridge to raise \$8,000 for granolithic walks, and Port Hope, \$15,000 for its waterworks system, have been approved.

Fredericton, N. B.

Tenders were called until Sept. 13 for construction of embankment and concrete pipe culverts at Havelock Road, Parish of Brighton, Carleton, N. B. Provincial Government. Chief Commissioner of Public Works, Hon. Jno. Morrissey.

Hamilton, Ont.

City clerk, S. H. Kent; city engineer, A. F. Macallum. Material required for cement walk and combined curb. Cumberland ave., \$284; creosoted wood block pavement, Ravenscliffe ave., \$3,640.

Ingersoll, Ont.

The council has decided to ask the waterworks company for permission to reduce the amount in the by-law for the purchase of the plant from \$129,000 to \$120,000, and in the event of this request not being granted the council wishes to withdraw from the obligation of submitting the by-law to the people.

Kelowna, B. C.

This municipality has under consideration the installation of a sewerage system. It is also proposed to add a 700-gal. per minute pump for waterworks and install many new water mains.

London, Ont.

City Engineer, G.W. Wright. The city engineer has been instructed to lay cement walks on the following streets: Richmond, Dundas, Wellington, Simcoe, Bathurst, Pall Mall, York street, Cynthia, Cabell. Total expenditure about \$13,437.82.

Lethbridge, Alta.

New estimates are being prepared for sewer and sewage disposal plant. City engineer, A. C. D. Blanchard. Consulting Engineer, T. Aird Murray, Lumsden Building, Toronto, has prepared plans and tenders may be called on preliminary work this fall.

Montreal, Que.

Plans are being prepared by city engineer for widening aqueduct. Cement required estimated to cost about \$1,000,000. The object is to develop electricity and to pump water for municipal purposes. City clerk, L. O. David; city engineer, Geo. Janin.

North Toronto, Ont.

Town Engineer, E. A. James. By-law to issue \$25,000 debentures for opening the road through Mount Pleasant Cemetery was carried; also that for \$20,000 to complete east and west parallel roads.

Point Grey, B. C.

Tenders are called until Sept. 25th. for steel pipe, \$200,000. Owner, Municipality of Kerrisdale. Clerk, H. Floyd. Engineers Cleveland & Cameron, Winch Building, Vancouver. 4-5 miles.

Point Grey, B. C.

Vancouver, B. C., City Clerk, W. McQueen. The residents of Point Grey wish to have a joint municipal main from Capilano. Estimates are as follows for 49,300 ft. of pipe: Pipe laid, \$190,000; canyon tunnel, 7,000 ft., \$10,000; submerged mains with shore connections, \$35,000; coal harbor crossing, \$10,000; False Creek crossing, \$35,000; engineering and supervision, \$14,000; other expenses, \$8,820; total, \$302,820. H. Floyd, Clerk, Point Grey.

Sombra, Ont.

On September 25th a by-law to raise \$6,000 for drainage purposes will be considered by the township council. W. H. McGhee, township clerk.

Sault-au-Recollet, Que.

Tenders were called until Sept. 18 for installation of system of sewer purification. Plans, etc., with engineer. Mayor, F. J. Brousseau. Municipal engineer, F. C. Laberge, B.A. Sc. 30 St. James street, Montreal.

St. Vital, Man.

Secretary, E. A. Poulasin. Engineer, G. Mullen, 372 St. Jean Baptiste street, St. Boniface. The secretary was instructed to call for new tenders for paving Pembina highway. Plans previously submitted were not approved by Prov. Public Works Department.

Toronto, Ont.

Tenders are called until Sept. 26th for asphalt, bitulithic, brick block, concrete pavements; concrete walks and curbs; sewers, grading. City of Toronto. Chairman Board of Control, G. R. Geary.

City Clerk, W. A. Littlejohn. Following local improvements are planned: Concrete sidewalks, \$4,781; asphalt pavements, \$20,113; macadam road, \$10,645; widening of Lawton avenue, \$20,000.

Vernon, B. C.

Tenders will be called at once for construction of sewers; estimated cost, \$12,061.45. City Clerk, D. G. Tate.

Vancouver, B. C.

Tenders are called until Oct. 4 for supply of 1258 feet of 30-in. continuous riveted steel pipe. City Clerk, Wm. McQueen. Supervising engineer, F. L. Fellowes.

Victoria, B. C.

Tenders are called until Sept. 25 for construction of an incinerator on Herald street. Purchasing Agent, W. W. Northcott, Victoria, from whom plans, etc., may be obtained.

The tenders for supply of sewer pipe were as follows: B. C. Pottery Co., \$35-750; Dominion Glazed Cement Pipe Co., incomplete tender, \$25,890; Evans, Coleman & Evans, tender for sewer brick at \$31 per M for 190,000 No. 1, \$5,980, and \$21 per M for 1,500,000 No. 2, \$31,500, were accepted. The city will call for 250,000 No. 2 brick at the same cost of \$21 per M. The tenders for additional paving were as follows: John Haggarty & Co., \$1.47 per yard; excavation 87½c; rock \$2.40; curb and gutter, 55c. Worswick Paving Co., \$1.35 per yard; excavation, 60c.; rock \$2.50; curb and gutter, 52c.; gutter 28c. T. R. Nixon & Co., \$1.69 to \$1.73; excavation 85 to 95c.; rock, \$2.50; curb and gutter, 70c.; gutter 30c. R. G. Stevenson, \$1.53; excavation, 70c.; rock, \$2.50; curb and gutter, 53c.; gutters, 23c. City engineer, \$1.60; excavation, \$2.50; curb and gutters, 55c.; gutters, 28c. Canadian Mineral Rubber Co., \$1.36 to \$1.43; excavation 75c.; rock, \$2.50; curb and gutters, 54c.; gutters.

Westboro, N. S.

Tenders were called until Sept. 19 for construction of concrete sidewalks. Plans, etc., at town hall. Inspecting trustee, R. S. Crain, Westboro, to whom tenders are to be addressed.

Welland, Ont.

Clerk, G. R. Boyd. \$4,000 was voted for the laying of new water mains on East Main and Muir streets.

CONTRACTS AWARDED

Gravenhurst, Ont.

The contract for cement walks has been awarded to A. C. Ferguson, Gravenhurst at 8 cents per square foot. Engineer in charge, A. Sloan.

Montreal, Que.

The contract for paving certain streets in Montreal (granite blocks), \$224,858, has been recommended to the Sicily Asphalt Co., 45 Prince street, Montreal. Recommendation likely to go through. The Hassam Paving Co. has obtained contract for paving six streets (composition blocks), \$141,449.

New Westminster, B. C.

The contract for grading road in D. L. 158, and McGregor avenue, New Westminster, B.C., was awarded to T. M. Coates, at \$19.75 and \$17.50 per chain. Another road in D. L. 158 to the same contractor at \$17.50 and Royal Oak road to N. B. Forbes at \$47.

Railroads, Bridges and Wharves

Baddeck, N. B.

Tenders called until Oct. 12 for construction of branch of Intercolonial Railway. Plans, etc., after Sept. 15th

at office of the chief engineer, Dept. of Railways and Canals, and with chief engineer, I. C. R., Moncton, N. B. Department of Railways and Canals, Ottawa. Secretary, L. K. Jones.

East Angus, Que.

Tenders are called for erection of a station to cost \$30,000, for Quebec Central Railway, Sherbrooke, Que. 2 storeys, concrete foundation and concrete blocks, hot air heating, electric lighting, asbestos roof. L. N. Audet, architect, Sherbrooke.

Fort William, Ont.

The Canadian Stewart Company has commenced work on the \$2,000,000 coal handling plant and freight terminal on Island No. 1 for the C. P. R.

Jamesville, N. S.

Tenders called until Oct. 4 for construction of breakwater. Plans, etc., at the department, at offices of the district engineers at North Sydney, Halifax and on application to local postmaster. Department of Public Works, Ottawa. Secretary, R. C. Desrochers.

London, Ont.

Permits have been granted for improvements to cost \$70,000 to C. P. R. offices; 2-storey, brick station, construction of new coaling plant, including chutes and approaches; steel and cement water tank, brick stores building, 30 x 50, and steel work for portico over new station. John Hayman has contract for brick work.

Little Lameque, N.B.

Tenders are called until October 2nd for construction of a wharf, Department of Public Works, Ottawa; secretary, R. C. Desrochers. Plans, etc., at the department and at the offices of the district engineers at Chatham, N.B., St. John, N.B., and on application to the local postmaster.

L'Assomption, Que.

Tenders called until Sept. 27 for construction of an ice pier. (River L'Archigan). Plans, etc., at office of J. L. Michaud, district engineer, Merchants Bank Building, St. James street, Montreal and on application to local postmaster. Department of Public Works, Ottawa.

Montreal, Que.

It is reported that tenders will be asked in about six weeks for constructing the superstructure of a bridge over Lachine Canal, 156 feet single-leaf highway. Strauss Bascule Bridge Co., Fort Dearborn Building, Chicago, are the designers.

The board of control has reported favorably on application of Montreal Street Railway to construct a new belt line in the city, including tracks already laid on Prince Arthur ave., etc., E. A. Robert, president.

Moncton, N. B.

Tenders called until Oct. 2 for Moncton Yard and cut-off. Plans, etc., office of chief engineer, Dept. of Railways and Canals, Ottawa, and at offices of chief engineer, Intercolonial Railway, Department of Railways and Canals, Ottawa. Secretary, L. K. Jones.

Marble Mountain, N. S.

Tenders called until Sept. 27 for construction of an extension to wharf and warehouse at Marble Mountain, Inverness County, N. S. Plans, etc., at the Department and at the offices of dis-

trict engineers at North Sydney and Halifax and on application to the postmaster at Marble Mountain. Tenders to be accompanied by accepted cheque for 10 per cent. of amount of tender. Department of Public Works, Ottawa. Secretary, R. C. Desrochers.

Moose Jaw, Sask.

The following by-laws were passed: \$52,000 debentures to provide for the city's half of the traffic bridge over C. P. R.; \$14,000 debentures for collegiate improvements, \$25,000 for permanent improvements, \$75,000 hospital debentures and a by-law authorizing the establishment of a public library.

North Bay, Ont.

Tenders are called until Oct. 3rd for construction of breakwater. Plans, etc., at office of J. G. Sing, district engineer, Confederation Life Building, Toronto, and on application to local postmaster. Dept. of Public Works, Ottawa. Secretary, R. C. Desrochers.

New Liskeard, Ont.

Tenders are called until Sept. 27 for construction of public wharf. Plans, etc., at office of J. G. Sing, district engineer, Confederation Life Building, Toronto, and on application to local postmaster. Department of Public Works, Ottawa. Secretary, R. C. Desrochers.

North Vancouver, B. C.

Permission has been granted to the North Vancouver Ferry Co. to construct a railway from landing under C. P. R. tracks to Alexander street. Estimated cost, \$25,000. Temporary subway.

Ottawa, Ont.

Three by-laws will shortly be submitted to provide for erection of the Bank street bridge, \$50,000, the construction of the booster or high fire pressure system, \$60,000, the improvement of the waterworks system \$195,000.

Prince Rupert, B. C.

Tenders are called until Sept. 25th for wharf and two approaches. (Quarantine Sta., Digby Island). Plans, etc., at office of G. A. Keefer, district engineer, New Westminster, and on application to postmasters at Prince Rupert and Victoria. Dept. of Public Works, Ottawa. Secretary, R. C. Desrochers.

Peterborough, Ont.

Tenders are called until October 11 for improvement of public wharf. Plans, etc., at department and at offices of district engineers, Confederation Life Bldg., Toronto, and on application to local postmaster. Department of Public Works, Ottawa; secretary, R. C. Desrochers.

Port Arthur, Ont.

The capacity of elevator and blast furnace is to be doubled; iron foundry established to use product of furnace. Total expenditure, \$3,500,000. Owner, Canadian Northern Railway, Toronto; vice-president, Sir Donald Mann.

Richibucto, N. B.

Tenders are called until Sept. 27 for the construction of breakwater. (South Beach, Kent Co.) Plans, etc., at offices of district engineers at St. John, N. B., Chatham, N. B., and on application to local postmaster. Department of Public Works, Ottawa. Secretary, R. C. Desrochers.

Stanley Bridge, P. E. I.

Tenders called until Sept. 20 for construction of branch railway to Clifton Bridge, 3 3/4 miles in length. Plans, etc., at office of Dept., chief engineer of the Intercolonial Railway, Moncton, and at the offices of the superintendent, P. E. I. Railway, Charlottetown, P. E. I. Department of Railways and Canals. Secretary, R. C. Desrochers.

Surf Inlet, B. C.

Tenders are called for construction of pile wharf at Princess Royal Island. Plans, etc., at offices of G. A. Keefer, district engineer, New Westminster, and on application to postmaster at Prince Rupert and Victoria. Department of Public Works, Ottawa. Secretary, R. C. Desrochers.

Sarnia, Ont.

Tenders called until Oct. 3rd for construction of wharf and dredging basin. Plans, etc., at offices of district engineers at London and Toronto, and on application to local postmaster. Dept. of Public Works, Ottawa. Secretary, R. C. Desrochers.

Upper Salmon River, B. C.

Tenders called until Oct. 4th for the construction of a pier. Plans, etc., at offices of district engineers at St. John, N. B., Chatham, N. B., and on application to postmaster at Almore, Albert Co., N. B. Department of Public Wks., Ottawa. Secretary, R. S. Desrochers.

Vancouver, B. C.

Approval has been given by Surrey council to B. C. E. R. for permission to extend power line to Blaine, Wash., U.S.A. It is said that \$14,700 has been appropriated. It is thought that in a short time a train line will be constructed.

CONTRACTS AWARDED

London, Ont.

Contracts for electrical equipment for coal chutes, heating and lighting for station, stores and oil houses, to be let shortly by Canadian Pacific Railway.

Thorold, Ont.

Turning basin to cost \$30,000, Welland canal. Owner, Department of Railways and Canals, Ottawa; secretary, L. K. Jones; canal superintendent, L. H. Weller, St. Catharines, Ont.; contractor, Weddell & Manley, Spadina ave., Toronto. Excavating, piling, concrete.

Three Rivers, Que.

Canadian Pacific Railway, Windsor street, Montreal, awarded contract on Sept. 13th to Lynn & Brennan, Quebec, for construction of bridge at Three Rivers.

Page & Germain, Three Rivers, have been awarded contract for construction of an iron bridge, 220 ft. long, two concrete abutments. Work will commence in a few days.

Whitehead, Man.

Bridge across Little Saskatchewan River, Department of Public Works, Winnipeg. Successful contractor, Ald. H. Koester, Brandon, Man., double or single span steel bridge; two cement abutments; 100-ft. span.

Woodbridge, Ont.

The contract for superstructure for bridge here has been awarded to Dominion Bridge Co., 55 ft. span; concrete abutments. Jno. A. Watson, Laskay.

Public Buildings, Churches, Schools, etc.

Alexander, Man.

Plans are being prepared for the erection of a 6-roomed school. Architects, Shillinglaw & Marshall, Brandon. Hot air heating system to be installed.

Bathurst, N. B.

Tenders are being called until September 30th for \$5,000 40-year five per cent., and \$5,500 40-year five per cent. school debentures. B. C. Mullins, secretary-treasurer.

Belleville, Ont.

Tenders called until Sept. 23 for erection of gymnasium and fire hall on the grounds of the Institution for the Deaf and Dumb. Plans, etc., at office of the superintendent, Belleville. Department of Public Works, Toronto. Secretary, H. F. McNaughton.

Calgary, Alta.

The city commissioners are contemplating the erection of an armoury here.

Chilliwack, B. C.

Tenders were called until September 12th for general contracts for church at Sardis. Architects, Grant & Henderson, Williams Building, Vancouver. General contract includes everything but the furnishings. J. Arnold, secretary.

Edmonton, Alta.

W. B. Sherman, Calgary, purchased site on Sept. 7th and plans will be commenced for erection of an up-to-date theatre to cost \$100,000.

Guelph, Ont.

Tenders are called until Sept. 21st for erection of a school to cost \$6,000, for Separate School Board. Architect, W. A. Mahoney, Guelph. 3 storey, brick and stone, stone foundation, hot air heating, electric lighting.

Holden, Alta.

Secretary treasurer, R. A. Thompson. The council decided to call for tenders for the erection of a new town hall.

Hamilton, Ont.

Plans are being prepared for erection of flats to cost \$70,000, Hess and Main streets. Owner, American Construction Co., 37 James south, Hamilton. Sixty, stone foundation, steel and brick, cut stone, steam heating, gas and electric lighting, slate roof, artificial stone, steel beams, passenger elevator, metal ceiling, telephone system. hardwood interior finish.

Joggins, N.S. (Co. of Cumberland).

Tenders called until September 29th for erection of wooden lighthouse with steel framework. Plans, etc., at Department of Marine and Fisheries, and at agency, Halifax, and at the post offices, Joggins's Mines, Amherst, PARSBORO, Pugwash and Spring Hill. Deputy minister, A. Johnson.

London, Ont.

Work has commenced on the removal of the buildings at 930 Maitland street, where a new church will be erected. Plans are being prepared. Full information from Mgr. Aylward, St. Peters Rectory, London.

Moose Jaw, Sask.

Tenders called until Sept. 25 for construction of public building. Plans, etc. at office of J. E. Cyr, Supt. of Public

Buildings for Manitoba, Winnipeg, Manitoba. W. T. Mollard, Clerk of Works, Regina, Sask., on application to the postmaster, Moose Jaw, Sask., and at the Department. Department of Public Works, Ottawa. Secretary, R. C. Desrochers.

J. D. Atchison, architect, Winnipeg, has been asked to revise the plans prepared for the boys college at Moose Jaw, to accord with the new site granted by the city.

Melfort, Sask.

Tenders are called until Sept. 20 for construction of public building. Plans, etc., at office of J. E. Cyr, Supt. of Public Buildings for Manitoba, Winnipeg, Man.; on application to the postmaster, Melfort, Sask., and at the Department. Department of Public Works, Ottawa. Secretary, R. C. Desrochers.

Montreal, West, Que.

St. Philip's Episcopal Congregation plan the erection of a new church; brick and terra cotta, concrete foundation, roof, metal shingles. J. J. Kirkpatrick, Montreal West, has been instructed to build the new church. Cost \$8,000.

Montreal, Que.

S. Rochon, 781 St. Denis street, will build five flats, 3-sty., 44 x 68, pressed brick, hot water heating, stone foundation. Architect, Art. St. Louis, 80 St. Gabriel street. Cost, \$10,000.

Edmond Chartraud, 1467 Cadieux st., six flats, 3-sty., 39 x 45, brick, stone foundation, flat roofing. Architect, Emille Pepin, 416 Wolfe street.

New Glasgow, N. S.

Tenders are called until Oct. 14 for erection of a church, stone and brick. Chairman Building Committee, Graham Fraser, New Glasgow. Architect, Dumaresq & Cobb, Halifax. Plans, etc., at office of architects and at office of R. H. Graham, barrister, New Glasgow.

North Toronto, Ont.

The High School Board are considering the purchasing of a site for new school. Inspector, J. A. Houston, Toronto. Principal, Mr. Reid. New High School imperative. Thos. Banton and Principal Reid appointed a committee to purchase equipment, globes, charts, etc.

New Toronto, Ont.

A by-law was passed by Etobicoke council at Islington on the 12th inst. authorizing the issuing of bonds for \$10,000 for the construction of a new schoolhouse.

Ottawa, Ont.

Tenders have been called for plumbing and heating required in new laundry at Lady Grey Hospital. Specifications at office of architect. City clerk, Jno. Henderson. Architect, A. LeB Weeks, Sparks street, Ottawa.

Prince Rupert, B. C.

City engineer, W. M. Davis. Authority has been given to prepare plans for erection of a temporary city hall on Fulton street to cost \$15,000.

Point Grey, B. C.

The Sisters of Sacred Heart have purchased 10 acres, Marine Drive and Buckland street, where they will erect a convent to cost about \$250,000.

Parry Sound, Ont.

Tenders are called until September 30 for construction of armory. Specifications at offices of Lieut.-Col. J. B. Miller, Parry Sound, and with the director of engineer services, headquarters, Ottawa. Department of Militia & Defence, Ottawa; Deputy Minister, Col. Eugene Fiset.

Port Arthur, Ont.

The Board of Education, Commissioners Dobie, Cain and Woodside, have purchased a site for the erection of a new central school.

Regina, Sask.

Methodist Church of Canada, Richmond street west, Toronto; Superintendent Educational Department, Rev. J. W. Graham, Victoria College Toronto, will have plans prepared at once for a ladies college building to accommodate 200 students; work to commence in the spring. Cost, \$200,000.

Provincial Health Commissioner, W. M. Seymour, M.D. Superintendent, Mr. Hart. Investigation has been made for a suitable site for a provincial sanatorium. Estimated cost \$100,000.

Stettler, Alta.

Town council passed a by-law to raise \$3,500 to build addition to town hall, found sum inadequate for the purpose, matter laid over until next meeting.

An opera house, \$12,000, is under consideration here. No tenders being called. Plans prepared in Calgary.

Sterling, Ont.

The site for a church here has been secured and financial matters arranged for its erection. Rev. F. L. Carpenter, Langley, B. C., is in charge.

Strathroy, Ont.

A by-law to spend \$40,000 for a Collegiate Institute was passed by the ratepayers.

Smith's Falls, Ont.

Tenders are called until Sept. 18 for debentures for local improvements, \$31,464.33, and school, \$12,500. Town clerk, J. A. Lewis.

Thornbury, Ont.

Tenders are called until September 25th for construction of wooden lighthouse tower by Department of Marine and Fisheries, Ottawa. A. Johnston, deputy minister.

Toronto, Ont.

Tenders addressed to Frank Barber, engineer, 57 Adelaide street East, will be received until Sept. 24th for erection of alterations to the County of York Registry Office on Richmond street. Brickwork, electric lighting, painting and hot water heating required.

Tenders called until September 20th for alterations and additions to cost \$35,000, at River and Queen streets, to Evangelia Settlement. Architects, Chapman & McGiffin, 59 Yonge street, Toronto. Two-sty. wing, 75 x 43, 3-sty. addition. 90 x 45, to present building, cut stone, brick, reinforced concrete stairs, steel beams, electrical work, prism glass. Addition to be used for gymnasium and assembly hall.

Addition to hospital on Bond street for Sisters of St. Joseph. Architect, A. A. Post, 15 Toronto street, Toronto.

Architect will receive tenders on electric fixtures, kitchen equipment and hardware.

Vancouver, B. C.

Tenders are called until September 29 for erection of isolation hospital. Medical Health Officer, Dr. F. T. Underhill; architect, S. M. Eyeleigh, care Dalton & Eyeleigh, 615 Hastings street west, Vancouver. Brick administration building, frame hospital.

Architect, N. A. Leech, Vancouver, has plans prepared for the erection of a new school at King Edward. Tenders will be called shortly for general contract.

Victoria, B. C.

The school board, Victoria, B. C., will purchase 14 lots in block 2, section 48, Oaklands, comprising 2 acres; and a site at Simcoe and Oswego streets for school purposes.

Winnipeg, Man.

Alex. Pantages, owner of Pantages circuit theatre, at the Pacific Coast, is contemplating the erection of a large vaudeville theatre in Winnipeg.

CONTRACTS AWARDED

Battleford, Sask.

The contract for the erection of the town hall has been awarded to M. A. Piggot & Son, of Battleford.

Guelph, Ont.

Y. M. C. A. building. Architect, W. A. Mahoney, Guelph; Mills & Hutton, Hamilton. Chairman building committee, H. G. Cockburn, Guelph; general contractors, Johnston & Williams, Guelph, Ont.; 4 storeys, 96 x 53, stone foundation, brick and steel, steam heating, electric lighting, felt and gravel roofing, interior finish oak, cement work, cut stone, marble, terra cotta, tile, mantels, fireproofing, metallic lath, structural iron, fire escapes, cornice and skylights, weather strips, pipe covering, electric work, electric bells, roofing, sheathing paper, steel beams, iron columns, ornamental columns and caps, plastic relief work, plate glass, prismatic glass.

Hamilton, Ont.

The contracts for Maple ave. school \$60,000, were awarded as follows: General contractor, W. H. Cooper, 197 Emerald street north; carpenter, James Calvert, 45 Tom street; plasterer, Arnold Clapham, 192 Bay street south; plumbing, Drake & Avery, 22 John street; iron work, R. Olmstead, 121 King street; steel, Hamilton Bridge Works; painting, Dodson, & Co., 37 John street; roofing, Dennison & Joselyn, 13 Walnut (all of Hamilton). Heating contract not let.

Iberville, Que.

School. Owner, Catholic Board of Commissioners; contractor, C. H. Malhiot, Iberville, Que. Solid brick, 3-sty., 60 x 60, metal roof, hot water heating, hardwood flooring. Contract awarded on the 13th inst.

Moore Park, Man.

The contract for 2-roomed school has been awarded to R. N. Willoby, Brandon, Man.

North Vancouver, B. C.

N. Y. Cross, contractor, has been awarded the contract for the erection of the First Baptist Church, to cost \$10,000. Work will commence at once.

Sherbrooke, Que.

School, \$33,000, for Catholic School Commissioners, Sherbrooke. Architect, J. W. Gregorie, Sherbrooke; general contractor, Sherbrooke Construction Co. Heating contract not awarded. Furnishings to be purchased later on. Building to be completed next spring.

Toronto, Ont.

Fred Holmes & Son, 1113 Yonge st., Toronto, have been awarded the contract for the cut stone and brick work for Government House (Chorley Park Rosedale). Cost \$125,000. Dept. of Public Works, Toronto. Secretary, H. F. McNaughton.

Vancouver, B. C.

S. J. Lund, 319 Empire Building, Vancouver, B. C., is the lowest tenderer, \$300,000, on the convent to be erected at Point Grey for the Sisters of the Sacred Heart; C. G. Badgeley, 318 Pender street west, architect; general contract includes all minor contracts; specifications, slate roofing, steam heating.

Virden, Man.

The contract for installing a steam heating plant in the municipal hall has been awarded to Manitoba Hardware Co., of Virden, at \$3,687.

Residences

Brandon, Man.

Specifications are being prepared for erection of a residence on 14th street for W. Vatcher, Brandon; 2 storeys, concrete foundation, frame, cement, hot air heating, electrical work, art glass, roofing paper.

Hantsport, N. S.

Work will probably start at once on a residence for C. Churchill, \$3,500, also a residence for G. Churchill, \$3,500.

London, Ont.

Mr. A. McKenna will call for tenders at once for the erection of a new 1½-storey brick veneer residence on Eva street. Private plans.

Montreal, Que.

Plans will be prepared at once for erection of a residence to cost \$17,000, on Westmount Boulevard. President, Robertson Macauley, c/o Sun Life Assurance Co., 142 Notre Dame W., Montreal. Architect, Robert Findlay, 10 Phillips Place, Montreal.

Ottawa, Ont.

Tenders are called by Department of Marine and Fisheries, Ottawa, for construction of wooden bungalow at Richibucto Life Saving Station, County of Kent, N. B. A. Johnston, deputy minister, Ottawa.

Quebec, Que.

Work is in progress for erection of apartments at 144 Grand Allee for Grand Allee Apartment Co., Ltd. Architects, McDowell & Henderson, Bank of Toronto Building, Montreal. General contractor, G. W. T. Nicholson, Eastern Townships Bank, Montreal; 6 storeys and basement, reinforced concrete with brick facing, 53 apartments, two elevators.

Toronto, Ont.

Tenders are called for erection of a residence to cost \$4,300, on Barlington ave., for R. G. Furness, 58 Wallace ave., Toronto; architect, W. G. Hunt, 679 Dovercourt road, Toronto. 2½-stys.,

36 ft. 3 in. x 25 ft. 3 in., stone and brick, stone foundation, hot water heating, electric lighting, slate roof, hardwood interior finish.

Tenders are called for erection of a detached residence, to cost \$3,000, on Pleasant ave., for Mr. Cole, 541 Euclid ave.; architect, J. Hunt Stanford, 24 Yonge Street Arcade, Toronto. 2½-stys., 17 x 44, stone foundation, brick, combination lighting, cut stone, cement, slate roof, electric bells, shingle stain, plastic relief work, plate glass, tile, mantels.

Pair dwellings, \$5,000, Symington avenue. Owners, Davis & Moore, 176 St. Clarens avenue; 2 storey, brick veneer, hot air heating, felt and gravel roof, electric lighting. Will build by day labor.

Plans are being prepared for erection of a residence to cost \$8,000, in Rosedale, for H. J. Atkinson, 22 Leuty avenue, Toronto. Architects, C. L. Stewart, 123 Bay street, Toronto; 2½ storeys, 28 x 46, brick, cement work, cut stone, electric light. Will be built by day labor.

G. Brady & Son, 46 Sorauren avenue, Toronto, will build a new house at 209 Crawford street; 2½ storeys, 35 x 23, brick, brick foundation, hot air heating, electric lighting, shingle roofing, to cost \$4,000, to be built by day labor. C. Wilmot, architect, 205 Yonge street.

Brettingham & Patterson, 51 Fern avenue, Toronto, will build two new houses on Pauline avenue. Architect, J. H. Galloway, Toronto street, Toronto; 2½ storeys, 40 ft. x 16 ft. 8 in., stone foundation, brick, shingle roof, hot air heating, to cost \$7,000.

R. Glendenning, 104 Westmoreland avenue, Toronto, will build a new house on Westmoreland avenue; 2½ storeys, 30 x 26, stone and brick, hot air heating, electric lighting, shingle roof; to cost \$3,000.

Larkin Bros., 81 Hogarth avenue, Toronto, will build pair dwellings, \$6,400; 7-9 Doel avenue; 2½ storeys, 38 x 32, brick foundation, rough cast and brick, hot air heating, shingle roof, electric lighting, plate glass.

Two pair dwellings, Curzon street \$12,800.

Residence, \$2,000, No. 5 Doel avenue. 2½ storeys, 38 x 16; specifications as above. Owner will build by day labor.

Tenders called until Sept. 14 for erection of a residence to cost \$6,000, on Highlands avenue, for C. A. Withers, 1107 Traders Bank, Toronto. Architect, S. A. Waggett, 61 Bleeker street, Toronto; 2½ storeys, 40 ft. x 34 ft. 6 in., brick, stone foundation, hot water heating, electric lighting, slate roof, hardwood interior finish, cut stone, tile, mantels.

Tenders are called for residence, to cost \$2,800, on S. S. Playton Cres., for A. & A. Grant, 318 Dupont street, Toronto; 2½ storeys, 44 x 23, brick, stone foundation, hot water heating, electric lighting, cement work, cut stone, brick, tile, mantels, electrical work, steel beams. Tenders received by owner on all work but carpentry.

Vancouver, B. C.

Mr. R. D. Boucher will erect a \$300,000 apartment house at 1054-62 Nelson street, 10 storeys, fireproof, steel and concrete construction. Messrs. Stroud & Keith, architects.

Vancouver, B. C.

Plans are being prepared for erection of a residence to cost \$12,000, on Shaughnessy Heights. Architect, W. F. Gardiner, 347 Pender street west, Vancouver; 3 storeys, concrete basement, 1 storey, native granite, stucco for upper two storeys, hot water heating, hardwood floors. Tenders will probably be called after Sept. 15th.

Plans are being prepared for erection of an apartment house in Kitsilano. Architect, Parr & Fee, 670—Granville street, Vancouver; 3 storeys, about 50 apartments, possibly frame.

CONTRACTS AWARDED**Montreal, Que.**

The contract has been awarded to J. Legarre, for a \$3,000 residence to be erected by P. Boyer on Cadieux street, 3-storey, 20 x 36, stone foundation.

The contract for the two dwellings being erected by J. H. Dewers, 448 Fulum, 2-storey, 25 x 40, concrete and brick, has been awarded to S. Whitaker, 285 Highland avenue.

The contract for the erection of two flats, \$5,000, on Delormier avenue, has been awarded to B. Mamieus.

Ottawa, Ont.

The contract for \$7,200 residence for Mrs. J. Angus Mackenzie, has been awarded to Shuttleworth & Black, architect, A. Le B Weeks, Sparks street, Ottawa.

Vancouver, B. C.

J. J. Disette, 570 Granville street, has been awarded the general contract for the erection of a six storey brick and concrete apartment block on Thurlow and Burnaby streets.

Business Buildings and Industrial Plants**Bridgeburg, Ont.**

The Lantz Marble Co., Buffalo, N.Y., will build large frame sheds costing \$5,000 and instal stone saws, lathes, planers, polishers, motors, air compressors, etc., to cost \$30,000.

Brandon, Man.

Owners, Geo. White & Sons Co., Ltd., manufacturers of engines, boilers, and machinery, Brandon and London, Ont., plan to erect a warehouse and office on Assiniboine avenue, to cost \$10,000. Permit is applied for. Manager, J. Vastbinder.

Calumet, Que.

The Riordan Paper Co., Ltd., have closed transaction covering erection of building. E. Inwood, Purchasing Agent, Calumet, Que.

Calgary, Alta.

John S. Metcalf Co., Ltd., Montreal, Que., are having plans drawn for installation of additional machinery for the Globe Elevator Co., 10,000 bu. shipping leg, 2,000 bu. scale, shipping spout, etc.

Edmonton, Alta.

E. M. Virden will erect, by day labor, a \$15,000 garage on 14th street, 30 x 150, steam heating.

A company is being floated. Plans, and detailed specifications will be ready

shortly for the erection of a cold storage plant. Estimated cost \$150,000.

Fort Frances, Ont.

The Virginia & Rainy Lake Lumber Co. are contemplating the erection of large mills in Fort Frances, Ont.

Kamloops, B. C.

Bids are being asked for the construction of the Royal Bank branch here. The estimate for this building is \$35,000.

Lindsay, Ont.

Mr. McComb submitted a proposition to a number of the business men, re-the establishment of a new malleable iron industry in this town.

Listowel, Ont.

A by-law will be submitted on the 3rd of October to authorize a loan of \$25,000 by the town to Frederick C. Slee, Chauncey J. Hamlin and James Fowler to provide for the establishment of a manufacturing industry here.

A by-law authorizing a loan of \$25,000 to the Electrical Supply Company on condition that they locate here, will be submitted shortly.

Lakeville, N. S.

Herbert Osler, Kentville, N. S., is about to erect a storage building, metal roof, to cost about \$3,500.

Montreal, Que.

Permit granted for alterations to stores, office, \$12,000, on St. James st., for N. J. Holden, 354 Joseph street; architect, H. C. Stone, 84 St. Francois Xavier street, 2 storey, 78 x 49, contractor not chosen yet.

J. C. Wilson & Co., Ltd., 242 Craig W., Montreal, will build warehouse and offices to cost \$125,000, on Lagachetiere and St. Alexander streets. Architects, Ross & Macfarlane, 1 Belnont street, Montreal. General contractor, G. W. T. Nicholson, Eastern Townships Bank, Montreal; 6-storey, brick and concrete, stone front.

Arthur Ahrens will build a safe factory, gravel roofing, stone foundation; architect, A. H. Lapierre, 30 St. James street, Westmount.

Tenders will be called to make alterations to building at 129 Mansfield st., for Chas. Edlington, 413 St. Catherine street west. (Picture dealer). Architect, D. J. Crighton, Jacobs Building, Montreal. Dwelling to be altered for a store.

Tenders called until Sept. 18 for material to finish interior of large building of Montreal. General secretary, Henri Roy, 26 St. James street, Montreal; architects, A. Venne, 15 Boulevard street, Montreal; Laurent & D. Viau, 76 St. Gabriel street, Montreal.

Plans being prepared for alterations to factory on Rivard street, for Canada Bread Co. Architect, C. J. Gibson, 75 Yonge street, Toronto. Superintending architect, D. J. Crighton, Jacobs Building, Montreal. Tenders will probably be called in about a week.

Niagara Falls, Ont.

Negotiations have been opened with the council by the Gaso Electric Motor Co., Ltd., in regard to their location here. The company is being formed. Industrial commissioner, W. E. Tuttle, Niagara Falls.

New Westminster, B. C.

Arrangements are under way for transfer of store and site on Columbia street to the Pantages Circuit Co., of Seattle, Wash., for an up-to-date vaudeville theatre.

North Bay, Ont.

Tenders were called until Sept. 18th for erection of store to cost \$18,000, for Cochrane Hardware Ltd. Architect, H. W. Angus, North Bay; 3 storeys, 36 ft. x 132 ft., solid brick, stone foundation, hot water heating, electric lighting, tar and felt roof, interior finish pine; cut stone, brick, terra cotta, structural iron, vault, freight elevator, sheet metal work, metal ceiling, roof & siding, cornice and skylights, fireproof windows, roofing, sheathing and deafening paper, steel beams, plate glass, prismatic glass.

Prince Albert, Sask.

Fifty feet frontage on First avenue, west has been purchased by the Bank of Nova Scotia for a bank site. The bank will erect a handsome building at once.

Prince Rupert, B. C.

Plans are being prepared for erection of a brick store and rooming house to cost \$20,000, for Chas. Gore, c/o Bevan, Gore & Eliot, Ltd., 503 Pender W. Vancouver.

Stettler, Alta.

The Stettler Foundry Iron Works purchased from H. A. Underwood, by L. Martin. New machine to be installed in their foundry and iron works; all kinds of castings to be handled. Mr. Underwood proposes to manufacture Underwood circular band saws and gas engines exclusively.

Imperial Oil Company took out a building permit for new storage tanks and building costing \$6,000, increased capacity 55,000 gallons; building to be erected on lot 4, block 54.

Toronto, Ont.

Plans are in preparation for offices on Richmond and Victoria, for Robins, Limited, 22 Adelaide street east, Toronto. Architect, J. M. Lyle, 14 Leader Lane, Toronto; 2 storeys, 45 x 67, brick, stone foundation, hot water heating, electric lighting, felt and gravel roofing, interior finish hardwood.

Plans are being prepared for addition to factory and warehouse at 160-168 Adelaide west, for the Boeckh Bros. Co., 60 York street, Toronto, manufacturers of brushes and brooms. No new machinery will be required in factory with the possible exception of shafting and pulleys.

Tenders are called until September 21 for addition to factory on Gladstone ave., for W. Neilson, Ltd.; architects, Chadwick & Beckett, Toronto street, Toronto. Two-sty., 76 x 56, brick, stone foundation, steam heating, electric lighting, felt and gravel roof, hardwood interior finish, freight elevator, cut stone, artificial stone.

Vancouver, B. C.

Architects Perry & Nicholais, Pacific Building, Vancouver, B. C., are preparing plans for new hotel on Pender street; 6 storeys, steam heating, brick and concrete, to cost \$75,000.

Continued on page 63.

Tenders and For Sale Department

TENDERS WANTED Steel Intake Pipe

Sealed proposals for a 60-in. steel intake pipe, approximately 500 feet long, of ½-in. riveted steel plates. Together with a Concrete Screen Wall, approximately 18 ft. x 30 ft., with appurtenances, for the City of Windsor, Ont., addressed to the Secretary of the Water Commissioners, Windsor, Ont., and endorsed, "Proposals for Intake Pipe and Screen Wall for Windsor Waterworks," will be received at the office of the Water Commissioners of the City of Windsor, Ont., until 12 o'clock noon, Thursday, October 12, 1911.

Proposals shall be made in accordance with the specifications and requirements on file in the office of the Water Commissioners.

Each proposal shall be accompanied by a certified cheque equal to ten per cent. of the amount of tender as surety for the acceptance of the contract payable on its face to the Water Commissioners of the City of Windsor, Ont.

The accepted contractor will be required to furnish an approved guaranty or surety bond in the sum of fifty per cent. of the full amount of his contract.

The Commissioners reserve the right to reject any or all proposals.

Copies of plans and specifications are on file at the water office, Windsor, at the office of the Contract Record, 220 King street west, Toronto, and also at the office of Smith, Hinchman & Grylls, Detroit, Mich.

By order of the Commissioners,

W. A. HANRAHAN, Sec.
38-40

Town of Scott

Sealed tenders will be received by G. M. Phillips, Secretary-treasurer, of the Town of Scott, Sask., until noon of Monday, September 25, 1911, for supply and delivery of the following machinery and materials, and for the performance of certain works.

Tender A.—Supply and Delivery of—
Generator and exciter and switchboard.
Transformers and meters.
Series tungsten street lighting system.
Pumping machinery.

Tender B.—Supply and Delivery of—
Two pneumatic storage tanks.

Tender C.—Supply and Delivery of—
Approximately 2,200 ft. of 8-inch steel wire pipe.

Approximately 7,000 feet of 6-inch steel water pipe.

Approximately 5,400 feet of 4-inch steel water pipe.

Approximately 15 hydrants and 22 valves.

Tender D.—
Trenching and laying steel water pipe, setting hydrants, valves, etc., and back filling.

Tender E.—
Erection of a power house and construction of a reservoir.

Plans and specifications may be seen at the offices of the Canadian Engineer, Winnipeg, Toronto and Montreal, and at the Consulting Engineer's office, Bottomly Block, Saskatoon.

A marked cheque for five per cent. of amount of the tender must accompany each bid.

The lowest or any tender not necessarily accepted.

McARTHUR & MURPHY, Engineers,
Bottomly Block, Saskatoon.

G. M. PHILLIPS, Sec.-Treasurer,
Scott, Sask.



To Contractors

Sealed tenders endorsed "Tenders for Buildings," addressed to the undersigned, will be received until noon on Saturday, 23rd September, 1911, for the building of a Gymnasium and Fire Hall on the grounds of the Institution for the Deaf and Dumb, Belleville, Ontario.

Plans and specifications can be seen at this Department and at the office of the Superintendent at the above Institution. An accepted bank cheque payable to the Honorable J. O. Reaume, Minister of Public Works, for five per cent. of the amount of the tender and the bona fide signatures and addresses of two sureties, or the bond of a guarantee company, approved by this Department must accompany each tender.

The Department will not be bound to accept the lowest or any tender.

H. F. McNAUGHTEN,
Secretary of Public Works.

Department of Public Works, Ontario,
Toronto, September 12th, 1911.

Newspapers publishing this advertisement without authority will not be paid for it. 38-38



Department of Railways and Canals, Canada

INTERCOLONIAL RAILWAY

Baddeck Branch Line

Sealed tenders addressed to the undersigned and endorsed "Tender for Alba-Baddeck Branch," will be received at this office until sixteen o'clock on Thursday, October 12th, 1911, for the construction of a branch line of railway from a point on the Intercolonial Railway near Alba to the town of Baddeck, a distance of 22.7 miles.

Plans, specifications and form of contract to be entered into may be seen and full information obtained on and after 15th inst., 1911, at the office of the Chief Engineer of the Department of Railways and Canals, Ottawa, and at the office of the Chief Engineer of the Intercolonial Railway at Moncton, N.B.

Parties tendering will be required to accept the fair wage schedule prepared or to be prepared by the Department of Labor, which schedule will form part of the contract.

Contractors are requested to bear in mind that tenders will not be considered, unless made strictly in accordance with the printed forms, and in the case of firms, unless there are attached the actual signature, the nature of the occupation and place of residence of each member of the firm.

An accepted bank cheque for the sum of \$30,000, made payable to the order of the Minister of Railways and Canals must accompany each tender, which sum will be forfeited if the party tendering declines entering into contract for the work, at the rates stated in the offer submitted.

The cheque thus sent in will be returned to the respective contractors whose tenders are not accepted.

The cheque of the successful tenderer will be held as security, or part security, for the due fulfillment of the contract to be entered into.

The lowest or any tender not necessarily accepted.

By order,
L. K. JONES,
Secretary.

Department of Railways and Canals,
Ottawa, September 9th, 1911.

Newspapers inserting this advertisement without authority from the Department will not be paid for it. 37-38

TENDERS Hull City Waterworks System

Sealed tenders addressed to John F. Boulton, City Clerk, and endorsed "Tenders for the Prolongation and Improvement of the Hull City Waterworks System," will be received up to 4 p.m. Monday, the 25th day of September, 1911.

Plans and specifications may be seen, and forms of tender obtained at the City Engineer's office every day after the 15th of September from 9 to 4 p.m.

Tenders must be filled on blanks supplied by the city engineer and no other shall be considered.

The Council requires a deposit of five per cent. of the amount of the tender. The Council shall not necessarily accept the lowest or any tender.

No account shall be paid for the publication of this advertisement without a previous authorization of the undersigned.

J. F. ALBERT LAFOREST,
City Engineer.

38-38



Department of Railways and Canals

HUDSON BAY RAILWAY

Notice to Contractors

Sealed tenders for the following supplies addressed to the undersigned and endorsed "Tender for Track Materials for the Hudson Bay Railway," will be received at this office until 16 o'clock on Monday, the 16th day of October, 1911.

30,000 gross tons steel rails 80 lbs. per yard.
1,700 gross tons splice bars.
2,100 kegs track bolts and nuts, 200 lbs. per keg.

8,000 kegs track spikes, 200 lbs. per keg.

Specifications, drawings, forms of tender, and form of contract to be entered into can be seen on and after Tuesday, August 22nd, at the office of the Chief Engineer of the Department of Railways and Canals, Ottawa and at the office of the Chief Engineer of the Hudson Bay Railway, Winnipeg, at which places forms of tender may be obtained.

Contractors are requested to bear in mind that tenders will not be considered, unless made strictly in accordance with the printed forms, and in the case of firms, unless there are attached the actual signature, the nature of the occupation, and place of residence of each member of the firm.

An accepted bank cheque equal to five per cent. of the tender made payable to the order of the Minister of Railways and Canals must accompany each tender, which sum will be forfeited if the party tendering declines entering into contract for the work, at the rates stated in the offer submitted.

The cheque thus sent in will be returned to the respective contractors whose tenders are not accepted.

The cheque of the successful tenderer will be held as security, or part of security, for the due fulfillment of the contract to be entered into.

The lowest or any tender not necessarily accepted.

By order,
L. K. JONES,
Secretary.

Department of Railways and Canals,
Ottawa, September 6, 1911.

Newspapers inserting this advertisement without authority from the Department will not be paid for it. 37-38

Are You On ?

If not, get on our mailing list and be one of the 14,000 who receive SHAW'S BOOKLET as issued. The September number is now ready for mailing. Contains 44 pages of attractive offerings in released machinery and contractors' plant. Gives price, make, size, capacity, condition, etc. It's worth having. It's free. Send for it.

WILLIS SHAW MACHINERY CO.,
89 South LaSalle Street,
Chicago, Ill.

TENDERS WANTED

Waterworks

The Water and Light Commissioners of the Town of Whitby are open to receive tenders up until October 1st, for the whole or part of the following work.

- Construction and sinking of an open concrete caisson, in the sand on the beach of Lake Ontario, to serve as a settling basin or intake well for waterworks plant.
- Depression and alterations to intake pipe to adapt it for use with proposed intake well.
- Protection of intake pipe from damage by ice in winter.

Drawings and specifications may be seen at the Mayor's office, and also at the office of the Contract Record, 220 King street west, Toronto. The lowest or any tender not necessarily accepted.

W. J. LUKE, Chairman
F. ROGERS, Secretary
38-39



Department of Railways and Canals

INTERCOLONIAL RAILWAY

Moncton Yard and Cut-Off

Sealed tenders addressed to the undersigned and endorsed "Tender for Moncton Yard and Cut-Off," will be received at this office until sixteen o'clock on Monday, October 2nd, 1911.

Plans, profiles, specifications and form of contract to be entered into can be seen on and after the 4th of September at the office of the Chief Engineer of the Department of Railways and Canals, Ottawa, and at the office of the Chief Engineer of the Intercolonial Railway, Moncton.

Parties tendering will be required to accept the fair wages schedule prepared or to be prepared by the Department of Labor, which schedule will form part of the contract.

Contractors are requested to bear in mind that tenders will not be considered, unless made strictly in accordance with the printed forms, and in the case of firms, unless there are attached the actual signature, the nature of the occupation and place of residence of each member of the firm.

An accepted bank cheque for the sum of \$40,000, made payable to the order of the Minister of Railways and Canals, must accompany each tender, which sum will be forfeited if the party tendering declines entering into contract for the work, at the rates stated in the offer submitted.

The cheque thus sent in will be returned to the respective contractors whose tenders are not accepted.

The cheque of the successful tenderer will be held as security, or part security, for the due fulfilment of the contract to be entered into.

The lowest or any tender not necessarily accepted.

By order,

L. K. JONES,
Secretary.

Department of Railways and Canals,
Ottawa, September 7th, 1911.

Newspapers inserting this advertisement without authority from the Department will not be paid for it.

TOWN OF AYLMER

Tenders will be received up till 6 p.m. Tuesday, September 26, for a steam heating plant for the Aylmer Town Hall.

The lowest or any tender not necessarily accepted.

F. WOOSTER,
Town Engineer.

Aylmer, Ont., Sept. 18, 1911. 38-38

TOWN OF PORT HOPE

PROVINCE OF ONTARIO

Waterworks

Sealed tenders will be received by the Secretary of the Board of Water Commissioners until 8 p.m. on Friday, September 29th, 1911, for the following works:—

- Filtration Gallery.
- Laying Intake Pipes.
- Constructing Pump Well.

A deposit of \$500 required.

Plans and specifications may be seen at the office of the Engineers, Mail Building, Toronto, or at the Board of Water Commissioners' office, Port Hope.

L. B. POWERS, M.D., Chairman.

R. GRAY, Esq., Superintendent.

CHIPMAN & POWER, Engineers. 38-38

Positions Vacant

Advertisements under this heading two cents a word per insertion. Minimum charge 50 cents

WANTED—Engineer, accustomed to laying out and estimating on plumbing, steam heating and ventilation systems, permanent position. Apply, stating salary and experience, to Box 329, Contract Record, Toronto, Ont. 37-37

Business Buildings and Industrial Plants

Continued from page 61.

Victoria, B. C.

Plans are being prepared for a new hotel on Yates street, for J. Morgan. Architects, Hutchinson & Ford, Sayward Building, Victoria; 7 storeys, brick, terra cotta facings, tar & gravel roof, interior marble and hardwood. The same firm is also drawing plans for a large apartment house.

Vancouver, B. C.

The Strathcona Building has been purchased from F. W. Hartley by W. J. Houten. Plans for a ten or twelve storey building will be prepared at once.

H. O. Lee, 2425 Main street, Vancouver, B. C., will erect a \$200,000 store and office building. Architects, Stroud & Keith, Carter-Cotton Building, Vancouver.

W. J. Van Houten, 1409 Nicola street, Vancouver, will have plans prepared at once for erection of a 12-sty. business block at Georgia and Granville streets.

Yarmouth, N. S.

Plans are being prepared and tenders to be called shortly for erection of a bank to cost \$25,000, for Royal

Bank of Canada, Montreal. Architect, Kenneth G. Rea, 54 Beaver Hall Hill, Montreal; 2 storey, terra cotta and concrete.

CONTRACTS AWARDED

Fort William, Ont.

Business block to cost \$20,000, for T. W. Bowlker, Boston. Contractor, Russell Bros., Fort William. Two stys., 50 x 100, solid brick. Contract awarded September 12th.

Halifax, N. S.

The contract has been awarded to W. G. Foley, Halifax, for an \$8,000 structure on Tower Row, 3 storey, wood construction, concrete foundation, electric lighting, cement work, cut stone, brick, asbestos materials, electrical work, electric bells.

Hamilton, Ont.

Factory to cost \$65,000, on Trolley street, for Diamond Flint Glass Co., Toronto and Hamilton. Architects, Stewart & Witton, 2 Hughson street south, Hamilton; general contract awarded H. L. Dickson Construction Co., Pittsburg, Pa.; 1 storey, basement, 300 x 150, steel frame, steel beams, structural iron. Permit has been secured and work will begin at once. Building to be completed Nov. 25th.

Montreal, Que.

Alterations to rubber factory to cost \$2,500, for Canadian Rubber Co., Craig street, Montreal. Architect, J. Pringle, Coistine Building, Montreal; general contractors, Shearer, Brown & Wills, St. Patrick street, Montreal; reinforced concrete, 24 x 22, two storeys, stone foundation, gravel roof.

St. Catharines, Ont.

Factory for Canadian Yale & Towne, Ltd., St. Catharines. Architect, E. D. Pitt, Niagara Falls, Ont.; general contractor, Bishop Construction Co., Traders Bank Building, \$125,000. Large and complete machine shop and laundry equipment.

Power Plants, Electricity and Telephones

Edmonton, Alta.

A by-law will probably be submitted to raise money to build a municipal gas plant.

Port Stanley, Ont.

The council are considering the installation of a hydro-electric light and power plant at an expenditure of \$21,750.

Princeton, B. C.

Princeton Coal & Land Co. have secured a site for power plant and application will be made for water rights. Equipment for power and lighting service required. Ernest Waterman, secretary.

Peterboro, Ont.

Tenders called until Sept. 20 for electric light fixtures, wiring, etc. Plans, etc., on application to architect and at the Department. Department of Public Works, Ottawa. Secretary, R. C. Desrochers. Architect, W. Blackwell, Peterboro.

St. Mary's, Ont.

On October 14th a by-law to raise \$15,000 for electric power extensions will be voted on.

Walkerville, Ont.

The town council have contracted with the Walkerville Light and Power Co. to furnish current at the rate of \$154 per with, which includes care and maintenance of lamps.

Welland, Ont.

The council decided to advertise for the lighting of the streets for the coming year. Present contract is held by Welland Electrical Co., and expires Jan. 15. Between 50 and 60 2,000-c.p. lights are in contract.

Winnipeg, Man.

Tenders are called until Sept. 28 by chairman of board of control for manufacture and delivery of wire and cable and underground line materials. Specifications at office of general manager, City Light and Power Dept., 449 Main street, Winnipeg. Secretary board of control, M. Peterson.

CONTRACTS AWARDED**Brandon, Man.**

Department of Public Works, Winnipeg. Engineer, A. E. Cope, Brandon. The contract for electrical wiring of the Hospital for Insane has been given to the Brandon Electric Light Co. Contract includes over 1500 lights.

Vancouver, B. C.

The Vancouver World Publishing Co., Vancouver. Agent, H. Hume, Dominion Trust Building, Vancouver. The contract for electrical installation has been awarded to J. G. Sutton, San Francisco. This contract does not include ornamental lighting on tower and exterior, nor materials or fixtures. It is stated these may be purchased in Vancouver and that tenders will be called for them.

Miscellaneous**Hamilton, Ont.**

The city of Hamilton, Chairman of committee, Norman Clark, Main street west, Hamilton, has decided to purchase two autos, one for police patrol, probably electric, and small car for fire chief.

London, Ont.

Fire Chief Aiken has been instructed by the fire and light committee to call for tenders for a fire chief's auto, both with chemical fire extinguishers attached and without.

Montreal, Que.

Tenders are called until Oct. 3rd for motor power and fire engines for fire department. Tenders to be accompanied by an accepted cheque for 10 per cent. of price asked. Board of Control. Secretary, L. N. Senecal.

Following debentures have been authorized: sewerage, North Toronto, One., \$265,500; Midland, Ont., \$2,296. Electric light, Bracebridge, Ont., \$8,300. High school, Dunnville, Ont., \$10,000.

Ottawa, Ont.

Tenders are called until September 22 for construction and installation of wooden racks. Specifications at office of Director of Engineer Services, headquarters, Ottawa. Department of Militia and Defence. Deputy Minister, Col. E. Fiset.

Building Permits**Calgary, Alta.**

J. H. Patton, \$3,000, house, Mount Royal; J. A. Knoepfl, \$2,500 house, Mount Royal; J. A. Knoepfl, \$2,000 house, Rosedale; Smith and Dawson, \$1,600 house, Hillhurst; P. Walsh, \$500 house, Erlton; M. Johnston, \$2,400 house, Parkview; M. A. McCacray, \$2,500 house, Elbow Park.

Montreal, Que.

Recent permits include: Joseph Forget, two flats, \$2,500, Boyer street, 2-sty., brick and wood, 25 x 35, gravel roofing; J. Ferron, 1471 St. Hubert, two flats, \$2,000, St. Andre, 2-sty., brick front, 23 x 42; P. P. Boileau, 48 St. Viateur, three flats, \$3,000, St. Urbain, 3-sty., 25 x 40, brick, stone foundation, flat roofing; T. O'Connell, corner Murray and Ottawa streets, six flats, \$9,000, Murray street, 3-sty., 52 x 55, pressed brick, architect, A. Piche; Isaac Jaffe, 1431 Garnier street, two flats, \$2,000, Sterbrooke ave., 2-sty., brick, 25 x 30; M. Larose, two flats, \$2,500, Park ave., 2-sty., brick and wood, 25 x 40; A. Lafleur, 27 Hogan, 9 flats, \$6,000, 2-sty., 75 x 40, pressed brick, cement foundation, gravel roofing.

Winnipeg, Man.

Dwelling, \$2,500, Merrion ave., for F. J. Conaghy; dwelling, \$6,000, Telfer st., for J. Stoller, 572 Flora ave.; dwelling, \$2,000, Camden Place, for J. F. Parker, 184 Young street; dwelling, \$2,000, Camden Place, for J. F. Parker, 184 Young street; dwelling, \$1,600, Selkirk ave., for J. B. Morrison, 1070 Selkirk ave.; store and dwelling, \$4,000, Rosedale ave., for J. B. Collough, 161 Walnut street; dwelling, \$3,000, Banning street, for Daykin, Scott Construction Co.; two dwellings, \$4,000, Jubilee ave., for H. J. Collins, 411 Ashdown Block; dwelling, \$1,200, Manitoba ave., for J. Cooperstock, 715 Burrows ave., dwelling, \$5,200, Grosvenor ave., for W. F. Carson, 80 Sherbrooke street; dwelling, \$6,400, Trinity street, for W. H. Barry; office building, \$10,000, Main street, for Union Trust Company, J. D. Acheson, architect; dwelling, \$5,000, Dorchester ave., for W. P. Jamieson, 608 Mulvey ave.; store, \$2,800, Rathgar ave., northeast corner John street, for J. A. Matthews, 428 Rosedale ave.; dwelling, \$1,500, Manitoba ave., south side Artillery and Battery, for N. Ostafyezuk, 458 Arlington street.

New Companies

Rockwood Realty Limited, Ottawa, Ont., incorporated, with a capital of \$60,000. Provisional directors, Cleophas Perron, Jos. Albert Faulkner and Dr. Rodolphe Chevrier, all of Ottawa, Ont.

Algoma Brick and Tile Company, Limited, Sault Ste. Marie, Ont., incorporated, with a capital of \$40,000. Provisional directors, Frederick Alex. Denman, and Geo. Woolrich, both of Sault Ste. Marie.

The Tugaske Rural Telephone Company, Ltd., has been incorporated, Edward J. Wright, Registrar of Joint Stock Companies, Regina, Sask.

Hurst Engineering and Construction Co., Limited, Winnipeg, Man., incorporated, with a capital of \$20,000. Ralph B. Pratt, architect; Harold Edwards and

Donald A. Ross, civil engineers, all of Winnipeg, are among the incorporators.

Lookout Lumber Company, Limited, 1118 Langley street, Victoria, B.C., incorporated with a capital of \$200,000. Frank Higgins, barrister, to be attorney.

Peachland Lumber and Manufacturing Company, Limited, Peachland, B.C., incorporated with a capital of \$40,000.

Red Cliff Land and Lumber Company, Limited, Vancouver, B.C., incorporated with a capital of \$400,000.

Hazleton Water, Light and Power Company, Limited, Hazleton, Skeena River, B.C., incorporated with a capital of \$50,000.

Upper Fraser River (British Columbia) Lumber Company, Limited, has been authorized to carry on business within the Province of British Columbia. Provincial office is situated at 615 Hastings street, Vancouver, David Gordon Marshall, barrister, to be the attorney. Head office of the company Montreal, Que.

The Chambers, McColeman Harrison Co., Ltd., Port Arthur, Ont., incorporated, with a capital of \$40,000, to carry on business as railway and general contractors. Provisional directors include Wm. Fitzgerald Langworthy, K.C., Alexander Jarvis McComber, both of city of Port Arthur.

The Belgo-Canadian Realty Co., Ltd., Montreal, Que., incorporated, with a capital of \$500,000, to deal in real estate, mining rights, timber limits, timber licenses, water powers, etc. Provisional directors, Wm. Jas. Shaughnessy and Chilion Graves Heward, both of Montreal.

Forest Home Co., Ltd., Winnipeg, Man., incorporated, with a capital of \$75,000, to carry on business as builders, contractors, etc. Incorporators, Robt. A. Harvie, dentist, and Samuel W. Montgomery, broker, both of Winnipeg.

Dunn Bros., Winnipeg, Man., have been incorporated, with a capital of \$400,000, to carry on business as contractors, engineers, etc. Incorporators include John Russell Higgins, attorney; Wm. Manahan and John Munro, all of Winnipeg.

Cushing Bros. Co., Ltd., Calgary, Alta., incorporated, with a capital of \$500,000, to carry on business as manufacturers and dealers in lumber throughout the northwest and elsewhere.

The Ain River Development Co., Ltd., Prince Rupert, B.C., incorporated, with a capital of \$100,000, to acquire and deal in lands, buildings, timber limits and claims, etc.

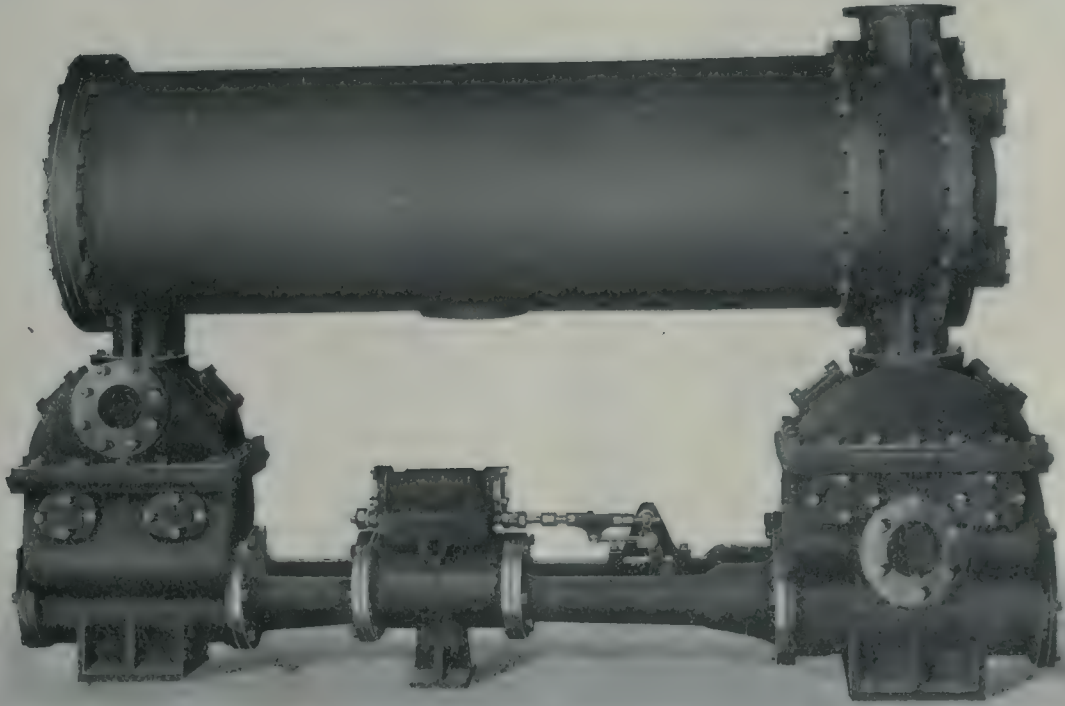
Netos Timber Co., Ltd., Vancouver, B.C., incorporated, with a capital of \$50,000, to carry on business in the province of British Columbia, or elsewhere, as wood, timber and lumber merchants, sawmill and shingle mill proprietors, dealers in sawn timber, wood shingles, poles, etc.

MacLean Daily Reports

The only systematic method yet devised for reporting BUILDING AND ENGINEERING projects from their inception to completion. Ask us for Rates and Specimen Reports.

220 King Street West - TORONTO

CONDENSORS



Condensor built by The John Inglis Co., Limited

BOILERS, ENGINES, PENSTOCKS,
Water Towers, Steel Tanks, Heavy Plate
Work, Condensers, Air Compressors, Pump-
ing Machinery, Special Machinery of all kinds

Let us Submit Prices.

The **John Inglis Company**

Engineers and Boilermakers

Limited

14 Strachan Ave., TORONTO, Canada

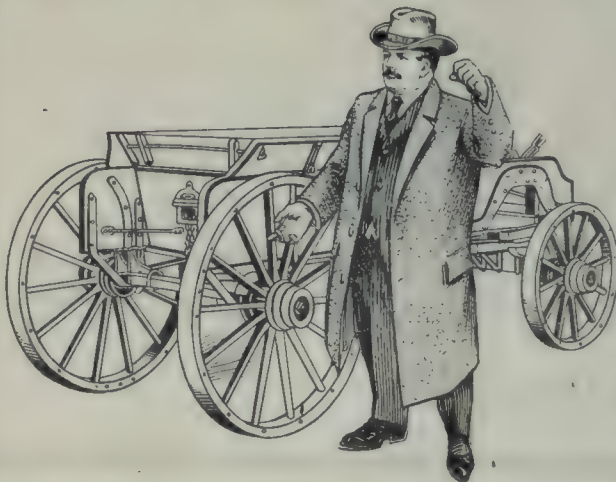
Ferro-Concrete Storage Tanks

Mr. R. Richardson, A. M. Inst. C. E., surveyor to the Handsworth Urban District Council, in reading a paper before a district meeting of the Institution of Municipal and County Engineers at Handsworth, referred to the sewage pumping-station and some of the troubles experienced with the ferro-concrete underground tanks. He stated that, like the doctor's "interesting case," perhaps one of the most interesting features, from the engineer's point of view, in connection with the ferro-concrete tanks, was their behaviour when they were subjected to the pressure of the subsoil water. The excavations for the tanks were sunk in very wet, soft sandstone, the site being only 150 yards from the river, and on nearly the same level. The subsoil, 5 ft. down from the roof of the tanks, was principally made-ground and clear of water, but below that level to the bottom of the tanks occurs a soft sand rock which is full of water. This was, of course, drained to a sump, and pumped away during the whole time the tanks were in course of construction, and when the work was complete, the shuttering was withdrawn, and the working space all round the tanks filled in, the subsoil water pumps were stopped, and the water outside the tanks allowed to resume its normal level.

It was known that the dead weight of the tanks themselves, except a small portion upon which the engine-house was built, would be insufficient to maintain their stability against the upward pressure of the subsoil water, and the designers of the tanks adopted means for anchoring them down. The floor of the tanks was extended outwards to make a projecting sill all round, 18 inches beyond the outer face of the walls. This should have had the effect of anchoring down the tanks and enabling them

to resist the upward pressure of the subsoil water which stands at a height of 16 ft. above the floor of the tanks. As the subsoil water began to attain its normal level, it was found to be lifting the tanks at the end furthest from the engine house, and as the water increased in height, so the tanks came further out of the ground. The maximum displacement was $6\frac{1}{2}$ inches. The subsoil water pumps were at once restarted and the water level lowered, water being at the same time admitted into the tanks so that the levels inside and outside were soon equal, the result being that the tanks went back into position with practically no damage done to the tanks, and none whatever to the engine-house, the only serious fracture being where the inlet pipes passed through the walls of the tanks. Apparently the reason why the anchor or sill was ineffective was because it was covered only with the filled-in material around the tanks, which compressed as they rose. This was afterwards remedied by filling the trench all round the tanks with concrete. "This," he says, "is rather an interesting point to engineers, because constructions of this character in brick or ordinary concrete, the walls and floors of which would probably average 5 to 6 ft. thick, and would generally be heavier than the water which they displace, would require no special means to keep them in position when once constructed; but with ferro-concrete construction, which is comparatively of such a light nature, special means must be provided for anchoring them down in water-logged ground, or they would be liable to float like a ship. The strains were severe and complex to which these tanks were subjected by the pressure of water when being held down by the weight of the engine house over a very small area at one end, and also by the large cast-iron pipes which were built into the wall at the other end."

Jim Fellowes Talks:—



of that, the sales of Watsons keep piling up. Think it over. After that maybe you would like my printed matter.

JIM FELLOWES, Canastota, N. Y.

Watson Wagon Company, Canastota, N.Y.

The First Builders of Bottom Dump Wagons

BRANCH OFFICES:

256 Broadway, New York, N.Y.

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The Voice of the People

Thursday, the twenty-first day of September, in the year of our Lord, nineteen hundred and eleven, will go down into history as one of the most epoch-making days in our national existence. The unmistakable voice of the people has been heard above the din of party clamour, and continentalism—and every other ism but true Canadianism—has been buried for all time. Canada has shown the world—above all she has shown the rest of the Empire—that despite her geographical proximity to the great republic to the south of her, despite all considerations of large immediate gain, she is unpurchasable.

The defeat of the reciprocity pact is a final proof of the true disposition of the country. It is no party victory. If it were, it would have no record in these columns. It is purely and solely a national triumph—the Dominion's seal of approval upon those who value their great national heritage and who have sufficient confidence in their country to bank their all upon its future, so long as that future is not jeopardized by foreign entanglement.

Liberals and Conservatives alike are rejoicing in this great victory of the people. Thousands upon thousands of Liberals polled their first Conservative vote last Thursday. If the latter need additional consolation it is theirs to know that the Liberal party would probably have been returned to power upon any other platform but reciprocity. All of which goes to show that the Canadian people, though small numerically, cannot be coerced, brow-beaten or fooled into national suicide. It shows that we have sufficient confidence to go after business in our own way and to demand it on our own terms. As for the good things that reciprocity offered, they will be ours before the tumult and the shouting has scarce time to subside.

Canada has achieved a great thing, not only for herself, but for the British Empire, whose interests

must ever be dear to those whose veins are coursed by the rich red blood of the old stock.

The charge of "jingoism" has been uttered for lesser imperialistic utterances than these. Let it suffice. Upon such an occasion the subordination of national pride to such a consideration would mean dishonor.

We take off our hat to the "Men of the Northern Zone," and echo the sentiments of Kipling:

"Take 'old of the wings of the morning,

And flop 'round the earth till you're dead,

But you won't get away from the tune that they play
To the bloomin' old rag over'ead."

Advertising Public Contracts

In an interesting article published in this issue, Mr. Jerome Cochran, designing engineer for the Trussed Concrete Steel Company, Detroit, Mich., "places before engineers the fundamental principles underlying the general requirements for advertising for bids on public works contracts." The subject is one of wide application and outstanding importance. It is treated in the most able manner by Mr. Cochran and we could only wish that all our city and government officials throughout Canada might be compelled to learn by heart certain portions we have in mind. Take, for example, the observations made in connection with the subject of adequate time allowance for tendering. Certainly the average municipal engineer in this country knows enough about his business to appreciate the justice of the claims made in this connection. But of what use is it, in the majority of cases, to pit his professional knowledge and technical training against the impatience and ignorance of city officials? We have discussed this matter in many previous issues and Mr. Cochran's remarks do our heart good. It might be urged that the impatience or ignorance of city officials could hardly be adduced as a reason for the unreasonably short allowance of time that has been made on numerous large government works. The solution for this is possibly found in the tendency, mentioned by Mr. Cochran, upon the part of many to keep bidding at home, with the idea of encouraging home industries. Possibly the solution may lie even deeper, but in any case the practice is against the best interests of the man who is finding the money for the work.

At the commencement of his article the author very properly defines the object of advertising, laying special emphasis upon the importance and resultant economy of giving wide publicity to all notices to bidders.

Special attention might be directed to the enumeration of subjects concerning which information should be given in the advertisement. Our public works departments as a rule give us little cause for complaint in this regard, but it is not always so with municipalities. An advertisement which contains only the most meagre information and which concludes by stating that full particulars may be obtained on application is an expensive method, for it generally means a great deal of unnecessary correspondence and delay, all of which costs far more money than the extra publicity.

We cannot refrain from quoting direct a particularly commendable piece of advice relating to the advertising medium. "Large contracts should invariably be advertised in the weekly technical journals devoted

to the special class of work involved, particularly those which make a specialty of keeping contractors posted on pending work."

The article itself is reproduced in a somewhat amended form from the *Engineering News*, which raises a further interesting point in discussing this article editorially:

Private Contracts Also

"Why not advertise for bids on private contracts as well as on public contracts?" asks our contemporary. "Let us say at once that we do not mean by this question to suggest that all contracts let by private concerns or even any large proportion of them ought to be publicly advertised. The disadvantages under which public works have often to be conducted on account of the rigid requirement of laws compelling public advertising and letting of contracts are fully appreciated.

"We do believe, however, that there are many contracts let by private firms and particularly by public-service corporations on which money could be saved and better work could be secured were the works publicly advertised before letting. Further than this, such public advertising and letting would tend to prevent graft and fraud, which now flourish inside many a private corporation quite as luxuriantly as in the shadow of City Halls and State Capitols.

"The business of many of the so-called corporations is really not private business at all. A railway or a water-works system or an electric lighting plant, a bank or an insurance company—none of these are the property of their owners to do with just as they please. Much less have the managers a right to manage according to their own sweet will. The managers of a railway company are trustees for the stockholders on the one hand and for the public on the other. Where they manipulate contracts for their own benefit they are defrauding both the stockholders and the public.

"We do not by any means go so far as to say that such public corporations should be compelled by law to advertise their contracts and let them openly. We do say that an honest Board of Directors of a concern can put up some effective bars against graft and fraud by ordering that all important contracts given out by their firm shall be advertised and let publicly.

"One recalls the sort of contracts unearthed when the affairs of the great life insurance companies were laid open to the public a few years ago, the recently exposed car repairing contracts on one of the oldest and most conservative of Western railways, the way in which unknown contracting firms without previous experience or financial standing have suddenly appeared as the successful bidders for large contracts.

"We believe public advertising and letting of contracts is needed as much to protect stockholders from robbery as it is to protect taxpayers."

Capital Investments in Canada

Under this title there has just been published in book form a series of articles contributed to the *Monetary Times* by Fred W. Field. As Sir Edmund Walker says in his prefatory note: "It is not often that an abundant supply of information on such a wide range of subjects connected with the development of Canada has been brought together in such a small compass. . . . The intention of the series of articles is to set forth fairly the opportunities afforded to the investor by this country." A host of authoritative and interesting data on all phases of

Canadian investment are contained between the covers of this excellent publication and the volume is one which will doubtless be received with much appreciation by bankers, financiers, investors, and the industrial and commercial interests. It is worthy of special note that no less a sum than £372,000,000 of British money has been invested in the Dominion of Canada.

Co-operation with British Manufacturers

Toronto, Sept. 15, 1911.

Editor, *Contract Record*:—

I have read with great interest the article entitled "British Manufacturers and Co-operation," published in your issue of September 6th, as well as articles of a similar nature which have appeared in former issues.

I was particularly interested in your remarks under the heading "Canadian Shortcomings," although I would point out that it is not necessarily unfair competition when the lowest tender is not accepted. In cases where English firms have been turned down under these conditions it is usually due to the fact that the purchaser has no confidence in goods of which he has not had any actual experience. Any firm commencing business in a new field always has to overcome such opposition as this, which, unfortunately, is exaggerated in Canada owing to its proximity to the United States. For example, one meets with many engineers on this side who have not the remotest idea of what is happening in Europe in their own particular line and who do not even know the names of the most eminent manufacturers there.

It is a fact that in certain lines European firms are right ahead of manufacturers on this side, while the contrary also holds good in other lines, and it is by reading the technical press and proceedings of foreign societies that one is able to obtain an insight into such matters. It is also partly due to efficient representatives not always being on the spot to give the customer any desired information; although this is very seldom the case, as no firm would expect to obtain contracts by correspondence only.

It is a very narrow-minded point of view—and one unfortunately often met with in this country—that anything that has not been adopted or taken up on this side cannot be any good. There are eminent men and manufacturers in all countries, and, owing to its greater population, a very large percentage of these must be in Europe; therefore, a purchaser desiring to obtain the best work and material would do well to consider the leading English firms in this respect.

Regarding the short time allowed for tendering, this is not peculiar to Canada: it is a failing of consulting engineers all the world over and it is one which, I consider, is due to the fact that a great many of these otherwise extremely able and experienced men have not actually spent any of their time in the estimating departments of the larger firms. In this case, it is difficult for them to realize the large amount of work entailed in making out a complete tender; the number of separate departments that have to be communicated with before the whole information required can be collected; the drawings to be made; sub-contractors, if any, to be communicated with, and then the putting together of all this information.

The ignorance you speak of with regard to the geographical situation of towns is not peculiar to

England, but is found with the majority of people in all countries who have not had the advantage of extended travel. How many people in Canada could place Melbourne, a town twice as large as Toronto, on a blank map of Australia, or say, off-hand, how long it takes to travel from Paris to Prague—or even state in what country the latter town is situated?

I must apologize for having taken so much of your space, but the above few remarks may perhaps assist in getting a fair view of this matter.

Yours very truly,

Siemens Brothers Dynamo Works, Limited
Arthur S. Herbert, Canadian Manager.

Excellent Crop Assured

A recent bulletin on the field crops of Canada gives their average condition by provinces of spring wheat, oats and barley at that time. The per cent. condition of wheat is given as 86.80, of oats 84.44, and of barley 84.73, which is about five to seven per cent. higher than last year and nearly the same as two years ago. The other crops range in condition from 80 to 86 per cent. and are generally somewhat lower than in 1909 and 1910.

The average yield of spring wheat is estimated at 19.14 bushels per acre for the Dominion, which is seven bushels more than last year, and the total yield at 186,928,000 bushels. The fall wheat was reported last month at 17,706,000 bushels, being grown almost wholly in Ontario and Alberta. The total wheat yield of the country is therefore estimated to be 204,643,000 bushels or 81,849,000 bushels more than last year at the same date. The average per acre is 19.50 bushels, or 6.30 bushels per acre more than last year.

For the Dominion the yield of oats is given as 363,153,000 bushels, which is 84,906,000 bushels more than last year's estimate at the same date, and the average at 35.81 bushels per acre, being more than last year by 7.10 bushels. The average for barley is also higher than last year by 7.31 bushels, and the total yield is estimated at 51,559,000 bushels as against 39,388,000 bushels for last year.

Cement and Its Relation to Brick

There is presented right now the peculiar condition of the cement industry increasing in volume and yet at the same time becoming of less importance as a rival to brick.

We get this impression, says the Clay-Worker, by reading between the lines of a recent report from the Geological Survey on the cement industry and reflecting on actual conditions in the trade of building, the actual positions occupied by cement and brick and their relations to each other.

To say that it is a cheerful idea for the brick manufacturer to entertain goes without saying, and, moreover, it is an idea that we believe the test of time will demonstrate. That we will find eventually cement entering into building construction along with brick, more of it being used all the time and at the same time more brick being used.

In other words, there will not be much pushing of cement along lines that were advocated a while back, to replace brick for general house construction, but more pushing of it to replace steel construction work in large buildings, for foundation work and for use in making mortar with which to lay brick.

The figures compiled by the Geological Survey show for the cement industry of 1910 an increase of ten million barrels over that of 1909.

There seems to be no question but what the cement industry made a new record in 1910 and the figures compiled show a total production of 76,934,675 barrels, valued at \$68,052,772. This is an increase of 15.3 per cent. in quantity and of 26.9 per cent. in value.

It all indicates that the cement industry is getting a better footing generally. It is getting in position to realize more on its product. Something nearer a fair value. The boom days and the wild following of various schemes and untried ideas seems to have passed and it is finding its place in the structural world in a way that makes for the permanency of the business and seems to augur for much better times in the future both in the manufacture and the handling of cement.

The best of it all is that along with this comes a feeling not only in the brick industry, but among the cement people as well, that its progress and success need not be in the way of battling against clay products, but is to come more by working in connection therewith. That each will progress in the point of quantity used in the future and that while at times there may be some rivalry as to which will enter into wall construction, in the general work of the future there will not be anything like the feeling of rivalry that existed in the past. There will be more replacing of steel than replacing of brick and there will be a better and saner use of cement products generally.

Architects' Convention at Montreal Next Month

The fourth annual general assembly of the Royal Architectural Institute of Canada will be held in Montreal on Tuesday and Wednesday, October 3 and 4 next. By courtesy of the Province of Quebec Architects' Association the sessions will be held in their rooms, 5 Beaver Hall Square. An address of welcome will be given by His Worship, Mayor Guerin. Addresses will also be given by Mr. J. Rawson Gardiner, president of the P. of Q. A. A.; Mr. James Ballantyne, president of the Builders' Association, and Prof. Leigh Gregor, Ph.D., of McGill, vice-president of the Montreal City Improvement League.

At 2.30 o'clock on the Tuesday afternoon a town planning conference will be held, when addresses will be delivered by prominent workers and leaders in this movement. At 8 o'clock in the evening the annual dinner will take place in the St. Regis Hotel.

On October 4th, at 10 a.m., the civic reception will be given. A drive around the city will follow, when the visitors will inspect the new Technical School and be taken to principal places of interest. The election of officers will be held at 2.30 and at 3.30 a conference will take place on proposed changes in the charter of the Royal Architectural Institute of Canada in view of the federation of the various Canadian architectural bodies. At 4.30 a meeting of the newly elected council will take place.

It is expected that some 75 delegates will attend the convention. Ladies accompanying members of the institute will be welcome. The president of the Institute is Mr. F. S. Baker, F.R.I.B.A., and the honorary secretary is Mr. Alcide Chausse, chief building inspector of the city of Montreal.

The Outstanding Advantages of Brick

Economy, Durability and Artistic Possibility Among the Many Strong Points of this Material — Practical Hints for Successful Building

As gold has been the standard of value and the basis of practically all monetary systems, so has burned clay been the standard material and the basis of building operations for centuries.

Thousands of years ago, the whole civilized world knew that no material was so adaptable to all requirements, so durable under all conditions and so susceptible of a high degree of artistic finish.

However, we often forget the wisdom acquired by experience and are led astray by the desire for novelty and the use of new materials which promise much. Even as statesmen and politicians have sought to change the gold standard, so have we sought to change the building material standard and have experimented with various materials, a large number of which are worthless, and none of which however valuable in their own special places, are satisfactory as substitutes for brick. Times and progress combined are rapidly clearing our streets of these experiments in unsuitable material and we note with pleasure that practically all our new buildings are of brick and terra cotta. These buildings represent the perfection of the clayworker's art and are a lasting satisfaction to their owners.

Ten thousand years ago men made brick. To be sure these were only sun dried and could not long resist exposure to the weather. In course of time they learned to face these sun dried walls with burned brick. In the ruins of Babylon and other ancient cities these face brick are found elaborately ornamented with colored glazes in as perfect a condition as when first laid. Whoever was the discoverer of the process of burning clay into a hard durable substance should be accorded the honor of being one of the greatest benefactors of the building industry and consequently of humanity. It has been said that buildings constitute a history of the civilization of the world; and if this is true, then brick are the type with which this history is printed.

From that distant time down to the present, the use of brick and other burned clay products has been continuous, and at different times and in different countries has attained a height of perfection and beauty almost unbelievable to one not thoroughly familiar with its possibilities.

All old Italian cities are full of the most beautiful brick and terra cotta work; in Germany it has been used and in Holland its use was and still is almost universal. Spain is full of fine buildings of molded clay, while England has gone so far that elaborate carving is done on brick work of a fine, firm texture—carving such as we would think possible only in stone.

All of the old buildings show that brick is not only durable but that it is a material which, like certain wet gods, improves with age and acquires additional charm with each passing year. This feature should be a great comfort to the architect when his building proves not to be the thing of beauty he had expected. If it is brick he knows that Nature will kindly take it in hand and after he has been dead for years some

artistic soul will discover and disclaim over the wonderful coloring and blended tones of the walls.

But in accomplishing this result Nature does not take kindly to man's interference and if any assistance is offered it must be done very carefully and tactfully and it must not be in the form of paint. Often, we have seen walls just beginning to bloom with the subdued tones of age "brightened up" with a thick coat of paint which utterly kills all the life, character and beauty of the material.

Paint is a good thing in its place, and like the mantle of charity may be made to cover a multitude of sins; but there should be nothing to cover in a brick wall. We should not forget that both the durability and beauty of the brick work depend not alone on the making of the brick, but upon the mortar, the bricklayer and the man who designs the building.

General Efficiency Essential to Best Results

The best brick will make a poor wall if improperly handled, and, by the use of good mortar and intelligence, much may be done with an inferior grade of brick. This does not, however, excuse the use of poor brick, for the result can never be entirely satisfactory. You know all about the making of the brick and how to obtain the desired color and texture; the bricklayer probably knows little about the processes through which the brick passes before reaching his hand, but he does know how it should be laid to secure the best results. While I, as the architect, may know even less than the bricklayer about the manufacturing process, yet I should know more about design; and our combined labor produces a complete building impossible to any one of us alone.

One important feature in the success of brick work which I should like to bring out may not interest you except as an additional means to successful building. This is the question of bond. Bricklayers, and architects as well, are just beginning to appreciate the importance of bond from the point of durability as well as of effect. Have you not, at a fire or even on some old building, often seen whole sheets of face brick peel off leaving exposed the real wall of common brick behind?

It is evident that such facing, merely tied on, can add little if any strength to the wall and it is a source of danger in case of accident. Why should we try to conceal the necessary bond, as though it were something improper, a thing not to be seen or mentioned in public?

In the old country numerous varieties of bonds are employed and they add greatly to the interest and beauty of the work not to speak of the strength gained by having the wall tied together into one homogeneous mass. Let us therefore have a bond, not invisible clipped corners or ties of wire and strips of metal, but a bond, visible and real, with each individual header doing its duty, undisguised. They give the wall a character and dignity which it would otherwise lack.

In such a case a careful study of mass and detail suitable to the material and an intelligent use of color

in joints would accomplish a most dignified and attractive result.

Many Advantages

Abraham Lincoln's remark about people might apply equally well to brick. He said, "God must have loved the common people, he made so many of them." Are not burned clay products almost the universal building materials? Our wheels do not skid so badly on brick pavements, our walks are often laid of brick, our buildings have foundations of hard vitrified brick, the walls above are of brick, the floors and partitions of hollow tile and the whole is crowned with a tile roof, a complete and beautiful structure which needs no repairs and fears no fire. Even when the building shows a front of granite or marble in most cases we find the body of the wall to be of brick. This, in the case of a severe fire, is the only part to escape destruction. Would it not be much better to use the one material throughout, thereby gaining in honesty of construction, strength, durability and artistic effect? The durability of brick is beyond question and the variety of color and texture is so great that it would seem impossible to devise more. The manufacturers, however, constantly studying for new effects, are every month surprising us with new varieties. It is now possible to obtain brick of a character to suit any style of architecture and it is a waste of money to send abroad for costly stone when we have such an unlimited supply of a better material at hand. Let us hope that the near future will develop the use of brick to such an extent that a frame building will be as rare as a marble one is now.—A. R. Van Dyck, in *Brick*.

Testing Trap-Rock Screenings for the Percentage of Foreign Material*

By W. S. Lozier, C.E.*

When we specify that trap-rock screenings for road construction shall not have more than a certain percentage of foreign material, we desire to eliminate such things as slate, limestone, sand, etc. How many engineers investigate the actual character of the screenings received other than through the most superficial examination? Exact tests for the percentage of foreign matter seem to be disregarded.

A short time ago, the writer was called upon to determine the percentage of foreign material in a quantity of trap-rock screenings submitted by a contractor as the material he intended to use as a binder, and after searching a good many books on the subject concluded that the point evidently had been passed over. How to make the test was then the question. A chemical test would not answer and so it was concluded to examine on a specific-gravity basis. It is well known that the specific gravity of trap rock is greater than the specific gravity of the other rocks. If a mixture of some liquid gravity could be found that would give a specific gravity which would be less than the trap rock and greater than the foreign material, the question seemed to be solved.

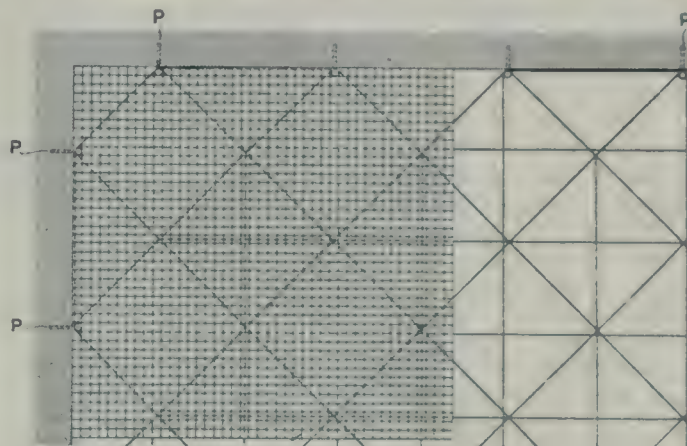
A solution of potassium and mercuric iodides was chosen, as it was nearly colorless and gave a specific-gravity-range from water to something higher than trap rock, according to the dilution. The screenings were introduced into the vessel containing the liquid and properly stirred so that no air would col-

lect around the particles, and also to cause a separation of the particles so that the larger and heavier ones would not carry the lighter ones to the bottom. The vessel was then set aside for a few hours to allow all settling to take place. The heavier material or trap, was found to have settled in a compact layer on the bottom and the lighter materials were floating at the top. It was then only a question of decanting off the liquid, filtering, washing, and filtering again, to determine the percentage of material that was not trap rock. To separate the foreign material into its different constituents, the process only had to be repeated with the same mixture and by the addition of more water to change the specific gravity to the desired figure.

Sound-Resisting Walls and Ceiling

A method recently devised in Germany for rendering walls and ceilings capable of effective resistance to sound transmission is illustrated diagrammatically in the accompanying sketch.

Under the ceiling or soffit of the floor, or parallel to the wall, as the case may be, a network of wire is



stretched tightly by means of pulleys, secured as at (a) into the adjacent walls, and not touching at any point the surface to be protected against sound. Then upon the wirework is plastered a composition formed of strong glue, plaster of Paris, and granulated cork, so as to make a flat slab between which and the wall or ceiling is a cushion of confined air.

The inventor points out that the arrangement is advantageous in the case of certain types of fire-resisting floors which, although otherwise excellent, are characterized by excessive sonority. He also draws attention to the fact that sounds are often transmitted from one part of a building to another, and from adjoining buildings through contiguous walls. This contention is undoubtedly correct, and those who undertake to provide against the conduction of sound will do well not to limit their efforts to the treatment of floors.

The method described is good in two respects:—

(1) The absence of contact between the protective and protected surfaces; and (2) the colloid nature of the composition recommended for plastering.—The Builder.

The use of color on concrete admits of all the variety there can possibly be in the painting of wood. Indeed, the tones in some of the delicate tints on concrete are softer and more effective than can be got on any other surface.

* Assistant Professor of Civil Engineering, New York University.

Municipal Filtration Plant at Montreal

Complete Details of Design—Economy, in this Instance, of Double Filters—Arrangement of Prefilters—Heating and Ventilating System

An important addition to the list of large municipal water purification works will be made upon the completion of the filtration plant for the city of Montreal, on which construction work was started recently. The plant has been designed for a capacity of 50,000,000 imp. gal. daily and will serve a present population of about 350,000, although provision has been made in the present plans for enlarging the works, as future needs require, to about three times their present size. The works will comprise a pumping plant of electrically-driven centrifugal units, 16 prefilters, 16 final filters, a clear water reservoir and a concrete wash-water tower. The plant will involve an estimated expenditure of approximately \$1,500,000, exclusive of land, and is specified to be ready for service September 1, 1913.

The work has been divided into four contracts in order that the letting might be made in the order most advantageous to the rapid and economical completion of the project. The first contract, for the pumping machinery, blowers and cranes, exclusive of buildings, has been awarded to the British Electric Plant Company of Alloa, Scotland. The second contract, for the final filters and appurtenances, involves the bulk of the concrete masonry on which it was desired to start work at an early date in the construction of the plant. Contract 2 has been awarded to the McGuigan Company of Toronto. The third contract covers the pre-filters and filtered water reservoir and the fourth the pumping station, wash-water tower and the superstructure of the various buildings and gate chambers. The last two divisions of the work have not as yet been placed under contract.

The studies upon which the design of the filters is based were made in co-operation with Mr. George Janin, chief engineer of the Department of Public Works, by Messrs. Hering & Fuller of New York City, who submitted a report embodying their findings and recommendations on July 2, 1910. Since 1856 the city has maintained a municipal waterworks plant, drawing its supply from the St. Lawrence River at a point about three miles below the mouth of Lake St. Louis, which is the confluence of the St. Lawrence and Ottawa rivers. The volume of water taken from the river averages about 44,000,000 gallons daily and reaches the suction wells of five existing steam pumping engines by gravity through an 8½ ft. concrete conduit about 5 miles long. A private corporation, the Montreal Water & Power Company, supplies about half as much water to the city and its suburbs as does the municipal plant. Its supply is drawn from the mixed waters of the St. Lawrence and Ottawa below the Lachine rapids. The total population of Montreal and its suburbs is estimated at about 555,500; of this number about 347,000 people are supplied by the municipal plant and about 200,000 by the water company. The question of the purchase of the privately owned plant has been under consideration. The water supply conduit, in its five miles of length, parallels the old power canal or head race which delivered water to the wheels of the original

pumping station. This canal is being enlarged to furnish water power for pumping the city supply and for a hydro-electric plant near the site of the new filters, to provide for municipal lighting; this plant will supply electrical energy for the operation of the pumps at the filter plant and the head race will serve as an emergency means of supplying water to the filters in case of accident to the regular conduit. Since February, 1910, the Montreal water supply has been treated with hypochlorite of lime following quite a severe epidemic of typhoid; the typhoid death rate in 1909 was 53.6 per 100,000.

The present water supply of the city is drawn from a shore intake about two miles above Lachine Rapids. It is a mixture of St. Lawrence and Ottawa rivers water and varies considerably in its character at different seasons of the year. The St. Lawrence above the mouth of the Ottawa drains an area of 510,000 square miles, containing about ten towns with an aggregate population of 82,000, which discharge sewage into the river. The St. Lawrence River water, Messrs. Hering & Fuller report, is normally quite clear and free from color and turbidity; it is rather hard, the alkalinity averaging 95 parts per million. The permanent hardness or incrustants are low, averaging 20 parts per million. The polluting matters entering the St. Lawrence River are greatly diluted, as the ordinary stream flow is estimated to exceed 500,000 cu. ft. per second.

The Ottawa River drains an area of about 60,000 square miles; there are about 90,000 people on the watershed contributing sewage to the river. The Ottawa River, unlike the St. Lawrence, is highly colored by swamps and timber lands and by numerous logging and sawmill industries; the water is very soft, having an average alkalinity of about 20 parts per million and a small amount of incrustants. The turbidity, chiefly of organic debris, ranges from 5 to 20 parts per million; there is comparatively little mineral turbidity.

The water at the present Montreal waterworks intake near shore is not a thorough mixture of the flow from the two rivers. In April and May, when the Ottawa is in flood, due to melting snow, the city supply is almost entirely Ottawa river water; during February and March, however, ice gorges block the flow of the Ottawa and the city receives, for the most part, St. Lawrence River water. Although the pollution of the river water is not excessive it is still believed to be sufficient from the rapidly growing population near the shores to warrant the construction of purification works.

Double Filtration Method Chosen

After investigating other possible sources of supply it was decided to continue using the St. Lawrence River water after subjecting it to double filtration and sterilization with hypochlorite. A site for the works was selected near the end of the existing intake conduit, and active construction is now under way. The improvements also include an extension of the

existing river intake to a point 1,200 feet from shore, the contract for which was let in 1910.

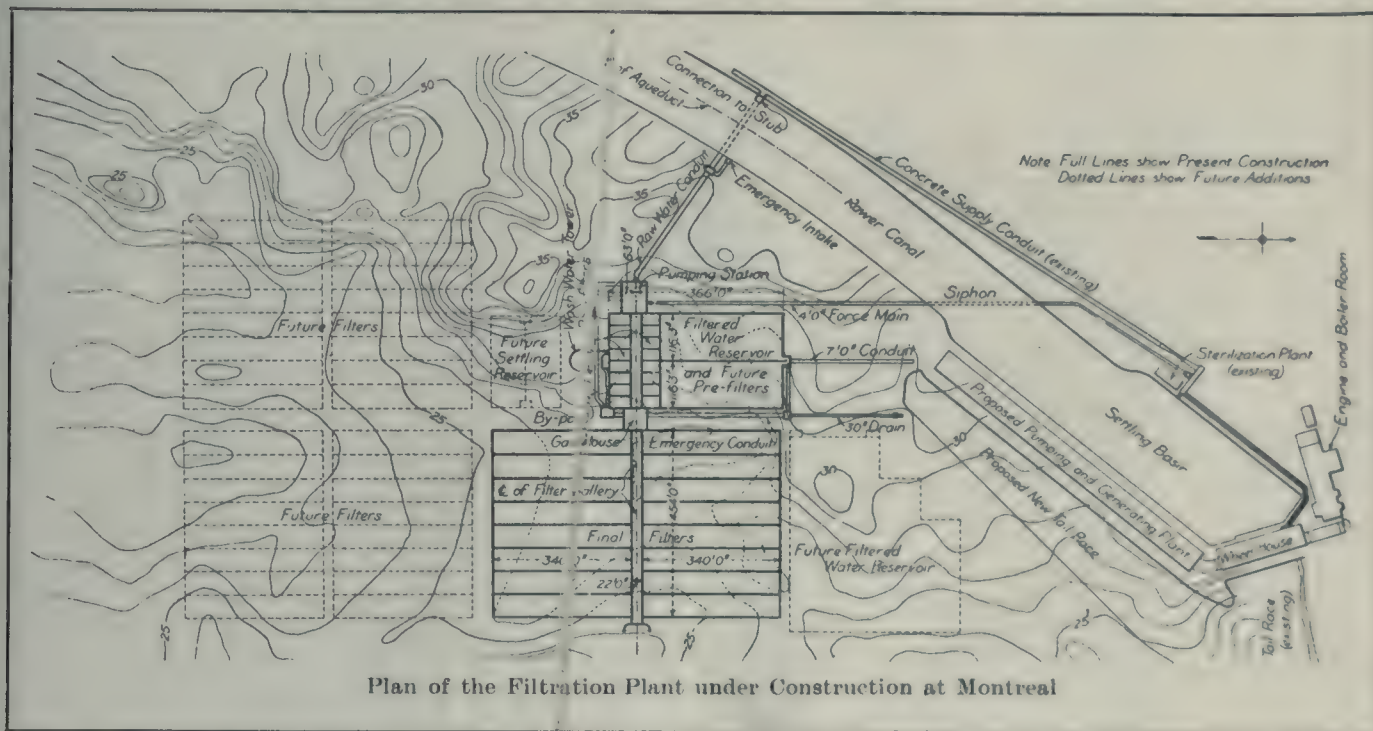
The selection of the double filtration method of purifying the St. Lawrence River water was made after other methods had been carefully considered; these included plain sand filters, mechanical filters, non-submerged filters, hypochlorite and ozone treatment. For a capacity of 60,000,000 gallons daily it was found that 11 acres of plain sand beds would be required as against 6 acres for the sand filters in a double filtration project, assuming that the latter could be operated at a rate of 10,000,000 gallons per acre daily as recommended in 1907 for the proposed filters for the Croton supply, New York City. If water is taken from the extended intake, as recommended, it is expected that no coagulant will be required for the double filtration scheme. In case the end of the intake should be stopped by frazil ice it may be necessary to draw water from near the shore

Lawrence water if that should ever be considered desirable.

Double filters, more or less similar to those in use at Albany and Philadelphia, were selected as being the most flexible type of works, in that they are expected to give satisfactory service ordinarily without the use of coagulants in dealing with the St. Lawrence water from the proposed outer intake, and they can be readily adapted to the treatment of the water near shore, although it is not expected that the shore water will ordinarily have to be used.

No coagulating facilities will be provided at the filter plant. If such treatment is needed at times of emergency, when frazil ice puts the new river intake out of commission, it will be handled with temporary appliances at a gate house at the upper end of the raw water conduit.

From the existing raw water supply conduit a connection is made to the new pumping station which



line. Under these conditions it is anticipated that the water will probably contain a large amount of vegetable stain which could not be handled satisfactorily by plain sand filters operating without a coagulant. Mechanical filters, it was considered, would be cheaper to build than either plain sand or double filters, but the operating costs for the latter are lowest; as compared with mechanical filters, the double filters will be cheaper in total cost, due to the saving of the expense for coagulant; as compared with plain sand filters they will be cheaper in total cost, it is believed, because with the rates adopted there is a sufficient saving in the cost of building the final filters to pay for the prefilters. The engineers also regard the prefilters as possessing special advantages under the local conditions in removing algae growths from the clear St. Lawrence water drawn from the mid-river intake, which is considered very important for the sand filters in permitting coagulant to be used temporarily if it is necessary to treat the colored Ottawa water from the shore intake and in softening the St.

delivers to the filters. This station will house eight motor-driven raw water centrifugal pumps, two wash-water pumps and two sump pumps. The raw water pumps are all below the surface level, so that there will be no suction lift; the water will be raised about 18 feet and will then flow by gravity through the re-filters and final filters to a filtered water reservoir.

Arrangement of Filters

The prefilters, 16 in number, are arranged in two batteries of eight each upon either side of an operating gallery and above one end of the covered filtered reservoir. The groined arch reservoir roof serves as the floor of the pipe gallery, the prefilters being supported on a second series of arches 8 feet above. The prefilters are of reinforced concrete. The raw water influent and the prefilter effluent are carried in rectangular concrete conduits, the one above the other, both being below the floor of a long operating gallery. From the raw water influent conduit 20-in. connections are made to each prefiltering unit, and the

admission of water is controlled by 20-in. hydraulically operated valves.

Each prefilter unit has an effective sand area 50 x 24 feet in plan and is divided longitudinally into two 12-ft. strips by a central wash-water gutter, whose sides extend above the elevation of the water in the filters; to each central gutter are connected eight lateral gutters spaced on 6-ft. 3-in. centers. The media in the prefilters will consist of 2½ ft. of sand having an effective size of from 0.50 to 0.60 mm. and a uniformity coefficient of not more than 1.65; not more than 1 per cent. is to be finer than 0.25 mm. This sand will be supported on about 8 in. of gravel, placed in four layers, and the size of the pebbles will range from 1 in. at the bottom to about 0.1 at the top.

Each prefilter will be equipped with a strainer and air system; water for washing will be supplied from a concrete tank fed by duplicate motor-driven pumps and air for agitating the filtering media will be delivered by a 5,000-cubic feet per minute blower. The prefilters have been designed to operate at a rate of about 136,000,000 gallons per acre daily. Each unit will be fitted with a rate controller, which will allow the passage of 3,750,000 gallons daily. The prefilter effluent will enter a gate house and from this point will be admitted to the final filters. There are 16 of these units, arranged as were the prefilters, in two rows on either side of a main gallery. The final filters are covered by groined arch vaulting and have flat concrete floors. Each unit measures 340 x 55 feet inside, the long, narrow shape being adopted to permit the use of a Blaisdell sand washing machine. The piers supporting the filter roof are spaced on 19-ft. centers and carry tracks for supporting the sand washer; these tracks extend the entire length of each longitudinal bay. There are also gutters along each bay to carry away the dirty wash-water during the sand cleaning process. The roof of the filters is raised at one end to provide head room for the operation of a transfer table which will shift the Blaisdell machine from one filter to another.

Filtering Material

The filtering material comprises 12 in. of gravel and 27 in. of sand. The gravel is to be arranged in four layers, the sizes in each layer, starting at the bottom; being approximately 5 in., 3½ in., 2 in. and 1½ in. At least 10 per cent. of the sand, according to the specifications, shall pass a sieve containing 50 meshes per inch and not more than 10 per cent. shall pass a sieve with 60 meshes per inch; at least 90 per cent. shall be less than 2.1 mm. in size.

The under drainage system comprises 8-in. half-round tile laterals, covering grooves in the filter floor and a main collector 2 ft. 6 in. wide cast as a depression in the concrete floor. The main collectors extend the long way of each filter, down the centre line, and the laterals are laid perpendicularly to it on either side at intervals of 9 ft. 6 in., making two lines of laterals between each row of piers. The main collectors discharge into rectangular filtered water conduit directly below the prefiltered water conduit from which filter is fed. These conduits, one above the other, form a monolithic structure with a thick layer of waterproofing interposed to prevent the seepage of water from one to the other.

The filtered water conduit delivers to the covered filtered water reservoir, which measures 429 to 232 ft. 6 in. in plan and has a capacity of about 7,500,000 gallons. Just before entering this basin provision has

been made for sterilizing the water with a solution of hypochlorite, which will be mixed in a room provided at the bottom of the wash-water tower. The reservoir will be divided into two equal parts by a concrete wall and each half will contain concrete baffle walls which will deflect the water from one side to the other. The object of the baffles is to insure a thorough mixture of the sterilizing solution with the water and eliminate any pooling of the water in corners. As noted before, the prefilters for the present installation of 60,000,000 gallons daily capacity are placed upon the roof at one end of the filtered water reservoir, and the ultimate plan contemplates the placing of additional prefilters over the same reservoir. From the reservoir water will be pumped into the city's existing service reservoirs.

Heating and Ventilating System

On account of the cold winter weather at Montreal special precautions have been taken to supply heat to the filters. A circulating fan will blow air through a fan duct containing electrical heaters of the gridiron type and the heated air will pass through ducts to the filters. The reason for specifying electric heating in preference to other methods is on account of the cheapness of the current to be supplied by the nearby hydro-electric plant. An adequate ventilating system also is to be installed.

The designs of the Montreal filtration plant were prepared by Messrs. Hering & Fuller, consulting engineers, New York City. The construction work is under the direction of Mr. George Janin, chief engineer of the Department of Public Works. Mr. T. W. L. Lesage is engineer superintendent of the Montreal waterworks. Mr. Frederick E. Field is resident engineer in immediate charge of construction, and Messrs. Hering & Fuller will act as advisory experts during the construction of the plant.—Engineering Record

Effect of Tar Road Drainage

Every now and then the complaint is made that the practice of using tar for surface coating of roads is destructive to fish in streams and lakes into which those roads drain. Referring to this subject the Autocar, a British technical paper devoted to the automobile industry, states that so far as it can discover, only a few fish have died and doubt is expressed whether the death of the fish is caused from the draining from tarred roads. Assuming that it is, it is thought well to remember that the road tar used is a powerful antiseptic, and that though it may not agree with fish and some of the lower organisms it is admitted that since the extensive tarring of the roads in one part of England certain diseases, particularly sores of the eyes, observed in children playing in the streets, have entirely disappeared, and that similarly beneficial results will doubtless be noted wherever roads are treated with the tar compound.

Weston Road Viaduct, West Toronto

In the article on the above work published in our issue of September 13 we stated in error that the overhanging sidewalk slabs "are reinforced by No. 8 rib metal." As a matter of fact these slabs are reinforced with expanded metal, as may be seen very clearly in the photograph. The rest of the steel consists of the Klutch deformed bar, furnished by Steel & Radiation, Limited. All the reinforcement used was supplied by this firm.

The Royal Bank Building, Saskatoon, Sask.

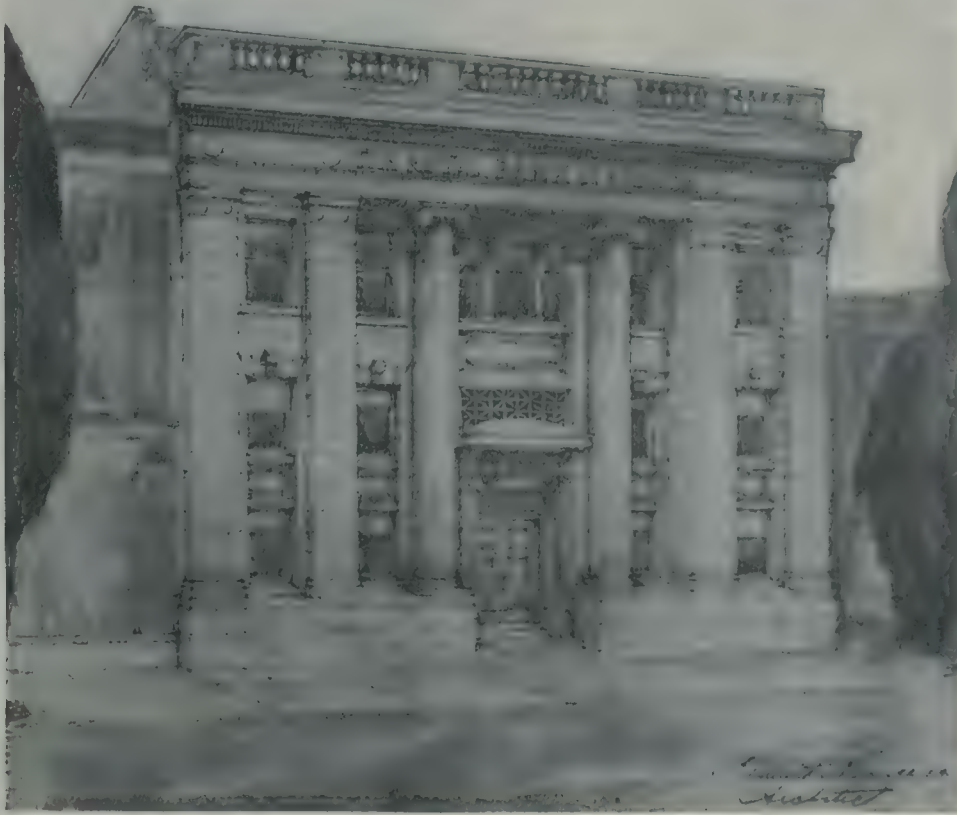
This building, which was designed by Mr. Kenneth G. Rea, A.R.I.B.A., architect, Montreal, will be executed in Indiana limestone or in Tindall limestone, as shown by the perspective.

The ground floor will be occupied by the Bank and the mezzanine and second floor will be rented as offices. An attic storey, which does not extend to the front elevation, will provide several rooms for members of the bank staff. The interior finish of the building will be of the best throughout. The vestibule floor and walls will be of marble, as well as the staircase to the office floor. The interior woodwork will be of quartered oak.

An interesting feature of the building is the construction of the brick walls, which are faced with brick

by more highly paid labor, in the judgment of the contractors would effect little saving.

The most elementary tools are used, that is, shovels, picks, and hammers. Labor being so cheap, there is no necessity of introducing complicated machinery. However, the French company is about to introduce several steam rollers on their roads. The work consists of macadamizing with crushed stone and then laying a top covering of sand. No special device is used. The stone is quarried with picks and powder and broken by hand, although machinery is being imported (from England and Germany) to crush stones. The stone is carried in baskets attached to the sides of donkeys or horses; carts are sometimes used. For each cubic meter the cost of hauling is 13 cents per kilometer (0.62 of a mile). Com-



Proposed Royal Bank Building, Saskatoon, Sask.—Architect, Mr. Kenneth G. Rea, Montreal

forming a natural bond with the backing of 8 in. to 12 in. of hollow tile, the plaster being applied directly to the interior surface.

Road Building in Turkey

Curious economic conditions in regard to road building exist in Turkey, according to Consul-General G. Bie Ravndal. Some 6,214 miles of roads are under construction at a cost of over \$8,000,000. Of this mileage two-thirds are old roads to be repaired. The work was let to two companies, a German company having 90 per cent. of it and a French company the balance. Labor is so cheap that machinery made

mon labor costs 26 to 30 cents per day, but generally the contractors arrange with the laborers for the crushed stone to be delivered along the roadside. The roadbed is prepared for a width of about 20 feet, then rolled, upon which is placed the crushed stone at a thickness varying from 6 to 8 inches and 12 feet wide. A layer of sand of about 3 inches thickness is then placed thereon. The maximum grade allowed by contract is 5 per cent., but the companies very frequently carry the grade up to 7 per cent. An open ditch along each side of the roadbed is constructed. Stone is used for under and cross drains. Stone and concrete are always used for culverts and bridges up to 6 meters; above that iron is used for bridges.

Advertising Contracts for Public Works

Requirements and Theory of the Notice to Bidders—Adequate Time Essential for Preparation of Tenders—Certified Cheques—Restrictions

By Jerome Cochran, Designing Engineer, Trussed Concrete Steel Company, Detroit.

The following article was written with the idea of placing before engineers the fundamental principles underlying the general requirements of advertising for bids on public works contracts. The article is made as compact and general as possible, and the requirements are applicable to all classes of construction work.

General Requirements

All the necessary preliminary preparations for the construction of a public work having been completed, the next step—assuming that the work is to be done by contract—will be to ask for proposals from contractors. Proposals are usually invited by advertising to that effect in the public press and technical periodicals of both national and local circulation devoted to the special class of work involved, so as to reach all the persons or firms likely to bid on such work.

OBJECT OF ADVERTISING.—The object of advertising is to bring into active competition all those who may be interested in and capable of performing a certain kind of work; hence, it should be done in such manner and localities as to reach the greatest number of bidders. Liberal advertising should be required for all public works contracts, for the great temptation on the part of many is to keep bidding at home, and encourage home industries. This generally results in poor economy by allowing a contractor's ring to be formed, thereby letting practically all contracts at abnormally high figures.

PREPARATION.—The preparation of the advertisement or notice to bidders is not so simple a matter as might, at first thought, be supposed. Such advertisements may be divided into two general classes. The first class merely states that proposals for a certain work will be received up to a stated date and hour, and that plans and specifications may be seen, and bidding blanks and necessary information obtained, at a given address. That is to say, the advertisement is limited to a very brief statement of the class of work or materials wanted, telling where plans and specifications can be obtained. The other class of advertisement gives in more or less detail the general character of the work to be done, the approximate quantities of the more important items, the time within which the work must be completed, and the amount and character of the certified check and bond required.

REQUIREMENTS GOVERNING PUBLIC WORKS.—All public works, whether for the federal government, one of the provinces, a city, county, or borough, are generally required by law to be advertised for a certain length of time and to a certain extent before letting. In other words, the law requires that officials give timely notice to all likely bidders by public advertising, when any particular line of work or commodity is called for. In some instances, particular newspapers are mentioned, but generally those having the widest circulation are selected for

advertising. It will be expedient for the engineer to inform himself as to the local requirements on this point before closing his contract, as legal objections have been sustained to contracts on the grounds that they were not properly advertised.

WHAT THE ADVERTISEMENT SHOULD CONTAIN.—The advertisement should be as short as possible to contain the necessary information, for where such public notices are much expanded and inserted in few papers, it generally indicates a desire on the part of the official to make advertising expensive, and hence decrease its amount and the chances for competition, at the same time giving unnecessary pay to some favorite paper. In other words, the advertisement should be concisely worded, and yet be sufficiently explicit as to the information required by persons desiring to bid, to prevent unnecessary delay. It should exhibit, when practicable, the requisite information on the following subjects:

- (1) A title indicating the kind of work, material or service required.
- (2) Place where the labor is to be performed or the goods delivered.
- (3) Date and hour at which bids will be opened.
- (4) Where further information may be secured.
- (5) Name and address of the person, company, or corporation proposing to have the work done.
- (6) An adequate description of the work, with special reference to the magnitude of the undertaking and approximate amount (or cost).
- (7) If it be public work, the attention of the bidders should be invited to the act of Congress or of the legislature, or to the ordinance, under which, or by virtue of which, the work is undertaken, authorized, or by which it is controlled.
- (8) When and where plans, specifications and blank proposals may be obtained, or the work itself may be inspected.
- (9) How bids are to be addressed and delivered.
- (10) Amount of cash, or of certified check, or guaranty bond required to accompany the bid.
- (11) Bond required for the faithful and complete performance of the contract.
- (12) Time required for the completion of the work.
- (13) Conditions of payment, if these are peculiar.
- (14) Whether or not the lowest bid will be accepted without reserve.
- (15) A reservation of the right to reject any or all bids.
- (16) Any general conditions or instructions with which bidders are expected to comply, as the letting of the work in parts or as a whole; bids to be received from experienced contractors, etc., with any suggestions that may be deemed necessary.

INSTRUCTIONS TO BIDDERS.—The advertisement, as stated above, should contain only general

information such as will enable a contractor to determine if he would like to understand the work. The fuller information enables the non-resident contractor to judge of the character and magnitude of the work involved, whether it is within his capacity to execute the work in the time named, whether he can furnish bond, and has time to make a careful estimate, and finally, whether he cares to compete for and undertake work offered by the parties, and under the supervision of the engineer or architect named. These facts determined, the contractor will apply for and receive full instructions for bidders.

All of the instructions to bidders need not be published as a part of the public advertisement, but should be printed upon blanks delivered to bidders, as they form a part of the requirements of the contract. In municipal and county work the advertisements and the instructions to bidders are generally sent out separately.

INVITATION TO CONTRACTORS TO MAKE PROPOSALS.—It is customary for consulting engineers and cities having much work contemplated to issue invitations to contractors to make proposals, so that should they fail to see the advertisement in the newspapers, or other medium, they will have been notified. Invitations are also issued to a selected number of contractors who are in a position to handle the proposed work efficiently. It is generally cheaper to send out a standard form of Invitation or Notice to Bidders than to carry on extensive advertising, although the law requires in most cases that all proposals for public work must be so advertised as to reach the greatest number of contractors.

The Theory of Advertisements

AS REGARDS THE ADVERTISING MEDIUM.—The act or charter of many public organizations requires that the work be advertised and proposals solicited from the public. This should be done primarily by advertisements in newspapers and engineering periodicals devoted to the special class of work involved. Small purchases need not be advertised in the papers, but no public money should be spent without at least three bids having been obtained, and all who wish to bid on any particular class of articles should be given an opportunity to do so. Small contracts are usually sufficiently advertised in local papers, but the notice to contractors should appear in practically all of them.

If an advertisement or notice to bidders appears in one daily paper and not in another, many contractors may not see it. Moreover, as the policy of too many papers is more or less influenced by whether or not they get the advertisements, it would be better to limit the advertisement to a brief statement of the class of work or materials wanted, date and hour of opening bids, where plans and specifications may be seen and bidding blanks and necessary information obtained, and require the notices to be published in every local daily paper. The saving due to even a single extra bid on one small contract will often more than pay for a year of such advertisements. Large contracts should invariably be advertised in the weekly technical journals devoted to the special class of work involved, and especially those which make a specialty of keeping contractors posted on pending work.

FRAUDULENT CONTRACTS.—In practically every case of fraudulent contracting, the advertising

is invariably kept at a minimum and generally no pretense is made of keeping an office list of contractors. In order to guard against such practice, the engineer should be required to promptly furnish to any one who asks it, full information as to the advertising of any contracts, past, present or future. Every advertisement for a contract of a public nature should be published by posters affixed on a bulletin-board at some designated, permanent and convenient place of the locality wherein the work or the service is to be performed; and in any other places and manner that may seem fit in order to secure as large a competition as possible from responsible bidders. The reason for this is obvious.

AMPLE TIME FOR BIDS.—The right to bid implies the right to know a sufficient time in advance to properly prepare a bid, and ample time should be allowed between the date of publication of the advertisement and that upon which bids are to be opened, to enable the most distant contractor time to investigate the locality and the work, collect the data necessary to submit an intelligent and well-considered proposal, and to make such preliminary arrangements for capital and plant as prudence may dictate.

To prescribe arbitrarily, by law or otherwise, how long each contract shall be advertised is unfortunately a difficult matter. The time necessary will, of course, depend upon the character and magnitude of the work and other conditions, and the engineer in charge will be able to determine the proper limit, provided he is not, as in a great many instances, unduly pressed to shorten the period by impatient city officials. If sufficient time is not allowed, which is generally the case, any contractor should have the right to enjoin the opening of proposals till such time has elapsed as the court decides is sufficient.

The honest engineer frequently finds it is to the best interest of his clients to get the work started in a hurry, even at a greater cost; and the dishonest one can take advantage of the same considerations with comparative safety because of the difficulty any one will have in impugning his judgment. The minimum period of advertising for public work should be arbitrarily fixed by law—longer periods being required for larger contracts. Proposals for contracting for the execution of public work, or furnishing materials, or for any service relating to public works are generally advertised for 30 days. This term is sometimes reduced in urgent cases, but should never be less than 10 days.

SEALED PROPOSALS.—It is generally announced that the bids or proposals which are to be submitted shall be sealed, with the implied understanding that these seals are not to be broken until the bids are opened at the place, date and hour named. This is for the purpose of preventing fraud. However, bids have been steamed open by office employees, and the figures given to rival bidders. To avoid this, every bid should be enclosed in two envelopes, the inner sealed with wax and the outer not showing that a bid is enclosed.

DATE OF OPENING BIDS.—The advertisement usually states at what hour the bids will be accepted. Whenever bids are advertised for they should be opened at the time mentioned, and no proposals for public work should be admitted after the time has expired, and those received should be opened immediately after the expiration of that time. Un-

less this is done, suspicious bidders may have opportunity, if not cause, to charge that the delay is for improper purposes. For the bids may all be in and the hour past when some friend of the man running the affair comes along and wants to hand in a bid, and even though it be too late, according to the advertisement, the bid will be accepted for consideration.

MANNER OF OPENING BIDS.—It is customary to state in the advertisement that bids or proposals will be opened in the presence of the bidders; in other words, at an open meeting of the board, committee, corporation, or council. Bidders are invited to be present at this meeting, and to hear the bids publicly read, with the privilege of taking down the prices named, if they choose. Municipal bids should always be opened and read in public, and recorded in a book kept for the purpose by an official clerk. The public should always have the right to inspect the bids at the opening.

Bids are also opened privately, and the results announced after the decision has been rendered upon due consideration of the parties interested. There is no law to govern on private work, for the private individuals, companies, and corporations can do as they please.

If the bids are not opened until the time set for reading them, there can be no harm in admitting a late bidder if the board and all the other bidders consent. In such cases however, the time limit for receipt of bids should be the time of opening bids, and no bids should be received after any bid has been opened under any consideration.

MANNER OF LETTING CONTRACT.—The advertisement should also state whether or not the work is to be let in parts or only as a whole. If it may be let in parts, the advertisement should indicate by all means what the lines of division are, so that one may know what parts he is at liberty to bid upon.

PAYMENTS.—It is customary to pay for contract work on monthly estimates of the engineer, reserving from each month's estimate of the worth of materials furnished and work done 10 per cent. to 20 per cent. until final completion. This enables the contractor to carry out the work without having the requisite capital to complete the work with his own means. If the conditions of payment are to be other than this, thus making them unusual and peculiar, such conditions should be stated in the advertisement.

FULL INFORMATION AS TO THE WORK.—The description of the work included in the advertisement should be sufficient to enable the contractor to determine the amount of work embraced in each contract, the time within which it is to be completed, the manner in which it is to be done, and the quality of the materials to be furnished, as well as the approximate cost of the same, and the amount of capital required to successfully prosecute it. In other words, full information should be given to bidders which will enable them to bid intelligently.

RESTRICTIONS EXCLUDING CERTAIN PERSONS FROM BIDDING.—Advertisements for bids for large work quite often have restrictions in them as to who the bidder may be, requiring him to have a certain amount of experience. This is especially the case with reinforced-concrete building construc-

tion where five years experience is sometimes required. In a great many cases, if work was let out to inexperienced firms, poor work would no doubt result.

Exclusion clauses are often put in to shut out certain bidders and contractors who have not completed contracts on time for pieces of work for the same advertiser. Again, if it is known that in any way a man has played crooked with his former employer, an exclusion clause will often be put in, so worded as to exclude him from the right to bid. Such a clause generally reads as follows: "No person is eligible as a bidder who has within two years prior to the letting of this contract made default in payment for any work or labor performed, or any skill or material furnished pursuant to any such contract as herein advertised, or who within said two years failed to complete any such contracts. In cases of failure to accept work for which they are low bidders, contractors on city work in some localities are not allowed to bid again for a year or two."

The reasonableness of a restriction which denies certain persons the privilege of bidding is not so apparent, for it renders it possible for the parties having the power to award the contract to foster favoritism by excluding experienced as well as inexperienced persons who have been so unfortunate as to have differences with public officers. A clause that provides that bids from "any person or firm who are in arrears to the city upon debt or contract, or who is in default as surety upon any obligation to the city, will not be received," or that "proposals from parties who are not known to be regularly and practically engaged in the class of work called for by the drawings and specifications will not be accepted," must give to some one the determination of these questions. If an official is inclined to be very exacting or officious, questions as to his fairness will certainly be raised.

CERTIFIED CHECKS.—The requirement of a certified check to be deposited with the bid is one to save the corporation from the expense and delay of re-advertising, if the accepted bidder fails to enter into the contract, and is intended to be retained to reimburse the city for such damage and expense. That is to say, should the successful bidder fail or refuse to execute a formal bond or contract within the required number of days after the same is sent, his certified check may be declared forfeited, the letter of acceptance of his proposal may be revoked, and all obligations in connection therewith will be released and annulled.

The checks are held in trust for the bidders and the corporation by the officer named to receive them, and are subject to the order of the board until all the conditions of the advertisement and board rules are complied with, when they become the property of the bidders, or of the corporation, according to whether or not the bidders have individually complied with the conditions of the letting.

The certified check or money should not be inclosed in the envelope containing the bid or estimate, but should be either inclosed in a separate envelope addressed to the party wishing bids, or submitted personally upon the presentation of the bid or estimate.

After the contract has been signed and the bond approved, the certified checks should be returned to their respective makers, or if the contract is not awarded within two weeks from the date of open-

ing the bids, the obligation of the bidders should cease and their checks be returned.

Neither the principal or sureties on any bid should have the right to withdraw or cancel the same until the proper authorities have let the contract for which such bid is made, and the same has been duly executed.

If the letting is deferred any bidder can probably demand the return of his certified check, but he at the same time loses his chance to obtain the contract. This is frequently a question of damage to bidders which must be settled upon the merits of the particular case. If the letting is deferred for a considerable time, recourse must be had to the courts. Strictly speaking, the board cannot defer the letting except by consent of the bidders, and cannot usually retain the bids or checks of those unwilling to wait.

BIDDER'S BOND AND SURETY.—The advertisement should require that "each bid or estimate shall be accompanied by the consent in writing of the persons so named, with their respective places of business or residences, to the effect that:

(a) If the contract be awarded to the person making the estimate, they will, upon its being so awarded, become bound as his sureties for its faithful performance.

(b) If he shall omit or refuse to execute the same, they will pay to the corporation any difference between the sum which he would be obliged to pay to the person to whom the contract may be awarded at any subsequent letting, the amount to be calculated upon the estimated amount of the work by which the bids are tested.

It is customary to require that the consent of sureties be accompanied by the oath or affirmation in writing of each of the persons signing the bond or bonds, that he is a householder or freeholder in the state where the proposed work is to be executed, and is the owner of property in value equal to the amount of the surety required for the faithful execution of the contract, over and above all his debts of every nature and over and above his liabilities as bail, surety or otherwise; that he has offered himself as surety in good faith and with the intention to execute the bond required by the law if the contract should be awarded to the person or persons for whom he consents to become surety.

An officer of a corporation should not be accepted as surety for such corporation, nor should a firm be accepted as surety for a member of the partnership. In other words, a firm as such, should not be accepted as a surety upon a bond for any of its members, nor a partner for a co-partnership of a firm of which he is a member. Stockholders who are not officers of a corporation may be accepted as sureties for such corporation.

Bidders should not be permitted to change the sureties on the bond submitted by them if they are acceptable to those letting the work.

Careful investigation should be made of the financial status of individual bondsmen offering themselves as securities on contractors' bonds, and no bonds of individuals should be accepted until it is conclusively shown to the satisfaction of those letting the work that such bonds afford ample security for the fulfillment of the undertaking in question.

CONCLUSIONS.—In conclusion, it might be stated that in the advertisement for bids, there should be a statement of the procedure that will be followed

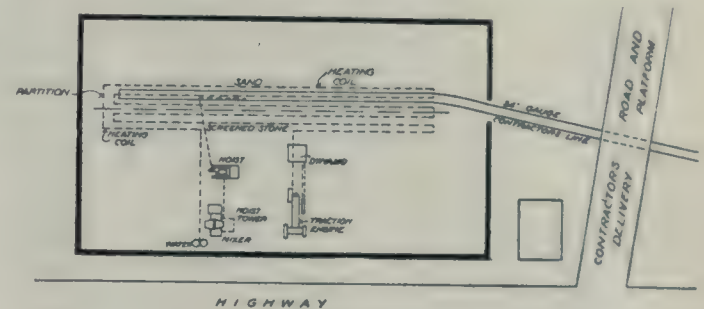
in receiving and opening bids, letting the contract and executing the same. These rules should be strictly adhered to, as they are a part of the basis on which bidders make their prices, and deviations therefrom are almost sure to work injury to someone.—Engineering News.

Concrete Plant for Cold Weather

The plant and arrangements described below will probably furnish some useful hints to contractors engaged in concrete work.

The methods in question were adopted by the Newton Engineering Company of Milwaukee for building a three-storey warehouse, 64 ft. by 112 ft. in plan, having a reinforced concrete skeleton with brick curtain walls.

We give a sketch plan showing the arrangement of the plant, which comprised an electrically-operated concrete mixer discharging directly into the bucket of an electric hoist consisting of a sectional steel tower with guides and head-frame for operation of the bucket-shaped cage. A special feature of the hoist was the manner in which the lower part was carried horizontally so as to cause the cage to pass under the outlet of the mixer so as to receive the concrete with-



Arrangement of Concrete Plant for Cold Weather.

out involving the use of intermediary appliances. In addition to saving the cost of unnecessary handling this method possesses the recommendation of reducing to a minimum the period elapsing between the mixing and deposition of the material.

The electrically-driven gear for operating the concrete hoist was provided with an extra winding drum for transporting trucks of material running on 24-in. gauge track shown in the plan, and for rendering other aid.

Beyond the concrete plant proper the contractors provided a 5-h.p. electric hoist for dealing with materials, such as brick, mortar, timber, and steel. In addition an electrically-driven circular saw bench was laid down for preparing timber used in the construction of moulds.

As electric power was not available on the site of the works the contractors generated the requisite current by a 20-h.p. traction engine.

Materials were brought to the site by a road shown at the right-hand of the plan, the wagons being driven up an inclined timber platform through trap-doors in which their contents could be discharged into the trucks running on the contractor's track beneath, the latter being laid on an inclined trestle. The trucks employed were of special design, discharging by a hopper bottom and a side outlet. The contractor's line inside the building was carried by a

trestle similar to that outside and close to a partition dividing sand from aggregate.

When the truck was used for delivering gravel a screen was attached below the bottom outlet, the result being that sand found its way through the pebbles to one side of the partition, while the screened pebbles rolled over and collected on the other side. In order to prevent the sand and aggregate from freezing steam pipes were laid on the ground beneath the material heaps, and supplied from the boiler of the traction engine. Exhaust from the coil was led into the vessels used for the supply of water to the concrete-mixer.

The procedure followed by the contractors was generally as described below. While the moulds and brick walls for each storey were being erected concrete materials were delivered and transported on the contractor's track to the interior of the building. The steam coil was kept hot so that the sand and stone should be thawed and remain warm until sufficient was collected for the concrete of an entire floor. When all was ready the operations of mixing and depositing concrete were commenced and continued without cessation until the entire floor was completed, thus obviating the bonding of old and new work. As the flooring was completed the surface was protected by canvas, this protection, in conjunction with the use of salamanders below the moulds, salt in the water, and warmed materials, eliminating all the troubles usually accompanying the execution of concrete work in frosty weather.

While the building was under construction the temperature for at least fifty days was below 15 deg. F. all day, and sometimes fell to below zero. The erection of this building under severe weather conditions with results stated to compare favorably with those obtained in warm weather shows that with suitable precautions reinforced concrete work is entirely practicable at low temperatures, but it must be borne in mind that the cost is considerably above the average.

Reinforced Concrete Reservoirs

Giving Concrete Itself Sufficient Strength to Withstand Internal Pressure—Experiences with Concrete Standpipe

In a paper entitled "A New Theory for The Design of Reinforced Concrete Reservoirs," Hiram B. Andrews, engineer for Simpson Brothers Corporation, presented to the Boston Society of Engineers an idea which has already been employed by him in the designing of one or more concrete reservoirs of recent construction.

The fundamental idea upon which his theory is based is not a new one. It was suggested by us several years ago in a series of articles describing concrete standpipes, although we did not claim originality for it. It is that if steel reinforcement is relied upon for taking the tension caused by the pressure of the contained water, and this tension becomes any very considerable percentage of the elastic limit of the steel, then the steel reinforcing bars will slightly elongate. This means that the concrete shell must increase in circumferential length, and therefore either a larger number of minute vertical cracks or a few wider ones will necessarily be formed in the concrete. These cracks are almost certain to produce more or less leakage. If the steel could be kept under its working stress while the concrete was being placed and setting, or if the cracks in the concrete could be

filled with cement mortar while the standpipe was filled with water, this difficulty would be met. But plastering the inside of the standpipe while it is empty can have no beneficial results so far as these cracks are concerned. The use of a more or less elastic waterproof coating on the inside, especially if there are a large number of minute cracks rather than a small number of wider ones, would probably produce the desired water tightness.

Mr. Andrews' theory or idea is to prevent the expansion of the reservoir when filled with water by making the concrete sufficiently strong to resist the tensile stress without cracking. In other words, he would make the concrete theoretically capable to withstand the pressure of the contained water without any reinforcement, adding the steel reinforcement as a safeguard against actual destruction of the reservoir and the accompanying serious results should the concrete fail to hold at any point. He also had found that the weakest point in the standpipe was apparently the junction of the vertical shell with the base and the first few feet of the sides themselves above the base. He therefore proposed to use here extra strong reinforcement consisting of bars well imbedded in the base and extending vertically for some distance into the cylindrical shell of the tank.

Shortly after reaching this conclusion the author prepared a design for a reservoir at Rockland, Mass.; where, he said, "we decided to use an especially rich mixture of concrete, a thickness of wall which would insure that the ultimate tensile strength of the concrete would not be reached when the reservoir was filled, to use an increased amount of vertical reinforcement especially between the base and the walls, and to install a steel dam at each horizontal joint between each day's work to prevent any direct seepage of water through the joint, provided it entered it. The hydrated lime was omitted; as we considered the proposed density of the concrete did not require it for impermeability, and also that where it had been used previously it had caused an unsightly efflorescence on the wall wherever there had been seepage. The plastering was omitted as we considered that any rigid coating upon this mixture of concrete was unnecessary; but instead, we applied three coats of soap and alum solution, commonly known as Sylvester Compound, to fill pinholes due to air bubbles, etc. The writer does not know that this was of any practical use, but it was a precaution which we took."

In working out the details the designer assumed that 1:12 concrete was good for 400 pounds tension per square inch. The steel was assumed to receive 16,000 pounds per square inch. It was also assumed that the ratio between the moduli of elasticity of steel and concrete is 10, so that if the concrete should be stressed to 300 pounds per square inch, for instance, the steel would be stressed to 3,000 pounds. In the standpipe in question, 46 feet in diameter and 104 feet high, this required a thickness of wall of 36 inches at the base, and 9.35 square inches of steel per foot of height.

In the discussion of the paper doubt was expressed by several as to whether concrete could be relied upon for 400 pounds per square inch tension; and there seemed especially to be doubt whether there might not be one or more weak places where the strength might be considerably less than this, which weak places would be the location of rupture when the reservoir was filled.

Steel Reinforcement Bars

At the annual meeting of the American Society for Testing Materials standard specifications for steel reinforcement bars were presented by a committee, of which William R. Webster was chairman, and were ordered submitted to the membership for a mail vote on their adoption. These were as follows:

1. Steel may be made by either the open-hearth or Bessemer process. Bars shall be rolled from billets.

2. The chemical and physical properties shall conform to the following limits:

Properties considered.

	—Structural Steel Grade—		—Hard Grade*		Cold-Twisted Bars.
	Plain Bars.	Deformed Bars.	Plain Bars.	Deformed Bars.	
Phosphorus, max.					
Bessemer	0.10	0.10	0.10	0.10	0.10
Open-Hearth	0.05	0.05	0.05	0.05	0.05
Ult. tensile strength, pounds per sq. in.	55,000-70,000	55,000-70,000	80,000 min.	80,000 min.	Recorded only
Yield point, min., pounds per sq. in.	33,000	33,000	50,000	50,000	55,000
Cold bend without fracture:		1,250,000	1,200,000	1,000,000	5 per cent.
Elongation, min. per cent. in 8 ins.	1,400,000	tens. str.	tens. str.	tens. str.	
Bars under $\frac{3}{4}$ in. in diameter or thickness.	180° d. = 1t.	180° d. = 1t.	180° d. = 3t.	180° d. = 4t.	180° d. = 2t.
Bars $\frac{3}{4}$ in. in diameter or thickness and over.	180° d. = 1t.	180° d. = 2t.	90° d. = 3t.	90° d. = 4t.	180° d. = 3t.

*The hard grade will be used only when specified.

3. In order to determine if the material conforms to the chemical limitations prescribed in Paragraph 2 herein, analysis shall be made by the manufacturer from a test ingot taken at the time of the pouring of each melt or blow of steel, and a correct copy of such analysis shall be furnished to the engineer or his inspector.

4. Chemical determination of the percentage of phosphorus shall be made by the manufacturer from a test ingot taken at the time of the pouring of each melt of steel and a correct copy of such analysis shall be furnished to the engineer or his inspector. A check analysis may be made by the purchaser or his representative if desired, in which case an excess of 25 per cent. above the required limits will be allowed.

5. For the purposes of these specifications, the yield point shall be determined by careful observation of the drop of the beam of the testing machine, or by other equally accurate method.

6 (a) Tensile and bending test specimens may be cut from the bars as rolled, but tensile and bending test specimens of deformed bars may be planed or turned for a length of at least 9 inches if deemed necessary by the manufacturer in order to obtain uniform cross-section.

(b) Tensile and bending test specimens of cold-twisted bars shall be cut from the bars after twisting, and shall be tested in full size without further treatment, unless otherwise specified as in (c), in which case the condition therein stipulated shall govern.

(c) If it is desired that the testing and acceptance for cold-twisted bars be made upon the hot-rolled bars before being twisted, the hot-rolled bars shall meet the requirements of the structural steel grade for plain bars shown in this specification.

7. At least one tensile and one bending test shall be made from each melt of open-hearth steel rolled, and from each blow or lot of 10 tons of Bessemer steel rolled. In case bars differing $\frac{3}{8}$ inch and more in diameter or thickness are rolled from one melt or blow, a test shall be made from the thickest and thinnest material rolled. Should either of these test specimens develop flaws, or should the tensile test specimen break outside of the middle third of its gauged length, it may be discarded and another test

specimen substituted therefor. In case a tensile test specimen does not meet the specifications, an additional test may be made.

(d) The bending test may be made by pressure or by light blows.

8. For bars less than $\frac{7}{16}$ inch and more than $\frac{3}{4}$ inch nominal diameter or thickness, the following modifications shall be made in the requirements for elongation:

(e) For each increase of $\frac{1}{8}$ inch in diameter or thickness above $\frac{3}{4}$ inch, a deduction of 1 shall be made from the specified percentage of elongation.

(f) For each decrease of $\frac{1}{16}$ inch in diameter or thickness below $\frac{7}{16}$ inch, a deduction of 1 shall be made from the specified percentage of elongation.

(g) The above modifications in elongation shall not apply to cold-twisted bars.

9. Cold-twisted bars shall be twisted cold with one complete twist in a length equal to not more than twelve times the thickness of the bar.

10. Material shall be free from injurious seams, flaws, or cracks, and have a workmanlike finish.

11. Bars for reinforcement are subject to rejection if the actual weight of any lot varies more than 5 per cent. over or under the theoretical weight of that lot.

12. When an inspector is furnished by the purchaser to inspect material at the mills, he shall have full access, at all times, to all parts of mills where material to be inspected by him is being manufactured.

The world's architects have been invited to take part in the competition for a design for the new Parliament Buildings to be erected by the Commonwealth of Australia at Canberra, New South Wales. The first, second and third prizes are respectively £1,750 sterling, £700 and £500. The designs must be delivered to the secretary of the department of home affairs, Melbourne, on or before Jan. 31, 1912, and will be submitted to a board consisting of an architect, an engineer and a licensed surveyor.

Heat transfer through furnace walls has been investigated by Messrs. W. T. Ray and H. Kreisinger, of the United States Bureau of Mines. They used a special furnace 43 feet 4 inches long over all, 3 feet wide and 3 feet 3 inches high, about 5 feet of the length being occupied by a mechanical stoker. A 2-in. air space separated the inner and outer walls and a 1-in. layer of asbestos was used between the inner and outer arch rings. Temperature measurements were made at many places by thermo-couples. The results are given in a bulletin issued by the bureau and from them the authors conclude that so far as a loss of heat is concerned a solid wall is preferable to a hollow one of the same total thickness, particularly if the air space is near the interior surface.

Cracking in Cement Grouted Pavements

Danger from Frost often Increased by Improper Provisions for Drainage—Other Troubles: Expansion Contraction, Settlement of Sand Cushion

* In a paper presented at the annual meeting of the Michigan Engineering Society, Earle R. Whitmore, city engineer of Port Huron, Mich., discusses at length the causes of the cracking of cement grouted brick pavements and suggests remedies.

The causes observed by Mr. Whitmore are five in number, and are as follows: Frost, expansion, settling of the sand cushion, settling of the subgrade, and contraction between transverse expansion joints. These are arranged in what he regards as the order of their importance and frequency of occurrence.

Frost

According to Mr. Whitmore's observations, frost is generally, if not always, the cause of the longitudinal cracks appearing at or near the crown of the pavement. In support of this theory, he gives arguments essentially as follows:

Such cracks invariably make their first appearance when the snow goes off in the spring, and are then small.

Where the subgrade is clay, cracks in pavements provided with ample expansion joints along the curb, as well as in those without expansion joints.

Where the subgrade is sand, and on well drained fills, cracks are not found, even where no expansion joints are provided.

The cracks follow the line of travel where the snow is packed and the frost penetrates deepest. Where there are car tracks in a street and the subgrade is a material that retains water, there is usually a crack along the driveway on each side of the tracks. Where other streets cross the paved street, the cracks do not continue across the intersection, presumably because the travel across the street and around the corners packs the snow, so allowing the frost to penetrate over such a large area that the pavement is raised evenly and is not broken. Where, however, a street joins the paved street but does not cross it, the cracks run off toward the curb as they approach the side street, continue across it and come back to the center beyond the side street.

If a careful examination be made of the concrete foundation under one of these longitudinal cracks, it will be found that the concrete is also cracked.

Mr. Whitmore then points out the failure of many otherwise excellent specifications to make proper provisions for drainage and so minimize the danger from frost.

To prevent cracking because of the action of frost, Mr. Whitmore recommends that when the subgrade is clay suitable drains be placed about 3 ft. below the tops of the curbs and the trenches filled with coarse material such as cinders or small field stone. These drains should then be connected with sewer inlets. He does not favor the use of cross drains. Mr. Whitmore states that he does not consider his observations sufficiently final to warrant the omission of expansion joints next to the curb since they are so generally specified, but states that it is his personal opinion that they are seldom of use except in very wide pavements. Once a crack is started, he says, it doubtless widens because of expansion and contraction, but he states that he has never seen a crack of this kind that appeared to have been caused originally by expansion.

Expansion

Damage to pavements by expansion, according to Mr. Whitmore, is comparatively slight and easily repaired, though sometimes spectacular when caused by the buckling of the pavement. Where there is no abrupt change of grade that allows the pavement to buckle, his observations indicate, he states, that the filler between the courses is sometime crushed in places and the cracks make diamond shaped or triangular divisions on the surface, seldom breaking a brick but following the joints. If there is a bend or an angle in the street the effect of the expansion will be carried to that point and the angle will be crowded considerably out of line.

These zigzag cracks are inconspicuous as a rule, but according to Mr. Whitmore, tend to shorten the life of the pavement by allowing water to penetrate, and by forming starting points for the cracks caused by the jarring of heavy traffic. As a remedy, he recommends the providing of frequent transverse expansion joints formed by laying several courses about $\frac{1}{4}$ inch apart and filling the joints with a bituminous filler before grouting the rest of the pavement. Mr. Whitmore holds that a single expansion joint $\frac{1}{2}$ inch or more in width is inadvisable because the passage of loaded vehicles causes a jar that soon loosens the adjacent brick; because in warm weather the bituminous filler in a wide joint is apt to run from the crown toward curbs; and because the expansion sometimes forces together the bottoms of the blocks next the joints while the tops are still held apart by earth and other material forced into the joint, with the result that the brick heave up next the joints.

Settling of the Sand Cushion

Cracks due to the settling of the sand cushion, according to Mr. Whitmore, result from several causes. Those enumerated by him are substantially as follows:

When spread on a macadam foundation the sand is apt to work down into the interstices in places, so causing unequal settlement and the cracking of the pavement. This could probably be avoided, he says, by filling and rolling the foundation in about the same manner as if it were to be a finished macadam roadway, but such procedure would not usually be economical. He holds that except under unusual conditions, a good concrete foundation is the most economical in the long run.

If, in laying the concrete foundation, sufficient care is not exercised to make the surface parallel with the required pavement surface, the sand cushion will be of varying thickness and will be likely, therefore, to settle unevenly.

If the foundation be laid properly, but the cushion carelessly luted, or laid with a templet and the templet not carried back and drawn over the surface several times, the surface will invariably be wavy and the cushion of unequal thickness. According to Mr. Whitmore, it is a serious mistake to leave the cushion uneven and depend upon the rolling to level it, for, though the roller will probably make it appear even, some of the blocks will be well bedded while others will receive practically no benefit from the rolling and will settle later under the traffic.

If the sand be partly dry and partly moist when spread, the cushion will settle unevenly. A pile of sand is often moist on the outside and dry inside, or vice versa, and, according to Mr. Whitmore, when such sand is used it should either be dried or, perhaps, moistened uniformly.

Cracks caused by the settling of the sand cushion, according to Mr. Whitmore, usually divide the surface into approximately rectangular areas varying in size from two or three brick to several square yards. The cracks do not extend across the brick. The rectangles go down under traffic heavy enough to break the grout, or, if the traffic is not heavy enough to break the bond, an arch is formed, which gives rise to the rumbling noise so often noticed.

The proper thickness of the sand cushion, Mr. Whitmore states, has been the subject of much discussion. He believes that if it be properly laid, any thickness from one inch to two inches is suitable. He also holds that a sand cushion properly and carefully constructed is as good as a mortar bed, and perhaps better.

Settling of the Subgrade

The settling of the subgrade, like that of the sand cushion, Mr. Whitmore attributes to several causes. Pavements laid across fills are apt to settle, and very wet and undrained subgrades are likely to produce the same result. Only great care, he states, will prevent the first, and suitable side drains will usually remedy the second trouble. Another cause cited is the improper filling of trenches opened for various purposes. Too great care, he says, cannot be exercised in backfilling such trenches.

Contraction Between Transverse Expansion Joints

The contraction between transverse expansion joints, according to Mr. Whitmore, results in the formation of fine cracks that are hardly noticeable unless outlined by moisture. When the expansion joints are placed at considerable distances apart, these cracks appear at intervals, he states, and follow the grouted joints from curb to curb. Where the expansion joints are 50 ft. apart two of these cracks appear in each 50-ft. section, dividing it into lengths of about one rod. He believes that cracking from this cause can be avoided by placing transverse expansion joints at intervals of about 15 ft., in which case it would be necessary to fill only one or two joints at each place with bituminous filler.—Good Roads.

A wave of prosperity has passed over Brandon, Man., this season and improvements and extensions are the order of the hour in municipal and general building circles. Among the latest firms who have branched out into new buildings may be mentioned Geo. White & Son, manufacturers of threshing machinery, the Safe Lock Fence Co., and the McPherson Fruit Co. The greatest municipal improvement that has been made in the city for many years, is the paving of the city with asphalt blocks. Work on the streets was commenced a few weeks ago. Ninth street, between Rosser and Pacific avenues, is now completed, with the effect of making it the best street in the city.

Repairing of one leaking intake tunnel has been carried out in the following manner. The tunnel is built of concrete, 5 ft. wide and 8 ft. high in the clear, and during ordinary stages of the river from which the water is drawn it is entirely submerged. When it was shut off and drained, however, a strong flow of water came in through holes in the bottom, as there was a large amount of ground water under a heavy head outside the conduit. The repairs were executed by a diver, working while the tunnel was full of

water. A mortar made of one part of cement and two parts of sand was mixed in the usual way, put into cloth bags, and carried by the diver to the holes, where it was emptied into these holes as readily as on land. After the holes were filled several sacks of sand were placed on top of the green mortar, to prevent any erosion by the water passing through the tunnel. The repairs have been entirely satisfactory.

Rapid Travelling Fire Apparatus

To get to fires in seconds instead of minutes is the secret of preventing heavy fire losses, in the opinion of the Westmount City Council. This view has been impressed upon the authorities by the Fire Chief and perhaps even more forcibly by Alderman John T. McBride, who some time ago was appointed to investigate speedy fire apparatus. Mr. McBride has visited a large number of important centres where auto carriages are in use and has also visited the manufacturing plants of a number of leading makers besides carrying on correspondence with, and receiving tenders from, leading manufacturers in European countries, America and Canada. On Alderman McBride's recommendation the council has decided to purchase a combined chemical and hose wagon from the Pope Manufacturing Company, of Hartford, Conn., known as the "Pope-Hartford Combination." This horseless machine will



Pope-Hartford Combination Chemical and Hose Wagon.

cost \$6,400 and is to be delivered next January. It will be installed in the new upper level fire station and will be the first motor-driven apparatus procured in the town. It is intended that this shall be followed by other mechanically driven apparatus until the entire brigade is furnished with horseless engines, ladder, trucks, etc. The combination wagon just purchased will be driven by a 75-h.p. gasoline engine and will be capable of attaining a speed of forty miles an hour. It will carry a thirty-gallon chemical tank, 20 feet of chemical hose, 1,000 feet of water hose, besides ladders, axes, lamps, and twelve men. In other words, it is capable of climbing any hill in Westmount either in summer or winter when carrying a load of five tons. Some of the hills of Westmount have a grade of 17½ per cent. As the area of the city is only 800 acres it is calculated that with rapid traveling apparatus no fire will ever be able to get out of the house, and seldom out of the room, in which it originates. The fire department expects to be able to get to any fire in Westmount within two minutes.

No better token of the development of Regina, Sask., is afforded than the activity in building circles in that city. During the first half of September the permits issued totalled \$152,450, nearly double the amount for the corresponding period of last year.

Notes from the Federal Capital

**Great Activity in Residential Building this Season—
Municipal Work in Prospect — Items of Interest**

Ottawa, September 25, 1911.

(Correspondence of the Contract Record.)

Municipal work in the city of Ottawa will be very heavy during the fall and winter. Operations will be started on the new bridge across the Rideau canal at the foot of Bank street on December 1st and tenders will be called for this work on October 1st. The bridge will be of reinforced concrete. It will be 60 feet wide and about 750 feet long. It will have six arches, the largest of which will be 76 feet, and 30 feet above the water level.

Two of the other spans will be over the water and three over land. The canal will be widened into an artificial lake at this point and the two smaller spans will be large enough to allow motor boats to pass underneath. Work has already been started sinking test pits, etc. The water is taken out of the canal on December 1st so that it will not be an inconvenience. The roadway will be 40 feet wide, the sidewalks 8 feet each, and two feet on each side will be taken up with railings and iron poles which will carry the lights and the trolley wires. The driveway which now crosses Bank street will cross under the arches which are over dry ground. The cost is estimated at \$115,000, plus \$15,000 for consequent damages.

The city has also voted \$60,000 for a booster system. A building will be erected on the corner of Slater and Kent street, where the booster for water service will be installed. There will be two centrifugal pumps and two electric motors. Besides this there are a great many new water mains to be laid, for which tenders will not be called. The prices tendered in the beginning of the year for such pipe will be paid.

Then there is a great amount of work going on at the present time. The operations on the big aqueduct are still being rushed. Dredges are at work taking out the rock under water in the river above the falls and 41-inch steel pipe is being laid. Three steam hoists and 150 men are engaged in the excavations in the aqueduct. The reinforced concrete intake pipe is being built and the concrete arch which covers the duct so that the street can be rebuilt, is being completed at the same time. It is expected that the work will be completed in June or July.

Thomas McLaughlin, who has the contract for the west-end drainage scheme, has five different gangs at work, and is laying 100 feet of concrete sewer a day. The excavation is through a shale rock. In the Dowes lake drainage system a 4-foot circular brick sewer is being built, the brick laid in cement. The ground is very wet as it is below the level of Dowes lake alongside. Already 1,500 feet has been built.

The Ottawa Improvement Commission has a heavy work before it. It is building a retaining wall about 600 feet long and 30 feet high along the base of the cliff from Nepean Point to Queen's wharf. The wall is about five feet thick at the base and three feet at the top. The wall is of concrete and the space between it and the face of the cliff will be filled in and a roadway built along the top. There is said to be a great deal of dissatisfaction in the Commission over this structure. Some of the members were in favor of piers being built or structural steel being used to support the roadway leaving the face of the cliff still visible instead of the solid concrete wall.

In private building there continues to be great activity. This is chiefly noticeable in the more extensive residences.

A number of these ranging in price from \$10,000 upwards are in course of construction and there is more building of the cheaper class than there was in the spring.

The federal campaign caused considerable interference in the work and tended to make labor scarce. The public works department, as at every election, greatly increased its force of outside employees and many men left the private employers for the better prices of the government. Even the City Engineer's department suffered and has had great difficulty in getting the extra men required for heavy municipal work. There is little or no change in the wages paid by the private contractors, and with the elections over the scarcity of men will at once be relieved.

Ontario Architects' Convention

The annual convention of the Ontario Association of Architects was held in Ottawa, beginning on September 13th. There was a fairly large attendance, most of the delegation being from Toronto, London, Hamilton and Ottawa. Strong exception was taken at the meeting to the proposal to hold a competition among architects for plans for the technical school at Toronto, the understanding being that the winner would only receive a prize for his plan. The plan is to be handed over to the construction department of the Public School Board and the building erected by this department, the architect who prepared the plans having no further say in the matter. It was urged that the architect whose plans were accepted should have the supervision of the work as in any other construction.

There was considerable criticism of the work done by the Ottawa Improvement Commission. It was recommended that the government should provide for an advisory board of architects nominated by the council of the Royal Architectural Institute, to study this work from all points of view and particularly with regard to the future.

During the convention the architects were entertained by the city and the local members. A visit was made to the Central Canada Exhibition. The new public buildings were inspected and the trip proved a most enjoyable one. The selection of the place for the next convention was left to the Council, which will meet at Toronto.

Details of the election of officers are given in another column.

Montreal Works in Progress

**First section of Place Viger Station practically
completed — Many large contracts well in hand**

Office of the Contract Record,

Montreal, September 25th, 1911.

The Montreal contractors have had a very busy month and have been at work on many important structures. Happily there have been no labor troubles to upset progress, and indications all point to a continuance of good business in the building trade.

Just now contractors have many big works in hand, some of which are nearing completion. The following gives particulars of how a portion of the work is going on:

Most of the work on the first section of the new C. P. R. station at Place Viger is about finished, and plans are now being prepared for the other operations necessary to carry out the entire scheme of improvement. So far as the new building is concerned, present appearances point to its being opened at the end of October. The structure is complete and the carpenters are busily fitting up the offices, the electrical part is being put in, and the roads are being graded. Offices are being erected of concrete in order to store goods. The general contractor is John Stewart &

Company, of Westmount. In connection with the same scheme Mr. C. E. Deakin is putting up two large freight sheds—one 1,000 feet long and the other 500 feet long. The roofs are now being put on. The viaduct which has been built by Mr. E. G. N. Cape over the station yard has been opened. It is constructed of reinforced concrete and is 1,006 feet long. The viaduct was rendered necessary owing to the pulling down of a number of buildings which destroyed the continuity of Notre Dame street, and it was to restore the thoroughfare that the viaduct has been built.

The new harbor elevator being constructed by the John S. Metcalf Company, Limited, is making good progress. Work is being done on the structure above the grain bins, and the foundation of the addition to the elevator is also being put in.

The Bishop Construction Company expect to complete the new "Herald" Building on Craig street about the end of February. A little more than half the concrete work is finished, the rate of construction being a floor a week.

Mr. E. G. N. Cape has commenced work on a branch of the Bank of Ottawa at the corner of Park and Fairmount avenue.

An additional two storeys are being erected at Mr. C. Gurd's mineral water factory, Bleury street. The work is of reinforced concrete.

The steel frame of the Montreal General Hospital extension is now complete, but it will be another two months before the structure is ready for the interior work to be commenced. The contractors are John Stewart & Company, who have also in hand the new Y. M. C. A. building on Drummond street. This is nearly finished, a large amount of interior work having been done. The floors are laid, the plastering completed, and the decorative work well under way.

At the General Post Office the entire inside of the building has been gutted and the alterations are well in hand. Steel work is up to the fourth floor.

The two big contracts of P. Lyall & Sons, Limited—the Dominion Express & Transportation building—have now reached an advanced stage. Both the structures are up, and there is only a small amount of work to be done on the exteriors, leaving the interiors to be finished.

The roof of the Canadian Artisans Association's building in the west end of Place Viger Square is now almost on, and, as we have already announced, tenders are being called for for the internal furnishings.

A reinforced concrete building of four storeys being constructed for Mr. J. P. O'Shea in Perrault Lane is completed as far as the fourth floor, and will soon be ready for the interior work.

James Stewart & Company's Operations

Nearly half of the brick work on the Port Arthur Wagon Company's plant at Port Arthur, Ont., is completed. Excellent progress has been made on the work and the contractors, James Stewart & Co., Chicago, anticipate the completion of the buildings by November 1. The operating machinery and equipment for this plant are being furnished by the owners, who expect to have the factory in operation by January, 1912. James Stewart & Co. also have under contract a 7-storey reinforced concrete warehouse for the Swift-Canadian Company at Edmonton. Building operations have reached the third storey and completion is expected by November 1. Here, also, the operating machinery and equipment are being furnished by the owners. The contract for the C.P.R. coal docks on Island No. 1, Fort William, has been awarded to James Stewart & Co. The estimated expenditure is \$2,000,000. Owing to the location of the plant the absence of trackage facilities

and the fact that the waters surrounding the island are not dredged, progress on the installation of the contractors' plant has been slow. At the time this information was sent us, however, work had only been in progress 30 days. The contractors, during that time, had dredged the McKellar river sufficiently to receive their equipment and had cleared the site of muskeg for some 20 acres, erected their temporary buildings and installed all their equipment, consisting of mixers, hoisting engines, derricks, clam shells, pumps, etc. In addition, they had taken out about 2,000 yards of dirt on the sea wall.

Supply Market Short at Edmonton, Alta.

Continuous activity in the building field is reported at Edmonton, Alta., which is having a record-breaking year. There is said to be a big demand in this city for small houses rentable at \$18 to \$20 a month. The scarcity of such dwellings in the past has caused the erection of a large number of shacks in all sections of the city. Certain lines of building material are hard to get in Edmonton, the chief trouble being in mill work. The factories are behind with their orders and it is generally felt that the city could do with more planing mills and sash and door factories. At the time of writing the supply of cement has caught up to the demand, but sand and gravel are hard to get.

G. T. P. Extending Rapidly

Substantial progress is being made in all directions in the construction and opening for traffic of the lines of the Grand Trunk Pacific. Recent reports given out announced the completion of the line to Fitzhugh, a point in the Jasper National Park, 1,027 miles west of Winnipeg and service will be immediately extended thereto, and it is expected that fifty or sixty miles additional beyond Fitzhugh will be graded for steel this fall. This would bring steel to Tete Jaune Cache.

Work on the Prince Albert branch is being rapidly pushed forward and steel has been laid as far as Waka, sixty-eight miles from the main line. Grading on this line has been completed within twenty-four miles of Prince Albert.

On the branch from Regina to the international boundary twenty-five miles of steel will be completed this fall. Sixty per cent. of the grading on the Regina-Moose Jaw branch has been finished.

Construction work on the Brandon branch, which runs south from the main line at Harte, a distance of twenty-four miles, is being commenced this week, and when completed will give the Grand Trunk Pacific the shortest line between Winnipeg and Brandon.

Grading has practically been completed on the first fifty miles of the Biggar-Calgary branch. Work was started last week on fifty miles of the line from Battleford West through the Cut Knife District towards Wainwright, Alberta.

On the Tofield-Calgary branch steel has been laid to the Red Deer river.

The above gives a good idea of how the work on the branches is being advanced, in addition to which the main lines are being pushed forward actively.

As the outcome of a tour of inspection of the West by Mr. Jones, their general manager, the Canadian Cement Company are said to have decided upon a programme of extension and improvement to their mills, particularly those west of the Great Lakes. The company's general business and prospects were never more flourishing.

Personal Mention

Mr. Peter Gillespie has been appointed Associate Professor in Applied Mechanics in the University of Toronto.

Mr. H. W. Price has been appointed Associate Professor in Electrical Engineering in the University of Toronto.

Mr. J. H. Black has resigned his position as Superintendent of the Temiskaming & Northern Ontario Railway, with headquarters at North Bay, Ont., to become General Manager of the Northern Ontario Light & Power Company, at Haileybury, Ont.

Mr. Harold Parker, chairman of the Massachusetts State Highway Commission, has resigned that office upon his appointment to the directorate of the Hassam Paving Company, Worcester, Mass. He will have general charge of that company's contracts in the United States and Canada.

Mr. M. P. Shea, who has been manager of the gasoline engine and motor boat department of the Canadian Fairbanks-Morse Company, Limited, St. James Street, Montreal, has resigned this position to go into business on his own account. He has taken an office at 296 St. James street, where he will open up on October 1st.

Professor W. Muir Edwards, of the University of Strathcona, Edmonton, has returned to the West from Ottawa, where he has been working, along with City Engineer Ker and Mr. Allan Hazen, on recommendations looking to a pure water supply and the effective disposal of the sewage of the Federal Capital. As announced in our last issue, Professor Edwards recently paid a visit to New York with Mr. Ker in the above connection. On their way back they inspected the incinerator and hypochlorite plants at Montreal.

Mr. J. W. Craven, of Bradley & Craven, Limited, of Wakefield, Eng., is enthusiastic over the opportunities for profitable brickmaking afforded by Western Canada. The city which claimed Mr. Craven's particular attention was Calgary. From there he had brickmaking material sent over to England for testing, with very satisfactory results. The site from where the material was sent contains 20 acres of good shale, and lies close to the track of the Canadian Pacific Railway. It is on the fringe of the building area of Calgary, enabling bricks to be delivered by horse team at a small cost per thousand. Electrical current is obtainable at the low cost of $\frac{1}{2}$ d. per unit, for manufacturing purposes, this low figure being due to the current being generated by water power; and the proximity to the railway, from which a siding will be made, gives facility for transport to other towns. With a works to produce 40,000 bricks per day, for which there is ample demand, Mr. Craven estimates, at the present selling price, there should be a profit of not less than \$8 to \$10 a thousand.

Mr. James Blake Hattie recently resigned his position as Engineer of Construction for the City of Westmount and will leave Canada in October to take up missionary work in Honan, North China, under the auspices of the Presbyterian Church. Mr. Hattie comes from Nova Scotia. He received the degree of Civil Engineer from McGill University in 1910 and almost immediately accepted the appointment to the position which he has just relinquished at Westmount. On the occasion of severing his official connection with the corporation of Westmount Mr. Hattie was presented by Mr. A. D. Shibley, the city clerk, on behalf of the members of the office staff, with a fitted suit case, accompanied by an illuminated address. Mr. Hattie was the recipient of similar recognition from the Presbyterian workers in connection with Chinese Sunday Schools

in Montreal, in which sphere he had for some time been actively engaged. Mr. Hattie will be engaged in engineering work on the mission field. Mr. R. G. Austin, who has been engaged compiling a new map of the City of Westmount, has been appointed to succeed Mr. Hattie as Engineer of Construction.

News and Notes

The American Railway Bridge and Building Association will hold its annual sessions at St. Louis, Mo., Oct. 17-19.

The League of American Municipalities meet at Atlanta, Ga., Oct. 4-6, for their annual convention. For particulars address the secretary, John MacVicar, Department of Streets, Des Moines, Iowa.

One of the largest brick manufacturing concerns in British Columbia is Coghlan & Sons, New Westminster, B. C. This firm has a 16-chamber continuous kiln which is giving every satisfaction. The capacity of the plant is 12,000,000 brick per annum.

The site has been fixed for the new G.T.R. tourist hotel in Jasper Park, Alta. The location is at Fiddle Creek, seventy-five miles west of Wolfe Creek. The proposed structure will be finished in almost palatial style. Operations will be commenced next summer.

The Raymond Concrete Pile Company, of New York and Chicago, have been awarded the contract for the reinforced concrete crane track foundations at the works of the Maryland Steel Company, Sparrows Point, Mr. George C. Shepard, chief engineer, marine department.

The annual convention of the American Society of Municipal Improvements is now in progress at Grand Rapids, Mich. The sessions opened on Sept. 26th, and will conclude on Sept. 29th. Fifteen members from this society will attend the International Municipal Congress and Exhibit at Chicago, Sept. 18-30.

At the meeting of the Council of the Ontario Association of Architects the following officers were elected for the coming year: president, A. F. Wickson, Toronto (re-elected); first vice-president, Jules F. Wegman, Toronto; second vice-president, C. P. Meredith, Ottawa; treasurer, Grant Helliwell, Toronto; registrar, M. F. Moore, Toronto.

The special commission appointed to report on the water and sewerage questions at Ottawa will meet in that city on October 1st, and continue in session until its recommendations are completed. Mr. Allan Hazen is to be in Ottawa this week to confer with Mr. Chas. Keefer, one of the engineers on the commission, who has just returned from a trip abroad.

Mr. Henry Hadley, Jr., C.E., engineer of Verdun, Que., reports the following work done in that municipality during the summer: One mile of macadam roadway; three and a half miles of concrete sidewalk; three miles of concrete curbs; one and a half miles of drains, and two miles of water mains. All the work is done by the day under the engineer's supervision.

The new stone crusher recently purchased by the town of Verdun, Que., will soon be in operation. This machine has a capacity of sixteen tons per hour. It is driven by a thirty h.p. motor the current being obtained from the municipal plant. This plant is quite complete and up-to-date in every particular and can be run both in summer and winter. Until recently Verdun was handicapped with regard to stone suitable for crusher work, but ample quantities are now being obtained from the old Montreal aqueduct which is being excavated for power purposes. The stone is being conveyed to Verdun by train. This will en-

able the town to do a large amount of road work to good advantage.

The American Road Builders' Association (150 Nassau street, New York), has accepted the invitation of the city of Rochester, N. Y., to hold its next annual convention in that city, Nov. 14-17. The feature of the meeting will be an up-to-date exhibition of road building machinery and material. Over 1,400 road builders from the United States and Canada attended the seventh annual convention of this association last year at Indianapolis.

The new brick plant of the Anvil Island Brick Company, Limited, of Vancouver, B. C., is turning out a splendid grade of red pressed brick. The plant is equipped throughout with modern machinery and appliances and has a capacity of 30,000 stiff mud brick per day. M. B. Taylor, manager of the company, had entire charge of the construction of the plant, for which he predicts unbounded success. The works are located on Anvil Island, Howe Sound, about twenty-two miles from Vancouver.

The Lock Joint Pipe Company, 165 Broadway, New York, have had a busy time in the Canadian field this year. Among the important contracts they have obtained for reinforced concrete pipe may be mentioned two for the city of Toronto, and also for Hamilton, Ont., St. Lambert, Que., Sault au Recollet, Que., Regina, Sask., Saskatoon, Sask., and Goderich, Ont. Satisfactory progress has been made. The last month witnessed the completion of large contracts for Toronto, Hamilton, Regina and Goderich.

The death occurred in Montreal on September 14th of Mr. J. B. Pauze, of J. B. Pauze & Company, the well-known building contractors. Mr. Pauze was in his fifty-first year and leaves a widow and two daughters. The deceased was the contractor for the new Montreal jail which is being erected for the Quebec Government at Bordeaux at a cost of about two million dollars. Amongst other large contracts carried out by him were the Provincial Bank and the Montreal Street Railway shops and sheds at Youville.

Messrs. Armstrong & Morrison, engineers and contractors, of Vancouver, were the successful tenderers for the substructure and erection of the superstructure of the new steel highway bridge over the Columbia river at Trail, B. C., which will be an important link in the new thorough highway planned by the provincial government. Their figure was \$93,902.50. The Cleveland Bridge & Engineering Company, of Darlington, England, secured the contract for the metal work at \$22,797, delivered at the bridge site not later than 15th January next. Messrs. Armstrong & Morrison will commence work on the substructure immediately, completion of the bridge within one year being guaranteed.

Messrs. Escher Wyss & Company, hydraulic engineers, of Zurich, Switzerland (Canadian head office, 408 Lumsden Building, Toronto), have lately secured an order from the Rio de Janeiro Light & Power Company, Mexico, for two 19,000 h.p. tangential wheels, the largest of their kind, to work under a head of 950 feet. This contract includes delivery of Messrs. Escher Wyss & Company's patent oil-pressure governors as well as the two pipe lines complete with valves, etc. Further orders have been received from the Tata Hydro-electric Power Company, Bombay, for four 13,200 h.p. and two 1,000 h.p. high-pressure turbines designed for a head of 1,680 feet and from the Fuji Cotton Mill (Japan) for four 3,000 h.p. and one 100 h.p. turbines designed for a head of 280 feet. These orders also include delivery of the necessary number of Escher Wyss & Company's governors. Orders of water turbines booked in the course of last month exceed 130,000 h.p.

According to a report furnished by the engineer, Mr. L. B. Merriam, Winnipeg, rapid strides are being made in the construction of the Kootenay and Alberta Railway. Mr. D. Whittaker, Pincher Creek, Alta., is resident engineer on this work and Grant, Smith & Co., are the contractors. During the past month 10 per cent. of the total construction was accomplished. The contract includes heavy earth excavation and embankment, two timber trestles, each 150 ft. high, with one 100-ft. Howe truss span. The length of the structures will be 1100 ft. and 800 ft., respectively. The total expenditure is estimated at \$450,000. The equipment on the work includes one steam shovel, four elevating graders, two traction engines, one cable way for timber and several hoists.

The Pacific Coast Pipe Company, of Vancouver, has been awarded the contract for the 6-foot continuous stave pipe line in connection with the Revelstoke city power plant. The company are also constructing an 11-ft continuous stave pipe line for the Powell River Power Company. A short time ago the city of Cardston, Alberta, awarded the company a contract for 6 miles of 10, 8 and 6-inch continuous stave pipe for its municipal water system, now under construction. Part of this contract is for a gravity supply main. Among the recent contracts completed by the company is one for 5 miles of supply mains for the Kootenay River Lands Company's holdings at Baynes' Lake, the property in which Norton Griffiths and Lord Compton are interested, but the control of which is held by Spokane capitalists.

IF

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If you can keep your head when all about you
Are losing theirs and blaming it on you;
If you can trust yourself when all men doubt you,
But make allowance for their doubting, too;
If you can wait and not be tired by waiting,
Or being lied about, don't deal in lies,
Or being hated, don't give way to hating,
And yet don't look too good, nor talk too wise;

If you can dream—and not make dreams your master;
If you can think—and not make thoughts your aim,
If you can meet with Triumph and Disaster
And treat those two imposters just the same;
If you can bear to hear the truth you've spoken
Twisted by knaves to make a trap for fools,
Or watch the things you gave your life to, broken,
And stoop and build 'em up with worn-out tools;

If you can make one heap of all your winnings
And risk it on one turn of pitch-and-toss,
And lose, and start again at your beginnings
And never breathe a word about your loss;
If you can force your heart and nerve and sinew
To serve your turn long after they are gone,
And so hold on when there is nothing in you
Except the Will which says to them: "Hold on!"

If you can talk with crowds and keep your virtue,
Or walk with kings—nor lose the common touch,
If neither foes nor loving friends can hurt you,
If all men count with you, but none too much;
If you can fill the unforgiving minute
With sixty seconds' worth of distant run,
Yours is the earth and everything that's in it,
And—which is more—you'll be a man, my son!

British Trade Inquiries

The following were among the inquiries relating to Canadian trade received at the office of the High Commissioner for Canada, 17 Victoria Street, London, S.W., during the week ending September 12th, 1911:—

A Scottish firm manufacturing pulley blocks, travelling trolleys, runways, wall crabs, and cranes for every purpose, desire to do Canadian business.

A London firm of engineers, contractors and merchant shippers desire to hear from Canadian importers of machinery and structural steelwork, gasholders and gas works plant, steel-framed buildings, cast iron, welded, weldless and rivetted steel socket and spigot, gas and water pipes, etc., etc.

An English engineer who is shortly proceeding to Canada desires to secure agencies for United Kingdom manufacturers of power plant of all kinds, and mechanical and electrical lifting gears, engineers' tools and supplies of all kinds.

A Toronto firm is open to take up an agency for the sale in Canada of art metal gas fittings, fire screens, etc.

A Montreal firm wish to be placed in communication with United Kingdom manufacturers of brazed brass tubes.

The representative of a Canadian producer of asbestos now visiting this country, wishes to get into touch with United Kingdom manufacturers seeking supplies of raw asbestos.

Canadian Boving Company's Contracts

The Canadian Boving Company have recently closed a number of new contracts, concerning which the following details will be of interest.

Penticton, B. C.—Two 190 h.p. impulse turbines to work at 900 r.p.m. under 2050 ft. head. The turbines will be direct connected to 3-phase generators, which are included in the same contract. One pipe line of welded steel plate 3/16-in.—1/2-in. thick of 14-in.—10-in. diameter, length about 10,500 ft., flanged joints.

Wilkie, Sask.—100 h.p. Diesel engine, to be direct connected to 3-phase generator.

Scott, Sask.—Similar equipment as above for Wilkie.

St. Thomas, Ont.—One steam engine driven turbo pump, 3,500 gallons per minute, 58-ft. head, direct connected to high-speed steam engine. One motor driven turbo pump, 2,100 gallons per minute, 58-ft. head, direct connected to 3-phase motor, supplied with hydro-electric power.

The office of the Canadian Boving Company is located at 164 Bay street, Toronto.

John Burns on American Water Supplies

At the opening of the new pumping station of the Metropolitan Water Board (London) at Walton, Mr. John Burns, President of the Local Government Board, who performed the ceremony, told some humorous stories illustrating the absorbing interest taken by Americans and Canadians in their water-supplies. "A few years ago," said Mr. Burns, "I was in America, where they do things on a big scale. I was one of a party that was seeing a celebrated town, and was much amused at the description given by the guide of the river which flowed through its midst. 'Ladies and gentlemen,' he said, 'you see through the trees the broad and heaving bosom of the river. That is the source from which we get a very generous water supply. The poor use it for soup, the middle class dye their clothes in it, and the very rich top-dress their gardens and lawns with it. Drive on sam.'"

Mr. Burns then told of an enterprising town in Can-

ada which was anxious to score off a rival town in the East. A journalist writing of this town said: "Edmonton is a young and pushful city, which prides itself on its water-supply. We have no desire to depreciate our Eastern rival, but in the matter of water-supply we are far ahead of her. The wood, the flotsam, the jetsam, and timber are so bad in her reservoirs that they have to filter their water through a ladder. The citizens have to extract the water from the debris with a gimlet, and when they have done that they have to disinfect it with chloride of lime, manganese, and iron. This clearing process, however, does not suffice, because after all these operations are carried out so many dangerous bacteria escape that they have to be taken from the water into the back yard and killed with a club."

Central Canada Exhibition a Great Success

The most successful year in the history of the Central Canada Exhibition at Ottawa closed on the 15th inst. Both in attendance and in quality of exhibits the event was the best of the kind ever held. This yearly exhibition at Ottawa is fast becoming recognized by manufacturers all over the country as an unexcelled medium for placing their various lines before the public of Central Canada. The attendance of 175,000 for the week testifies to the interest taken by the general public.

Among the exhibits noted by the representative of the Contract Record were several of interest to our readers.

The Beaver Board Company, manufacturers of the well-known line of Beaver Board for interior finish, had a splendid exhibit in charge of their Canadian manager, Mr. E. B. Stuart. It consisted of dining and living rooms, covered with Beaver Board, beam ceiling and panel walls.

The International Marine Signal Company, Limited, of Ottawa, engineers and builders of steel and structural iron, had an exhibit of their well-known Wilson's Portable Flare Lights. Great interest was shown in this exhibit by the contracting community.

The General Supply of Canada, Limited, Ottawa, had a well-arranged and comprehensive display which included pumps, machinery and supplies.

The Glidden Varnish Company's exhibit which was in charge of E. J. Hofford, of the head office, elicited many enquiries.

The Ideal Concrete Machinery Company, of London, Ont., showed a concrete block machine equipped with automatic transfer core actuator and automatic scamper and finisher.

Wettlaufer Bros., of Toronto, showed a full line of their well-known concrete mixers.

A Missouri court has recently ruled on the vexed question of extensions of time for the completion of contracts. A contract was in question which had a clause providing that if the foundation walls were not entirely completed and ready at the time agreed upon, for the subsequent work, that the contractor should have an extension of time for the completion of the work, equal to the number of days which had been in default on the completion of the foundation. The contract also provided for a notification to the contractor for the superstructure at least ten days before he should be required to start work. The court held these provisions to be just and reasonable and that the contractor for the superstructure was entitled to the notification, and was not under obligation to start work until he had received it.

Contracts Department

News of Special Interest to Contractors, Engineers, Manufacturers and Dealers in Building Supplies.

Information for insertion in these columns is invited from Architects, Contractors, Engineers, etc.

Waterworks, Sewerage and Roadways

Buctouche Harbor, N.B.

Tenders are called until October 3rd for work of dredging. Department of Public Works, Ottawa; secretary, R. C. Desrochers.

Calgary, Alta.

On October 3rd the following will be submitted: \$14,000 for laying and constructing trunk sewer; \$30,000 for constructing and extension of conduit system; \$42,000 sewer connections and purchase of sewer trenching machinery; \$395,000, construction and extension of waterworks system; \$375,000, construction and extension of municipal street railway.

Galt, Ont.

Tenders are called until Oct. 2 for waterworks debentures, \$10,000, cost of making permanent additions and improvements 30 years 4 per cent. Chairman finance committee, A. M. Edwards.

Hamilton, Ont.

Tenders are called until Sept. 27 for construction of sewers on 13 streets. City engineer, A. F. Macallum. Received by G. H. Lees, chairman Board of Control.

London, Ont.

By-law passed authorizing construction of storm sewer on Emery street between Ridout and High streets and tenders will be called at once. City engineer, G. W. Wright.

City engineer, G. W. Wright. Cement sidewalks on Maitland street, Bellevue avenue, 518 ft. south have been authorized. Tenders will be called at once for laying sheet asphalt pavement on King street. Estimated cost \$19,400. Work to include a 6-in. concrete base.

Tenders were called until Sept. 25 for furnishing material and constructing the Ramsay drain and branches, comprising: 1,200 ft. 14-in. tile, 5,110 ft. 12-in. tile, 964 ft. 8-in. tile, 450 ft. 6-in. drain, 1,170 ft. 4-in. tile, 2 catch basins, 1,200 cu. yds. excavation open drain. Tenders to be accompanied by a cash deposit of \$100. Plans, etc., at office of township clerk or with the engineers. Work to be completed Dec. 1st 1911.

Montreal, Que.

Tenders are to be called shortly for low level pumping station to cost \$35,000. Work includes installation. Equipment required, 12,000,000 gal. steam pump. Engineer, Geo. Janin.

Neepawa, Man.

Sec-treas., J. W. Bradley. The by-law to expend \$100,000 on waterworks was carried.

New Westminster, B. C.

The sewerage scheme for the West End, as laid out by the city engineer, has been approved by the council and

work ordered to begin at once. The proposed work will not interfere with present street grades.

North Battleford, Sask.

The town council contemplate early next spring to spend a large sum on sewer and water mains, also cement sidewalks.

Port Colborne, Ont.

Tenders are called until October 7 for construction of approximately 1 1/4 miles of cement concrete sidewalks. Specifications at the office of the Village Clerk. Reeve, John Cook; municipal

clerk, Frank D. Noble.

Sandwich, Ont.

The town is planning to make extensions to the water main. \$5,000 has been voted for the purpose. No arrangement about calling for tenders. E. R. North, clerk.

St. Lambert, Que.

Tenders were called until Sept. 22 for laying of concrete sewer pipe. Plans, etc., with secretary-treasurer. Sec-treas., J. R. Beatty.

Toronto, Ont.

The city is planning the construction of asphalt pavements, \$46,508; concrete walks, \$6,153; cedar blocks, \$2,165. C. H. Rust, city engineer.

The city engineer has recommended asphalt, brick block, concrete pavements, and concrete curbing at an estimated cost of \$28,009. Work to be done as local improvements on the initiative principle. City engineer, C. H. Rust.

Vancouver, B. C.

By-laws will be submitted for one million dollars for extension of water mains; \$550,000 for the Georgia-Harris street bridge; \$1,000,000 for sewers, street opening and grading, \$300,000, and the balance for proposed bridges across False Creek and \$500,000 to be set aside as a start on a sinking fund for the purchase of the B. C. E. R. by the city in 1919.

Westboro, Ont.

Tenders are called until Sept. 29 for construction of 4 miles of drainage for Monaghan Creek Drainage Scheme. Plans, etc., at town hall, Westboro, and at office of S. E. Farley, 164 Sparks st., Ottawa. Tenders to be accompanied by accepted cheque for 3 per cent of tender. Townships of Nepean and Goulbourne.

Whitby, Ont.

Tenders are called until Oct. 1 for whole or part of following construction: (a) sinking of an open concrete basin, on Lake Ontario shore, as a settling basin or intake wall for waterworks. (b) Depression and alterations to intake pipe to adapt it for use with proposed intake well. (c) Protection of

intake pipe. Plans, etc., at the office of J. H. Downey, Mayor.

CONTRACTS AWARDED

Ottawa, Ont.

Contract for pavement on York street went to Union Construction Co., \$23,239; also that on Cumberland street, \$117,993. Ottawa Construction Co., Wellington street, \$13,000.

Ridgetown, Ont.

The greatest difficulty has been experienced in sinking wells owing to quicksand. One, however, has been obtained which gives flow of 100,000 gallons, and it is proposed to sink additional wells in the same locality. The contract for pipe has been let to the National Foundry Company of Toronto. Hydrants and valves to the London Foundry Company, and a \$50,000 steel elevated tank to the Des Moines Bridge Company, of Pittsburg. F. W. Farncombe, London, engineer.

Railroads, Bridges and Wharves

Besserer's Grove, Ont.

Tenders are called until October 18 for construction of a pier wharf at Besserer's Grove (Hiawatha Park) Russell County, Ont. Plans, etc., at the department, at the offices of the district engineer at Montreal and with the postmaster at Orleans, Ont. Tenders to be accompanied by accepted cheque for 10 per cent. of amount of tender. Department of Public Works, Ottawa; secretary, R. C. Desrochers.

Bassano, Alta.

620 acres have been purchased within half a mile of the C. P. R. depot here and it is reported that the Western shops of the C. P. R. will be located here instead of at Calgary or Medicine Hat.

Beaumont, N. B.

Tenders are called until Oct. 10th for construction of a wharf at Beaumont, Westmoreland county, N. B. Plans, etc., at the department and at the offices of the district engineers at Chatham N. B., and St. John, N. B., and on application to the local postmaster. Tenders to be accompanied by accepted cheque for 10 per cent. of amount of tender. Department of Public Works, Ottawa. Secretary, R. S. Desrochers.

Bridgeburg, Ont.

A new railway bridge under consideration to supercede a steel bridge, 9 spans, truss construction, 8 stone piers, 2 stone abutments, double-tracked. Estimated cost \$3,000,000. First stage of work, bridge over ship canal at Black Rock, is completed. Owner, Grand Trunk Railway Co., Montreal.

Cache Bay, Ont.

Tenders are called until Oct. 11 for construction of wharf. Plans, etc., at

Department and at office of J. G. Sing, district engineer, Confederation Life Building, Toronto, and on application to local postmaster. Tenders received by secretary until Oct. 11, 1911. Department of Public Works, Ottawa. Secretary, R. C. Desrochers.

Charles Forest's Cove, N. S.

Tenders are called until Oct. 10 for construction of breakwater. Plans, etc., at offices of district engineers at North Sydney, N. S., Halifax, and on application to postmaster at Arichat, N. S. Department of Public Works, Ottawa. Secretary, R. C. Desrochers.

Chilicamp Point, N.S.

Tenders are called until October 10th for construction of breakwater. Plans, etc., at Department of Public Works, Ottawa, and at offices of district engineers at North Sydney and Halifax, N.S., and on application to postmaster. R. C. Desrochers, secretary.

Edmonton, Alta.

Work will commence at once on a 2-mile extension on street railway for which rails have been purchased from Gorman, Clancy & Grindley, agents for United States Steel Co. Track to be in operation this fall.

Finlay Point, N.S.

Tenders are called until October 17th for construction of extension to the wharf. Plans, etc., at Department of Public Works, Ottawa, and at offices of district engineers at North Sydney, Halifax, N.S., and on application to postmaster at Mabou Coal Mines, Inverness Co., N.S. R. C. Desrochers, secretary.

Fredericton, N. B.

Tenders are called until Oct. 16 for re-building White bridge over Misamichi river between Bolestown and Doaktown. Plans, etc., at Department at Charles Duffy's, Bolestown, and Henry Swim's, Doaktown. Department of Public Works, Fredericton. Chief commissioner, John Morrissy.

Gimli, Man.

Tenders are called until October 10th for construction of an extension to Protection Pier. Plans, etc., at Department of Public Works, Ottawa, and at offices of district engineer at Winnipeg, Toronto, and on application to local postmaster. R. C. Desrochers, secretary.

London, Ont.

Plans are being prepared for a new C. P. R. station in East London, 2 storey, brick, to contain waiting room, ticket office, baggage room, offices for superintendents' assistant and staff and operators' quarters. Plans at office of Engineer Cooper, London.

Little Bras D'or, N. S.

Tenders are called until Oct. 11 for construction of breakwater. Plans, etc., at Department, offices of district engineer at North Sydney, and Halifax and on application to local postmaster. Department of Public Works, Ottawa. Secretary, R. C. Desrochers.

Louisdale, N. S.

Tenders are called until Oct. 11 for construction of wharf. Plans, etc., at Department and at the offices of district engineers at North Sydney, Halifax, and on application to local postmaster. Department of Public Works, Ottawa. Secretary, R. C. Desrochers.

Meat, Cove, N. S.

Tenders are called until Oct. 3 for construction of wharf at Meat Cove, Victoria county, N. S. Plans, etc., at the office of the district engineer at North Sydney, N. S., and on application to the local postmaster. Tenders to be accompanied by accepted cheque for 10 per cent. of amount of tender. Department of Public Works, Ottawa. Secretary, R. C. Desrochers.

New Westminster, B. C.

Plans for the proposed Great Northern depot at this point have been filed with the council. Permission will be asked of the Provincial Government to allow the railroad company to construct the depot on ground leased to the government for 99 years, and a proviso of the permission to build is that should any other railroad desire to enter the city at any time they would be allowed to use the same depot.

North Vancouver, B. C.

City engineer, G. S. Hanes. The engineer has been instructed to report on a steel bridge on Lynn Creek between D. L. 853 and 854. It is probable that this type of bridge will be constructed after by-law is passed to that effect the first of next year.

Ottawa, Ont.

Temporary repairs will be made to Billings' bridge, to cost \$265. City Engineer N. J. Ker has requested council to be allowed to prepare estimates for new bridge to be placed in the estimates for next year.

Port Hood, N. S.

Tenders are called until Oct. 10 for construction of an extension and raising of breakwater at Port Hood, Inverness county, N. S. Plans, etc., at the Department and at the offices of the district engineers at Chatham, N. B., and St. John, N. B., and with postmaster at Beaumont, N. B. Tenders to be accompanied by accepted cheque for 10 per cent. of amount of tenders. Department of Public Works, Ottawa. Secretary, R. C. Desrochers.

Peterboro, Ont.

The Midland Construction Company, 524 Confederation Life Building, are calling for tenders for rails, fish plates, bolts and spikes for Peterboro Radial Railway, size 70 lb. Also tenders required for cross arms.

Petewawa, Ont.

Tenders are called until Oct. 11 for construction of the public wharf at Petewawa, N. Renfrew county, Ont. Plans, etc., at the Department and at the offices of J. G. Sing, district engineer, Confederation Life Building, Toronto, and with the local postmaster. Tenders are to be accompanied by accepted cheque for 10 per cent. of amount of tender. Department of Public Works, Ottawa. Secretary, R. C. Desrochers.

Renfrew, Ont.

The Renfrew Power Co. are tearing down all stone and timber abutments at south end of dam. It is not known what amount of concrete is required for piers around pipes and for abutments. Estimated cost, \$3,000. Superintendent, W. Byron.

Regina, Sask.

The following by-laws will be submitted to the ratepayers on Oct. 3rd:

\$400,000 for construction of municipal system of street railway; \$1,500,000, construction of waterworks; \$150,000 for the construction and extension of the trunk sewer and disposal works.

Rous Brook, Lunenburg, N. S.

Tenders are called until Oct. 19 for construction of a wharf at Rous Brook, town of Lunenburg, N. S. Plans, etc., at the department and at offices of the district engineers at Halifax, N. S., and Antigonish, N. S., and on application to the local postmaster. Tenders to be accompanied by accepted cheque for 10 per cent. of amount of tenders. Tenders received by secretary until 4 p.m. Oct. 19th. Department of Public Wks., Ottawa. Secretary, R. C. Desrochers.

Sandwich, Ont.

Tenders are to be called for the erection of three bridges. The expenditure of \$1,600 has been voted by the people. Clerk, E. R. North.

St. Bonaventure d'Upton, Que.

A new iron bridge will probably be erected here. H. Lemaire, secretary.

St. Joachim de Chateauguay, Que.

Tenders are called until Sept. 23 for construction of bridge on St. John river near Lake St. Louis. Owner, town of St. Joachim. Sec.-treas., Fortunat Laberge.

St. Louis de Gonzague.

Contractor Docithe Gendron, St. Louis de Gonzague, Que., wishes prices for steel highway bridge, 70 ft. span x 16 ft. wide, or 70 ft. x 18 ft., delivered and erected. Four-foot sidewalks in both cases.

Township of Raleigh, Ont.

Tenders are called until Sept. 30 for erection of three concrete and steel bridges, 12th and 13th cons. road. Plans, etc., at offices of engineer or clerk, Middle Road, Raleigh. Engineer, W. G. McGeorge, C.E., Chatham.

Three Rivers, Que.

Tenders are called until Oct. 11 for additional filling at new coal dock at Three Rivers, St. Maurice county, Que. Plans, etc., at the department and at the offices of the district engineers at Quebec, Montreal and Three Rivers. Tenders to be accompanied by an accepted cheque for 10 per cent. of amount of tender. Department of Public Wks., Ottawa. Secretary, R. C. Desrochers.

Toronto, Ont.

Tenders are called for eighty miles of roadway, part macadam, rock and asphalt and for several concrete and steel bridges in connection. County of York. Engineer, A. E. James, 57 Adelaide st., East, Toronto.

Welland, Ont.

Contemplated electric railroad along Lake Erie, for Niagara, St. Catharines & Toronto Railway. General manager, E. F. Seixas, St. Catharines. Right of way has been twice surveyed and land is now being purchased. Length 21 miles standard gauge tracks, 65 lbs. rail. Route parallel to Bridgeburg & Goderich branch of G.T.R.. Several stations will have to be built. No estimate has yet been made of cost.

CONTRACTS AWARDED

Quebec, Que.

Station for Grand Trunk Pacific. Architect, Marchand & Tanquay, Que. Successful contractor, Jos. Gosselin, Le-

vis, Que., \$700,000, much below architect's estimate.

Station, \$27,000. Owner, Quebec Central Railway, Quebec. Architect, R. P. Lemay. General contractors, Cote & Fierres, Limoilu county, Que. Sub-contracts not yet let.

Trail, B. C.

Bridge over Columbia River. Owner, Department of Public Works, Victoria, public works engineer, J. E. Griffith. Contractor sub-structure and super-structure, Armstrong & Morrison, Bowler Building, Vancouver, \$93,902.50, the lowest tenderer.—Cleveland Bridge & Engineering Co., Da lington, Eng., will provide the steel to be on the ground not later than Jan. 15th, 1912. Surveys completed—work to begin at once.

Victoria, B. C.

The contract for the first 18 miles of the Saanich extension of the B.C.E.R. has been awarded to Moore & Pethick, Board of Trade Building, Victoria. A unit of 6000 h.p. will be installed at this plant in addition to its present equipment.

Welland, Ont.

Work is in progress for construction of a street railway, East Main and Muir street. Owner, Niagara, Welland & Lake Erie Railway. President, C. J. Laughlin; engineer, D. T. Black, Welland. Contractor, Heindrich Leach, Cleveland, Ohio.

Public Buildings, Churches, Schools, etc.

Abernethy, Sask.

Sec.-treas., H. H. Turner. Tenders are called until Sept. 24th for the sale of \$3,000 debentures for a rink, 6 per cent. for 15 years.

Athens, Ont.

Tenders are called until Oct. 9th for erection of public building. Plans, etc., on application to T. A. Hastings, clerk of works, postal station F., Yonge street, Toronto, and at local post office. Department of Public Works, Ottawa. Secretary, R. C. Desrochers.

Aylmer, Ont.

Tenders are called until Sept. 26 for a steam heating plant for the town hall. Town engineer, F. Wooster.

Brantford, Ont.

Brantford skating and curling rink on Waterloo street was destroyed by fire, loss \$22,000; insurance \$10,000. W. R. Turnbull, president; F. W. Frank, secretary. Shareholders will meet in a few days to discuss re-building. A new site will probably be selected.

Public building to cost \$5,000 for Armenian Society. Committee in charge, L. Goodwin, Y.M.C.A. secretary; W. S. Brewster, solicitor, Dr. E. C. Ashton, A. K. Burnall, city treasurer, Vaham Safarian, Geo. Muradian and others. Hall to include hall library and school room.

Bridgeburg, Ont.

Site has been purchased by the Roman Catholic Church for the erection of a new church on Gilmore Road to cost \$4,500. Priest in charge, Rev. Father Murray.

Battleford, Sask.

Tenders were called until Sept. 25th for electric wiring, fixtures, etc., for public building. Department of Public Works, Ottawa. Secretary, R. C. Desrochers.

Carleton Place, Ont.

Tenders will be called after Sept. 28 for erection of a skating rink, 200 x 91, steel frame with lumber covering, concrete piers, electric lighting, structural iron, roofing, ice space 70 x 175. Architect, C. J. Burrett, Sparks street, Ottawa.

Cardinal, Ont.

The Presbyterian Church are having plans prepared by Architect, A. Stuart Allaster, Brockville, for alterations to their church to cost \$2,500.

Edmonton, Alta.

Two by-laws will be submitted to the ratepayers on the 9th of October to provide \$31,000 for the purchase of property for street purposes and the other to provide \$40,00 for the construction, furnishing and outfitting of a children's shelter.

Edmonds, B. C.

Plans are being prepared for erection of a new club house to cost \$6,000. Architect, A. Campbell Hope, 603 Hastings street, West, Vancouver. Ornamental iron, shingle roof, hot water heating. Tenders called privately shortly.

Kemptville, Ont.

Sketches are being prepared for erection of a library to cost \$3,500. Public Library Board, Kemptville. Architect, A. Stuart Allaster, Brockville. Cement block foundation, hot air heating. Details regarding interior finish not decided.

Kerrobert, Sask.

Plans have been completed for a new rink to accommodate two sheets of curling ice and a hockey and skating sheet. Work will start immediately. Cost, \$5,000.

London, Ont.

Victoria Hospital Trust. Superintendent, T. H. Heard; acting chairman, Geo. B. Harris, will receive estimates at once for installation of new telephone switchboard, centralization of heating system, proposal to build new boiler house on river bank, thus necessitating a complete re-arrangement of piping.

Montreal, Que.

Messrs. Gault & Ewing have purchased the Mechanics' Institute property at the corner of St. James and St. Peter streets on behalf of a French syndicate.

Point St. Charles Congregational Church are asking for supply of pews to seat 600 people; also a memorial window. Tenders received at once by A. McA. Murphy, 76 Bleury street Montreal. Church to be opened on Thanksgiving Day.

South Vancouver, B. C.

Plans are completed for a new Presbyterian church for South Hill, to cost \$3,000.

St. Johns, Que.

Furnishing and equipment required for convent, cost \$3,000. Rev. Arthur Papineau, Superior College de St. Jean, St. John's, Que. Three-sty., frame and

brick, electric lighting, hot water heating, metal roof. Fire escapes. Work being done by day labor. Laundry machinery required.

St. Leonard de Port Maurice, Que.

Tenders were called until Sept. 25 for a school. Architect, Z. Trudel, 238 St. Andre street, Montreal. Que., has prepared plans, etc., which may be seen at his office.

Sandwich, Ont.

Money has been voted and tenders are to be called for erection of town hall to cost \$10,000, on Bedford street. Clerk, E. R. North.

Toronto, Ont.

Tenders will shortly be called for leaded glass work and church furniture for their new building, St. Clair ave. and Avenue road. Deer Park Presbyterian Church; architects, Messrs. Sharp & Brown, 18 Wellington street east, Toronto.

Plans have been prepared for erection of a church, to cost \$20,000, on Perth ave., for St. Martin's Church. Rector, Rev. Sweetman, 1307 Bloor street west, Toronto. Gothic design, red brick and stone dressing. Tenders will be called in about ten days.

Vancouver, B. C.

Plans will be submitted to council for a temporary building for McGill University College, to contain class rooms, offices and lavatories.

A committee has been appointed to join fire and police commission. A by-law is projected to provide for an emergency hospital and laboratory. City clerk, W. McQueen.

The ratepayers will vote on a by-law next January providing for \$5,000,000 for works as follows: \$1,000,000 for a city hall; \$100,000 for a city jail; \$30,000 for sub-police stations.

Wallaceburg, Ont.

Tenders are called until Oct. 10 for construction of public building. Plans, etc., at office of H. J. Lamb, district engineer, London, Ont., at the Department and at local post office. Department of Public Works, Ottawa. Secretary, R. C. Desrochers.

Welland, Ont.

The Salvation Army are planning the erection of new barracks on Division and Cross streets, 2 storey, brick, stone foundation to cost \$10,000. No tenders have been called yet. Capt. Clark, local officer.

Westmount, Que.

The city of Westmount are contemplating the construction of three underground lavatories in the near future. Plans have been prepared by architect Currie, the city surveyor, and are now before a committee of aldermen.

Winnipeg, Man.

Tenders are called until October 7th for construction of Magazine and Explosive Store Building. Specifications at office of officer commanding Military District No. 10, Winnipeg, and at office of the Director of Engineer Services, Headquarters, Ottawa. Department of Militia and Defence, Ottawa.

Architects, J. & W. Mellville, Builders Exchange, Winnipeg, have plans of a motion picture theatre to cost \$16,000, Main street, W. S. Logan and Alex-

ander. Owner, Jones & Harrison, 608 Main street, Winnipeg. Brick, concrete foundation, plastic work, cement work, cut stone, brick, ornamental iron, electrical work, ornamental columns and caps, art and prismatic glass. Work being done by day labor.

CONTRACTS AWARDED

Big Point, Ont.

School, 3,500. Owner, Dover South Separate School Board; architect, J. L. Wilson & Son, Chatham, Ont.; contractor, Thomas Payment; masonry, Sparks Bros., both of Chatham. Heating contract not yet let.

Fort Erie, Ont.

Work is in progress for erection of guild hall to cost \$5,000, for St. Paul's Church. Pastor, A. C. Mackintosh. General contractors, Hanna Bros., Bridgeburg, Ont. Equipment to be installed, two telephones, electric lighting and fans, steam or hot water heating.

Galt, Ont.

The contract for the addition to be built to the opera block has been awarded to Wilshing Bros.

Jonquiere, Que.

Church, \$140,000. Architect, R. P. Lemay, Quebec, Que. General contractor, Jos. Giroux, St. Casimire, P. Q. Contract awarded last week; building to be completed next year.

Regina, Sask.

The contract for the new Assiniboia club house on Victoria avenue has been awarded to Smith Bros. & Wilson, for \$57,400. Storey & VanEgmond, architects.

Tilbury, Ont.

Public building to cost \$25,000. Department of Public Works, Ottawa. Secretary, R. C. Desrochers. Engineer, H. J. Lamb, London, Ont.; general contractors, John Piggott & Sons, Chatham, Ont.; masonry, Wm. Draper; sheet metal, F. Callahan.

Vancouver, B. C.

The contract for the erection of a moving picture theatre for Borker & Noble has been awarded to A. C. Hunter, 2507 Main street. Jos. H. Bowman, Brown Building, architect.

Residences

Fort William, Ont.

Residence to cost \$5,500 for Dr. C. C. McCullough, Fort William. Architect, R. E. Mason, Fort William. General contractor, I. Lynes, Fort William; brick veneer, 36 x 31, 3 storeys. Contract awarded Sept. 18th.

Kitsilano, B. C.

Architect G. P. Bowie, 570 Granville street, Vancouver, has prepared plans for an apartment house. 42 suites, roof garden 132 x 92, cement facing, and tenders may be called shortly.

London, Ont.

The residence for Governor Carter of the jail has been condemned by the inspector. A meeting of the City and County Councils will be held to arrange for erection of new building to cost \$3,000. Inspector of Prisons, Dr. R. W. Bruce Smith, Toronto.

Montreal, Que.

J. E. Beaudin, 215 Quesnel, will build 8 flats, 2-storey, 48 x 70, pressed brick and wood, stone foundation, gravel roofing. Cost \$7,500.

Wilfred Chicoyne, 184 Casault, will build 4 flats, 3-storey, 25 x 40, stone and wood, cement foundation, gravel roofing. Cost \$3,000.

Four flats to cost \$3,000 on Waverly street, for N. Fournier, 2677 Esplanade avenue, Montreal; 2 storey, 25 x 50, pressed brick, stove heating, gravel roof, gas lighting.

Work has commenced on foundation for six flats for J. A. Joly, 1203 St. Viateur street. Three-sty., 50 x 90, stone front, hot water heating, gravel roofing, electric lighting.

Work on excavation is in progress for six flats, to cost \$5,000. Owner, J. O. Gagnon, 1849 Notre Dame, Montreal. Three-stys., 48 x 40, pressed brick, stone foundation, gravel roof.

Owner, A. Giguire, 296B. Lafontaine Park, will build 15 flats, 3-storey, 100 x 45, brick and wood, cement foundation, gas, gravel, roofing. Architect, J. A. Ouellet, 360 Catherine street east. Cost \$10,000.

Work has commenced on the erection of six flats to cost \$7,500, (Christophe Colomb), for A. Deschamps, 1308 St. Hubert street, Montreal. 3 storey, 25 x 38, cement foundation, gravel roofing, stove heating.

Work is in progress for erection of 2 flats to cost \$5,000 on Maplewood avenue, for L. E. Trudeau, 790 Maplewood avenue, Montreal. 2 storeys, 20 x 60, each, brick and wood, hot water heating, gravel roof. Foundation is already started.

Saskatoon, Sask.

Architect Frank Martin, 20th street, Sask., has plans prepared for erection of an apartment house on Broadway to cost \$25,000.

Toronto, Ont.

Tenders will be called shortly for the erection of an apartment house to cost \$15,000 on University avenue. Architect, A. E. Yollis, 244 Simcoe street, Toronto.

Vancouver, B. C.

Plans are being prepared for erection of a residence to cost \$12,000, (Shaughnessy Heights). Architects, Jones & Aspell, 347 Pender street W., Vancouver. 2½ storeys, 48 x 50, hot water heating.

Plans have been approved for an apartment house to cost \$36,000, on Homer street, for Mr. George Simons. Architect, Schlomer & Schmidt, Riggs Selam Building, Vancouver. 6 storeys, hot water, tar and gravel roof, elevator. Tenders will probably be called shortly.

CONTRACTS AWARDED

Fort William, Ont.

Three dwellings to cost \$6,000. Owner, H. E. Copp, Fort William; contractor, Russell Bros., Fort William. 2 storeys, 21 x 30, frame and cement. Contract awarded Sept. 18.

Hamilton, Ont.

The contract for the residence being erected by Thomas Dallyn, 28 Eastwood avenue, has been awarded to Fred Sullivan, 200 Hunter street. Building to

be 2½ storeys, 30 x 32, brick and stone, electric light and gas, shingle roof, hardwood finish. Cost \$3,400.

Residence, for W. E. Phinn, Welland. Architects, Munro & Mead, Chancery Chambers, Hamilton; general contractor, R. Tope, 191 Robinson street, Hamilton. Steam heating, electric light, slate roofing. Heating, plumbing and roofing contract not let yet.

The contracts for the residence being erected by James Byer, 19 Burris street, have been awarded as follows: Masonry, carpentry, cement and steel work, James Byers; plastering, Thomas Squires, Arthur street.; heating, Robert Dow, 15 Bay street N.; plumbing, Jas. Stainor, 59 Augustus. Building to be 2½ storeys, 45 x 35, brick and stone, hot water heating, shingle roof, pine finish. Cost \$4,500.

Maisonneuve, Que.

Work is in progress for erection of six flats, to cost \$9,000, for J. Grenon, 310 William David street, Maisonneuve; general contractor, J. Real Clouthier, 10 William David street, Maisonneuve. Three-sty., 25 x 40, pressed brick, cement foundation, hot water heating. Foundation started

Montreal, Que.

Work is in progress for residence to cost \$3,500. Owner, E. Dupre, Notre Dame des Neiges. 2 storeys, 38 x 50, stone foundation, gravel roof.

Work has started on the erection of three flats to cost \$4,500 for Dr. F. X. P. Gayette, 336 Pins IX street, Montreal. General contractor, A. Chevalier, 240 Jean d'Arc street, Montreal. 3 storeys, 40 x 25, stone foundation, pressed brick, gravel roof, stove heating. Foundation is already in.

Quebec, Que.

Residence, to cost \$38,000, for L. Le-moine. Architect, R. P. Lemay; contractor, Emile Cote, Quebec City. 2½ storeys, 40 x 45, stone and brick. Heating and plumbing not let yet. Building to be completed in the spring.

Business Buildings and Industrial Plants

Bridgeburg, Ont.

Reeve Atwood intends to erect a 3-storey brick business block on Jarvis street next spring. Two buildings will have to be moved. Estimated cost, \$15,000.

The Lantz Marble Company, Buffalo, N.Y., have secured three acres of land on Janet street, for new factory to be erected at a cost of \$5,000. Machinery costing \$35,000 to be installed. No contracts have been let yet.

W. E. Reynolds, Buffalo, N. Y., is negotiating for site on Lewis street for a factory to manufacture brass and copper fittings for machinery. Building to cost about \$1,500. Machinery required to the amount of \$2,000. Building will probably be started this fall.

Negotiations are in progress for site for small factory on Lewis street, for Singer Sewing Machine Co., New York, U.S.A. Central Canadian Branch, Manning Chambers, Toronto. Mr. Batts, barrister, London, Ont., owner of land. Plant and land to cost \$5,000. Gas engine to be used. Frame, 1 storey. Plant to be used to assemble rough casting.

Calgary, Alta.

The Great West Liquor Co. will erect a large warehouse on Tenth avenue, 2-storey, will be built at present at a cost of \$30,000, but it is intended to add another three storeys later on. Cost \$30,000.

Dryden, Ont.

A by-law will be submitted on Oct. 16th to authorize the Town of Dryden to enter into an agreement with the Dryden Timber & Power Co., Ltd., to exempt them from taxation for ten years and to fix the rate of assessment at \$60,000 for the said term, in return for which pulp and paper mills will be erected. Clerk, A. L. Orvis.

Edmonton, Alta.

Chalmers & Williams, Milwaukee, will supply 12 tube mills for Edmonton Portland Cement Co., \$32,000.

Work is in progress for erection of a warehouse; 7 storey, reinforced concrete. Work has been completed to third storey. Building expected to be completed Nov. 1st. Operating machinery and equipment being furnished by owner.

Port William, Ont.

The Imperial Oil Company are contemplating extensions to their plant this fall or next spring.

Hamilton, Ont.

A. L. King, 43 West avenue, N. Hamilton, is building addition to present building on Burris street and electric fixtures and store fittings are required, to cost \$5,000.

Muntsville, Ont.

The Muskoka Wood Manufacturing Co. are planning extensions to their factory and storehouse. R. J. Hutcheson, president.

London, Ont.

Owner, Holeproof Hosiery Co., building on King street to be remodelled. Large quantity of new machinery will be installed. Carpentry contractor, Wm. Gerry.

Matsqui, B. C.

The People's Trust Co., of New Westminster, will shortly erect a bank building at this point.

Merritton, Ont.

A by-law will be submitted to the ratepayers on October 12th to grant the Interlake Tissue Mill, Ltd., partial exemption from municipal taxation, in return for which buildings to cost \$25,000 will be erected. Clerk, R. Clark.

Nelson, B. C.

The French's Complex Ore Reduction Co., Ltd., will erect shortly in Nelson a plant for the treatment of the zinc ores of this district on a commercial scale. A conference of the directors of the company has just been held when this decision was arrived at. A factory is also to be built for the making of dry batteries from the zinc and black manganese oxide produced, and a third plant is to be installed for the making of zinc pigment from the pure metal saved from the ores.

North Vancouver, B. C.

A plant is to be erected for the manufacture of steel sleeping cars and general work in steel and iron. The sec-

retary of the North Vancouver Board of Trade states only the plans have been completed so far.

Ottawa, Ont.

Tenders are called for erection of a business building to cost \$60,000 for Hiram Robinson, 150 MacLaren, Ottawa. Architect, Jas. Mather, Wellington street, Ottawa. Tenders called on painting and glazing.

Prince Rupert, B. C.

The Granby Smelter Co. are looking for a site for the erection of a smelter. F. M. Sylvester, vice-president.

Sheep Creek, B. C.

George Owen of the Alhambra Hotel, of Rossland, will shortly erect a large building here to be known as the Sheep Creek Hotel.

Stettler, Alta.

A deal is pending for 4 or 5 lots as site for distributing warehouse to cost about \$10,000. Nothing definite decided until after Oct. 1st. Owner, International Harvester Co. of Canada, Ltd., Hamilton, Ont. Secretary-treas. of town, D. Mitchell.

Saskatoon, Sask.

Sketches have been prepared for erection of a store to cost \$50,000 on 20th street for Saskatoon Trading Co., Saskatoon. President, J. Paul. 3 storeys, 75 x 140, brick. Architect not chosen yet. Tenders probably called in the spring.

Turgoose, B. C.

The Bazan Bay Pressed Brick and Tile Co.—Samuel Spencer, of Turgoose, Saanichton, Vancouver Island, is given as manager,—has been formed to establish an up-to-date plant, extensive holdings of clay lands close to the Victoria & Sydney Railway having been secured. Draining tiles for farming purposes are to be a specialty.

Toronto, Ont.

Architect E. G. Strathy, 123 Simcoe street, Toronto, is preparing plans for the erection of two stores on Dundas street to cost \$4,000.

Tenders are called until Sept. 28 for the different trades, including brick, steel, carpenter work, etc., in connection with the erection of a large factory building in West Toronto. Plans, etc., at office of the architect, E. J. Lennox, 164 Bay street, Toronto.

Vancouver, B. C.

F. J. Hart & Co., of 134 West Hastings street, Vancouver, are reported to be planning the equipment of a steam laundry at New Westminster, B. C.

Plans are contemplated for erection of an office building to cost \$25,000, on Hastings street, for Hudson Bay Company. Architect, W. A. Doctor, 922 Metropolitan Building, Vancouver. 2-storey, stone facing, 26 x 120.

The Metropolitan Building Co. and J. W. Weart, 1022 Metropolitan Building, are interested in the proposed erection of a new 10-storey brick and concrete office building on Hastings street West, to cost \$350,000. Babcock & Wilcox, architects, Tacoma, Wash.

A. L. Goldschmidt, of the Standard Engineering Co., of Seattle, states that a company incorporating here for the manufacture of electric switchboards

and panels, is looking for a suitable factory. Several carloads of material and machinery are en route and the company will be ready to fill orders in a short time.

Winnipeg, Man.

Tenders are called until Oct. 7th for construction of magazine and explosive store building. Specifications at office of the commanding officer district No. 10, Winnipeg, and at office of director of Engineer Services, headquarters at Ottawa. Department of Militia and Defence. Deputy Minister, Eugent Fiset.

Yarmouth, N. S.

Tenders are called for erection of a bank building, corner Main and Alice streets, for Royal Bank of Canada. 2 storeys, stone front, ornamental doors, and windows, office fittings, vaults.

CONTRACTS AWARDED**Brantford, Ont.**

Paint shop on Mohawk street, for Cockshutt Plow Co., Brantford. Superintendent, Geo. Wedlake. General contractor, A. E. Faulkner, Brantford; 3 storeys, 105 x 60, brick, concrete foundation. Heating and plumbing contract not let yet.

Owner, Scarfe & Co., varnish works; contractors, Schultz Bros. Co., Ltd., Brantford; architects, Taylor & Taylor, Brantford; brick, 70x32, additional sty., \$4,000. Contract awarded Sept. 15th; building to be completed December 1st. Plumbing contract not yet let.

Eglington, Ont.

Bank to cost \$6,000. Owner, Union Bank of Canada, Quebec, Que. Architect, M. Bryan Gilbert, 47 Wellington E., Toronto. Contractor, H. Baxter, 40 Jones avenue, Toronto. Hot water heating, electric lighting, open plumbing, felt and gravel roofing, interior finish oak, tile, Spanish tile eaves.

Hamilton, Ont.

Factory to cost \$40,000, Jackson and McNab streets, for Standard Sanitary Co., Ltd., Hamilton. Architect, Stewart & Witton, 2 Hughson street S., Hamilton; general contractor, W. H. Cooper, Emerald street N., Hamilton. 2 storeys, 114 x 54, reinforced concrete, stone foundation, steam heating, electric lighting, electrical work.

Magog, Que.

The Bishop Construction Company, Montreal and Toronto, have been awarded by the Dominion Textile Co., Ltd., a contract for a small extension to the dye house at the plant, Magog. P. Q. T. Pringle & Son, Ltd., engineers and architects.

Montreal, Que.

Work is in progress for alterations to wagon shed to cost \$3,000. Owner, Department of Militia and Defence, 53 Union avenue, Montreal. General contractor, Geo. W. Goodbody, 335 De l'Epee, Montreal. 2 storey, 20 x 30, brick.

Bakery to cost \$40,000 on Laurier avenue and Mance street, for E. J. Stewart, 143 Esplanade avenue, Montreal. Architect, L. R. Montbriand, 230 St. Andre street, Montreal; general contractor, H. Demers, 47 Labelle street, Montreal; 50 x 102, yellow pressed brick front.

Owner, Charles Gurd, 76 Bleury st., factory, addition of 2 storeys, 80 x 75.

Continued on page 63.

Tenders and For Sale Department

TENDERS WANTED Steel Intake Pipe

Sealed proposals for a 60-in. steel intake pipe, approximately 500 feet long, of ½-in. riveted steel plates. Together with a Concrete Screen Wall, approximately 18 ft. x 30 ft., with appurtenances, for the City of Windsor, Ont., addressed to the Secretary of the Water Commissioners, Windsor, Ont., and endorsed, "Proposals for Intake Pipe and Screen Wall for Windsor Waterworks," will be received at the office of the Water Commissioners of the City of Windsor, Ont., until 12 o'clock noon, Thursday, October 12, 1911.

Proposals shall be made in accordance with the specifications and requirements on file in the office of the Water Commissioners.

Each proposal shall be accompanied by a certified cheque equal to ten per cent. of the amount of tender as surety for the acceptance of the contract payable on its face to the Water Commissioners of the City of Windsor, Ont.

The accepted contractor will be required to furnish an approved guaranty or surety bond in the sum of fifty per cent. of the full amount of his contract.

The Commissioners reserve the right to reject any or all proposals.

Copies of plans and specifications are on file at the water office, Windsor, at the office of the Contract Record, 220 King street west, Toronto, and also at the office of Smith, Hinchman & Grylls, Detroit, Mich.

By order of the Commissioners,

W. A. HANRAHAN, Sec.
38-40

TENDERS for Concrete Bridge and Abutments

Sealed tenders, plainly marked as to contents, will be received by John Ramsden, Clerk of York County, up to twelve o'clock noon of Saturday, September 30th, 1911, for the construction of Concrete Abutments and a Concrete Bridge on the highway between the Townships of York and Markham over the River Don in the County of York.

Plans and specifications may be seen and all necessary information may be obtained at the office of the undersigned, 57 Adelaide street east, Toronto.

The lowest or any tender not necessarily accepted.

FRANK BARBER,
York County Engineer.
39-39

Tenders for Sidewalks

PORT COLBOURNE

Sealed tenders for the construction of approximately one and three-quarter miles of cement concrete sidewalks in the Village of Port Colborne, will be received up to 12 o'clock noon, October 7th, 1911.

Plans and specifications may be seen at the office of the Village Clerk.

The lowest or any tender not necessarily accepted.

JOHN COOK, Reeve.
FRANK D. NOBLE Mun. Clerk.
Port Colborne, Ont.
September 20th, 1911. 39-40

TENDERS WANTED Waterworks

The Water and Light Commissioners of the Town of Whitby are open to receive tenders up until October 1st, for the whole or part of the following work.

(a) Construction and sinking of an open concrete caisson, in the sand on the beach of Lake Ontario, to serve as a settling basin or intake well for waterworks plant.

(b) Depression and alterations to intake pipe to adapt it for use with proposed intake well.

(c) Protection of intake pipe from damage by ice in winter.

Drawings and specifications may be seen at the Mayor's office, and also at the office of the Contract Record, 220 King street west, Toronto.

The lowest or any tender not necessarily accepted.

W. J. LUKE,
Chairman

F. ROGERS,
Secretary
38-39



Department of Railways and Canals

INTERCOLONIAL RAILWAY

Moncton Yard and Cut-Off

Sealed tenders addressed to the undersigned and endorsed "Tender for Moncton Yard and Cut-Off," will be received at this office until sixteen o'clock on Monday, October 2nd, 1911.

Plans, profiles, specifications and form of contract to be entered into can be seen on and after the 4th of September at the office of the Chief Engineer of the Department of Railways and Canals, Ottawa, and at the office of the Chief Engineer of the Intercolonial Railway, Moncton.

Parties tendering will be required to accept the fair wages schedule prepared or to be prepared by the Department of Labor, which schedule will form part of the contract.

Contractors are requested to bear in mind that tenders will not be considered, unless made strictly in accordance with the printed forms, and in the case of firms, unless there are attached the actual signature, the nature of the occupation and place of residence of each member of the firm.

An accepted bank cheque for the sum of \$40,000, made payable to the order of the Minister of Railways and Canals, must accompany each tender, which sum will be forfeited if the party tendering declines entering into contract for the work, at the rates stated in the offer submitted.

The cheque thus sent in will be returned to the respective contractors whose tenders are not accepted.

The cheque of the successful tenderer will be held as security, or part security, for the due fulfilment of the contract to be entered into.

The lowest or any tender not necessarily accepted.

By order,

L. K. JONES,
Secretary.

Department of Railways and Canals,
Ottawa, September 7th, 1911.

Newspapers inserting this advertisement without authority from the Department will not be paid for it. 38-39

Are You On ?

If not, get on our mailing list and be one of the 14,000 who receive SHAW'S BOOKLET as issued. The September number is now ready for mailing. Contains 44 pages of attractive offerings in released machinery and contractors' plant. Gives price, make, size, capacity, condition, etc. It's worth having. It's free. Send for it.

WILLIS SHAW MACHINERY CO.,
39 South LaSalle Street,
Chicago, Ill.

CITY OF LETHBRIDGE ALBERTA, CANADA

Extensions to Power Station

Sealed tenders marked "Tender for Power Station," will be received by G. W. Robinson, secretary-treasurer of the city of Lethbridge, up to and including Friday, November 24th, 1911, for the supply, delivery, and erection, of the following equipment for the Power Station Extension:—

Section B.—Boilers and accessories.

Section C.—Mechanical draft and economizer.

Section D.—Steam turbo-generator set and condensing equipment.

Section E.—Steam engine driven exciter.

Section G.—Sub-station equipment.

Plans and specifications can be obtained from Arthur Reid, superintendent engineer, City of Lethbridge.

An accepted cheque for ten per cent. of the amount of the tender must accompany each bid.

The lowest or any tender not necessarily accepted.

G. W. ROBINSON, Sec.-Treas.,
Lethbridge, Alta.
39-40

TOWN OF STEELTON

Electric Lighting System

Notice to Contractors

Sealed tenders will be received by the Town Clerk until 8 p.m. on Tuesday, October 3rd, 1911, for the following works:—

Contract B.—Erection of Brick Sub-station and Hose Tower.

Contract K.—Furnishing and erecting complete electrical equipment for Town Lighting System, including sub-station equipment.

Contract M.—Electric Fire Alarm Equipment. Plans and specifications may be seen at the office of the Town Clerk, Steelton, and at the office of engineers, 204 Mail Building, Toronto.

JAMES LYONS, Esq., Mayor.
JAMES ROBINSON, Esq., Town Clerk.
CHIPMAN & POWER, Engineers,
Toronto, Ont.
39-39

CITY OF TORONTO

Tenders for

Overhead and Pole Line Material

Separate or bulk tenders on prescribed forms, will be received by registered post only, addressed to the Chairman of the Board of Control, City Hall, Toronto, Canada, up to noon on Wednesday, October 18, 1911, for the supply of overhead and pole line materials, which include the following: No. 2-0 trolley wire; 300,000 c.m. feeder wire; steel tubular poles; span wire, hangers, cars, insulators and pins, etc.

Specifications and forms of tender may be obtained on application to the Department of Railways & Bridges, City Engineer's Office, Toronto.

Envelopes containing tenders must be plainly marked "Tender for Overhead and Pole Line Material" (on the outside).

The tenderers shall submit with their tenders, the names of two sureties (approved of by the City Treasurer, not members of the City Council or officers of the Corporation of the City of Toronto) or in lieu of said sureties, the bond of a guarantee company approved as aforesaid.

The lowest or any tender not necessarily accepted.

G. R. GEARY, Mayor,
Chairman of the Board of Control.

City Hall, Toronto,
August 31, 1911.

39-40

Board of Education

Tenders Wanted

Sealed tenders, addressed to the Secretary-Treasurer of the Board, will be received until

Monday noon, October 2nd, 1911
for

Addition to Caretaker's Cottage, Harbord Street Collegiate Institute. All trades.

Heating and Ventilation and Heat Regulation, Essex Street School.

Plumbing Work, Annette Street School

Sheds and Fences, Boustead Ave. School

Specifications may be seen and all information obtained at the office of the Superintendent of Buildings, City Hall. Each tender must be accompanied with an accepted bank cheque for five per cent. of the amount of tender or its equivalent in cash. Tenders must be in the hands of the Secretary-Treasurer at his office in the City Hall not later than 12 o'clock noon on the date named, after which no tender will be received.

The lowest or any tender will not necessarily be accepted.

W. C. WILKINSON,
Secretary-Treasurer.

W. W. HODGSON,
Chairman of Committee.

Des Marais Machine and Drill Co., Ltd., Ottawa, Ont. incorporated with a capital of \$50,000 to carry on business as mechanical engineers, machinists &c. Incorporated, Geo. R. Nash and Livius Percy Sherwood, both of Ottawa.

Airozone Electric Ventilating Company, Ltd., Toronto, Ont., incorporated, with a capital of \$350,000, to manufacture and deal in electrical apparatus, machinery, etc. Provisional directors, Gideon Grant, Robert McKay and Edwin Smiley, all of Toronto.

Business Buildings and Industrial Plants

Continued from page 61.

brick and cut stone, concrete foundation, steam heating, electric lighting, gravel and tar roofing, concrete floors. Architects, Jas. S. Smith, 208 St. James street. General contractor, Atlas Construction Co., Ltd., 745 St. Catharine street west. Work has just started. Cost, \$12,000.

Point Claire, Que.

The Bishop Construction Company, Montreal and Toronto, have been awarded a contract by Mr. C. W. McLaren for farm buildings and improvements. Architects, Messrs. Finley & Spence, Montreal.

Quebec, Que.

Cold storage to cost \$30,000, for I. B. Renaud & Co., Quebec. Architect, R. P. Lemay, Quebec; contractor, Emile Cote, Quebec. 4 storeys, 60 x 40, brick and iron. Sub-contracts not let. No public notice given of tenders.

Toronto, Ont.

Tenders have been accepted for the \$120,000 warehouse on Adelaide street west, being erected by Frank Wilson, 77 Adelaide street west.

Victoria, B. C.

Contractor Thos. Ashe, 1519 Foul Bay Road; architect, Ridgeway Wilson. 1323 Pemberton Block, Victoria. Cost \$40,000 for store and apartments.

The contract for a block of stores and apartments for Pandora and Cook sts has been awarded to Thomas Ashe. W. Ridgeway Wilson, architect, 2 storey, 120 x 112, concrete basement, steam plant, glazed brick.

Welland, Ont.

Work is in progress for erection of a business block to cost \$8,000, for A. Wilson, Welland. Architect, T. L. Nicholas, Welland; general contractor, M. Vanderburg, Welland. 2 storeys, 65 x 30. Walls up. Telephone system will be installed.

Winnipeg, Man.

Printing office to cost \$265,000, on Carleton and Portage, for Free Press Co. (Printing and Publishing). Contractor, Carter-Halls-Aldinger Co., Ltd., 1010 Union Bank, Winnipeg. 6-storey and basement, 120 x 160, fireproof construction. General contractor doing all the contract.

Office building on Lombard street, for Union Trust Co., Winnipeg. Architect, Jno. Atchison, Bank of Toronto Building, Winnipeg. Contractor for excavation, etc., Lyaal Mitchell Co., 389 Main street, Winnipeg. 12 storeys, 101 x 27½, steel frame, fireproof, tile pile and concrete foundation, two storeys, granite, concrete balance, steam heating, electric lighting, three elevators. The above firm have contract for excavation and putting in of cement pillars based on rock bottom. Plans for superstructure not ready.

Power Plants, Electricity and Telephones

Carillon, Que.

Walter J. Francis, consulting engineer, 24 Commercial Building, Montreal, has reported on the possibilities of power development at Carillon Falls, controlled by the National Hydro-electric

Co., Henry Miles, president. Present power, 30,000 h.p. possible 160,000. Capital required for development purposes, \$5,000,000.

Davidson, Sask.

The by-law has been carried by a substantial majority to raise \$10,000 for the purchase and installation of an electric light system. Secretary-treas., A. J. Robertson.

Steelton, Ont.

Tenders are called until Oct. 3 for B—erection of brick sub-station and hose tower; K—furnishing and erecting complete electrical equipment for town lighting system, including sub-station equipment. M—Electric fire alarm equipment. Plans, etc., at office of town clerk and at office of engineers. Tenders received until Oct. 3 by town clerk.

Saskatoon, Sask.

Work is in progress for power development to cost \$2,500,000. Owner, Street Railway Company. President, M. E. Evans, Edmonton. Soundings are being made in the Saskatoon river for a dam site; dam to be built this winter. Power house, car barns, etc., will be started in the spring. The rail will be laid next year.

Trail, B. C.

G. A. Paul, of Columbia Gardens, is taking up the matter of securing telephone communication from Waneta, Columbia Gardens, Fruitvale, and ultimately extending the line to Salmo.

Miscellaneous

Coquitlam, B. C.

Corporation is contemplating the purchase of rock crusher and fire engine. John Smith, treasurer.

Edmonton, Alta.

The Reeves Bros. Co., Alliance, Ohio, will supply three rotary kilns at a cost of \$33,000. Engineer, Mr. Hassam, King Edward Hotel.

Montreal, Que.

Tenders are called until Sept. 29 for material required for walls, iron balustrades, stairs, fences and grating. iron posts for electric lamps. Estimated cost, \$35,000. City of Montreal, Que. Secretary Board of Control, L. N. Senecal.

Ottawa, Ont.

Tenders were called until Sept. 25 for supply of B. C. fir and white oak timber for the Department of Public Wks., Dredging branch, Victoria Island, Ottawa, Ont. Specifications at the department. Tenders to be accompanied by accepted cheque for 10 per cent. of amount of tender. Department of Public Works, Ottawa. Secretary, R. C. Desrochers.

Winnipeg, Man.

Tenders are called until Sept. 29 for supply of portable steel voting compartments. City of Winnipeg. Secretary Board of Control, M. Peterson.

Unclassified Items

Chatham, Ont.

Owner, William Sloane is contemplating the erection of a new apartment house here.

Fredericton, N. B.

Plans are being prepared for addition to building to cost \$2,500, for McMur-ray & Co., Fredericton. Architect, W. E. Minue, Fredericton, N. B.; 3 storeys, brick, gravel roofing, steam heating, electric lighting.

Hamilton, Ont.

A movement has started to build Italian church here. Rev. A. E. Mitchell, Knox Church, has matter in hand.

Montreal, Que.

Work is in progress on foundations for the erection of six flats to cost \$8,000, for L. Dallic, 287 Garnier street, Montreal; 3 storeys, 25 x 30, brick and wood, cement foundation, gravel roofing, gas.

Work on excavation has commenced for five flats to cost \$5,000 (Cartier st. above Ontario) for F. Therrien, 373 Dorion street, Montreal; 3 storeys, 50 x 40, brick, cement foundation, gas and electric lighting, gravel roofing.

Work will commence in a few days on the erection of six dwellings to cost \$7,000 (Christophe Colomb street) for A. Deschamps, 77 Christophe Colomb st., Montreal; stone and brick, hot water heating, iron stairs, hardwood finish, metal roofing, electric lighting.

Work will commence this week on the erection of five dwellings to cost \$7,500 (Duquette street) for Ed. Mitchell, 267 St. Denis street, Montreal; stone and brick, hot water heating, iron stairs, electric lighting, hardwood floors, metal roofing.

Outremont, Que.

L. E. Trudeau, 20 Maplewood avenue, will build six houses on Maplewood street; stone and brick, hot water heating, iron stairs, hardwood finish, metal roofing, electric lighting. Work will commence in a few days. Cost \$5,000.

Quebec, Que.

Tenders are called until Oct. 11th for construction of Immigration Building at Princess Louis Dock, Quebec. Plans, etc., at offices of district engineer, Quebec. H. N. Lymburner, Supt. Public Buildings, Montreal, Que., and at the department. Tenders to be accompanied by accepted cheque for 10 per cent. of amount of tender. Secretary R. C. Desrochers, Public Works Dept., Ottawa.

Tenders are called until Sept. 30 for erection of Sunday School building (Gerrard and Leslie streets) for Riverdale Methodist S. S. Bldg. Architect, Burke, Horwood & White, 22 Toronto street, Toronto.

Tenders are called until Oct. 18 for supply of overhead and pole line materials, which include the following: No. 2/0 trolley wire; 300,000 c. m. feeder wire; steel tubular poles; span wire, hangers, cars, insulators and pins, etc. Specifications, etc., on application to the Dept. of Railways and Canals, City En-

gineer's office, Toronto. Board of Control, Toronto. Chairman, G. R. Geary.

Tenders are called until Sept. 30 for construction of concrete abutments and a concrete bridge between tps. of York and Markham, over Don River. Plans at office of engineer. Owner, County of York. Clerk, John Ramsden. County engineer, F. Barber, 57 Adelaide street, E., Toronto.

Weyburn, Sask.

Post office to cost \$48,911. Department of Public Works, Ottawa. Secretary, R. C. Desrochers. Contractor, Naven Bros., Moose Jaw, Sask.; cut stone, pressed brick. Work will be commenced as soon as the contractors can get the material on the ground.

Windsor, Ont.

The Hupmobile Co., Medbury Power Bldg., Windsor, Ont., will erect 2-storey factory, 100 x 175, reinforced concrete, steam heating, electric lighting, gravel roofing, steam heating, vaults, dynamos, motors, electric work, concrete floors, boilers, engines, factory, machinery, elevators. Cost \$25,000.

Building Permits**Montreal, Que.**

O. Dansreau, 2546 Park ave., 9 flats, \$8,000, 3-sty., 50 x 60, stone foundation, gravel roofing; Adrien Porelance, 826 Ontario street, 3 flats, \$3,000, 3-sty., 25 x 25, wood and brick, cement foundation, gravel roofing; E. E. Turgeon, 534 Huntley street, 3 flats, \$3,500, 3-sty., 25 x 60, pressed brick, gravel roofing, stone foundation, hot water heating; Leopold Riopelle, 1094 Rachel street, 4 flats, \$4,000, 3-sty., 25 x 73, stone and brick, cement foundation, gravel roofing, hot water heating; Isaie Marsolais, 430 Maisonneuve street, 3-sty., 28 x 40; gravel roofing, stone foundation; J. E. Robin, 553 Ninth avenue, 3 flats, \$3,800, 3-sty., 25 x 46, brick front, cement foundation, gravel roofing; Oliver Char-est, 702 Casgrain street, 2 flats, \$3,300, 3-sty., 35 x 50, wood and brick, stone foundation, gravel roofing; Zoel Lan-oureux, 2577 Urbain street, three flats, \$7,000; 3-sty., 25 x 40, brick and wood, cement foundation.

Vancouver, B.C.

M. H. Nelems Construction Co., Inns of Ct. bldg., 2-sty. store and apartment building, \$7,000; owners contractors. D. Campbell, 1781 10th ave. east, three 2-sty. residences, \$2,500; owner contractor. J. M. Locke, 1476 William street, contractor. Mrs. Snyder, 634 Keefer street, 2-sty. apartment house, \$6,000; J. Sinfield, 647 Grove street, contractor. Prudential Builders, Ltd., 2-sty. frame residence, \$5,450; owners contractors. Western Securities, Ltd., five-sty. apartment building, \$100,000; James Travis, 906 Hastings street east, 2-sty. residence, \$2,500; M. E. Wing, \$2149 Charles street, four 1½-sty. resi-dences, \$8,000; H. B. Arnold, 2-sty.

residence, \$3,800; R. Willets, 743 10th ave. east, 1½-sty. residence, \$2,500; Chas. Phillips, 1905 10th ave. west, 1½-sty. residence, \$3,000; Robt. J. McLaren, 3-sty. frame store and apartment building, \$8,000; D. C. Fulton, Canada Life Bldg., 2-sty. residence, \$3,500; E. T. McGuire, 138 6th ave. east, 2-sty. frame residence, \$3,500.

Winnipeg, Man.

Dwelling, \$2,300, Ashburn street, for P. Wicker, 577 Strathcona street; two dwellings, \$5,600, Home street, for R. James, 780 Ellice ave.; dwelling, \$2,800, Strathcona street, for R. James, 780 Ellice ave.; two dwellings, \$4,000, Bever-ley street, for L. Clark, 349 Magnus ave.; three dwellings, \$9,600, Banner-man ave., for T. Leak, 445 Magnus ave.; three dwellings, \$15,000, McMillan ave., for Foster & Co., 710 Dorchester ave.; church, \$20,000, Maryland street, for First English Lutheran Church, R. L. Smith, architect; factory, \$3,000, Flora ave., for American Soda Water Com-pany, 358 Flora ave.; two dwellings, \$3,000, Lansdowne ave., for M. Brown, 573 Selkirk ave.

New Companies

The Hardstone Brick Co., Ltd., Win-nipeg, Man., incorporated with a capital of \$500,000 to buy, sell and deal in timber limits, clay belts, mining rights, brick, and general building materials. Incorporators, Frank Leitner, Eugene W. Peters and S. Hart Green, all of Win-nipeg.

Barcelona Traction, Light and Power Co., Ltd., Toronto, Ont., incorporated capital \$40,000,000 to develop electrical power, to built reservoirs, dams, aqueducts, &c., to acquire wood, metal, &c. Incorporators, Robt. Gowans, Robt. C. H. Cassels, and Samuel M. Mehr, all of Toronto.

The Vincent Park Land Co., Ltd., Montreal, Que., incorporated with a capital of \$49,000 to construct wharves, piers, and other buildings and carry on a general land and building business. Incorporators, Frank A. O'Neil, Chas. V. Keeling, and Douglas W. Massie, all of Montreal.

Imperial Wire and Cable Co., Ltd., Montreal, Que., incorporated with a capital of \$5,000,000 to purchase, sell or lease telephone, telegraph, light, heat, power, hydraulic or compressed air plants, works, &c. Incorporators, Ren-nie C. McMurty, and George R. Dren-nan, both of Montreal.

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Contract Record

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Vol. 25

October 4, 1911

No. 40

The Operation of the Extra-Provincial Licensing Acts.

An interesting and valuable pamphlet on the operation of the Extra-Provincial Licensing Acts in force in the different provinces of Canada has just been issued by the Canadian Manufacturers' Association. The author of this work is Mr. F. W. Wegenast, LL.B., of the Ontario Bar, secretary of the legal department of the above body.

Something of a sensation was caused in the business world last year when the British Columbia Act came into force, but while a severe criticism of this enactment was heard on all sides, the period during which the Dominion Government might have disallowed the Act was suffered to elapse, and now, while many regard the Act as not being worth the paper upon which it is written—so far, at any rate, as it affects Dominion companies, it will doubtless continue to be enforced by provincial authorities until it has been established by either the Supreme Court or Privy Council that it was ultra vires of the British Columbia legislature. It is hoped that a test case will arise in the near future by which the invalidity of the provisions of the Act may be proven, and it is interesting and reassuring to note that the Canadian Manufacturers' Association has undertaken to support such litigation.

It is not only in British Columbia, however, that such an Act is in force. Similar enactments have been passed, during the last ten years, by nearly all the provinces. This fact is of the utmost importance not only to manufacturers but to every company in the Dominion carrying on inter-provincial business. The Acts of the various provinces have been analyzed very carefully by Mr. Wegenast, who cites a number of cases showing the arbitrary nature of their provisions. Be it understood that, in the majority of the provinces, a company doing business without a license is not only subject to a large penalty but is also

held incapable of bringing action in respect of any contract made in that province. Concerning the manner in which these penalties operate we cannot do better than to quote Mr. Wegenast:—

"If the Acts were confined to the imposition of a tax or license fee and the general regulation of corporate activity, and if their requirements were enforced by penalties administered under a reasonable procedure, the effect might not be unduly oppressive, whatever might be thought of the wisdom and constitutionality of the legislation. But to the pecuniary penalties there is in most of the Acts added a provision denying to companies not duly authorized under the Acts the capacity to appear in the courts for the enforcement of corporate rights. A company which has not been alert to inform itself of the precise operation of the Acts may, therefore, find itself deprived of an essential element of its corporate capacity. Thus a British company or a company from another province which has for years been carrying on business in Ontario through occasional commercial travellers or by correspondence may by the mere fact of appointing some person resident in the province to act as its representative, deprive itself of the right of suing in the courts of Ontario upon its business contracts or claims;—in other words it becomes, so far as business relations in the province are concerned, an outlaw. In the province of British Columbia the position is rendered still more serious by the fact that business through non-resident travellers or by correspondence is not excepted, so that even an isolated business transaction by a foreign company which has no representative or branch in the province is fraught with the risk of legal incapacity on the part of the company to enforce its rights. And this disability can be overcome only by compliance with very onerous formalities and the establishment of a head office in the province and the appointment of a resident attorney with extensive powers."

To the lay mind it is monstrous to think that a company under any circumstances should be unable to enforce its rights by legal action. How much more is this so when applied to a concern which has duly received its charter from the Dominion government?

For the present there is no other course open to those concerned than to see to it that their business is adjusted to meet the requirements of the various provincial enactments. The only alternative to this appears to be to run the risk of a law suit in which there would be no chance of success without going to the Supreme Court and perhaps the Privy Council on the constitutional aspects of the case.

The constitutional point at issue is whether or not the provinces have in these Acts exceeded their powers under the British North America Act. The whole question is bristling with complications both on the legal, and the practical side and presents one of the most serious constitutional issues that have come before the courts since confederation. The situation is such that an early decision of the issue in one way or another is in the highest degree desirable. Until such a decision is obtained there is no choice but to learn as much as possible about the provisions of the various provincial acts and comply carefully with their requirements. Herein the Canadian Manufacturers Association's publication will be of the greatest possible assistance to the commercial interests of the Dominion. The explanatory passages throughout are particularly lucid, and despite the ticklish nature of the subject discussed there is not enough legal phraseology in any portion of the text to make a thorough understanding thereof in the least difficult to the lay mind.

Poor Work and the Engineers Duty

Several instances of poor work have recently attracted so much private comment that it is worth while considering briefly the matter of an engineer's responsibility to draw public attention to structures that may be in a precarious condition. For example, reinforced concrete work, which is more difficult to inspect thoroughly than structural work fabricated in a shop, is subject to injurious influences if the construction is poor. It sometimes happens that reinforcement bars are so poorly set in the members that they show in places on the surface. Sometimes the concrete is extremely porous and readily disintegrated. Sometimes the aggregate used in the concrete is so soft that it is unsuitable for use in members carrying heavy compressive strains. Sometimes the concrete is deposited under water without the precautions being taken to see that the material is in proper condition when it reaches its final resting place. Some of these conditions may be observed from time to time in structures which are probably not appreciably injured by them, but the question is different when they occur in a structure like an important seashore pier, for example, which may carry heavy machinery and large numbers of people simultaneously. A combination of poor workmanship and materials, porous concrete, a salt-air exposure and heavy loads, may cause a weakening of such a structure that makes it a matter of grave suspicion to an engineer. Has he any obligation, as a specialist, to run the risk of heavy damage suits in order to warn the public against using the structure until it has been thoroughly inspected? The condition mentioned is not a theoretical one, but is a case which is causing a few engineers considerable worry, lest by their silence concerning the defects the public is permitted to run dangerous risks.

In this particular case the conditions are complicated by the fact that a part of the structure, which was well built, remains in a satisfactory condition. The concrete piles and beams are apparently as firm and dense as when first put in place. On the other hand, portions of the work show, in photographs taken at the time of construction, evidences of poor workmanship, and pieces that fell from the structure recently indicate that the materials were poor and the workmanship of like quality. The pier can probably be made perfectly safe by its owners, who are now carrying out repairs, after a fashion, and some of those acquainted with the facts believe that the best way to serve the public is to scare the owner into making these repairs in a thoroughly safe and expeditious way rather than by publishing scare-line stories in the papers. The case is much the same, in fact, as that of a certain concrete building. This structure has been damaged seriously by electrolysis due to currents escaping from the power house of an electric railway in the immediate vicinity. The columns and beams affected in this way show all the customary indications of electrolytic damage. It so happens, however, that the expert of the electric railway company prevailed upon the owners of this building to regard the damage as due to their own power plant and certain alleged remedies for this condition were endorsed by him and carried out. As a matter of fact, although the publication of an account of this electrolytic destruction has actually been procured in some journal, it is understood, the specialists who have investigated the matter are practically unani-

mous in the opinion that the injury was caused by current from the electric railway and is likely to continue, so that eventually the structure must fall down as a result of the insidious destructive agent at work. The owners have destroyed any chance they previously had of putting responsibility on the electric railway company by accepting the advice of its expert, but engineers acquainted with the case are asking if they should keep silent and allow men and women to run the risk of serious injury and death in this structure.

Both of these cases are submitted as deserving of careful consideration by those interested in questions of professional ethics. In each case, any direct reference to the structure might cause business inconveniences to its owners, who would retaliate by a suit for damages against those having the hardihood to bring up the matter publicly. Moreover, there is the possibility that when the case went before a jury, the latter would fail to understand the technical matters involved and would render a verdict against the rash engineer. There is also the further consideration, in the case of the building mentioned, that the owners themselves have been cajoled into a wrong belief by the technical agent of the company doing the damage, so that the only outcome of any active public discussion of the matter at this time is likely to be trouble for anyone who brings it up. These conditions are particularly severe on specialists in reinforced concrete, because they cannot very well call attention to such matters for the public will regard them as criticizing the work of professional competitors.—Engineering Record.

Geographical Ignorance

It is often asserted that the Englishman at home is, as a rule, woefully ignorant of Canada, and particularly of geographical matters pertaining to this country. The writer can vouch for the fact that there is a certain amount of truth in this assertion, but upon reflection he is inclined to think that there is a great deal in what Mr. Herbert said writing in our last issue. It is easy enough to ascribe certain failures to others, but after all perhaps it is rather bad taste when the same failings exist perhaps to a greater degree in ourselves. The point made by Mr. Herbert is unassailable. Ignorance of the geographical situation of towns and cities is not limited to English manufacturers. These at any rate, generally speaking, know their own country, and in fact the whole continent of Europe like a book. Mr. Herbert wonders how many Canadians could place Melbourne on a blank map of Australia, or say, offhand, how long it takes to travel from Paris to Prague. We will go a step further than that: we wonder how many could place Hamilton on a blank map of Canada, or say, off-hand how long it takes the Toronto Street Railway to get from the Exhibition grounds to King and Yonge streets during the first week in September.

The preservation of iron in concrete is again attested in the demolition of an old gasometer in Hamburg, Germany, as reported by "Fer et Acier," of Brussels. This structure was built about 1852 and when taken down 48 years later, the iron anchor bolts which had been completely encased in a cement concrete were found to be as fresh and bright as new iron, with no traces whatsoever of rust.

A Seemingly Unfair Building Ordinance Provision may be an Advantage

The dishonest in any craft should be eliminated. The dishonest concrete worker is the most serious handicap which the concrete industry has. There is this much consolation in some of the obstacles in the way of concrete construction inserted in building codes by various interests which fear a fair competition with concrete: they will tend to eliminate the dishonest, the indifferent and the careless workers, either by compelling them to be honest, serious and careful or by driving them out of the business.

The city of Milwaukee is about to adopt a new building ordinance. The provisions which it is proposed to adopt to regulate the manufacture and use of concrete block give clay brick an unfair advantage in competition—an advantage which the qualities of the two materials do not warrant. However, that is not surprising. It was so in Detroit. It is so in other cities. The men interested in furthering concrete construction—a new industry—are new in the councils of government and of politics as compared with the representatives of other building interests. The penalties which are thus imposed upon the concrete interests do not differ from the penalties imposed upon every new thing or idea since the world began, when that new thing or idea upset established practice or established thought. That doesn't make the provisions fair by any means. It means simply that, for a time, concrete will have to shoulder the burdens, until general public knowledge of the unfairness rights the wrong. Public knowledge will right the wrong quickly perhaps, or after a long time. This depends upon the honesty and activity of the concrete products manufacturer, the concrete contractor and the concrete engineer. The best educational work along this line is the evidence of the thing itself. Good concrete will educate the public to good concrete. One job of bad concrete will undo the work of many jobs of good concrete, because the public has a perverse and cynical mind and the knowledge and import of evil travel faster than those of good.

Now, in Milwaukee, some of the perfectly honest progressive concrete interests object to the provision in the proposed code that block makers shall mark with date, name and mixture proportion every block turned out of a mold. That may not seem fair, yet such a provision is going to work out to the advantage of the industry. It will standardize best methods and it will eliminate the dishonest worker. When you have eliminated the dishonest worker, other handicaps of concrete will be removed.—Concrete, Detroit.

Poor Concrete Causes Trouble at St. Paul

Building Inspector Van Ornum, of St. Paul, Minn., has taken a shot at cement foundations under wall dwellings—not as such, but because his forces have been finding walls put in by careless contractors which are sadly under the requirements. The ordinance requires concrete foundation walls shall be composed of one part of cement to three of sand and six of broken rock or gravel, but it has been found quite frequently that a mix of one of cement, seven or eight of sand and one of gravel has to answer. The inspector considers this sort of a wall unsafe, and will condemn any such that he may find. This is but an-

other instance of how uncertain the concrete proposition may be in the hands of a reckless or thrifty contractor. Foundation walls of concrete are presumed to be all right, but they will not submit to having the cement skinned out of the job and then produce a wall that will do good work. With such an uncertain line as a mixture of the character named would give, would be almost certain to allow unequal stress through a dwelling, causing settlement cracks to show in the plaster, throw doors out of line and twist finishing work to the general discredit of the work. A built-in sideboard which happened to rest over an especially weak place in the foundation wall, unless the supporting timbers or frame were strong enough to carry the strain, which they should not be required to do, might easily be sagged and strained, its mirrors cracked and otherwise thrown out of true.

New Scotch Building Material

The great heaps of refuse to be seen adjoining coal and iron pits throughout Scotland, which have always been looked upon as useless waste product, are now found to be valuable in the manufacture of bricks. A new industry has recently been started in Glasgow for the utilization of "coke breeze." This "breeze," mixed with Portland cement, produces a "fireproof partition," made in the form of slabs varying in size from 2 feet to 3 feet 6 inches in length, and 1 foot in breadth, and in thickness from 1 to 4 inches. These dimensions can be increased if specially desired.

When built as inside partitions of buildings, the addition of a coat of lime and putty or sand finish gives a perfectly smooth surface. The partitions are absolutely fire and vermin proof. They have the quality of thoroughly deadening sounds and can be built on floors without beams or other structural detail. The material has been taken up and approved of by Glasgow architects. It has been used in various important buildings in Glasgow and elsewhere, and has given complete satisfaction.

Arrangements are being made for shipments to South Africa, where it is thought it will ultimately be in great demand. The prices per square yard obtained by the manufacturers for the various thicknesses are as follows: Four inches, 73 cents; 2½ inches, 60 cents; 2 inches, 48 cents; 1½ inches, 36 cents.

Present indications are that the fire loss in the United States and Canada for 1911 will exceed \$260,000,000. The figures for the first six months of the year show a total of \$129,691,750, as compared with \$99,228,900 during the same period last year. The losses for 1910 were \$234,406,650, and if the present ratio of increase continues throughout the year, the 1911 losses may approach \$300,000,000. This will exceed any year except those of the San Francisco and Baltimore conflagrations.

In view of the extensive public works under way and to be made in Chilliwack, B. C., the city council is considering the purchase and erection of a concrete-pipe building plant. The city engineer has been instructed to estimate the amount of pipe that will be required, and it is stated that if a reasonable saving can be made a plant will be purchased.

Contractors Who Win—and Why They Win

Close Attention to Details of Primary Importance—Value of Modern Efficiency Methods — Operation of Modern Accounting System

Contracting is a money-making business. In a large percentage of failures no one but the contractor himself is to blame. In business there is no such thing as luck. Every move a contractor makes brings about some result, either toward or away from business growth. Most contractors who lose money lose it because they do not keep proper account of receipts and expenditures. Every year a large amount of unprofitable business is done all over the country by contractors who do not know they are losing until too late, when suddenly they find themselves with debts and obligations greater than their assets. Then there is

INQUIRY RECORD	
Date _____	Business _____
Name _____	Remarks _____
Address _____	
Build. when _____	Ready, when _____
Property, location _____	
Property, purpose _____	
Follow up _____	
Contract let _____	
Contractor _____	
Remarks _____	

CONTRACT RECORD

Fig. 1—Inquiry Record.

a crash and a few more careless contractors are put out of business.

Some of the most successful contractors knew practically nothing about the business when they started. That is, they were not experienced builders. They knew how to run a business, however, and they understood how to make money. They appreciated the best way to invest time and money in men and material and make them yield a profit, and they knew how to keep close tabs on their business so as to be posted on their financial condition at any hour of the day. Unlike so many less efficient contractors, the men who win keep track of business details and are not liable to become involved in losses that drag them down to business failure.

Most builders who fail are careless in their book-keeping. They take money in, sometimes in large sums, and pay it out in equally great amounts without figuring the margin between cost and receipts. In this way some builders unconsciously lose money for years, work frequently costing them more than they receive for it, and they don't know it.

Modern efficiency methods are doing wonders for the building business, and any contractor can easily operate along efficient lines by the application of a modern accounting system to his business. He can install a system that will keep him in close touch with every detail of it, without any great effort on his part. A few blank forms to fill out and a ledger or two are sufficient. Every business is so different it is impossible to lay down rules, except in a general way, for the guidance of all. With a little thought any builder

can devise a good, practical business system for himself, based upon one successfully used by others.

Every business transaction that occurs in the office should leave some record behind it. Let the contractor begin by installing a card index system. A simple one, not complex, for it must be admitted that some card systems require so many entries that it takes a special clerk to keep them up. Fig. 1 shows an inquiry card of great assistance to contractors. Every builder has many inquiries during the course of a year, and as they are almost always from prospective customers they represent live business possibilities. It is a good thing to enter them on a card similar to Fig. 1. When Mr. Brown calls up to inquire about prices, or to ask other building information, his name and address are entered at the top of the card, with date and any other news that seems potent. If Mr. Brown gives information concerning date he expects to build and character of proposed building, with its location, this information is carefully entered in the next section. Thus the contractor has a complete record of Mr. Brown and his proposed building, a record easily made in a few minutes' time, and which can be followed up at later periods with a view to getting a chance to bid on the work. The dates of subsequent "follow up" letters or interviews are entered in the proper space, so that the contractor may know just how many times he has followed up the prospective job. If the contract finally goes to another builder this fact is entered, with the date, so in this way the contractor keeps tabs on the entire matter from beginning to end.

An index card of this sort not only serves as a record valuable for future reference, but it also acts

OWNER _____	
ADDRESS _____	
Contract let _____	Promised _____
Contract Price _____	Architect _____
Sub-Contractors	
EXCAVATION _____	PLASTER _____
MASON _____	PAINTING _____
CARPENTER _____	ELECTRIC _____
PLUMBING _____	
Contract completed _____	Insurance _____
Remarks _____	

CONTRACT RECORD

Fig. 2—Contract Entry Card.

as a sort of prompter for following up prospective business. Filed away where it may be easily reached, such a record helps the builder to remember the exact status of every prospective job which comes to his notice, and oftentimes with a little judicious soliciting he can land the job.

Another index card which will be found extremely useful is the contract entry card shown in Fig. 2. This is to be filled out when the contractor gets the job. It contains name and address of owner, with date of signing the contract, contract price, date when work

is to be completed and name of architect. Names of sub-contractors are given, and after the job is completed the date is given, with any pertinent remarks. During the progress of a job notes are made of dates and amount of builders' insurance, so that the record may be easily referred to when insurance is increased. It will be seen that the card shown in Fig. 2 supplements information contained in Fig. 1, and both together record completely all tentative work and all actual work which comes into the office.

Even so small a matter as the contractor's name

Williams Trust BUILDING		6/20 1911	
G. J. Simmons		TIMEKEEPER	
11		51	
12		52	
13		53	
14		54	
15		55	
16		56	
17		57	
18		58	
19		59	
20		60	
21		61	
22		62	
23		63	
24		64	
25		65	
26		66	
27		67	
28		68	
29		69	
30		70	
31		71	
32		72	
33		73	
34		74	
35		75	
36		76	
37		77	
38		78	
39		79	
40		80	
41	8	81	
42		82	
43	5	83	
44	5	84	
45	5	85	
46	5	86	
47		87	
48		88	
49	8	89	
50		90	
51		91	
52		92	
53		93	
54		94	
55		95	
56		96	
57		97	
58		98	
59		99	
60		100	
8 20 48			

Fig. 3—Daily Record Sheet.

and business address stamped on his check will be found helpful in business building. Every opportunity to have his name go before the public should be taken advantage of by a contractor, and a name-printed check is good advertising. If he will go one step beyond and have his business specialty printed on his checks, he will find it a wise thing to do. Many contractors specialize, not merely as mason or carpenter contractors, but as specialists in sound construction, and they advertise the facts on checks, letter heads,

and by neatly lettered tablets on their wagons. Nothing pulls business better than reputation for sound construction, which always attracts the better class of building owners, who have money enough to build the best and wish to deal only with contractors who do the very best grade of work. Money is rarely made on cheap work. Most builders who win do nothing but high-grade work, for which they receive a good price.

When it gets right down to the details of accounting, builders cannot use too much care in keeping track of costs and receipts. More money is lost through careless bookkeeping than in any other way. No builder can win unless he knows to a penny just how his accounts stand, for then he is in no danger of unpleasant surprises. If he finds he is losing on any particular kind of work he has a chance to adopt different methods or cut out that kind of work altogether. The main thing in contracting is to have accurate, easily read records of every transaction. Fig. 3 shows an excellent daily record sheet for keeping the time of workmen on the job. In may be recorded by a timekeeper who remains on the job all the time or the contractor himself may enter the items every day. Each man is numbered. At the top of the sheet is

# 243		H. K. 6/24/11	
RATE	444		
6/19	8		
6/20	8		
6/21	8		
6/22	8		
6/23	8		
6/24	5		
45 @ 444 = 19.90			
CONTRACT RECORD			

Fig. 4—Wage Sheet.

the name of the building, date and timekeeper's name. Columns are arranged for entering the kind of work going on, such as masonry, concrete, carpentry, etc., and in these columns are entered the number of hours each man puts in on his particular branch of work. At the end of the week each man's time is figured up on the wage sheet shown on Fig. 4, and both daily sheet and weekly sheet are filed for future reference. On a big job, after the weekly wage sheet of each man is filled out, the timekeeper issues an order on the office for each man's pay, as is shown in Fig. 5. This the workman takes to the office, where he is paid by bank check. All these forms are preserved, each checking the other, then the transaction is posted in an ordinary ledger.

When it comes to material every item used on any job should be charged to it, so that when the building is completed the books of the contractor will show in dollars and cents just how much material and labor were used, and he will know the amount of his profit. Fig. 6 is the final sheet on which is entered details of cost. Such a sheet is useful, as it brings to the contractor's notice the exact status of the job and furnishes data for making future estimates. Contractors who keep in close touch with their business in this way are not the ones who lose. Careful accounting helps contractors to win if anything can, and those

No. 79	19.80	No. 79	Chicago, June 26, 1911
WELLS BROTHERS COMPANY CONTRACTORS AND BUILDERS ROOM 1218 MONARCH BUILDING			
Date June 26, 1911	On Williams Trust (Manitowoc) Building		
J. D. Jackson	Please pay to J. D. Jackson		
Carpentry	Nineteen and 80/100 Dollars		
Work ending June 24, 1911	for 45 hours work @ 44 cts per hour		
Check No. 77.87	Check No. 77.87	C. S. Simons Treasurer	
		Work ending June 24, 1911	

Fig. 5—Office Order Form.

who employ efficient methods in their business can usually be depended upon to make good. Such business usually shows a satisfactory profit at the end of the year.—Abridged from Building Progress.

Building	Citizens' Bank	Location	Market Street
Architect	Ward and Haver	Date	August 1, 1911
Size of Building	50x66		
Height	45		
Cubic Contents	148,500		
Type of Construction	Brick and Stone		
Type of Foundation	Stone		
Estimated Cost	46,981		
Actual Cost	47,115		
Cubic Foot Cost	31 1/4		
General Expenses and Insurance		235.58	
Permits and Water		92.87	
Road			
Wrecking			
Shoring			
Piling			
Caissons			
Masonry		22,562.55	
Concrete Work		89.7	
Asphalt Work			
Structural Steel			
Cut Stone		1,928	
Granite			
Terra Cotta			
Tile Fireproofing			
Concrete Fireproofing			
Carpentry		10,122	
Cabinet Work			
Plastering		2,082.67	
Ornamental Iron			
Bronze Work			
Vault Doors			
Miscellaneous Iron			
Prismatic Lights			
Fire Escapes			
Sheet Metal and Skylights			
Fire Doors			
Roofing		18,394.44	
Painting		1,123.46	
Decorations			
Glazing		423.58	
Plumbing—Sewers and Gas		1,985	
Steam Heating		1,549	
Ventilating			
Electric Wiring		658	
Electric Plant			
Elevators			
Sidewalk Lifts			
Dumbwaiters			
Vacuum Cleaning			
Refrigerating Plant			
Sprinkler System			
Telephone Wiring and Telephones			
Marble		13,158.5	
Tile		471,150.0	
Mosaic			
Rubber Mats			
Mail Chute			
Hardware—Shelf			
Fixtures			
Staircases			

Fig. 6—Final Sheet Showing Cost Details.

Modern Sewage Purification at Sault au Recollet, Que.

The municipality of Sault-au-Recollet, Que., has under way the installation of a sewage disposal plant to cost over \$20,000. Already contracts have been let for a main sewer of reinforced concrete 5,600 feet long, 30 inches in diameter, at a cost of \$25,000, and a system of 12 to 15-inch pipe for the regular town service costing \$67,000. The new plant includes a clarification plant, a dosing chamber and percolating beds. Visitation Island, which stands in the midst of the Back river, opposite Sault-au-Recollet and 400 feet from the shore of Montreal Island, will be connected with the Sault-au-Recollet system by means of 16-inch cast iron pipe laid in a trench in the bed of the river where the water is five or six feet deep. The concrete pipe will convey all the sewage of the town to a large well, where the sewage will be screened before entering the reservoir. Here all solids will be removed and dried and carted away for fertilization and other purposes.

The sewage is pumped from the well to a height of some 25 feet by turbine pumps, operated by vertical motors, the electricity for which is supplied by the Saraguay Electric and Water Company. One of the pumps has a capacity of 500,000 gallons and the other one million gallons a day.

On leaving the dosing chamber the sewage is conveyed to the percolating beds. These cover an area of 84 feet by 36 feet and are constructed of broken stone from 1½ to 4 inches in diameter and laid to a depth of eight feet. From under these beds a drain takes the sewage into the river through another 30-inch concrete pipe. The purification of the liquids takes place by a spraying system. The "Taylor" nozzle is used, giving 21 sprays and a water fall of nearly two feet. The character of the organic matter is changed by the action of the oxygen of the air. This system is considered by Mr. F. C. Laberge, B.A., B.Sc., who is the municipal engineer, to be the most up-to-date as well as the most economical yet devised. It is in use in Columbus, O.; Baltimore, Md.; Mount Vernon, N.Y.; and many other American cities and in many large European centres.

The lock-joint system of sewage pipe is being used throughout the town as much of the soil is very wet and this gives a waterproof conduit. Besides the springy nature of much of the soil considerable rock and quicksand are also found, making the engineering difficulties and the expense of the undertaking greater than usual. Altogether the municipality is spending about \$125,000 on its drainage system.

The general contract for this work has been awarded to Messrs. Beaulieu & Chagnon, 1343A Erables street, Montreal. The pumps are being supplied by the John McDougall Caledonian Iron Works, Limited, William street; the motors by Allis-Chalmers-Bullock, Limited, and the nozzles and syphons by the Pacific Flush Tank Company, of New York.

A popular conception of the architect's failing in completing a house within the estimate is illustrated in the story of the proud father who thought he discerned great architectural talent in his eight-year-old son.

"Why," asked a neighbor, "does he draw well?"

"No," replied the father, "but he started a few days ago to build a hen-coop at an estimated cost of sixty-five cents, and it has already cost me three dollars and a half."

The Last Broad-Gage Railway in North America, the Carillon & Grenville Ry.

The early railways of the United States and Canada had gages of various widths, since in those days there was little thought of their ultimately being extended and connected to form through lines and complete railway systems. In the United States, the last broad-gage lines (with gages wider than the present standard of 4 ft. 8½ ins.) have been converted to standard gage for many years, and only a few narrow-gage lines remain. In Canada, a gage of 5 ft. 6 ins. was adopted by several of the early railways, but all have been converted to standard gage, with the exception of one short isolated line. This is the Carillon & Grenville Ry., having a length of 13 miles. As the line has been purchased recently by the Canadian Northern Ry., which will rebuild it to standard gage and make it a link in its system, some mention of it at this time will be of interest. The railway is notable not only for its gage, but for its 60-year old locomotives, and for the fact that it has retained its construction, equipment and corporate existence unchanged for over 50 years.

The Carillon & Grenville Ry. extends between the two towns of Carillon and Grenville, on the east bank of the Ottawa river, in Quebec. Between these points there are rapids in the river, and for some years the line has been owned by the Ottawa River Navigation Co., and operated only in connection with steamer service above and below.

It was built under an act passed by the Canadian government in 1856 for construction of a line between Quebec and Lake Huron by five companies which were constituted a body corporate under the name of the Lake Huron, Ottawa & Quebec Junction Ry. Co. The act authorized the Montreal & Bytown Ry. Co. and the Vaudreuil Ry. Co. jointly to build a line from opposite Grenville to the city of Ottawa, the former company to build the half nearer to Grenville.

It is of interest to note that this charter of 1856 opened with the following statement regarding the development of Canada:

It is of the utmost importance to the general interests of this Province, that a main line of railway communication should be opened from Lake Huron to the Ottawa and thence to Quebec in the most direct line; and the opening of such line from Arnprior or some place between Arnprior and Pembroke, on the River Ottawa, to such point on Lake Huron as may be found best adapted for the purpose, would secure for the said main line so large a proportion of the travel and traffic of the Great West as to ensure the success of the remainder of the line from the River Ottawa to Quebec, while it would also open for settlement a most valuable tract of country now unimproved and waste.

The act set apart for the railway from the Ottawa River to Lake Huron, 4,000,000 acres of land; this was to be granted in proportion to the length of line built, when not less than 25 miles had been completed "in a good and permanent manner, equal at least to that in which the Great Western Railway is made, and with stations, rolling stock and other appurtenances sufficient for the proper working of the railway." The grant was conditional upon the report "of some skilled engineer whom the governor shall appoint for the purpose."

The line from Grenville to Carillon is all that was ever built under the charter to the Montreal & By-

town Ry., and in 1859 an act was passed authorizing certain persons "interested in the purchase at sheriff's sale" of this part of the line, to form the Carillon & Grenville Ry. Co., and complete the line to landing places on the river at these points; the capital stock was set at \$200,000. In 1860 another act was passed, providing for extensions from Carillon to connect with the Grand Trunk Ry. and other railways between Quebec and Montreal, and providing also for an extension to Ottawa in the event of certain other companies failing to build a line between Montreal and Ottawa. The capital stock was increased to \$1,800,000. The charter granted under this act was unique in that it set no limit as to the time within which the extensions should be made. In 1861, an act was passed permitting an extension to Lachine to connect with the Montreal & Champlain Ry.

Nothing came of any of these large projects, and the line has remained until now an isolated piece of railway. It was purchased by the Ottawa River Navigation Co. in 1863, and has since been operated only during the summer season and in connection with the steamer service, serving as a portage line past the rapids. In 1899 it was expected that the line would be purchased by the Great Northern Ry. of



The Locomotive "Carillon" of the Grenville & Carillon Ry., (5 ft. 6 ins. gage). Built in England about 1850.

Quebec, but this railway was itself absorbed by the Canadian Northern Ry., which has now purchased the old Carillon & Grenville Ry.

The gage of 5 ft. 6 ins. was adopted because several of the early Canadian lines were of that gage. The track is laid with 65-lb. iron rails of English manufacture, and of the bridge (or inverted U) type of section. The equipment in 1899 comprised 3 locomotives, 3 passenger cars, 1 second-class car, 2 baggage cars and 2 flat cars. At the present time it has but two locomotives. The older of these, named the "Carillon," is shown in the accompanying cut, and is said to have been built in 1849; other reports put its date a few years later. In any case, these old locomotives are probably the oldest in existence that are still in active service. One of the engines was bought from the Grand Trunk Ry. about 27 years ago, and is one of 50 engines built for this line during 1854-1858 at the Canada Works, Birkenhead (England), to the order of Peto, Betts & Jackson, the contractors for the construction of the Grand Trunk Ry. The cylinders are outside the frames and inclined towards the driving axle; they are 16 x 20 ins., but others of the engines had a diameter 15 and 17 ins. (with 20 ins. stroke). The engines with the smallest cylinders had a single pair of 6 ft. driving wheels.

As originally built, each engine had a single leading axle, but these were replaced gradually by four-wheel trucks. The boiler is of iron, with copper firebox, and 170 brass tubes $1\frac{1}{8}$ ins. diameter. The steam pressure is 110 lbs. Wood is used for fuel. The weight of the engine is about 60,000 lbs. This Carillon & Grenville Ry. engine is said to be the last of the lot of fifty noted above.

It is to be hoped that this engine and a stretch of the original track will be secured by some museum or other institution in Canada as interesting relics of early railway practice.—Engineering News.

Proposed New Arena at Toronto

The arena now being constructed on Mutual street, Toronto, by P. Lyall & Sons, Limited, Montreal, will possess one unique feature—it will have the largest ice surface on the American continent, the dimensions being approximately 90 x 230 feet. The exterior of the building will be of stone and local buff brick, while the interior is to be of steel and concrete, and the whole structure will be practically fireproof. The



Proposed Arena, Mutual Street, Toronto
Peter Lyall & Sons, Contractors.

seating accommodation will provide for between 7,000 and 8,000 people, and these will have an uninterrupted view owing to the arrangement by which the arches spring from behind the audience. The steel trusses are to be the largest in the country, and are approximately 170 feet between the supports.

The plans provide for various hockey, skating, club and dressing rooms, and in this respect the accommodation will be of a very complete nature. A feature is the domestic ice plant, which will manufacture 100 tons of artificial ice from distilled and filtered water. This will enable the management to give an artificial sheet of ice for hockey clubs and to be quite independent of weather conditions.

The building will be available for horse and automobile shows and similar events, arrangements having been made to specially cater for such requirements. There will be double boxes provided, with the Governor-General's box in the centre.

In order to accommodate the horse shows, etc., a large assembly room is designed at one end of the building. This will be particularly useful in allowing the various classes of horses to be arranged; and two

entrances are provided so as to allow horses to depart after judging while others are entering.

The arena is being financed by Montreal and Toronto capitalists, who have formed a syndicate under the name of "The Arena Gardens of Toronto, Limited." The gentlemen interested are: Montreal—R. Reford, W. I. Gear, Col. J. Carson, R. S. Logan, Hartland McDougall, E. A. Shepherd, A. G. B. Claxton, and G. A. Ross. Toronto—Sir Henry Pellatt, president; Aemilius Jarvis, Joseph Kilgower, R. A. Smith, Hume Blake, Geo. W. Beardmore, Lawrence Solman and George Horne.

The architects are Ross & Macfarlane, of Montreal, and F. H. Herbert, Toronto.

A Concrete Platform Footing for a Small Tower

A five-storey brick building, between Sixty-first street and Sixty-second street on Madison avenue, New York, has in the center of its street front a 25 x 25-ft. tower eight storeys high, which was constructed after the erection of the main part of the building. When the excavation for the foundations of the tower were made down to the existing rubble footings, about 12 feet below curb, the soil was found to be too soft and wet to carry the tower loads on ordinary footings and the excavation was sheeted down to a total depth of about 15 ft. below the curb without improving the conditions. Explorations below the bottom of the pit indicated that the soil became still softer for a considerable depth, so that nothing would be gained by carrying the difficult open excavation any further.

As the weight of the tower only developed about 1000 lb. pressure per square foot of the entire area covered by it, it was considered that the ground was well able to sustain it, and a foundation was designed to distribute the load uniformly over the whole area. Accordingly the bottom was carefully leveled and covered with a few inches of concrete on which was spread a course of expanded metal with the sheets overlapping in both directions. Concrete was then spread uniformly over the expanded metal, giving a total thickness of 12 in., and a second course of expanded metal was laid similarly at right angles to the first. This was continued until the bottom of the pit was entirely covered by a 25 x 25-ft. monolithic mass of reinforced concrete 4 ft. thick. After this I-beam grillages were placed on it to receive steel columns for the tower and the building was duly completed. It has now been in service over three years, no settlement has been observed and the construction is considered satisfactory.

In Lyons, pavements made of glass have been in use for some time. They are constructed of seramocrystal, ceramic stone, or devitrified glass, and are laid in the form of blocks, eight inches square, each block containing sixteen parts in the shape of checkers. It is said that these blocks are so closely fitted together that water cannot pass between them. The whole pavement presents the odd effect of a huge draft board. The special advantages claimed for this style of pavement are that it has greater resistance than stone, that it is a poor conductor of cold—ice, accordingly, not forming readily upon it—and, finally, that it is more durable than stone and much cheaper, besides affording no places for lodgment of microbes.

Satisfactory Practice in Brick Paving

As Exemplified by the City of Grand Rapids, Mich., which has 75 Brick Paved Streets—Practical Notes on Construction

The city of Grand Rapids, Mich., for several years back has mainly used vitrified brick in surfacing its streets. In consequence the experience of that city affords some useful lessons concerning brick as a material in paving construction.

The first vitrified brick pavements were laid in 1891, and the city now has seventy-five streets, or sections of streets, which are surfaced with this material. One particularly noticeable feature of the work which obtained practically from the beginning is the quality of the foundations upon which the brick streets were laid. These have been, and are still being, constructed of concrete six inches in thickness, finished with a smooth surface to the grade of the completed street.

The sand used for cushion, and which was easily obtainable, may be described as a soft, velvety fine sand, very easily compressed, and it is believed by those familiar with the work of construction, judging from the present appearance of the streets, that the fact that this sand lends itself to uniform compression accounts in large measure for the satisfactory results obtained in connection with the laying of a durable pavement. Another interesting point easily observable by those who are conversant with brick streets in other cities of the middle west, is that the quality of the brick obtained from the beginning of brick pavement construction in Grand Rapids was much above the average and shows evidence of a uniformity of manufacture, although twelve different manufacturers supplied brick for the purpose. Importance is also given to the fact that the compaction by rolling after the brick were placed in position has been done with a skill and care that has added to the longevity of the pavement.

Pitch, Cement Grout and Asphalt Fillers

On the first brick streets built in Grand Rapids, the authorities used pitch for a filler, the character and kind of which is not known to a certainty, but is believed to have been what is now known on the market as No. 4 or No. 6. On two streets, Shawmut avenue, built in 1894, and Lake avenue, built in 1897, a sand filler was used. In 1897 East Bridge street was constructed with a filler of cement grout, but this construction was then abandoned until about 1901, when it was resumed and has since been generally adopted.

In the earlier construction, the cement grout was made by a mixture of one part cement to two parts sand, and no expansion cushion was provided. Later the grout was proportioned one to one and an expansion cushion was provided next to the curb in one or two cases, but for the most part expansion cushions were provided for in the interstices of five courses of brick with bituminous filler laid at right angles with and across the entire width of the street. After this experiment and practice, the expansion cushion next the curb was abandoned, and for a few years, until 1909, the practice in the use of transverse cushions only was almost universally followed in the case of the use of cement grout filler. A combined

filler of pitch and cement grout, and asphalt and grout were used in some instances. After the asphalt fillers came into use a few of the streets were filled with that material.

Monroe street, which is regarded as the principal business street of the city and carries a heavy traffic, was one of the first to be laid with brick in 1891, and was reconstructed with vitrified brick of block size in 1909. It is stated that the old brick themselves were not worn beyond use in spite of their eighteen years' service, but that the street had become so irregular and uneven because of the many cuts and openings which had been made in it, that the public demanded a better street. This street, as it exists today is considered to combine the best practice in brick paving as demonstrated by the several years of experience in Grand Rapids, and confirmed by the history of vitrified brick street development in other cities. The new surface was laid on the old concrete foundation, and according to the methods which had been found most effective, viz., a thoroughly compacted sand cushion, block well rolled after laying, cement grout filler, and expansion cushions next to the curb. Transverse cushions are not attempted at all on this street, except a three-quarter-inch joint every fifty feet, between the outer rails of the street railway tracks.

Development of Brick Paving in Grand Rapids

Mr. E. H. Christ, a member of the board of public works, and others familiar with the subject, recently gave out some information concerning the building and development of brick paving in Grand Rapids, which may be summarized as follows:

The brick as observed at present in the streets where sand filler was used are found to be chipped and worn about the edges and dirt finds a lodging place in the interstices. The same condition is found to exist where bituminous fillers were used, to a greater or less extent, according to their age, and also where the one-to-two cement filler was used, except at the gutters.

In the case of the older cement filled streets only a measure of imperfection is shown, such as might be expected in two particulars: where the cross expansion cushions were used the expected defects appear unmistakably; and where there was a neglect in providing a sufficient expansion cushion next to the curb it is again apparent that the bricks were pinched as though put in a vise, the result being that the bricks appear chipped and in some instances crushed. In the section of street lying between the transverse expansion cushions and laid with cement grout, the surfaces are smooth, unbroken and sanitary.

According to the 1909 report of the board of public works, Grand Rapids has 296.37 miles of streets, of which 183.5 miles have been improved.

During 1909 contracts for brick paving were let on streets in Grand Rapids having a total yardage of 60,689. A six-inch Portland cement concrete foundation in proportions of 1 part cement, 3 parts sand

and 6 parts gravel or broken stone, was specified in all cases.

Use of Sawdust Concrete

Sawdust concrete has been used in the new Public Library building at Springfield, Mass., as a base on which to lay the cork carpet covering the floor. The object of the sawdust concrete was to obtain a layer into which nails could be driven and which at the same time would hold the nails. The company that laid it states that it accomplishes both these purposes. If it had not been used it would have been necessary to lay the usual wooden floor, on sleepers and a cinder fill, between the structural slab and the cork carpet. The mix originally specified

was 1:2:2, one part cement, two parts sand and two parts sawdust; but before applying it the contractors decided to experiment with various proportions. It was found that the 1:2:2 mixture would not set and after a couple of weeks could almost be blown away by the wind. Further experiments led to the conclusion that a 1:2:¾ mix, three-fourths of a part of sawdust, would give proper results and 5,000 sq. ft. of this mixture were laid. The thickness of the layer was 1 in. and after four months of service indications are that the material is successful. No cracks developed, even in strips as long as 125 and 150 ft., except at the joints at the end of a day's work. At some of these points cracks opened to a width of ¼ in.

Sulphite, Oil and Oil-Cement Concrete

Used for Road Treatment—Details of Experiments Undertaken by the United States Office of Public Roads—Methods of Application

The Office of Public Roads of the Department of Agriculture has just published an additional progress report on experiments in dust prevention and road preservation carried out by the office during the year 1910.

The experiments at Washington were made with three materials, waste sulphite liquor, semi-asphaltic oil emulsion and oil-cement concrete. The first two materials were used on roads in the Agricultural Department grounds. These roads are of trap-rock macadam, which was originally bound with screenings of soft limestone and, although subjected to only a moderate amount of light traffic, they became quite dusty in dry weather. Both the sulphite liquor and the oil emulsion were used with the idea of acting as surface binders as well as dust layers.

One section treated with concentrated waste sulphite liquor had been treated with a similar material in 1909, as described in our issue of July 27, 1910. At the beginning of the Spring of 1910 the road was in good condition, but with this exception there was no evidence of previous treatment. The sulphite liquor used was a brown fluid, viscos and sticky, with a specific gravity of 1.265, a per cent. of loss at 100 deg. centigrade of 50.25, and a per cent. of organic solids of 42.81. This material was pumped into an ordinary watering cart by means of a rotary hand-pump. It was then diluted with water and applied as in ordinary street sprinkling. Different strengths of solution were used in six applications; that of the first two, made on two successive days in April, being 50 per cent. the third, in May, 16 2/3 per cent.; the fourth, in June, 25 per cent.; and the two last, in August and October, 23 1/3 per cent. These six applications kept the road practically dustless and in excellent condition. Before each application the road was swept free from sticks, leaves and other detritus with ordinary hand brooms. In dry weather the road presented a smooth, hard, well-bounded surface, softening somewhat in wet weather but not becoming actually muddy. The total amount of binder used in the six applications was 0.67 gallons per square yard. The cost per square yard was 9.38 cents for binder and 0.98 cents for labor. This section was 615 feet long and 16 feet wide.

Another section about 400 feet long by 16 feet wide was treated with semi-asphaltic oil emulsion. The emulsion used had been purchased the previous autumn and had been stored out of doors through the winter, during which time a certain amount of separation of the oil from the emulsifying agents had taken place in each barrel, and it was found impossible to emulsify this separated oil, which floated to the top of the mixture in the sprinkling cart, clogged the sprinkler and, when applied to the road, produced soft, sticky places, which had to be sanded. In order to avoid this trouble the watering cart was never completely emptied on the road, but the separated oil was run off on a vacant lot. Notwithstanding this trouble, and the fact that the road before treatment was not in very good condition, the material as applied proved quite satisfactory. The fluid applied was sticky, with a piney odor, had a specific gravity of 0.962, a per cent. of loss at 100 deg. Centigrade in five hours of 19.94, organic matter in residue soluble in CS but insoluble in 86 deg. B paraffine of 11.83 per cent., and 4.28 per cent. of fixed carbon. This was applied in dilutions of 20 per cent. to 8½ per cent. strength in six applications, three in April, one in May, one in June and one in August. After the third application the road was sanded in places where the oil had made the surface sticky. A thin asphaltic skin was formed over the road which gave it the appearance of a bituminous macadam road with a mosaic surface. These six applications contained altogether 0.187 gallons of binder per square yard, and cost 2.62 cents per square yard for binder, 0.5 cents for sand and 0.82 cents for labor. This road was in very fair condition when last inspected. In dry weather it presents a mosaic asphalt-like surface, which becomes slightly muddy under horse-drawn traffic in wet weather.

The same emulsion was applied to a section 750 feet long which was in rather poor condition, the surface having raveled in places and the coarse foundation stone showing through. The road should have been reconstructed, but no money was available and the attempt was made to keep it from further destruction for another year by the use of oil emulsion.

Applications were made on the same days as on the previous section, and in practically the same amounts except that the second application was at the rate of only about two-thirds as much binder per square yard. This reduced the cost of binder to 2.39 cents per square yard, the sand and labor costs being the same. Another section of the same length was treated in the same way, the original condition of which was even worse than the one just described, and consequently it received one more application of emulsion, two months after the last application to the other sections. For the amount used the emulsion has produced very satisfactory results on these two sections, although neither is in what would be called excellent condition. Indications point, however, to the fact that the treatment which they have received will keep them in shape until they can be resurfaced.

Three sections were treated with a combination of concentrated waste sulphite liquor and semi-asphaltic oil emulsion. In the first of these the sulphate liquor was applied alone in the first applications, a mixture of sulphite liquor and emulsion in the second and third applications, and emulsion alone in the last three. In the second and third experiments sulphite liquor was used alone in the first, third and last three applications, and a mixture of that with emulsion in the second and fourth applications, screenings being applied to the road after the third application. This mixing of materials did not prove as satisfactory as either material used alone, for it was found that the emulsion would, to a considerable extent, waterproof the road surface and prevent proper absorption of the sulphite liquor in later treatments.

Blast-furnace slag laid at Youngstown, Ohio, which had been treated with waste sulphite liquor in 1909, as described in our issue of July 27, 1910, was examined on January 27 of this year and found in good condition, with a fairly well-bounded surface.

Oil-Cement Concrete

Oil-cement concrete experiments were made on Meridian Place, the soil of the subgrade of which is a coarse, gravelly red clay, which after rain becomes sticky on the surface but remains firm below. The street is subjected to light traffic, consisting of delivery wagons and pleasure vehicles. The work done by the Office of Public Roads, and which formed the basis of costs given, included everything subsequent to the grading and construction of curbs and gutters. The foundation was constructed in two courses, the first of $\frac{1}{2}$ to $1\frac{1}{2}$ -inch broken stone, 5 inches deep when loose, which was rolled until firm with a 12-ton, three-wheel roller. Screenings were then applied and the surface finished as an ordinary macadam road. Seven different sections were laid, four with fluid residual petroleum, two with cut-back petroleum residue and one with plain cement concrete. On the first section a stiff mortar of one part cement to two parts sand was mixed by hand, and oil amounting to 10 per cent. by weight of the cement was mixed with the mortar. This was laid on the prepared foundation to a depth of $1\frac{1}{4}$ inches and immediately covered with $\frac{1}{2}$ to $1\frac{1}{2}$ -inch broken stone to a depth of $2\frac{1}{4}$ inches. When an area 20 feet long and one-half the width of the road had been laid it was rolled with a 5-ton tandem roller in an attempt to force the stone down into the mortar; but it was found that the mortar did not work up into the voids

of the top course sufficiently. A thin mortar of the same oil composition was then mixed and poured over the surface and broomed in, and a light coat of stone screenings from $\frac{1}{2}$ -inch to dust was placed as a finishing surface. The oil used had a specific gravity of 0.936, viscosity 44.1 per cent. of loss at 163 deg. Centigrade of 1.26, and per cent. of bitumen insoluble in 86 deg. B paraffine naphtha of 1.99.

On Section 2 a concrete of cement, sand and broken stone mixed $1\frac{1}{2}:2:4$ was prepared with the same oil as before to the amount of 10 per cent. by weight of the cement, this being mixed with the mortar before the stone was added. This mixture was spread $2\frac{1}{2}$ inches deep on the foundation and tamped until the mortar flushed to the surface and filled all voids, the surface being left somewhat rough. While rolling an adjoining section the next day the roller was run over this surface, causing slight cracks to develop in places. When last inspected, on January 31, no evidence of these cracks could be found.

Mixing and Tamping

For the third and fourth sections the concrete was first prepared in a "bug" mixer. The sand or stone screenings were first placed in the mixer with the cement and the mixer driven to the stone pile, the cement and fine aggregate being meantime mixed dry. Here broken stone, water and oil were added and, after the machine had been driven about 500 feet, the concrete was dumped upon a board. As it was not thoroughly mixed it was turned twice by hand and then placed upon the foundation and brought to a desired grade and crown with the use of the backs of steel rakes. The same kind and amount of oil was used as before. In the third the concrete was mixed $1\frac{1}{2}:2:4$, and in the fourth of the fluid residual experiments a mixture of cement, sand, screenings and broken stone was made in the proportion of $1\frac{1}{2}, 1:2:4$. The amount of oil was increased to 15 per cent. of the weight of the cement. The concrete was tamped as before and finished off with the back of a shovel. In the third experiment tamping did not bring sufficient mortar to the surface and a cement grout was poured over a portion of it and broomed in as in the first section.

In the fifth section, sand, screenings and broken stone were mixed as in the fourth, but a cut-back petroleum residue was used in an amount equal to 15 per cent. by weight of the cement. This had a specific gravity of 0.962, a per cent. of insoluble bitumen 18.16, a flash point (open-cup method) of 35 deg. Centigrade and a per cent. of fixed carbon of 8.90, as compared to 3.40 in the residual used in the other sections. The sixth section was identical with the fifth, except that only 10 per cent. of the oil was used instead of 15. The plain concrete used in Section 7 was the same mixture as that used in 4, 5 and 6. The object was to compare this with those with which oil had been mixed.

All of these sections were closed to traffic for at least seven days after being laid and were sprinkled daily during that time. A thin layer of sand was spread over a part of the road and stone screenings over the balance. When last inspected, on January 31, all of the sections were in excellent condition, although the street was covered with a light coat of mud brought on from other roads. No particular difference had yet developed between the various sec-

tions. The cost of the several sections varied from \$1.13 to \$1.25 per sq. yd.

Experiments in New York City

Experiments in oil-cement concrete were conducted on Staten Island, New York City, also, by the Office of Public Roads in co-operation with the Bureau of Engineering and Construction of Richmond Borough, the latter furnishing labor, sand and stone. The foundation was prepared by picking and leveling an old macadam surface. The concrete surface was laid upon the foundation as nearly as possible, 4 in. deep, but it probably averaged $4\frac{1}{2}$ inches over the entire roadway. A mixer of the old Smith type was used. Sand and cement were first mixed to form a thin mortar and a bucket of oil and a barrow of stone were then added, followed by the remainder of the stone. It was found that the stone last added did not mix thoroughly with the remainder and a barrow of the sand, cement and oil mixture was then taken from the front of the machine and dumped into the batch again. After thorough mixing the concrete was wheeled to the road in barrows. It was found that, as far as the mixture was concerned, it made no difference in what manner the material entered the machine, and that described was adopted as the quickest way of mixing the batch.

Each batch consisted of one barrel of cement, 8 cubic feet of sand, 16 cubic feet of crushed stone, together with varying amounts of oil. The mixture was given as much water as the concrete could contain without losing its shape when placed upon the road. The road was closed to traffic for seven days after completion. Fluid residual petroleum was used in two experiments and cut-back petroleum in the other two. Of the former 15 per cent. was used in one and 10 per cent. in the other experiment, and $18\frac{3}{4}$ per cent. of cut-back residue was used in each of the other two experiments. In the first two the surface of each day's work was covered the following morning with about $\frac{1}{2}$ -inch of loose sand, wet down to keep the concrete moistened. About 20 ft. of the third section was mixed very wet, lightly tamped, smoothed with the back of a shovel and floated with a straight edge. In this last hair cracks were noticed in a few days. The fourth experiment was practically the same as the third.

When last inspected, on January 21, the Staten Island road did not appear as satisfactory as the similar work done at Washington. The division line between each day's work was plainly apparent and the entire surface was rather rough and uneven. The first two sections were in better conditions than the other two. A few cup-shaped depressions were noticed and a number of cracks, some extending entirely across the road. One portion of the third section was very crumbly and, in fact, scarcely better than ordinary macadam, and the fourth section was nearly as bad.

At Ridgewood, N.J.

Experiments in oil-cement-concrete were also conducted at Ridgewood, N. J., in co-operation with the county highway engineer of Bergen County. These were similar to the experiments described above, except they were laid upon bridge floors. The old wooden floors were replaced with cement concrete laid on iron sheathing and reinforced with chicken wire, the concrete being $6\frac{1}{2}$ inches thick at the centre and $4\frac{1}{2}$ inches at the sides. Only the upper layer of $1\frac{1}{2}$ to 2 inches contained oil. One bridge was 37

feet long by 19 feet wide, the other 25 feet long by 37 feet wide.

After a few batches of the ordinary concrete had been laid and tamped, and while it was still wet, a batch of oil-cement-concrete was placed upon the surface and tamped until mortar flushed to the surface. This concrete was mixed by hand and shoveled into place. It was composed of cement, bank sand and crushed trap rock mixed 1:2:4. The sand and cement were first mixed into a stiff mortar, to which was added in one case fluid residual petroleum to the extent of 15 per cent. by weight of the cement, and in the other 18 per cent. of cut-back petroleum; both very similar to the oils employed at Washington. The stone was next added and mixed in. After the concrete had been placed and tamped one-half the surface was covered with a thin coating of sand and one-half with stone screenings. The bridge was closed to traffic for ten days and the surface kept damp during that time. After the concrete had set it was given a light surface treatment of the same oil at the rate of one-eighth gallon per square yard, and sufficient sand was applied to take up any excess of oil. When last inspected, on January 21, both bridges were in good condition, the one prepared with fluid residual showed a rather rough mosaic surface, free from cracks but spalled somewhat at the end from the impact of vehicles. The other bridge was covered with an oil-earth mat about $\frac{3}{16}$ inch thick, but there was no evidence of cracks where this was scraped away, although the concrete appeared somewhat soft under a knife.

Soft Soap for Waterproofing Concrete

Before commencing to build a granary alongside the River Donau in Budapest, the engineer subjected various waterproofing compounds to chemical analysis, and found the chief constituent to be soft soap. Therefore the foundation raft was finished with a layer of fine concrete 1.18 in. thick, rendered with cement mortar to the thickness of 0.39 in., both mixtures being prepared with water containing sufficient soft soap to make the proportion of that material about 8 lb. per cubic yard of concrete and mortar.

The practical value of the soap was demonstrated after the raft had been finished, as under a high head of water due to flood the construction proved to be perfectly watertight, although water percolated through an adjacent foundation slab of ordinary concrete.

More scientific inquiry into the efficacy of soft soap for waterproofing concrete was subsequently made by constructing a small tank of soap concrete and mortar and examining the material after the vessel had been filled with water for a month. It then appeared that while the mortar and concrete was uniformly penetrated for a short distance below the surface the remainder was quite dry and very hard.

The most probable explanation of the action of soft soap is that free lime in the cement enters into combination with constituents of the soap, forming an insoluble compound of sebaceous character filling up the interstices in the concrete.

Concrete laying at Gatun Locks, on the Panama Canal, was begun on August 24, 1909, and on August 24, 1911, there had been placed 1,548,790 cubic yards, leaving to be placed 451,210 cubic yards. An aver-



Albert Street Subway, Regina, upon completion. Contractors: Parsons Construction & Engineering Company

age of 2,183 cubic yards was laid per working day during the period August 24, 1909 to August 24, 1910, and an average of 2,911 cubic yards per working day during the period August 24, 1910 to August 24, 1911. The work has been done by two plants, one consisting of eight 2-yard cube mixers, whose product is placed by four duplex cableways stretching across the lock site, and the other, of two 2-yard cube mixers, whose product is conveyed to place by construction railway. The cableway plant was not in full operation until January, 1910, although it began work on August 24, and the second plant began mixing concrete on December 27, 1909. The amount of concrete placed each month will decrease steadily from this time forth, because the floor in all three locks is completed, and the second plant, which was largely engaged on the floor work, cannot be used to full capacity much longer. The walls in the upper and middle locks are practically completed, and the placing of concrete in large quantities is now confined to the lower locks, the walls of which are rapidly nearing completion.

Tests are to be made by the Isthmian Canal Commission to determine the value of cement mortar, applied to iron plates by the "cement gun," as a preservative of iron. Twelve plates, 63.8 x 14 ins., have been coated with a 1:3 mortar of cement and sand, after they are cleaned to grey metal by the sand

blast process. Six of these have been covered with a ½-in. coating, and the remaining six with a 1-in. coat on one side, and a 1½-in. coat on the other. Three plates of each kind have been sent to Balboa, and three to Cristobal, where they will be kept immersed in salt water to test the mortar method of preventing corrosion. Two plates of each kind will be taken from the salt water bath at the end of three months, and one-half of the coating will be removed to determine the condition of the metal. The duration of the test for the balance of the plates will be determined later.

Albert Street Subway, Regina

The above view is from a photograph of the completed Albert Street Subway at Regina, Sask., the construction of which was described in our issue of November 9, 1910. The subway is the largest west of the Great Lakes. It is an excellent piece of workmanship and reflects most creditably upon the contractors, the Parsons Construction & Engineering Co., Ltd., of Regina. The work, it will be recalled, involved over 4,000 yards of concrete, 3,500 yards of earth excavation and 8,000 lineal feet of piling, in addition to the steel bridge to carry four tracks. Temporary pile bridges prevented interruption to railway traffic during the progress of building operations. The subway with approaches has a total length on three streets of 1,230 feet.



An Early Progress View of the Construction of the Albert Street Subway at Regina

The Uses of Gypsum in Modern Building

An Economical and Serviceable Material with a Wide and Varied Application—Its Preservative, Fireproofing and Other Values

The extent to which gypsum is used in modern building trades may be illustrated by the tremendous strides made in recent years in the mining and manufacturing of this material, and the fact that 90 per cent. of the output is used directly or indirectly in the building of new and old structures. The annual output of gypsum approximates a value of \$25,000,000, and the rate of increase each year is nearly 20 per cent. The discovery of new methods of utilizing gypsum, and the invention of new machinery and processes for manufacturing it into commercial forms, are responsible for its increased output, writes George E. Walsh, in the *National Builder*.

In the modern building movement every effort is being made to minimize the danger from fire and to substitute so far as possible manufactured "lumber" for wood. The increasing cost of lumber, and our diminishing forests, make it essential that substitutes for wood be used to an ever increasing extent. In other words we are building faster than the supply of lumber increases, and to conserve our forests we must use materials other than wood for general construction purposes.

Gypsum in some of its manufactured forms serves a most important factor in both of these fields. It is sufficiently fire-resisting to make it of the utmost use in buildings, and cheap, abundant and serviceable enough to make it a good substitute for lumber in innumerable cases. Gypsum is light in weight, strong, and easily worked into any shape desired. Added to these qualities are others such as low conductivity of heat, and great resistance to water under fire conditions.

An Excellent Fireproofing Material

The most common ways of using gypsum for fireproofing is in the form of plaster boards, tiles, wall furring, partition blocks and for the covering of columns and beams. Plaster board made of gypsum is made in one-quarter to half an inch thickness, and from 32 to 36 inches in width and length. These boards designed at first to take the place of wood lath are to-day used extensively for partitions and for walls as well as for ceilings and the sides of furnace rooms. They are light in weight and very tough, and can be nailed directly to studding and joists.

There are two distinct varieties of gypsum of Paris used in the building industries. One is stucco plaster, which is quick-setting, and the other building or hydraulic plaster, which is slow-setting. Stucco plaster is burned at a low temperature, and it still contains a good deal of the original water of crystallization. In the ceramic industries plaster of Paris is used extensively, but in the construction of temporary houses, such as those built for fairs and exhibitions, adulterants are employed to a large extent. Lime and sand together, or layers of mixture overcoated with pure gypsum, are commonly used, the plaster sometimes running as low as 20 per cent. by weight.

In making stucco plaster and plaster board for partitions and even outside walls in recent years wire

cloth with more or less open mesh is used as a reinforcement or core. The wire cloth is coated on one or both sides with the gypsum, and the board becomes firm and rigid for building purposes. Sand, lime, ashes, cocoa fibre, excelsior, hair, rushes, hoop iron and metal shavings have all been employed as binders for gypsum boards, and as a result great variations in the industry may be noted.

As in the employment of cement, the use of gypsum has sometimes given a bad account of itself through careless or ignorant manipulation. For instance, coal ashes and old plaster have sometimes been used so that the resultant material easily crumbled and disintegrated. That only gave a bad name to gypsum plaster work, but no more so than concrete has often received through the ignorant or careless mixing and adulterating. Where good materials are used, and good methods of mixing and pressing are employed, gypsum products in their various forms give good satisfaction.

Gypsum Flooring Tiles in Europe

In Europe gypsum flooring tiles have been used to some extent in buildings where the tramping is not hard or severe, such as in storage houses. Plaster tiles, even though reinforced with wire metal, have not received much attention in this country. But plaster lumber for partitions is popular and widely used. Millions of tons of gypsum enter into their manufacture every year.

Plaster boards of this nature are lighter than water, and they can be sawed, cut, planed, and fitted as easily as wood, and they hold screws and hooks well. They can be made and used at any season of the year, and when installed they are vermin proof and practically fireproof and almost sound proof.

With the exception of special patented forms of plaster boards, they do not have sufficient compressive strength to make them useful for holding up roofs and upper floors. They are strong enough to bear up their own weight, but cannot be used like bricks in wall for carrying loads. A partition made of plaster that must carry a special load is built up of stucco and hydraulic gypsum reinforced with metal or wire lath. A good deal of experiment has been carried on in recent years to make satisfactory reinforced plaster material for heavy duty work. But it is doubtful if this material will ever become popular for outer wall construction. In the first place it must be protected from weathering when used for outside work. A wash of cement is the most satisfactory protection, although asphalt is used where appearances do not count. The cement wash cannot be applied directly to the plaster, and a preparatory coat of lime wash is first used or a thin coat of lime plaster.

Gypsum is largely used as an adulterant for asbestos, and frequently 80 per cent. of asbestos pipe covering is composed of gypsum. This fact is good evidence that gypsum makes a good fire protection and a fine non-conductor of heat and cold. Gypsum plaster is also an excellent protection for both wood

and iron beams and girders in many mills and factories. It keeps the wood from rotting and the iron from rusting. It is not easily affected by acids and dyes, and in a good many establishments, as tanneries, wash-houses and dyeing factories, it is freely used to protect all exposed wood and metal parts.

Wide Application in Mill Construction

Probably in factory and mill construction gypsum plaster finds as great use as anywhere. Appearances do not count so much here, and the rough plaster boards are nailed on to protect the building from fire, rust and decay. It is applied to the walls and ceiling of boiler and furnace rooms and wherever acids and dyes are used. When used for apartments and private houses, the plaster boards are first nailed on and then joints are finished off with a coat with a coat of plaster that can be worked to a smooth surface. Plaster boards are made generally with a smooth and rough surface. The latter is placed outside so as to receive a finishing coat when the walls and partitions are all up and the trim nailed on.

Where partitions are made entirely of plaster boards, they are usually nailed to the vertical studding, but often they are used without studding at all. In such cases they have to be reinforced in some way. For temporary structures there is no material so cheap or satisfactory as plaster boards. The trade is enormous for this work. The plaster boards are then stiffened by using rushes, twigs, straw and other material laid lengthwise. When twigs are used, they must be soaked in water first to prevent their cracking the stucco when exposed to wet weather after being embedded in the plaster. Small twigs are better than big ones.

Plaster boards of this nature are usually laid in double layers, one layer running vertically and the other horizontally. Sometimes an air space is left between to increase the non-conductivity of heat and cold. A certain amount of studding must be used to support the boards, but not sufficient to keep them in place. The saving in studding is thus quite considerable. Barns, garages, and similar small buildings are made with great success in this way.

The use of stucco plaster boards for roofs has increased in recent years, and all sorts of methods have been employed to make them satisfactory. If rightly used they prove very durable and useful. The stucco plaster boards are nailed to light rafters. Very thin boards are employed for this purpose, and on top of this a three-quarter-inch layer of gypsum beton is laid, consisting of stucco plaster with either sharp sand or good sharp, screened coal ashes. Finally a layer of asphalt roofing paper is placed on the roof, and strewed with sand or fine gravel while the paint is still wet. For comparatively flat roofs this makes an excellent covering. It is very light, durable and fireproof. It will also protect the inside to a remarkable extent from the heat of the sun. Contractors' buildings put up in the tropics with such a roof protection are very popular.

German Practice

In Germany a good deal of plaster board is made at the factories with galvanized woven wire or expanded metal as the core or reinforcement. The wire cloth is stretched between standards, and a mixture of gypsum and lime is applied to both sides with cow hair or other substance as a binder. Partitions with an air space between are also made in this way. Two layers

of wire cloth are then used, with a space between, and then plastered on each side. Partitions of this nature are made ready for setting up in buildings.

Gypsum plaster is applied both to wooden lath and metal lath in many of our modern buildings. When plastered on wood lath about one-third of the material is worked through the interstices to form keys or clinches. On wire or expanded metal lath even a greater amount goes into the formation of keys. There is a great saving of the material when manufactured in plaster boards, for there are no keys necessary, and nearly all of the material is formed in a compact mass outside. When plaster boards are put up, with a rough surface exposed, it requires comparatively little plaster to finish off a smooth surface. A quarter of an inch of plaster on the boards makes a perfect finish that is less liable to break or crack than any other method of wall construction. Usually in nailing on the boards they are spaced a quarter to a third of an inch apart so that the gypsum mortar used as a finish will fill these spaces to act as a sort of key or anchor to a whole surface. The boards are thus all joined together in one homogenous mass that cannot easily crack.

Gypsum is used to-day more and more in cities and the country, and builders are utilizing it in hundreds of different ways never dreamed of a few years ago. As a factor in the building trades of the future it must be reckoned with, and builders and contractors must familiarize themselves with its various uses and application to keep abreast of the developments of their profession.

Reinforced Concrete Poles

Poles of reinforced concrete for both high and low tension electric current are finding an increasing demand in Germany, and Karl Roessle, in "Beton und Eisen," describes those used for the "Hohenzollern-Sportpalast," skating rink in Berlin. Because of the decay of wooden poles, the high price of iron poles and the constant attention required for maintenance, the management decided to employ reinforced concrete. The simplicity of the system used, the Wolle, made it possible to cast all poles in wooden forms at the site of the work. Both the fabrication and the erection were accomplished without use of machinery, and the cost was about one-half that of iron poles. The poles were lightened by adopting a tapered section, reducing the size from about 1.2 by 1.8 feet at the bottom to .46 by 1 foot at the top, and at equal distances for the greater part of the length, holes were cut through, which not only reduced the weight, but also presented less surface for wind pressure in the direction of the smallest resisting moment.

The height of the poles, which curved at the top, was about 44.3 feet, of which 8.2 feet was in the ground, which brings the arc light 32.8 feet from the ground surface. Heavy signs, suspended between posts, increased the bending moment at the ground level. Therefore, a flat iron plate of rectangular cross section, about 2 by 3½ feet, was placed on either side between the ground and the pole extending from the surface of the earth downward. The greatest difficulty experienced was in placing the conduits for electric wires. The poles were erected by wooden shears 29.5 feet in length, and, although the total weight of each pole was approximately 9,259 pounds, they were raised without injury when but fourteen days old.

Expansion and Contraction of Concrete

Moisture as well as Temperature Conditions an Important Factor as Shown by Recent Tests—Relation to Design of Concrete Structures

In a paper recently read before the American Society for Testing Materials, Prof. Alfred H. White, of the University of Michigan, embodied the results of a series of tests on the destructive effects on mortars and concrete, of expansion and contraction due to wetting and drying and the chemical processes of setting and hardening. As distinguished from change of volume due to variations in temperature, which has been quite accurately determined to be, per unit length, 0.000055, or 0.00055 per cent., per degree Fahrenheit, these latter classes of changes have heretofore received but little consideration. The tests, however, show that they are of great importance as affecting the durability of concrete structures.

The conclusions based on the experiments, as summed up by Engineering and Contracting, are in substance, briefly, that neat cement bars expand when wetted and contract when dried. Bars of 1:3 mortar act similarly, but the magnitude of the movements is less. No tests were made on concrete bars; but, reasoning by analogy, we may assume that they will behave like mortar bars, and will change in dimension when wetted or dried, somewhat less than do mortar bars. The amounts of change in the volume of cement and mortars due to wetting and drying, are great enough to indicate serious destructive possibilities from expansion and contraction of concrete, as a result of varying moisture conditions.

These studies are, we believe, substantially new. As the author of the paper describing them states, the precise figures given may not safely be accepted as definite. We may also agree with him in the hope that further investigation will follow. Further, we believe that engineers will agree with us in crediting the author with having demonstrated a perhaps largely unknown and certainly a seldom defined cause of expansion and contraction movements in cement mortars and concretes. Acknowledging this debt in full, the thing that chiefly concerns us as engineers is: What danger do these discoveries indicate to the integrity of concrete structures designed according to the best engineering knowledge of design and construction in this material?

It is well known to engineers that concrete contracts and expands. Perhaps engineers have too tacitly assumed that these phenomena are solely a function of temperature changes, but this is not altogether certain. It is a matter of engineering observation that concrete expands and contracts in climates and under conditions where temperature changes are neither frequent nor extreme.

Contraction and expansion, irrespective of their cause, act in one of two ways: They rupture the concrete, or they induce initial stresses in the material. Irrespective of their causes, contraction and expansion have to be provided for, and they are commonly provided for, in designing concrete structures. Long retaining walls are provided with expansion joints, or reinforced against rupture by expansion and contraction. Bridge spandrels are invariably provided with expansion joints. Expansion joints are stipu-

lated generally in sidewalk, pavement, and floor construction. Sometimes they are provided in reinforced concrete buildings, and the reason that they are not generally provided is that building framework is sufficiently flexible to adjust itself to the moderate distortions likely from expansion and contraction. It is quite true that expansion and contraction cracks occur in concrete structures of all kinds named, but this is due to faulty engineering and not to fault in engineering knowledge.

The practical significance of the studies described is not that they show that contraction and expansion take place in concrete structures, for these phenomena are well known and it is well known that they must be provided for, but that they show that moisture conditions are probably important causes of expansion and contraction. These studies emphasize the need of providing for expansion and contraction movements when designing concrete structures. The means for doing this are not unfamiliar and are normally successful when honestly employed. They are easily capable of being neglected or slighted, and in sidewalk and floor work they are perhaps more often slighted than not.

Dust Laying With Calcium Chloride

The highways department of the city of Leeds, Eng., has recently treated portions of a macadam roadway with granular calcium chloride to combat the dust. Solutions of the same had previously been tried at greater cost and without such satisfactory results.

The road is first well swept and two applications of the chloride are made on succeeding evenings, of about one-half pound per yard, at a cost of about \$0.008 per square yard. From personal observation the writer notes the following: July 19, first application; July 20, rain; second application; July 21, dry breezy day, no dust; July 24, no dust; July 25, heavy thundershowers; July 31, no dust, after a few days of very hot weather; August 9, road in good condition, chloride seems to act as binding; August 10, stiff breeze, but no dust; August 14, road still in good order.

The ordinary sweeping of road was carried on.

Jas. MacLaren & Company, Buckingham, Que., have awarded to Haney, Quinlan & Robertson, of Montreal, the contract for the erection of a concrete bridge across the Lievre river, above High Falls, about 24 miles from Buckingham. The dam will be 900 feet long and in places 40 feet high. It will be used at first for log driving purposes and later for power development. Work will begin at once. Mr. J. B. McRae, Ottawa, is the engineer.

Fire losses and the cost of fire prevention in the United States amount annually to \$450,000,000, or more than the total American production of gold, silver, copper and petroleum in a year.

Continuous Caisson Foundations for High Buildings

In the financial district of New York City, the great height of buildings, the exceptional value of floor space, even in basements, and the character of the soil make the problem of substructure more difficult and expensive than in any other city. Owing to the heavy loads on the foundations, the frequently treacherous nature of the soil and the requirements of security for adjacent buildings, most of the tall buildings erected there within the last three years have pneumatic caisson foundations carried to rock. In all cases the cellar floor is at least as low as the ground-water level, from 15 to 30 ft. below the surface, and in many cases is considerably deeper, sometimes providing, below the curb level, as many as four storeys, which are utilized for the mechanical equipment of the building, for storage, safe deposit vaults and for some kinds of business purposes.

Under these circumstances the exterior cellar walls are subjected to a heavy horizontal thrust from the pressure to the sand and water. They require great mass, thickness and strength or heavy cross-bracing, to resist it, besides special provision to waterproof them and prevent leaks from the hydrostatic pressure due to a head of sometimes as much as 40 ft. The problem of retaining and waterproofing below ground-level has usually been a troublesome one in this place and was rather unsatisfactorily met until a solution of it was found in utilizing the foundation piers themselves to form a watertight inclosure for the cellar. In this case the wall columns are seated on rectangular piers, comparatively narrow in the direction perpendicular to the lot line and as long as practicable in the opposite direction. The width necessary for working space and the length conveniently handled usually determine these dimensions at about 6 ft. by 20 to 30 ft. and the caissons are sunk end to end in contact or with only a very few inches' clearance between them, thus making a sectional wall or dam enclosing the lot from the surface of the rock up to an elevation usually above the ground-water level. After all of the caissons are sunk their ends are permanently connected together from top to bottom by concrete, thus making one solid mass of masonry like a permanent cofferdam inclosing the lot.

When this dam is constructed first, as it ought to be, its efficiency is immediately apparent in that the flow of ground water is cut off inside it and the caissons for the interior foundation piers may be sunk by open excavation when pneumatic caissons would otherwise have been required, thus effecting an important economy in their construction. The general excavation can also be carried out in this enclosure during the construction of the superstructure, but as it progresses the unbalanced exterior pressure becomes so great that heavy temporary cross-bracing between opposite walls is required to sustain it until the steel framework and floors are erected and provide permanent reaction for it.

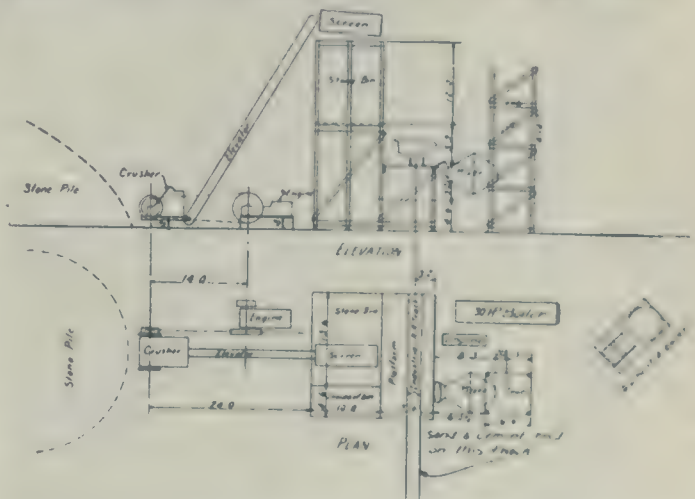
In 1897 the 155-ft. long side walls of the Commercial Cable Building were built on rectangular steel caissons arranged end to end with a clearance of a few inches between them, which, although not bonded with the piers themselves as in later cases, was filled with clay rammed in position to form a watertight section until the interior wall was built against it. The first complete dam for a building foundation was that of the New York Stock Exchange, built in

1902 with wooden pneumatic caissons, in which bonding chambers were formed as the piers were connected and afterwards served to receive concrete connecting adjacent piers and caissons in substantially the same manner as is now done.

Numerous ingenious details have been devised for establishing the connections between adjacent caissons, but in general the builders have eventually resorted to concreting the recesses left in the ends of the caissons, thus forming a sort of key between them, executed either in the open or under pneumatic pressure, as might be necessary. Little or no time or cost is involved beyond what is necessary for ordinary pneumatic caisson foundations and besides providing economical watertight retaining walls, the general excavation can be carried down to any depth less than 100 ft. below water level, thus affording a great increase in the amount of space that can be utilized below the ground floor.—Eng. Record.

A Compact Concrete Plant Layout

As an example of a compact and economical concrete plant layout might be cited the one erected by the Aberthaw Construction Company in building eight new reinforced concrete flumes for the Penobscot Chemical Fiber Company, at Great Works, Maine. Each of these flumes is 58 feet long, 14 feet



high and 16½ feet wide, and they were designed by Hardy S. Ferguson, consulting engineer, New York.

Of necessity, this mixing plant is located out in the river over the tail races which were constructed last year. The sand and cement are brought from the railroad 1,200 feet distant by side dumping cars running on an industrial track that extends above and back of the mixer. The crushed stone is raised by an elevator to the bins and by one of two chutes is fed into an independent side dumping car on the same industrial track as the sand and cement cars.

The cement and sand are received, proportioned and dumped into the mixer and then follows the stone from its car. Thus there are two operations for each batch. The mixed concrete is finally raised in the tower by a double drum hoist and deposited into the carts that deliver it to the point under construction. The concrete is proportioned generally 1:2:5.

The closeness of quarters is appreciated when it is noted that the extreme width of the mixing plant is 18 feet and the length over all only 54 feet. It is such careful planning as this that brings economical results, reducing the cost of mixing and placing to the lowest point.—Cement Era.

Modern Features of Sewerage Disposal

Generally Accepted Principles—What is being done in Great Britain and Other Countries — The Disinfection of Sewage Effluents*

By T. Aird Murray, M. Can. Soc. C. E.

In some quarters an impression prevails that many of the generally acknowledged or accepted standard principles appertaining to sewage disposal are becoming out of date. This impression is not without foundation, but just how far it is true is a subject of practical interest to sanitarians.

Last year the Provincial Board of Health of Alberta issued a circular to municipalities stating in brief that the whole question of sewage disposal was passing through a transition stage; therefore, they generally advised caution. Such a statement is calculated to make those responsible for municipal expenditure pause and wonder just where they are at.

The necessity for efficient sewage disposal is generally acknowledged. It has been acknowledged for years in Great Britain, European countries and the United States of America. Millions of dollars have been expended in schemes, in experimental work and in collecting data. Books and treatises innumerable have been produced dealing with the subject both from the practical and scientific standpoints. A British Royal Commission recently closed a session extending over several years, held 144 meetings, examined 197 expert witnesses and sent out circular letters all over the world asking for and receiving all kinds of data. This commission published their report which in 1908 was considered the most complete and authoritative treatise on the subject of sewage disposal. The German government have been examining into the question and have employed not only expert engineers but expert chemists and biologists; they have issued from time to time reports and treatises which have been translated and have become common knowledge to the sanitarian. Many of the American States, such as Massachusetts, Ohio, etc., have formed central experimental stations governed by experts and have issued annual reports for years handing out the most valuable and exact data and conclusions to the world generally. Many civil engineers and chemists have given their whole time and energy to this question of sewage disposal.

Generally Accepted Principles

Now it is generally acknowledged that all these authorities are in agreement on certain general principles.

The generally accepted principles may be defined as follows:

(a) Sewage contains quantities of mineral and organic matter. The organic matter is found both in the form of suspended solids and solids in solution, and is liable to putrefaction. The process of putrefaction causes foul odors and is apt to create a nuisance at the point of discharge.

(b) Sewage contains the germs or bacteria of certain diseases, especially the infection of typhoid fever. These germs are found mostly in connection with solid matters, particles of animal tissue, etc.

(c) The putrefaction of the organic matter will not cause any specific disease. The organic matter, apart from the disease germs it contains, is harmless, and the gases which are given off, causing the foul odors, are likewise harmless, as long as they are not in sufficient quantity to displace the natural oxygen of the air and thus cause as-

phyxiation. The germs of disease are not carried by the gases and can only be liberated from the sewage by splashing in the immediate neighborhood of the disturbance. Sewer air, (at one time thought otherwise) is not capable of spreading contagion. Contagion or infection is only obtained by direct contact of some particles of sewage, containing the disease germ with food (solid or liquid). If sewage contained no disease germs (no matter how foul the sewage or otherwise), it could not produce typhoid or any other disease, even if it came into contact with milk or drinking water. The whole danger to health, the pathogenic danger, or the sanitary danger connected with the distribution of sewage is entirely due to the specific disease germs which have originally come into contact with the sewage. Sewage in its purely chemical constituents is not dangerous. Sewage in its biological or bacteriological constituents is dangerous.

(d) The ultimate aim in sewage disposal may consist of (1st) only dealing with the organic matter in such a way that it will cause no nuisance, viz., that at the point of discharge no putrefaction shall take place and thus no foul odors will be emitted. (2nd) Dealing with the organic matter in such a way that all disease germs are exterminated, so that the power of distributing disease is taken away from the sewage. (3rd) Dealing with the organic matter in such a way that both of the above objects are realized.

(e) It is known that when the organic matter in sewage comes into contact with a liberal supply of oxygen, that the organic matter undergoes a change which renders it non-putrefactive and no foul odors are omitted. In order to avoid any foul odors or nuisance from sewage all that is required is that it be partly oxidised.

(f) The sewage disposal systems which have aimed solely at the avoidance of a nuisance by systems of oxidation have not been sufficiently complete to destroy the germs of disease.

(g) In order to exterminate disease germs from sewage it is necessary to go a step further than merely to provide a non-putrefactive sewage, and to provide some efficient system of disinfection.

There is not one of the above general principles which can be picked out and allowed to be in contradiction to the conclusions of all the great authorities upon this subject. These conclusions are not new; they have been understood and acknowledged by scientific men for many years now. Wherein then, is there any foundation for saying that "old principles must give way to new"?

The fact of the matter is, it is not a question of principle but a question of application of acknowledged principles.

Sewage Disposal in Great Britain and U. S.

In Great Britain the general aim of sewage disposal has been and is to obtain a non-putrefactive effluent. The aim has been to remove sewage pollution from streams to the extent only of removing a nuisance. Average strength sewage contains approximately 3,000 lbs. of dried solid matter per each 1,000,000 gals. of sewage 200 lbs. of which may be mineral and 100 lbs. organic. It has been found that in connection with rivers whose areas are thickly pop-

* Read before the Union of Saskatchewan Municipalities, Sept. 27, 1911

ulated, that they cannot digest all this matter and that they become foul in appearance and odor. In Great Britain, with one or two exceptions, the cities and towns do not obtain their domestic water supply from rivers flowing through inhabited areas. The water supply is generally from upland collecting areas or natural lakes where there is no chance whatever of sewage pollution. Hence, efforts in sewage disposal in Great Britain have almost solely been directed to preserve the natural beauty and aesthetic appearance of streams and not to make them fit as sources of water supply.

The city of London is an exception as it takes its water supply from the upper Thames and its tributaries, which receive sewage only partially treated. The London water supply undergoes most thorough purification treatment before distribution.

A great many of the cities of the United States take their water supply from rivers receiving sewage. It is customary in the States to purify all such water supply and insist only on partial treatment of sewage.

Disinfection of Sewage

The question of disinfecting sewage—that is of exterminating disease germs—is from the view of application, comparatively speaking, new. It has never been pretended by those who know, that the generally recognized methods of sewage disposal, produced drinking water. Fakers there have been who have set up such pretensions, but such have been connected solely with commercial ventures. Germany was the first country to apply the principles of sewage disinfection, and the United States have given more attention to this part of the subject than Great Britain or any other country apart from Germany.

In 1909, E. B. Phelps, of the Massachusetts Institute of Technology, published a report of extensive investigations and experiments in connection with the disinfection of sewage. These investigations and results have brought the whole subject of the disinfection of sewage effluents acutely before sanitarians.

Phelps showed that sewage is amenable to high degrees of disinfection by the use, as a mixture, of very small proportionate amounts of chlorine derived from chloride of lime. He showed that 3 parts per million of chlorine will satisfactorily disinfect the effluents from ordinary sewage works constructed for the removal of putrescibility, the bacteria being removed by 98 to 99 per cent, the cost being from \$1 to \$1.50 per million gallons of sewage. He also showed, that, from 5 to 10 parts per million of chlorine will disinfect screened or settled sewage (that is sewage from which part of the solids have been removed) at a cost of from \$1.50 to \$3.50 per million gallons. Phelps showed that absolute sterilization was not necessary, and that partial sterilization or disinfection was sufficient to kill off the disease germs.

These practical investigations and conclusions were interpreted by some as likely to revolutionize sewage disposal processes. They form the only possible foundation for the somewhat vague supposition that "sewage disposal methods are undergoing a transition stage."

Such investigations have, however, had no appreciable effect upon the standard methods of sewage disposal.

The preservation of the natural condition and appearance of a stream and the avoidance of all nuisance from odors is just as an acute question as ever. Disinfection of sewage will not remove or diminish the 3000 lbs. of solids per 1,000,000 gallons of sewage entering a stream. Disinfection may retard putrefaction for a time but only for a time. Disinfection will not satisfy the person who sees actual filth floating in a stream, no matter how sure he may be that all the germs of typhoid or otherwise have

been eliminated. On the other hand disinfection or elimination of disease germs added to the standard processes for the avoidance of actual nuisance may in many cases prove valuable and prove not a revolution of standard processes but simply a development.

Disinfection of sewage effluents is likely to prove the most prominent and useful of modern features. It must be acknowledged that no sewage effluent if only treated up to the stage of removal of putrescibility has any right to enter a domestic water supply source. In the case of sources which are not available for water supply such may continue to receive either partially treated or even untreated sewage.

An Important Question in the West

What are the western conditions? And, especially, what are the special conditions relative to Saskatchewan?

In this province we have two large rivers, the north and south branches of the Saskatchewan river, which have their source in the Rocky mountains. Other streams are small in capacity, mostly running dry in the summer season. This province, unlike Great Britain, presents no features which will allow of collected upland waters. The annual rainfall is small, the ground porous, the country flat, and evaporation great. Apart from shallow surface wells, and the small creeks or streams, the two main factors of pure water supply are the two branches of the Saskatchewan river and the tributaries connected with them. It is absolutely essential apart from aesthetic value, apart from the question of nuisance and apart from any other question that every effort be made to keep out of our rivers, streams, creeks, and other visible sources of water supply all causes of disease infection.

What would you think if it was proposed to any municipality which you represent, that you spend several thousand dollars in avoiding an apparent nuisance to the senses, and you were told at the same time that such an expenditure in no way affected the chance or otherwise of spreading typhoid?

Large cities with an abundance of capital available may be warranted in ignoring the question of perfect sewage disposal, because they can afford the expensive luxury of perfect water purification. But they are only warranted as far as the matter affects them locally. The small community and the individual farmer cannot afford expensive methods of water purification. A city may obtain its water supply from a polluted river and filter and so treat its water so as to render it pure. The city may receive its milk supply from farmers located on that river where the filtered city water is not available and where the farmer may have to depend upon unfiltered water for domestic purposes, washing of milk cans, etc.

Western Canada can, at the present time, boast of practically pure stream waters, from the sewage contamination point of view. The amount of sewage discharge is yet small; it will, however, be an increasing amount. It is for the western people to determine that they will unite in so treating all sewage effluents that the greatest available quantity of water possible shall be preserved pure for domestic supply. It is in this connection that disinfection of sewage effluents is of more importance to Saskatchewan and the West, than it is in Great Britain or in many parts of the United States where the condition of the rivers has become practically hopeless.

Chlorine Efficient and Economical

The least costly and most efficient method of disinfecting sewage effluents is by the addition of small proportions of chlorine.

Chlorine cannot be economically or efficiently adminis-

tered to sewage unless a large proportion of the solids are previously removed and the liquid sewage rendered non-putrefactive.

The admixture of chlorine does not revolutionize the standard methods of sewage purification. Where the standard methods were necessary in the past they are still necessary. Chlorine used as a disinfectant simply forms a continuation of the standard methods and forms a useful and practical adjunct to any sewage disposal system discharging an effluent into any body of water which during its course may be or is available as a water supply either to individuals or to communities of individuals.

In Saskatchewan at present the government are insisting upon the purification of sewage to the extent of the elimination of disease germs where such effluents enter any body or channel of water which may be or is used for domestic water supply. Regina, Moose Jaw, Saskatoon, Prince Albert and many of the smaller towns are at present engaged in installing up-to-date systems of sewage disposal which are in accordance with the standard methods but which have, in addition, the plant necessary for thorough disinfection.

Modern Features Summarized

Modern features of sewage disposal may be summed up as follows:

(a) The removal of a large proportion of the solid matter by screening and sedimentation in tanks.

(b) The removal of the tendency to putrefaction by bringing the liquid sewage into contact with oxygen, generally by use of aerated filters, or when occasion will allow it, by dilution with large quantities of water containing the necessary dissolved oxygen required to oxidize the organic matter of sewage.

(c) The removal of the tendency of sewage to spread certain diseases if it comes in contact with food supply, or in other words the disinfection of sewage by the elimination of disease germs.

Apart from the discharge of sewage into tidal basins it is generally necessary that the processes under (a) be followed. With efficient screening and attention much of the matter connected with nuisance production can be retained; and with the further application of sedimentation practically all the solids apart from very fine particles can be retained. Such an effluent after screening and sedimentation is amenable to disinfection by use of about 7 parts in 1,000,000 of chlorine. The question of leaving out the process of oxidation by means of aerated filters and relying upon oxidation by the body of water receiving the effluent depends as follows:

(a) Upon local conditions—such as the extent, freshness, flow or circulation of the body of water, and whether used as water supply or otherwise.

(b) Or if disinfection be necessary, a careful study of the capitalized annual cost of the extra chlorine treatment required as against the capital cost necessary to install aerated filters requiring less chlorine.

In connection with inland streams and bodies of water which are required as sources of domestic water supply, it will generally be found that the whole three processes are necessary both from point of view of efficiency and ultimate economy. No cut and dried method of sewage disposal can, however, be laid down which will fit in with all conditions. Within certain limits the whole subject, like most other subjects, is subject to common sense and the results of experience.

Municipal Engineering as a Profession

By B. Wyand*

There no longer exists the need to drive home the fact that municipal engineering is a distinct profession. There was a time when the statement would have been met with a shrug of the shoulder or a curl of the lip. To-day no dispute is possible. The profession is recognized universally, and its separate existence is proved in that the Legislature is the one notable exception that has not yet awakened to the fact that this very lusty infant is among us and is making vigorous outcry for its rights. The pedigree of this interesting infant is lost in obscurity. Road foremen, inspectors of nuisances, village grocers, ex-policemen, drapers and civil engineers of the old school are among its progenitors, and it is possible that each of these crossings has had its healthy influence upon the matured product.

The Consulting Engineer

Municipal engineering is a profession which will some day be found to have usurped the whole field of engineering, except that form known as Government engineering. The consultant will, I am afraid, have a very bad time; but the inevitable has to be faced. As matters are now, the municipal man is not encouraged to prepare schemes of any magnitude, and many who are really capable—there are, of course, quite as many (if not more) who are not capable—conceal their knowledge. There is always trouble about payment where the salaried officer is concerned, and when a fee is arranged it is usually only a proportion of that which the consultant would be paid. Honorariums are merely a means to an end—the end being the payment of an amount equal to about one-tenth of that which is morally due. To come back to my point, however. In every direction now municipal trading is being extended. Municipal schemes to run means more responsibility for the officer, and the necessity for a better class of officer—a more highly trained and more intelligent man. This, again, means higher salary, larger staff, and better accommodation, together with the less frequent requisitioning of the consultant. It may be urged that never was the consultant so in evidence as during the last few years. It is quite true, but it has to be remembered that he is largely engaged in installing first schemes. Extension will not, in scores of cases, go for him; for the necessity for a highly-trained man to run a concern does away with the necessity for another highly-trained man to repeat, to improve or to extend what has already been done.

Improving the Status

There has been much talk of late about improving the status the profession. The term is a misleading one. What is wanted is to improve the status of the members of the profession, and every man who realizes that he is an adviser, and not a servant, is working on right lines. Municipal engineers must realize their own importance. I do not mean that they should cultivate deep voices and contort themselves into ponderous attitudes. I mean only they must feel their responsibilities, and recognize the fact that supremacy is their place in local life. Even the chairman of the council is merely a cipher when contrasted with the municipal engineer, and he should, as far as possible, be made to feel this. The chairman may be the better man in many ways; but when it comes to engineering he should be made to recognize the fact that he must play fourth fiddle, and must feel

happy that he has not been relegated to the orchestral triangle. A man is estimated in this world much at the value he places upon himself, and the humble, shrinking individual who is led by his council is never likely to command either respect or a periodical increase of salary. The blatant gentleman who boasts freely is much more likely to succeed for a time; but his day is not usually a long one, and he is the last man to make capital out of a reverse of fortune.

Security of Tenure

I will say nothing harsher of councillors than that they are entirely unnecessary, and I am sadly afraid that security of tenure will be difficult of attainment so long as district councils exist. It is not to be expected—it would be foreign to human nature—that councillors would welcome the continued services of a man with whom they had quarreled and of whose services they had endeavored to rid themselves. The life of the officer would be a miniature hell; indeed, things would be made so unpleasant for him that he would welcome resignation.

The sole duty of the council should be the making of the rate, and this could be as well done by one man as by 20—the collector could, in fact, do it. Directly a council concerns itself on engineering matters it becomes ridiculous, and the effect of its interference is to hamper the technical officers. These should be appointed by a central controlling authority, and should be removable only for misconduct, or at an age when a pension (and a sufficient one) falls due. Their appointment would, in fact, be a life one, with promotion to larger appointments as vacancies occur. They would be responsible to the central department only, just as are police and post-office officials. What would happen were these classes appointed and dismissed at the pleasure of small local bodies? Perhaps, when councils no longer exist, the municipal engineer will be appreciated at his true worth. Until then but little can, I fear, be done.

Salaries

The question of salaries is all-important. Municipal engineers are usually woefully underpaid and overworked. Higher salaries and less hours of labor would reduce the ranks of the unemployed, and the overcrowding question would not recur for years. There would be room for thousands if proper and sufficient staffs were engaged. £150 (\$750) a year should be the minimum salary for even a deputy or chief assistant.

Qualifications

The full qualifications for a municipal engineering appointment are so many and so varied that no one man could satisfy a standard. The essential qualifications would place no light tax on a man's abilities, and none should be appointed without these. Some towns have, I believe, passed resolutions to the effect that no man should be appointed who has not passed the examination of the Institution of Civil Engineers, qualifying for at least associate membership. This is, of course, pure nonsense; indeed, so far as municipal engineering goes, the examination is three-fourths sheer waste of time. While there are special examinations for municipal engineers, it is as ridiculous to ask a man to pass another as it would be to ask a judge to pass in surgery because he might on some occasion have to hear an action in which a broken leg was introduced. That some limitation should be imposed upon the appointment of quite unqualified men no one will deny, but is equally important that the test to be undergone shall be a reasonable one. It is to be hoped that councillors will not allow themselves longer or to any further extent to be hoodwinked by men whose interest is with

an alien profession. It must not be forgotten either—and I cannot lay too great a stress upon it—that civil engineering as practiced is only one branch of municipal engineering. A calculating boy or similar wonder need not necessarily make a good municipal engineer.

I have no hesitation, in conclusion, in placing municipal engineering at the top of all the professions. It is one in which the duffer can never shine, and there is no other profession of which this can be said, except perhaps that of the barrister, and he, unless possessed of special talent, has no chance unless he be promoted to the bench. The time has arrived when the municipal engineer must take the place which is his by right, and with two active bodies (associations) to voice his interests, both working now upon similar lines, great strides must inevitably be made during the next decade or two. Individual effort is, however, none the less necessary.

Railway Notes from Edmonton, Alta.

According to information to hand from Edmonton, Alta., every mile of the Canadian Northern main line from St. Albert to 16 miles beyond the summit of the Yellow Head Pass is now under contract. The Cowan Construction Company have sublet to Phelan & Shirley a contract for 65 miles of grade in the mountains. The Cowan people have the contract for all the main line from Pembina river to some distance beyond the Yellow Head. Messrs. Phelan & Shirley will start work at once with a large force of men and carry on operations throughout the winter.

McMillan Bros. & Keeny, who have the contract for the grade from St. Albert to the Pembina river, have nearly finished this work. Steel has been laid as far west as the Sturgeon river. D. F. McArthur, who has the section of the C. N. R. line between the Pembina and the McLeod rivers, has been putting additional equipment on the work with a view to completing this fall. James O'Connor, who has been working all the summer on the 40-mile stretch west of the McLeod river, has taken over from Phelan & Shirley the contract for 37 miles east of the mountain section.

Mr. Shirley states that work is progressing favorably on the Bickerdike branch of the G. T. P., for which his firm holds the contract. Steel has been laid to the McLeod river at mile 8 on the Bickerdike branch for some time and a temporary structure is now being put in over which the steel will be laid until a permanent steel bridge can be built. A 550-foot tunnel is being driven at mile 34 and Mr. Shirley expects that its construction will be completed by the middle of November. There is some trestle work to be done on the line between the McLeod river and the tunnel but this probably will be completed by the time the tunnel is ready for the track and if no setbacks are experienced there are prospects of the steel being laid to mile 40 this fall. About 1,000 men are now at work on the Bickerdike branch, according to Mr. Shirley.

In a recent letter to the Contract Record, Mr. Jno. Y. McNaught, reeve, district of North Vancouver, directs our attention to a phase of the development of that municipality during the last few years. There has just been completed in this district a fine new municipal hall at a cost of \$12,000, and the school board are now erecting a new 4-roomed school at a cost of \$9,000. The latter building is the fifth school erected in this district since 1905, when the total number of children on the school roll amounted only to fifteen.

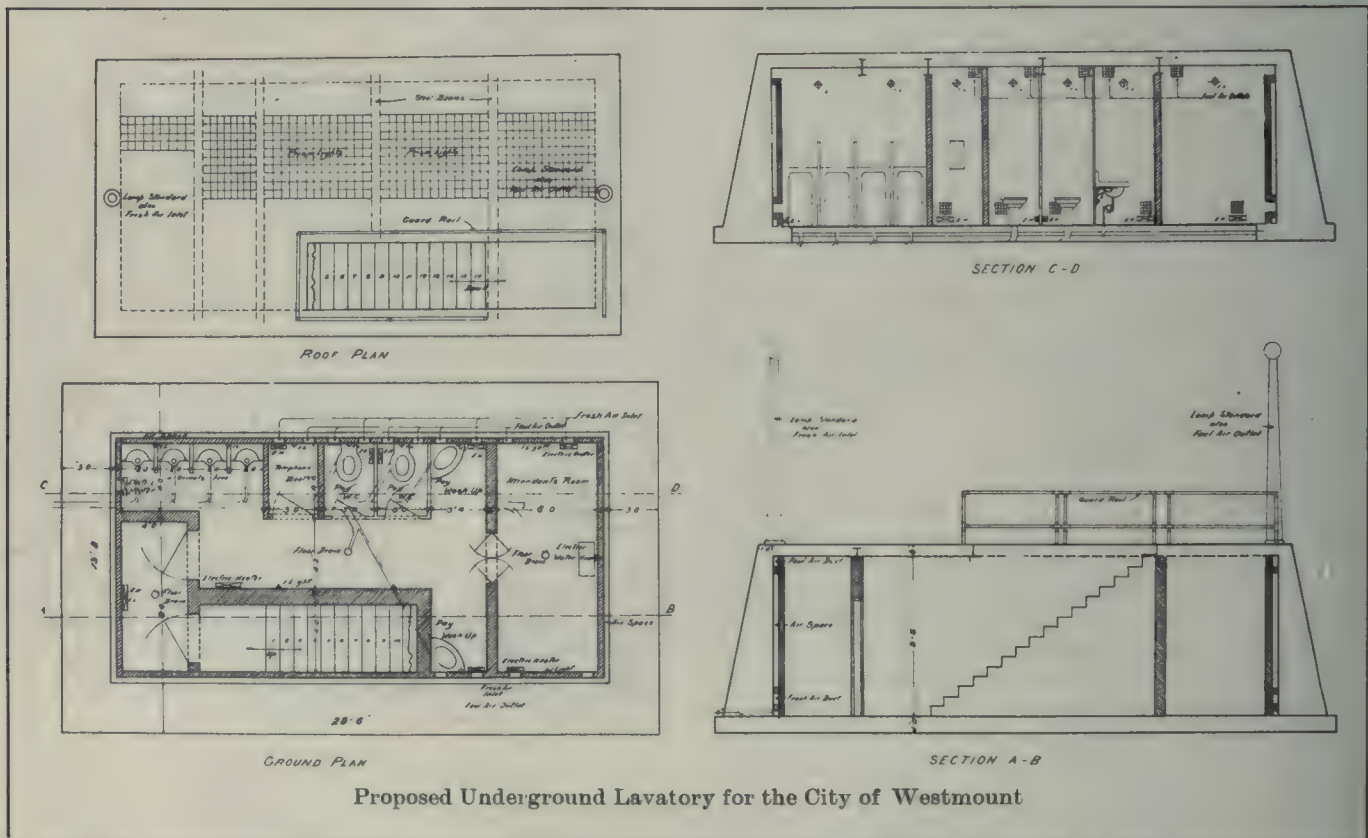
Municipal Improvements at Westmount

Westmount is nothing if it is not progressive. Situated almost in the centre of the city of Montreal, and surrounded on all sides by the commercial metropolis of Canada, this little city which has an area of only about 800 acres has come to be looked upon as a model of civic government and material progress. Determined to be up-to-date, preparations are being made for putting electric wires underground; installing auto-wagons for the fire department, electric light signals for the police, cluster lights for the streets, and constructing underground lavatories in different parts of the city. It is further proposed to have all the lanes of the city paved and to have the garbage receptacles, which, according to law must be air-tight, kept off the lanes and in the premises of the various householders. Before this could become law the proprietors would have to agree to donate the lanes to the city as they are now all private property. There seems to be a growing sentiment in favor of the project for the sake of making the

point, not being suitable for building purposes, it has been decided to erect a fence on the street lines of 2½-in. piping. The fence will be about four feet high. Every fifty feet a post will be erected, or rather a five-foot tube connected to answer the purpose of a lamp post. Electric wires will be threaded into the piping of this fence so that light will be given at 50-foot intervals. Cluster lights will be put in on Rosemount avenue ready for use by October 1st. This style of lighting will be adopted throughout the city next year when it is expected that the wires will be put into underground conduits on Sherbrooke street, St. Catherine street and Western avenue.

A new permanent bridge of reinforced concrete faced with random rubble masonry is to be erected in the park to take the place of the old wooden structure which has done service for many years. It will have an elliptical arch and is likely to be completed this fall.

The greatest improvement, and one that will be another example for Montreal to follow, is the construction



city cleaner and healthier. A few citizens already, to show the feasibility of such a plan have constructed platforms to hold the garbage receptacles just inside a gate or door at the rear of their premises. When the scavenger's wagon passes the men open the door, lift out the receptacle, empty it and return it to its place, causing no litter and leaving nothing offensive behind.

The city council a week or two ago passed a by-law authorizing the opening of Western avenue from Wood avenue to Atwater avenue, a distance of about two blocks. The levels have been taken, the plans are being prepared and the grading will be proceeded with almost immediately. It is expected that the sewer will be laid and the sidewalk put down on one side of the street this fall. The other sidewalk and the paving will be done in the spring.

A novel system of lighting has been devised for a steep portion of Mount Pleasant avenue. The property at this

of underground lavatories. Of these there will be three, situated at convenient points in the city. These will be self supporting it is expected, or nearly so, the source of revenue being shoe shine parlors, slot telephones and the wash room. Each building (or rather basement) will contain a pay telephone, four free urinals, two free closets and two free wash basins, besides the shoe shine parlor and attendant's room. The urinals will be divided by marble partitions and supplied with "Presto" push button flush valves. The telephone booth will be sound proof and the lighting facilities will be arranged so that the booth will be lighted only when occupied. The closets will have door locks operated by a slot device so that the door will open on a five cent piece, or other coin being deposited. The ventilation will be perfect and the lighting arranged so as to be in operation only when the closets are occupied. In two corners of the lavatory wash basins will be pro-

vided with hot and cold water, mirrors, towels, combs, brushes and whisks. A small charge will be collected by the attendant for this service. The construction will be of concrete lined on the inside with glazed brick with an air space between the concrete and the brick. A portion of this space will be used for air ducts. The floor will be of tile on concrete. The interior finish will be such that it can be washed down with the hose and drains under the floors will carry away the dirty water. The roof will be of concrete inset with prism lights. Fresh air will be let in and foul air will escape through ornamental shafts or lamp posts. The heating of the apartment and of hot water will be by electricity so that there will be no smoke fumes. The cost of the lavatories will be between \$5,000 and \$6,000, according to the estimate of Mr. Archibald Currie, the city surveyor, who has designed the structures. One at least of these conveniences is expected to be ready for use this fall.

Building Activity in Victoria, B. C.

As previously reported in these columns, the contract has been let for an addition to the British Parliament buildings at Victoria, to cost \$1,000,000, practically doubling the size of the buildings. The contract was awarded to McDonald & Wilson, of Vancouver. Work is to be commenced immediately and rushed with all possible speed. The building is to be erected of British Columbia stone, same as original structure, and be fully up to all modern improvements. The new wings and addition will be erected south of the present fine structure, and so built as to be in harmony therewith, fronting on Superior street, the Parliament buildings thus occupying an entire block. It is expected that when the building is completed and furnished and the grounds laid out in landscape the total outlay may reach \$1,250,000, and that British Columbia will have the finest Parliament buildings in Canada.

One of the finest buildings recently erected in Victoria is the Sayward Block, corner View and Douglas streets, of reinforced concrete, with brick facing, 6 storeys and basement, 120 by 80 feet, the cost being \$350,000.

The new \$125,000 Westholme hotel has just been completed on Government street, 3 storeys and basement, with 95 feet front, and containing 65 rooms. The Prince George hotel is being erected, fronting 60 feet on Douglas street and 104 feet on Pandora street, costing \$150,000; built of reinforced concrete, with stone and brick facing, containing 150 rooms.

Work has been commenced by the Norton Griffiths Company, of Vancouver, on an 8 storey reinforced concrete building on Government street, to be completed by July, 1912, to cost \$350,000. It will be 79 by 109 by 140 feet, and a thoroughly modern building for stores and offices.

A reinforced concrete building for the Pemberton estate, 6 storeys and basement, costing \$425,000, has been completed on corner Fort and Government streets. It has 12 stores on ground floor, 4 floors are rented for offices, while the entire upper floor is occupied by the Pacific Club. This building fronts on three streets.

The Times newspaper has completed a fine 5-storey and basement office building on opposite corner Fort and Broad streets, thoroughly equipped for newspaper purposes and for offices. It is built of reinforced concrete, with brick facing, and cost \$250,000.

The Young Men's Christian Association Building, 5 storeys and basement, built of brick and costing \$150,000, has just been completed. It occupies a lot 90 by 150 feet, and is fully equipped with all modern accessories.

The Union Bank of Canada has just let contract for new building on Government street, to cost approximately

\$100,000. It will have 6 storeys and basement, occupy 56 ft. by 110, and front on View and Government streets.

Just in rear of above-mentioned building work has commenced on a similar office structure for Elliott, McLean & Shandley, to be of same size and height and cost. It will be situated corner Broad and View streets.

A large skating rink is being erected near the British Columbia Agricultural Association Fair Grounds to be completed by November 1st. The building will be 332 by 144 feet, with an ice surface of 210 by 85 feet. It will have a seating accommodation of 3,600. It will be a high-class rink, similar to those of Boston, Cleveland, New York and Chicago.

The new home of the Union Club, of Victoria, is to occupy the lot 146 by 125 feet on Gordon and Humboldt streets. Loring P. Rixford, of San Francisco, who is the architect, will provide a handsome building of 4 storeys in height, of reinforced concrete with an exterior of brick and terra cotta. The two lower storeys will contain the club-rooms proper, while the two upper storeys will contain 48 rooms for members. The building will be beautifully finished in the interior in hardwood, thoroughly modern in every respect, and will cost \$200,000. The Sound Construction Co., of Seattle, has been awarded the contract.

C. P. R.'s Western Improvements

Messrs. George Ham and W. T. Robson, of the C. P. R., have just returned to Montreal from an inspection trip in Western Canada and report great progress in connection with the company's building operations in that part of the Dominion. Seventy men are at work on the extension of the Banff Hotel. Among other improvements they are putting in large swimming tanks. A hundred men are at work at Lake Louise, where 150 rooms are being added to the Lake Louise Chalet. It is hoped to have the roof on this extension before the snow falls.

Excavation is progressing rapidly for the new C. P. R. hotel at Calgary. Operations are being pushed night and day.

The president of the C. P. R. gave instructions recently to go on with the Empress Hotel at Victoria. It is also stated in Vancouver that the Vancouver Hotel instead of being renovated will be rebuilt, work to commence in the early spring. Workmen are also going ahead as fast as possible with the extension to the Royal Alexandra Hotel at Winnipeg. The Swiss village, consisting of six houses of handsome Swiss Chalet design, erected during the past summer at Golden are now completed and ready for occupation.

The Brandon Construction Company, Limited, Brandon, Man., have just completed an 8-roomed school building for the Brandon school board, at a cost of \$40,000. This building was erected according to the Kahn system of reinforced concrete. Excellent progress was made by the contractors. Excavation was started on May 1st and the building was completed and classes were being held therein on Sept. 1st. Mr. H. A. William was superintendent of construction on this work for the contractors. During the past month the Brandon Construction Company completed the excavation, footings and walls for the new C. P. R. depot, which is to cost \$45,000, and made similar progress on the \$40,000 power house which they are building for the Brandon Insane Asylum. At the time of writing, operations on the depot are held up for want of steel and cut stone. The contractors, however, expect to have the roof on in six weeks' time. The men are working day and night on the power house so as to get the concrete and brick work fin-

ished before the frost sets in. Messrs. A. E. Shether and J. T. Armstrong are superintending the work at the depot and power house respectively.

Personal News and Notes

Mr. Lawrence Russell has succeeded Mr. M. P. Shea as manager of the gasoline engine and motor boat department of the Canadian Fairbanks-Morse Company, Limited, Montreal.

The building permits at Vancouver, B.C., for the first half of September total \$1,173,840. There is every prospect that the aggregate for the month will pass the \$2,000,000 mark.

During the first two weeks of last month, Edmonton, Alta., issued building permits to the value of nearly a quarter of a million dollars, an increase of nearly \$50,000 on the whole of September, 1910.

The Glasgow-Vancouver Engineering Society is the name of a new professional body which is being organized at Vancouver. Mr. F. L. MacPherson, Edmonds P.O., may be addressed for particulars.

J. Haffner, C.E., of the firm of Smith, Kerry & Chase, Vancouver, is in charge of the survey of the Banff-Windermere automobile roadway. His surveyors are now at work laying out the route between Golden and Summit.

The Northern Construction Company will award contracts for approximately 200 miles of construction on the C. N. R. within the next week or so. This will be on the last 400 miles of the line between Hope and Kamloops, B. C.

A new city hall estimated to cost \$1,000,000 is proposed for Edmonton, Alta. It is possible that a by-law will be submitted at the next election. The idea is to raise \$500,000 at present and make provision for an additional wing later.

The municipality of St. Vital is anxious to secure direct communication with the city of Winnipeg, and to that end proposes to construct a double street car track and traffic roadway structure across the Red River, at an estimated cost of \$100,000.

Building activity continues apace at Calgary, where it is expected that the building permits for September will total over \$1,000,000. Among the most recent building projects is the McDougall Block, for Eighth ave.,—a 6-storey structure which will cost \$110,000. A large number of residences ranging in value from \$5,000 to \$15,000 are under construction in the Mount Royal and Elbow Park subdivisions of the city.

Messrs. Peacock Bros., 68 Beaver Hall Hill, Montreal, recently installed a contro-flow condenser, manufactured by Richardson & Westgarth, of Hartlepool, for the Nova Scotia Steel Company at North Sydney, C. B. The same firm has just put in a new G. & J. Weir (Glasgow) million-gallon tandem compound steam service pump for the Saraguay Electric Company at Bordeaux. Also two tandem compound feed pumps for the same company.

The contractors for the excavation work for the new G. T. P. hotel at Winnipeg, Messrs. Rigby & Kellet, have commenced operations, and expect to complete in two months. Their contract includes sheet piling and shoring. Sub-contracts have also been taken in connection with other portions of the work by Mr. G. W. Joclyn, of the Geo. A. Fuller Company, who has opened an office at room 1001 Union Bank Building, Winnipeg.

Among the by-laws which will probably be submitted to the ratepayers of Toronto next January are those for tubes estimated to cost at least \$4,000,000, and the Bloor street viaduct, estimated to cost \$1,500,000. It is possible also that a by-law will be submitted to raise a considerable sum for a sea-wall. No estimates as to the cost of the tube have yet been submitted, but the figure of \$1,250,000 a mile is regarded as somewhere near the mark.

The announcement was made recently that L. B. de Laitte, the French inventor, would proceed at once with the erection of a factory for the manufacture of automatic gas in Vancouver. A plant to cost half a million dollars to manufacture the machinery required is proposed and it is estimated this will give employment to 300 workmen. It is claimed that by the automatic process gas can be produced nearly one-third cheaper than at present and an automatic gas plant can be installed in towns for \$5,000 which would cost \$100,000 for the usual carbonating gas.

It is expected that the engineers appointed by the Dominion Government to report on the most desirable route for the new Welland Canal will soon send in their report. It is stated that they will recommend what is known as the Jordan route, beginning at Morgan's Point, a few miles west of Port Colborne, and ending at Jordan harbor. The new canal will have only two locks, which will be of immense depth. It now takes ten or twelve hours to traverse the canal. With the new channel, the time will be cut in half. The canal will be deep enough to accommodate ocean-going vessels.

The Canadian Hassam Paving Company, Limited, Montreal, have obtained many excellent contracts this season. They have just completed important paving work for Grand Allee and Grenville, Que., and they are now busy on the paving of Beaudry, Chambord and Mary Ann streets, Montreal, and also upon concrete sidewalks at St. Lambert, Que. They have about 50 men at work and a full equipment of rollers and mixers. Messrs. K. A. Richardson and E. H. Whittaker are superintending the construction for the company and excellent progress has been made during the past month under their supervision. Messrs. Chas. Peters and Chas. McCormick are among the most recent additions to the staff of the Canadian Hassam Paving Company.

Obituary

Montreal has lost during the past few days two well-known members of the building trade and the architectural profession. The first of these was Mr. H. R. Ives, who passed away suddenly at the age of 78 years. He was born in Plainville, Conn., and came to Montreal in 1859, where he founded the firm of Ives & Allan, manufacturers of bedsteads, ornamental iron and steel and brass goods. Mr. Allan retired some years ago, when the firm name was changed to H. R. Ives & Company. In 1908 the business was taken over by another company and Mr. Ives became connected with the Canada Foundry Company as their Quebec representative. He was a member of the Canadian Society of Civil Engineers, the Engineers' Club, the St. James Club, the Canadian Club and several other organizations.

Mr. James Wright, architect, died on September 27 in his eightieth year. He was born in Glasgow, and came to Canada at the age of 21 years, settling in Cobourg. Ten years later he came to Montreal, where he has resided ever since, following the profession of an architect and superintending the erection of some of the finest residences, churches and other buildings in the city. He is survived by three sons and four daughters. He was a past-president of the Caledonian Society and a member of the St. Andrew's Society.

Contracts Department

News of Special Interest to Contractors, Engineers, Manufacturers and Dealers in Building Supplies.

Information for insertion in these columns is invited from Architects, Contractors, Engineers, etc.

Waterworks, Sewerage and Roadways

Belleville, Ont.

Tenders were called until October 2 for laying of water mains. Plans, etc., at office of city engineer, J. G. Lindsay.

Fort William, Ont.

Tenders were received by the City Clerk until 5 o'clock, September 29, for the construction of sewers. Plans, etc., at office of John Wilson, city engineer.

Galt, Ont.

A by-law to raise \$10,000 for extension and additions to waterworks system in Galt; a by-law granting the Dominion Cannery Lithographing Plant, Ltd., a bonus of \$30,000 in Simcoe; and a by-law authorizing the issuing of \$3,000 debentures for the purpose of providing a site for the high school.

Guelph, Ont.

The Board of Works have recommended that sewers be laid on Neeve street, Toronto street, Tiffany street and Lemon street.

North Bay, Ont.

Tenders were called until September 30th for construction of about 14,000 ft. of 14-in. wooden pipe line and 2,600 ft. of 12-in., including the placing of necessary valves and hydrants between Main street and reservoir. Corporation to furnish pipe and fittings f.o.b. North Bay. Accepted cheque for five per cent. to accompany tender. Plans, etc., with T. N. Colgan, Commissioner of Works.

Tenders are called until October 18th for construction of a 16-inch steel intake pipe at Trout Lake, approximately 850 feet in length, also a concrete pump well and cast iron pipe connections to pump. Plans, etc., at office of Commissioner of Works, at office of "Canadian Engineer," Toronto, and with the Consulting Engineers. Tenders to be accompanied by accepted cheque for five per cent. of amount of tenders. Construction engineer, the John Galt Engineering Company, Winnipeg, Man. Commissioner of Works, T. N. Colgan.

Sackville, N.B.

Tenders closed on the 27th for the laying of concrete sidewalks, to cost about \$3,000. Engineer in charge, J. Eddington, Moncton.

Swift Current, Sask.

On October 14 the following by-laws will be submitted: \$10,000 for sidewalks; \$44,000, waterworks system; \$10,000, installation of sewerage system.

CONTRACTS AWARDED

Exeter, Ont.

The town of Exeter have awarded the contract for the supply of the pipe for 2,500 feet of new mains to be laid from the town to the G. T. R. to the United

States Cast Iron Pipe Company of Buffalo. Work will be done by day labor.

London, Ont.

Asphalt pavements. City Engineer, G. W. Wright; contractor, Barber Asphalt Paving Co., Land Title Bldg., Philadelphia, Pa., at from \$1.25 to \$2.60 per square yard.

Niagara Falls, Ont.

Concrete walks, to cost \$11,000. Engineer, J. C. Gardner, Niagara Falls; contractor, D. W. Mitchell Construction Co., Niagara Falls South. Work to be done this fall.

Sault-au-Recollet, Que.

Installation of system of sewer purification. F. J. Brousseau, mayor; F. C. Laberge, B.A.Sc., municipal engineer, 30 St. James street, Montreal; Beaulieu & Chagnon, contractors, 1343a Erables street, Montreal.

Vancouver, B.C.

Two road rollers. W. McQueen, clerk; contractor, the Waterous Mfg. Co., \$3,000 each. Other tenderers, Canadian Equipment & Supply Co., \$2,700 each; J. E. W. McFarlane, \$3,350 each; Western Engineering Co., \$3,200 each; Frank Darling Co., \$3,250 each; Dominion Equipment & Supply Co., \$3,965 each.

Railroads, Bridges and Wharves

Cheticamp, N.S.

Surveys have been made for three miles of railway from mines to shipping pier, and equipment is required. Work to be done by day labor. Owner, Dr. Fiset, Eastern Harbor; general manager, Herbert Au Coin; engineer in charge, Mr. Hamilton, Cheticamp.

Grand Forks, B.C.

A petition is being sent to the Minister of Public Works at Ottawa, pointing out the advisability of improving the navigation of the Christine Creek, by the construction of a dam on the Kettle river.

Krout Point, La Have River, N.S.

Tenders are called until October 18th for construction of pile wharf. Plans, etc., at the Department of Public Works, Ottawa, at the offices of the district engineers at Halifax, N.S., and Antigonish, N.S., and on application to local postmaster. Tenders to be accompanied by accepted cheque for ten per cent. of amount of tender. R. C. Desrochers, secretary.

New Harbor, N.S.

Tenders are called until October 17th for construction of an extension to the breakwater at New Harbor, Guysboro Co., N.S. Plans, etc., at the Department of Public Works, Ottawa, at the offices of the district engineers at Antigonish, N.S., and Halifax, and on application to local postmaster. Tenders to be accom-

panied by accepted cheque for ten per cent. of amount of tenders.

Oakville, Ont.

A by-law will be submitted December 29th for the issuing of debentures for erection of a high level bridge and approaches to it across Sixteen Mile Creek.

Port Richmond, N.S.

Tenders are called until October 18th for construction of a wharf at Port Richmond, Richmond Co., N.S. Plans, etc., at the Department of Public Works, Ottawa, at the offices of the district engineers at Sydney, N.S. and Halifax, N.S., and on application to the local postmaster. Tenders to be accompanied by accepted cheque for ten per cent. of amount of tender. R. C. Desrochers, secretary.

Regina, Sask.

The following by-laws will be voted on: \$400,000 for assisting in construction of municipal system of street railway, \$150,000 for the construction of waterworks; \$150,000 for construction and extension of trunk sewer and disposal works.

Tenders were called until October 2nd for the erection of freight shed, 40 x 296 ft. 6 in., brick and mill construction, concrete foundation, steam heating, electric lighting, tar and gravel roofing, structural iron, metallic lath, sheet metal work, fireproof doors and windows, asbestos material, steel beams, iron columns, for Canadian Northern Railway Company, Winnipeg, Man. K. B. Pratt, architect.

South Vancouver, B.C.

The council have authorized the calling of tenders for erection of a bridge on Hanburg ave. Tenders received until October 4th.

Sherbrooke, Que.

The Canadian Wire & Cable Co., Ltd., Montreal, are the contractors for the supply of aluminum cable to be used in the Rock Island Transmission Line of the Sherbrooke Railway & Power Co.

Shediac Island, N.B.

Tenders are called until October 17th for construction of wharf at Shediac Island, Westmoreland Co., N.B. Plans, etc., at the Department of Public Works, Ottawa, and at the offices of district engineers at Chatham, N.B., and St. John, N.B., and on application to local postmaster. Tenders to be accompanied by accepted cheque for ten per cent. of amount of tender. R. S. Desrochers, secretary.

St. Gerard de Magella, Que.

Tenders are called until October 11th for construction of an ice pier at St. Gerard de Magella, in River L'Assomption County. Plans, etc., at the Department of Public Works, Ottawa, and at the office of the district engineer at

Montreal and on application to the postmaster at Vacluse. Tenders to be accompanied by accepted cheque for ten per cent. of amount of tender. R. C. Desrochers, secretary.

Toronto, Ont.

Tenders are called for tube subway and stations. The Board of Control have adopted the specifications for proposed tube railway from Front and Bay streets, Terauley street, etc., to St. Clair ave. Received until November 1. C. H. Rust, engineer. See advertisement in "Tenders and For Sale" department of this issue.

Victoria, B.C.

The Esquimault & Nanaimo Railway will build an extension of 37 miles at once, and tenders for clearing right of way from McBride Jct. to Union Bay are being called. Specifications, etc., at office of divisional engineer, E. & N. Ry., Victoria; superintendent, H. E. Beasley, Victoria. Tenders received by superintendent until October 16th.

RAILROADS AWARDED

Buckingham, Que.

Jas. MacLaren & Co., Buckingham, Que., have awarded the contract to Haney, Quinlan & Robertson, of Montreal, for the erection of a concrete bridge across the Lievre River, above High Falls, about 24 miles from Buckingham. The dam will be 900 feet long and in places 40 feet high. It will be used at first for log driving purposes and later for power development. Work will begin at once. Mr. J. B. McRae, Ottawa, is the engineer.

Montreal, Que.

Foundation has started for erection of shops and engine house to cost \$80,000 (Notre Dame street) for Harbor Commissioners of Montreal, 59 Common street, Montreal. Architect, Marchand & Hoskell, 164 James street, Montreal. General contractor, C. E. Deakin, 11 Sacrament street, Montreal; reinforced concrete, concrete foundation, steam heating, electric lighting, tar and gravel roofing, terra cotta, iron ladder and stairs.

Ottawa, Ont.

Two bridges. Owner, County of Carleton, Court House; county clerk, Chas. McNab; county engineer, R. W. Farley; general contractor, J. LaLonde, Sparks street, Ottawa. Construction of two reinforced concrete bridges, each 20 ft. long, 18 feet wide. Contract awarded September 26th.

St. Bonaventure'd Upton, Que.

Bridge. Owner, Municipality of St. Bonaventure'd Upton, Que. Contractors, N. W. Frechette & Henri Alex. La Baie du Febvre, Que. Steel construction, 183 ft. long, concrete abutments.

Public Buildings, Churches, Schools, etc.

Brantford, Ont.

A by-law will be submitted to the rate-payers for the raising of \$85,000 for enlargement of John H. Stratford Hospital.

Burnaby, B. C.

Tenders will be received by Architect Jas. H. Bowman, Crown Building, Vancouver, for hot air heating in the two-room school being erected here.

Calgary, Alta.

J. C. McNeil, 403 6th ave. west, Calgary, plan the erection of a picture theatre, 2-sty., 25 x 130, terra cotta, concrete foundation, steam heating, electric lighting, gravel roofing. Electrical work and motor required.

Craigflower, B.C.

The Department of Public Works, Victoria, are calling for tenders for erection of a 2-room school-house. Plans, etc., at office of Wm. Campbell, secretary-treasurer, School Board, Royal Oak, B.C., and at the department. Tenders received by Public Works Engineer, J. E. Griffiths, until 12 o'clock, October 4th.

Eganville, Ont.

Tenders are called for erection of a church. Owner, Church Wardens St. John's Church, Eganville; architect, Jno. W. Watts, 45 Bank of Commerce Chrs., Ottawa; stone construction. Tenders are now being received by Thos. G. Boland, Eganville. Date for closing not specified.

Hamilton, Ont.

Tenders are to be called this week for erection of a church to cost \$25,000. (Main street near Ferguson avenue), for First Congregational Church. Secretary of Church, W. J. Atchison, 98 Main st. W., Hamilton. Architect, Stewart McPhie, Bank of Hamilton Building, Hamilton; 1 storey and basement, 140 x 55, brick, stone and steel, stone foundation, hot air heating, electric and gas lighting, steel roofing, hardwood finish, cement, cut stone, brick tile, metallic lath, structural iron, sheet metal work, electric bells, iron columns, plastic relief work, art glass.

Invernes, N. S.

Work has commenced on a \$5,000 school being erected on McIsaac street, 40 x 65, frame construction, cement foundation, hot water heating, shingle roofing.

School to cost \$3,000; 2 storeys, 39 x 45, frame construction, cement foundation, hot water heating. The town is waiting for their bonds to be sold before starting operations. They will be issued shortly.

Work is in progress on the erection of a town hall, to cost \$8,000, on Central avenue. Architect, J. B. Henderson, Invernes; 3 storey, 45 x 90, frame construction, cement foundation, hot water heating, shingle roofing. Office fittings and fixtures, also new fire apparatus required.

Kingsville, Ont.

Plans are being prepared for the erection of a public library to cost \$8,000. Architects, Crane & Pennington, Windsor, 1-sty. and basement, 40 x 40, brick and stone, hot water heating, electric lighting, tar and gravel roofing, oak finish.

London, Ont.

The board of education are having plans prepared for a new school in the southeastern part of the city.

Nelson, B. C.

Plans are being prepared for a hospital to cost \$80,000. \$15,000 will probably be contributed by city, a grant of \$40,000 by provincial government, leaving \$25,000 to be raised by the citizens.

Ottawa, Ont.

Tenders called until Oct. 4th for a church. Owner, Roman Catholic Diocese. Architect, A. LeB. Weeks, Canada Life Building, Ottawa. 62 x 120, solid brick, concrete foundation, steam heating, electric lighting, metal roofing, hardwood finish, cement work, electrical work.

Quebec, Que.

Tenders addressed to the secretary R. C. Desrochers, will be received by the Department of Public Works, Ottawa, until October 17th for the construction of a reception building in Park Savard.

Regina, Sask.

Plans will be prepared at once and work will be commenced early in the spring on the erection of a ladies' college to cost \$200,000. Building to provide accommodation for domestic science, music and fine art departments.

St. Pierre, Que.

Tenders are called for the erection of a school house. Plans, etc., at office of architect, Dalbe Viau, 76 Gabriel street, Montreal. Received by Rev. J. B. Desrosiers, curate.

South Vancouver, B.C.

Plans have been prepared by G. A. Horel, 25th and Main street for a Methodist Church at the corner of 4th and St. Paul street, and tenders are now being called.

Transcona, B. C.

Contemplated church on Victoria st. Owner, Roman Catholic Church. Priest in charge, Rev. Father Lee; 80 ft. in depth x 30 ft. wide. Work will commence at once.

Victoria, B. C.

Tenders are called until Oct. 18 for erection of a high school building on grounds at the corner of Fernwood rd. and Grant street. Tenders to be accompanied by accepted cheque for 5 per cent. of amount. Plans, etc., at office of architect. Separate tenders will be received on heating and electrical work. Owner, Board of Trustees; architect, C. Elwood, Rooms 1 and 2, Green Block, Victoria.

Winnipeg, Man.

The congregation of the Norwood Presbyterian Church are contemplating the erection of an addition to their present building.

Welland, Ont.

S. L. Lambert is planning the erection of a new rink to cost \$4,000. Work will be commenced as soon as suitable site can be obtained.

CONTRACTS AWARDED

Carson, B. C.

The general contract for the new school has been awarded to Messrs. Allen & Norris, Grand Forks, for \$2,762.50. Work will commence at once.

Hull, Que.

Fire stations to cost \$22,000. City clerk, F. D. Boulton; architect, C. Brodeur, Main street, Hull; general contractor, A. Bourke, Hull. Solid brick and metal roof. Contract awarded Sept. 25th.

Medicine Hat, Alta.

Church to cost \$75,000 on Fifth avenue. Owner, Methodist Church, H. F. Forester, secretary; architect, W. T.

Williams, Medicine Hat; contractor, Andrew Forester, Medicine Hat; 80 x 120, brick and cut stone, concrete foundation, steam heating, electric lighting, shingle roofing, ventilating system.

Montreal, Que.

Club House on St. Denis street. Owner, French Canadian Artizans of Montreal. Architect, A. Verne, 15 St. Lawrence Blvd., Montreal; contractor for interior finish, Alfred Pion, 338 Marquette street, Montreal. Stone construction, hardwood finish, telephones, fire escapes electrical work, passenger elevator. Work to be completed about New Years, 1912.

North Battleford, Sask.

Work has commenced on the erection of an asylum to cost \$460,000. Owner, Saskatchewan Provincial Government; architects, Storey & Van Egmond, Regina, Sask. Contractors, Saskatchewan

Construction Co., Regina.

The contract for the erection of the church on King street has been awarded to Gillet & Warwick, N. Battleford, building to be 1-sty., 50 x 30, frame, concrete foundation, hot air heating, electric lighting, shingle roofing.

Point Grey, B. C.

The contract for the erection of the convent for the Sisters of the Sacred Heart has been awarded to S. J. Lund, Empire Building, Vancouver, who will be calling for tenders for sub-contracts in about a week.

Vancouver, B. C.

School (King Edward). Architect, N. A. Leach, Vancouver; general contractor, The Norton Griffiths Steel Construction Co., Ltd., Dom. Trust Bldg., Vancouver, \$125,665. Other tenderers, Smith & Sherborne, 615 Hastings W., \$127,979; Baynes & Horie, 615 Hastings W., 131,000; D. Matheson, 131,595; M. P. Cotton & Co., Ltd., 198 Hastings, \$189,500. Tenders for heating will be called in about two months time.

Welland, Ont.

The contract for the addition to the moving picture theatre has been awarded to A. E. Mason, Welland, 2 storey, 120 x 86, frame construction, stone foundation, electric lighting, hardwood finish.

Residences

Bridgeburg, Ont.

William Cosh will erect a 2½-storey brick residence on the south side of Gilmore Road to cost \$3,500.

Hamilton, Ont.

Plans are being prepared for the erection of a residence, \$4,000, for Hamilton Jockey Club, Court House Building, Hamilton; 2 storey, 40 x 60, stucco construction, stone foundation, electric lighting, shingle roofing, interior finish ash, cement work, electric work, electric bells. Office furniture and safe wanted.

Tenders were called until Sept. 30 for a residence to cost \$15,000 for Hugh Brennan, 394 Main street E., Hamilton. Architect, Mills & Hutton, Bank of Hamilton Building, Hamilton; 2½ storeys, 50 x 50, stone, brick and steel, stone foundation, steam heating, electric and gas lighting, shingle roofing, hardwood finish, cement, cut stone, tile, mantels,

structural and ornamental iron, artificial stone, metallic lath, weather strips, sheet metal work, shingle stain, electric work, roofing, sheathing and deafening paper, plate and art glass.

Kitsilano, B. C.

Plans are being prepared for erection of an apartment house on 4th avenue and Stevens street. Architect, Andrew Dewar, 84 Lonsdale avenue, North Vancouver. Building to be 3 storey, brick and frame, hot water heating, marble tile, tar and gravel roofing, hardwood finish.

Midland, Ont.

Plans have been prepared for erection of a residence to cost \$4,000 for G. E. Grise, Midland. Architects, G. W. Gouinlock, Temple Building, Toronto. 2 storey, brick and frame building. Tenders will be called by owner.

Montreal, Que.

Work has commenced for erection of two flats for J. L. Tessier, 54½ Rivard street, Montreal; 2 storeys, 25 x 40, wood construction, cement foundation, gravel roofing.

Excavation has started on the erection of two flats, to cost \$2,000, for Leon Lefond, Rosemond Blvd., Montreal; 2 storeys, 32 x 66, brick, stone foundation, gravel roofing.

Work is in progress for two flats to cost \$3,000, for Henry Gougeon, 1122 St. Lawrence street, Montreal; 2 storeys, 25 x 36, brick and stone, stone foundation, gravel roofing.

Work has commenced on the erection of nine flats to cost \$5,000 for Jos. Martel, 1220 Messier street, Montreal; 3 storeys, 50 x 57, pressed brick and wood, electric lighting, tar roofing.

The foundation has been started on three flats to cost \$3,000, Forsythe street for Jos. Harel, 207 Montgomery street, Montreal; 3 storeys, 25 x 38, brick, stone foundation, gravel roofing.

Work has started on the erection of two flats on Christophe Colomb for Alphonse Provost, 856 Huntley street, Montreal, 2-sty., 25x40, brick, concrete foundation, gas, gravel roofing.

Work is under way for erection of 2 semi-detached residences to cost \$11,000, for J. B. Scott, 463 Lansdowne ave. West Montreal; 2 storeys, concrete and brick, etc., lighting, hot air heating.

Work is in progress for erection of a residence to cost \$5,000, for E. Lieberts, 1209 St. Viateur street, Montreal; 2 storeys, 30 x 40, solid brick, hot air heating, electric lighting, gravel roofing.

J. A. Joley, 167 Guy street, will build six dwellings on Mance street; stone and brick, metal roofing, iron stairs, hardwood finish, hot water heating, electric lighting. Work will commence at once. Cost \$9,000.

Work is in progress for erection of two flats to cost \$2,500 on Sanguinet street, for Telesphore Robert, 534 Sanguinet street, Montreal; 2 storeys, 20 x 59, pressed brick, stone foundation, gas, gravel roofing.

Work is under way on erection of six flats to cost \$6,000, for T. Hogue, 3122 St. Lawrence street, Montreal, to be 2 storeys, 75 by 25, brick and wood, concrete foundation, stove heating, gravel roofing.

Work will be commenced shortly on

the erection of nine flats to cost \$7,000, for Joseph Tremblay, 235 Jeanne d'Arc street; 3 storeys, 50 x 40, pressed brick, cement foundation, stove heating, gravel roofing required.

Work on excavation has started for erection of four flats on Labelle street for Jos. Martin, 1288 St. Lawrence st., Montreal; general contractor, E. Genereaux, 628 Chambford street, Montreal; 2 storeys, 45 x 50, brick and wood, stone foundation, stove heating, gravel roofing.

Work is in progress for erection of six flats to cost \$9,000, on Ottawa street, for Thos. O'Connell, 183 Ottawa street. Architect, A. Piche, 52 Victoria Square, Montreal; masonry and carpentry contractor, Heffernan & Beck, 745 St. Catherine street W., Montreal; 3 storey, 52 x 55, pressed brick. Foundations started. Painting, glazing, roofing and plastering not yet awarded.

Excavation is under way for twenty-four apartments to cost \$45,000, for Alex. MacKay, 523 Argyle avenue, Montreal; architect, James E. Adamson, Molson's Bank Building, Montreal; 50 x 170, fire-proof building, brick and concrete, stone foundation, hot water heating, electric and gas lighting, gravel roofing, fire escapes, galvanized iron, dumb waiter. Building will be commenced shortly.

Ottawa, Ont.

Tenders are called for erection of residence, 3 storeys, 24 x 54, solid brick, stone foundation, electric lighting, shingle roofing, cement work, brick, mantels, electrical work, shingle stain. Date for closing not yet decided.

Outremont, Que.

Excavation has started on erection of two semi-detached dwellings, for L. Letourneau, 2351 Waverly street, Montreal; 2 storeys, 23 x 36, brick and wood, concrete foundation.

Work on foundations has commenced for two flats to cost \$3,000 on Durocher street, for F. J. F. Pick, 2308 Waverly street, Outremont; 2 storeys, 25 x 40, brick and plank, concrete foundation, stove heating, electric lighting, gravel roofing.

Port Arthur, Ont.

Residence to cost \$6,500 for W. B. Russell, Port Arthur; architect, W. F. Crouch, Port Arthur; 2½ storeys, brick veneer, stone and concrete foundation, hot water heating, electric lighting, B.C. shingle roofing. The contract is likely to be awarded to W. F. Crouch in the course of a few days.

St. John's, Que.

Owner—Manager, Cluett & Peabody Co. plan to erect a new residence, stone and brick, hot water heating, electric lighting, metal roof, hardwood finish. Cost, \$6,500.

Toronto, Ont.

Tenders will be called shortly for erection of a residence to cost \$9,500, (St. Andrews Garden), for S. J. Sharp, 19 Adelaide street E., Toronto; 3 storeys, brick and stone.

Excavation started to-day for two residences to cost \$5,600, on Manning avenue, for S. J. Sharp; architect, J. Hunt Stanford, Yonge street arcade, Toronto; 2 storeys, solid brick.

Plans have been prepared for the erection of a residence to cost \$3,000, for L.V.

Russell, 1084 College street, Toronto; architect, J. W. Cowan, 65 Adelaide st., Toronto; brick construction. Owner will call for tenders shortly.

Tenders are called for erection of a residence, cost \$3,800, for J. E. Wainwright, 18 Beatrice street, Toronto; architect, J. Hunt Stanford Yonge Street Arcade. Two-sty., brick and roughcast construction, hot air heating, shingle roofing. Tenders received by owner. No date specified for closing.

Tenders called until Oct. 2nd for addition to caretaker's cottage, Harbord Collegiate Institute, heating and ventilation and heat regulation, Essex street school. Plumbing work, Annette St. school, sheds and fences, Boustead ave. school. Plans, etc., at office of Supt. of Buildings, City Hall. Tenders to be accompanied by accepted cheque for 5 per cent. of amount of tenders. Owner, Bd. of Education; chairman, W. W. Hodgson; secretary-treasurer, W. C. Wilkinson.

Vancouver, B. C.

V. W. Jones will build a residence, 2-storey, stone, shingle roofing, hot water heating, native granite, art glass. Architect, N. A. Kearns, 127 Lonsdale avenue. Cost \$5,500.

Plans are being prepared for an apartment house to cost \$115,000, (Haro and Denman streets), for H. M. Cuttingham, Seattle; architects, Quandt & Cruetzer, Haight Building, Seattle; 6 storeys and basement, 66 x 132, brick and stone, steam heating, marble, tile, terra cotta, tar and gravel roofing, ornamental iron. Construction will start the first of January.

Windsor, Ont.

Plans are being prepared for a 2-sty. residence, 32 x 28, brick construction, brick foundation, hot water heating, electric lighting, shingle roofing, oak and Georgia pine finish, for Miss Ferrari, Campbell ave., Windsor. Cost, \$4,500.

Westmount, Que.

A residence to cost \$7,000 will be erected on Grosvenor street, for T. S. Hudson & Co., (Contractors), B. 12 Bd. of Trade; 3 storeys, 25 x 35, hot air heating, slate roofing. The concrete foundation is being put in.

Excavation has been started for the erection of a residence to cost \$10,000, for H. H. Judah, 952 Dorchester street, Montreal. Architect, H. A. Adams, 9 Oxenden avenue, Montreal; 2 storeys, 30 x 48, brick, stone foundation, hot water heating, elec. lighting, slate roofing, hardwood finish.

CONTRACTS AWARDED

Bridgeburg, Ont.

Two residences on Dufferin street, cost \$6,000, for W. E. Miller, Buffalo, N.Y.; general contractor, Oscaic Teal, Bridgeburg. 2½-sty., frame construction, concrete foundation, hot air heating, gas lighting, shingle roofing, hardwood finish. Work will commence at once.

Work is in progress for erection of a residence to cost \$4,000 on Phipp street. Owner, Charles Glenney, Bridgeburg. General contractor, J. W. Barnhart, Bridgeburg; 2½ storeys, brick construction, concrete foundation, hot air heating, gas lighting, shingle roofing, hardwood finish.

Calgary, Alta.

Excavation work is completed for apartments, cost \$9,000, 15th ave., for E. N. Butler, 924 15th ave west, Calgary; general contractor, F. Costin, Mt. Pleasant, Calgary. 3-sty., 41 x 52, brick, concrete foundation, steam heating, electric lighting, shingle roofing, electric work, telephone. Work being done by day labor.

Hamilton, Ont.

Residence, on Mt. Royal ave., cost \$4,000, for W. Howell, 126 Markland st., Hamilton; general contractor, W. H. Northcott, 28 Mt. Royal ave. Excavating and masonry, Rudolph Bros; heating and plumbing, J. N. Lexon, 607 Barton street east, Hamilton; 2½-sty., 34 x 27, brick, stone foundation, hot water heating, electric and gas light, shingle roofing, hardwood finish. Contract awarded September 28th.

London, Ont.

J. G. Noyes will build a 2-sty. brick house, stone foundation. J. Partridge has the contract for electric lighting and heating, and J. Hutkins for the brick work. Cost \$3,200.

Maisonneuve, Que.

Moise Lortie, 359 Bourbonniere street, will build five flats, 3-sty., 25 x 35, pressed brick, cement foundation, stove heating, gravel roofing. Excavation has started; cost \$4,500.

Four flats to cost \$5,000, for Louis Messier, 14 St. Alexsis street, Montreal; 3 storeys, 26 x 40, stone, cement foundation, stove heating, gravel roofing. Work will commence in a short time.

Six flats to cost \$9,500 for Mrs. Germaine Beaudoin, 180 Adam street, Maisonneuve, general contractor, Wilfrid Tardif, 91 Adam street, Maisonneuve, Que. 3 storeys, 54 x 32, stone front, concrete foundation, stove heating, gravel roofing. Work will commence shortly.

Montreal, Que.

Magloire Blain, 609 Frontenac street, will build four flats, 3-sty., 25 x 38, brick and wood, concrete foundation, gas and electric lighting, gravel roofing. Excavation is under way; cost \$3,500.

Six flats to cost \$6,500 on Green ave. Owner, N. Guy, 1599 Notre Dame West, Montreal. General contractor, H. Anbertin, 76 Fourth avenue, Vianville; 3 storeys, 40 x 45, pressed brick, gravel roof. Work has not commenced yet.

Work has started on alterations to residence to cost \$3,000, for Fleischmann & Co., 523 St. James street, Montreal. General contractor, R. Neville, 26 Latour street, Montreal. 3 storeys, 30 x 40, brick roofing, stone foundation, slate and gravel roofing.

Work in progress for five flats, cost \$5,000, on Workman street, for Alphonse Piche, 52 Victoria Square, Montreal. General contractor, Henry Martin, 438 St. Antoine street, Montreal; 3-sty., 30 x 44, brick and wood, cement foundation, gas, gravel roofing.

Excavation is under way for the erection of six flats to cost \$6,000 for C. Lariviere, 242 Manufacturers street, Montreal. General contractor, V. St. Andre, 1305 Notre Dame W., Montreal; 3 storeys, 48 x 39, brick and stone, gravel roof, gas lighting.

Six flats on Esplanade, cost \$12,000, for Mrs. A. Goyette, 131 Laurier street, Montreal; general contractor, A. Marchessault, 207 Desjardins street, Mont-

real. Three storeys, 50 x 68, brick, cement foundation, hot water heating, gas and electric lighting, gravel roofing.

Work has commenced on the alterations to four cottages at 96 St. Norbert street, to change them into 8 flats, 2 storeys, 110 x 36, brick, stone foundation, gravel roofing. Owner, Mrs. P. Hutchinson, 840 Lorne Crescent; contractor, J. A. Sequin, 260 St. James street.

Work on foundation has started for two flats, on St. Denis street, cost \$2,500, for Standard Chemical Iron and Lumber Co. of Canada, Ltd., 1559 Sanguinet street, Montreal. Two-sty., 22 x 37, brick veneer and 3-in. plank, concrete foundation, stove heating, gas, tar and gravel roofing.

The contracts for the residence being erected by H. W. Glassford have been awarded as follows: Masonry and excavation, Gray & Wighton, 244 Pine avenue; plastering, Williams & Wilson, 320 St. James street; electrical work, Geo. A. Deguire & Co., 391 Bleury st.; carpentry, T. S. Hudson & Co., B12 Bd. of Trade Building; roofing, Campbell, Gilday Co., Ltd., 663 St. Paul street; iron work, Structural Steel Co., Ltd., Longue Point, all of Montreal. Cost, \$16,000.

Ottawa, Ont.

Residence to cost \$150,000, for the Grey Nuns, Ottawa. Architect, Chas. Brodeur, Hull, Que. General contractor, Alfred Pion, 338 Marquette street, Montreal. 5 storeys, stone and brick, concrete foundation, electric lighting, fireproof. Excavation just begun, work to be finished by January, 1913. Painting, glazing, plumbing and heating contract not yet awarded.

Outremont, Que.

Nine flats. Owner, M. C. Laberge, 779 St. Denis street, Montreal. General contractor, 1210A Dufferin street, Montreal; 3 storeys, 50 x 40, brick, stone foundation, gravel roofing, gas. Work on excavation started.

Toronto, Ont.

Work is in progress for erection of a residence to cost \$6,000, for T. H. Smith, 886 Dufferin street, Toronto; general contractor, Rumney Smith & Co., 886 Dufferin street, Toronto; 2 storeys, brick construction, concrete foundation. Excavation completed. Plastering, heating and plumbing contracts not yet awarded.

Westmount, Que.

Work will commence shortly on a 2-sty. residence for G. O. St. Marie, 13 Ingleside ave., 55 x 38, stone and brick, hot water heating, electric lighting, gravel roofing. Cost \$4,500.

Business Buildings and Industrial Plants

Arnprior, Ont.

An offer to build a flour mill, with a capacity of 240 bbls. per 24 hours, has been received by the town council from Thos. A. Low, president of Renfrew Roller Mills, if said council will give exemption from taxation for fifteen yrs. A by-law will be submitted shortly.

Brandon, Man.

The Brandon Steam Laundry will build an addition to the laundry; steel

and concrete, electric lighting, cement work, fireproofing, reinforced concrete, fire escapes, fireproof door and windows, electric work. Plans prepared by W. A. Elliott, architect.

Calgary, Alta.

The St. Catharines Broom and Brush Company is contemplating the establishment of a factory in Calgary.

Cheticamp, N. S.

A warehouse will be erected on Main street, 2 storey, 50 x 120, frame, concrete foundation, shingle roofing, for Dr. Fiset, Eastern Harbour. Managing director of company, Herber Au Coin; architect, Mr. Hamilton, Cheticamp, N. S.

Edmonton, Alta.

Rice street market square has been chosen as a site for the new City Hall. Committee have been instructed to engage an architect to prepare plans.

Hamilton, Ont.

Plans are considered for erection of a business building to cost \$8,000. City engineer, A. F. Macallum; galvanized iron, steel and frame building on dock. Will probably be built in spring.

Tenders were called until October 4 for erection of a warehouse for R. Watkins, 252 Park street south, Hamilton. Architect, A. W. Peene, cor. King & James streets, Hamilton. Four storeys and basement, 56 x 78, steel and brick, stone foundation, electric and gas lighting, tar and gravel roofing, cement work, cut stone, fireproofing, structural iron, cornice, electric work, steel beams, iron columns.

Lindsay, Ont.

The Ohio Automobile Co. have under consideration the erection of a plant for assembling automobiles. Representative, Mr. Schafer. Committee in charge, W. Flavelle, Sutcliffe, Mr. Carlyle, Goodyear Tire Co., and others.

Listowel, Ont.

A by-law will be submitted to the ratepayers to authorize a loan of \$35,000 for the establishment of a manufacturing industry.

Medicine Hat, Alta.

E. W. Davies, Calgary, has under consideration the erection of a nail factory here.

Harry Tuill & W. H. Martin, both of Medicine Hat, are carrying on negotiations which have been taken up with the city regarding the establishment of an industry for the manufacture of gas well drilling machinery and heavy forgings. Estimated cost, buildings—\$15,000; machinery—\$50,000.

Montreal, Que.

Excavation has started for erection of a printing office on Notre Dame W., for Wm. Rutherford & Sons Co., 425 Atwater avenue, Montreal; 2 storeys, 20 x 24, brick encased, cement foundation, gravel roofing.

Excavation work commenced on store and five dwellings to cost \$7,500, on Duquette street, for Edmund Mitchell, 147 Valois street, Montreal; 3 storeys, 48 x 55, pressed brick, cement foundation, gravel roofing.

Work is in progress for erection of five dwellings and store, \$8,000, on Laurier street. Owner, Jos. St. Armand, 1975 St. Lawrence Blvd., Montreal; 3

storeys, 50 x 60, pressed brick and wood, stone foundation, hot water heating, gas and electric lighting, gravel roofing.

J. A. Gionette & Co., 160 Pie IX St., will build four stores and eight dwellings, \$18,000. Architect, C. A. Reeves, 58 St. James street, Montreal; 3 storeys, 76 x 74, brick construction, hot water heating, electric and gas lighting, gravel roofing. Work will commence shortly.

J. Desautels, 1829 Dufferin street, will build an addition of a storey and encase the whole of his building in brick, 25 x 36, brick, cement foundations, gravel roofing. Contractor, E. D. Ladouceur, 2735 St. Herbert street.

North Battleford, Sask.

Following buildings are contemplated—New warehouse for International Harvester Co. of America, Railway ave.; new warehouse for Imperial Oil Co., Railway ave.; new hotel on King street.

North Vancouver, B. C.

The Wallace Shipyards Co. have taken out a permit for building extensions to machine shop, frame and galvanized iron.

Ottawa, Ont.

Tenders are called for erection of a warehouse for Robertson Bros. Toronto. (Wholesale confectioners). 2 storeys, 53 x 97, solid brick, concrete foundation, electric lighting, tar and gravel roofing, cement work, brick, electric work, steel beams. Architect, W. E. Noffke, Central Chambers, Ottawa.

Petrolia, Ont.

Tenders will be received by the town clerk, Petrolia, for the sale of the following debentures: \$5,792, canning factory site; \$16,296.68, local improvements, until 5 p.m., October 16th.

Quebec, Que.

Tenders will be called shortly for a reinforced business building, stone and brick, asbestos roofing, to be erected on the Quebec docks, at an estimated cost of \$500,000.

St. Romauld, Que.

The Automatic Wood Turning Co. are preparing plans and specifications to about double their plant.

Toronto, Ont.

Tenders are now being received for the sale of the Y. M. C. A. property, corner of Yonge and McGill streets. It is reported that a large modern hotel will be erected on the site.

Excavation is completed for store and dwelling to cost \$6,000, on Roncesvalles avenue, for A. Grassi, 288 Bathurst st., Toronto. Building will be commenced in a few days.

Tenders are called for erection of a warehouse on Front street, for George J. Foy, Ltd., 3 Front street E., Toronto. Architects, Curry & Sparling, 90 Yonge street Toronto; 5 storeys, 200 x 60, mill construction, metal windows.

Transcona, Man.

Plans, etc., are being prepared for a block to be erected at the corner of Oxford and Regent streets. W. J. Christie & Co., Union Bank building, Winnipeg, negotiated the sale of site.

Vancouver, B. C.

A site has been purchased for a factory for the manufacturing of patented iron and brass beds. Local manager,

Wm. Foreund, Dominion Trust Building, Hastings street.

Welland, Ont.

Canada Steel Foundries, Ltd., Welland, are contemplating extensive additions to their plant.

The John Deere Plow Co., Moline, Ill., has decided to erect plant here; estimated cost \$1,000,000.

Winnipeg, Man.

The McLaughlin Carriage Co., 278 Maryland street, are contemplating making extensive alterations to their garage.

Plans are now being prepared in Chicago for the erection of a creamery plant to cost \$250,000, on Burnell street, for the Crescent Creamery Co., Lombard street, Winnipeg. President of company, R. A. Rogers.

CONTRACTS AWARDED

Fort William, Ont.

Addition to hotel for James, McCranor, Fort William, Ont. Architect, Carl Wirth, Fort William. General contractor, R. E. Wright, Fort William. Awarded Sept. 22nd. Heating and plumbing contract not yet awarded.

Halifax, N. S.

Factory building. Owner, Moir's Ltd. Argyle street, Halifax. Architect, Dumaresque & Cobb, St. Paul Building; general contractor, Byers & Anglin, 65 Victoria square, Montreal; 8 storeys, 68 x 95, reinforced concrete, concrete foundation, steam heating, electric lighting, roofing—concrete covered with tar, felt and gravel, telephones, electric work, boilers, 1 freight elevator. Building to be completed February 1, 1912.

London, Ont.

The contract for the erection of the warehouse for the Ontario Spring Beds Co. have been awarded as follows: Carpentry, Wm. Hayman; brick work, Jas. Moran.

Medicine Hat, Alta.

Pool room, bowling alley, etc., for Victor Ready & Wm. Finlay, Medicine Hat. Architect, Wm. Williams, Medicine Hat; general contractors, Fulton & Worthy, Medicine Hat; 2 storeys, 50 x 130, hollow tile and brick, concrete foundation, gas and electric lighting, gravel roofing, tile entrance. Pool room, bowling alley, cigar store and moving picture theatre equipment required.

North Bay, Ont.

Store, cost \$17,000, for Cochrane Hardware Ltd., North Bay; architects, H. W. Angus, North Bay; contractor, Hughes & Co., North Bay; 2-sty. and basement, 36 x 132, solid brick, stone foundation, steam heating, electric lighting, felt and gravel roofing, hardwood finish, freight elevator. Contract awarded September 26th.

Ottawa, Ont.

Business building to cost \$60,000, for Hiram Robinson, 150 MacLaren street, Ottawa. Architect, Jas. Mather, Wellington street, Ottawa; heating and plumbing contractor, McKinley & Northwood, 56-58 Rideau street, Ottawa. Contract was awarded Sept. 22nd.

Port Arthur, Ont.

Match factory on Norah avenue, for J. B. McArthur, Port Arthur. Architect, J. Antonisen, Port Arthur, Ont.; general contractor, Geo. Otto, Port Ar-

(Continued on page 64)

Tenders and For Sale Department

Are You On ?

If not, get on our mailing list and be one of the 14,000 who receive SHAW'S BOOKLET as issued. The September number is now ready for mailing. Contains 44 pages of attractive offerings in released machinery and contractors' plant. Gives price, make, size, capacity, condition, etc. It's worth having. It's free. Send for it.

WILLIS SHAW MACHINERY CO.,
39 South LaSalle Street,
Chicago, Ill.

CITY OF LETHBRIDGE ALBERTA, CANADA

Extensions to Power Station

Sealed tenders marked "Tender for Power Station," will be received by G. W. Robinson, secretary-treasurer of the city of Lethbridge, up to and including Friday, November 24th, 1911, for the supply, delivery, and erection, of the following equipment for the Power Station Extension:—

Section B.—Boilers and accessories.

Section C.—Mechanical draft and economizer.

Section D.—Steam turbo-generator set and condensing equipment.

Section E.—Steam engine driven exciter.

Section G.—Sub-station equipment.

Plans and specifications can be obtained from Arthur Reid, superintendent engineer, City of Lethbridge.

An accepted cheque for ten per cent. of the amount of the tender must accompany each bid. The lowest or any tender not necessarily accepted.

G. W. ROBINSON, Sec.-Treas.,
Lethbridge, Alta.

39-40

Architects Attention

The Windsor Board of Education offers a first prize of \$500 and a second prize of \$250 for competition by architects for plans for a twelve-room school to be erected in the City of Windsor. Complete working drawings and specifications unsigned to be forwarded to the Secretary of the Board on or before the 15th of November next. Cost of building not to exceed \$40,000 complete, exclusive of drawings.

The plans accepted to be the property of the Board, and in the event of the successful architect being employed the Five Hundred Dollars will be part of his fees. Rejected plans will be returned.

Architects tendering will mark the plan with some designation and mark same on sealed envelope enclosing name and address of the party competing.

Description of Building

Two storeys and basement, brick building with stone foundation, roofed with wooden shingles, hardwood finish, hard plaster, steam heating, modern system of ventilation, first-class sanitary arrangements, no artificial lighting.

Plans to conform to the regulations of the Education Department.

ALEX. BLACK,

Secretary-Treasurer.

40-41

Tenders for Sidewalks

PORT COLBOURNE

Sealed tenders for the construction of approximately one and three-quarter miles of cement concrete sidewalks in the Village of Port Colborne, will be received up to 12 o'clock noon, October 7th, 1911.

Plans and specifications may be seen at the office of the Village Clerk.

The lowest or any tender not necessarily accepted.

JOHN COOK, Reeve.

FRANK D. NOBLE Mun. Clerk.

Port Colborne, Ont.

September 20th, 1911.

39-40

Town of Vermilion ELECTRIC LIGHT PLANT

Sealed tenders will be received up till noon of October 16th, 1911, by C. V. Caesar, Secretary-treasurer, Vermilion, Alta., for the delivery and erection of the following work covered by:—

Section "A" Steam boiler, feed pumps and heater, etc.

Section "B" Steam engine.

Section "C" Electric generator and switch-gear.

Plans and specifications can be obtained from the secretary-treasurer, Vermilion, or from the engineers, 34 Victoria street, Toronto, or the offices of the Contract Record, B34 Board of Trade Building, Montreal, or Commercial Traveller's Building, Winnipeg.

Secretary-treasurer,

C. V. Caesar, Bowring & Logan,
Vermilion, Alta. 34 Victoria St., Toronto.

40-40

TENDERS WANTED

Steel Intake Pipe

Sealed proposals for a 60-in. steel intake pipe, approximately 500 feet long, of ½-in. riveted steel plates. Together with a Concrete Screen Wall, approximately 18 ft. x 30 ft., with appurtenances, for the City of Windsor, Ont., addressed to the Secretary of the Water Commissioners, Windsor, Ont., and endorsed, "Proposals for Intake Pipe and Screen Wall for Windsor Waterworks," will be received at the office of the Water Commissioners of the City of Windsor, Ont., until 12 o'clock noon, Thursday, October 12, 1911.

Proposals shall be made in accordance with the specifications and requirements on file in the office of the Water Commissioners.

Each proposal shall be accompanied by a certified cheque equal to ten per cent. of the amount of tender as surety for the acceptance of the contract payable on its face to the Water Commissioners of the City of Windsor, Ont.

The accepted contractor will be required to furnish an approved guaranty or surety bond in the sum of fifty per cent. of the full amount of his contract.

The Commissioners reserve the right to reject any or all proposals.

Copies of plans and specifications are on file at the water office, Windsor, at the office of the Contract Record, 220 King street west, Toronto, and also at the office of Smith, Hinchman & Grylls, Detroit, Mich.

By order of the Commissioners,

W. A. HANRAHAN, Sec.

38-40

Debentures for Sale

The Corporation of the Town of Uxbridge will receive tenders up to November 1st, 1911, for the purchase of \$11,000 Public School Debentures, bearing five per cent. interest, payable in twenty-five equal annual installments of principal and interest.

Address, Dr. M. H. CROSBY,
Clerk.

40-41

CITY OF LONDON

Tenders for Tile Sewers

Sealed proposals addressed to the "Chairman and Members, No. 2 Committee" will be received at the office of the City Clerk until 5 p.m., on Thursday, October 12th, 1911, for the construction of tile sewers on (1) York street; (2) Harvard and Yale streets; (3) Eva street.

Each bidder shall name a lump sum for the above works, and a separate price for any deduction or additions on main and side drains, and make his tender on the form furnished by the city engineer.

Plans and specifications covering the above-mentioned works may be seen at the office of the City Engineer.

Contractors to enclose a marked cheque for ten per cent. of the amount of their bids.

The City reserves the right to reject any or all bids and to accept any bid.

NEIL COOPER,
Chairman No. 2 Committee

GEORGE W. WRIGHT,
City Engineer.

40-41

City of Toronto

Tenders for

Subway Construction

Sealed tenders will be received by registered post only, addressed to the chairman of the Board of Control, City Hall, Toronto, up to 12 o'clock noon on Wednesday, Nov. 1st, 1911, for the construction of three miles of reinforced concrete subway and subway stations.

No tender will be received for less than one-half mile sections.

Envelopes containing tenders must be plainly marked on the outside "Tenders for Proposed Subway Construction."

Plans and specifications may be obtained on application to the Department of Railways and Canals, City Engineer's Office, Toronto, also on file for inspection at the following points:

1. N. B. Colcock, Ontario Government Agent, 163 Strand, London, W.C.

2. Canadian Engineer, B/33 Board of Trade Building, Montreal.

3. Engineering News, 220 Broadway, New York.

4. Engineering Record, 239 West 39th St., New York.

5. Engineering Contracting, 537 S. Dearborn street, Chicago, Ill.

6. Canadian Engineer, Room 404, Builders Exchange Building, Winnipeg.

Each tender must be accompanied by a marked cheque for two thousand (\$2,000) dollars for each one-half mile section tendered on.

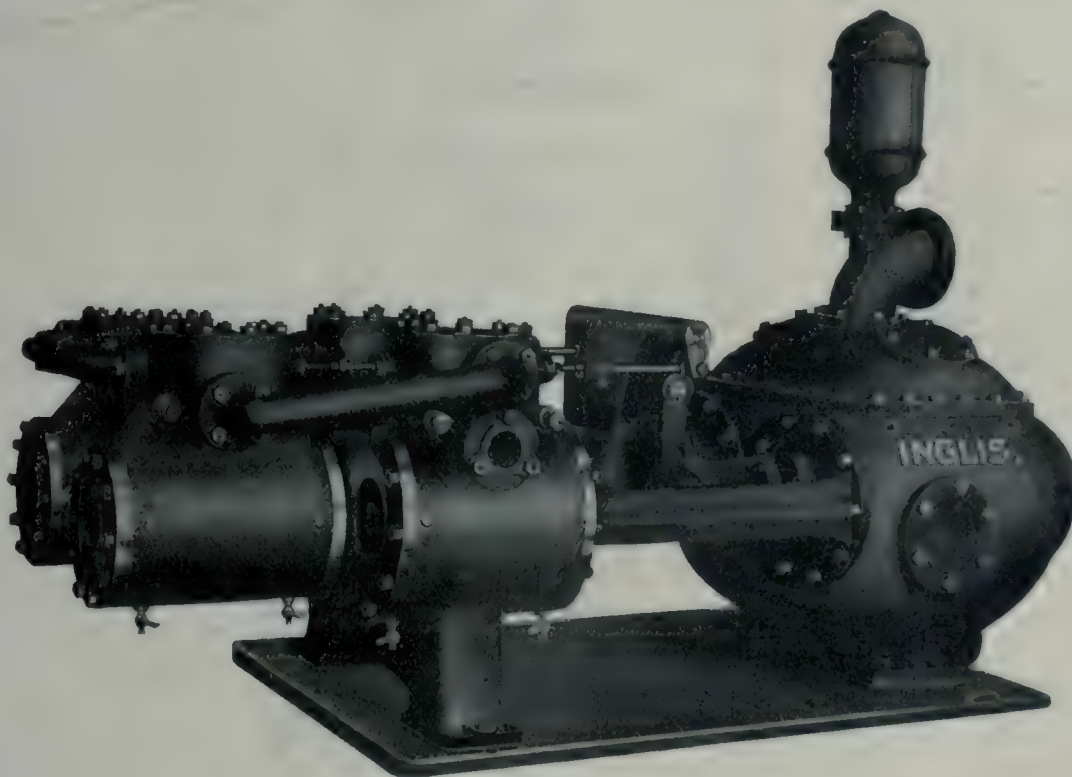
The lowest of any tender not necessarily accepted.

G. R. GEARY, Mayor.
Chairman of Board of Control.

40-43

Water-Works Plants

for Towns and Cities



"Inglis" 1,000,000 gall. Pumping Engine.

Our long and successful experience in the building and installation of Pumping Engines and Water Works Machinery should be a strong argument in favour of "Inglis" products. During the fifty-two years (52) our plant has been in operation, we have built many Pumping Engines, all of which have given entire satisfaction.

Capacities from one to thirty million gallons per 24 hours.

Send us your inquiries.

The **John Inglis Company**

Engineers and Boilermakers

Limited

14 Strachan Ave., TORONTO, Canada

Business Buildings and Industrial Plants

(Continued from page 61)

thurs; 1 storey, 160 x 160, cement, brick and steel construction, concrete foundation, electric lighting.

Toronto, Ont.

Addition to factory, cost \$4,000, on Bellwood ave., for Coca Cola Co., 65 Bellwood ave.; general contractor, Walter Nash, Gore Vale avenue, Toronto. One-sty., brick and stone, slate roofing. Heating and plumbing contract not yet awarded.

Vancouver, B. C.

The contract for the construction of the Hudson Bay Insurance Co. building on Hastings street has been awarded to Contractor Schultz, 2 storey, 26 x 120, brick with stone facings, \$26,000.

Winnipeg, Man.

Bakery for Canadian Bread Co., Ltd. Architects, Barkberger, Cooley & Barkberger, Pittsburg, Pa.; general contractor, G. H. Archibald, 803 Union Bank Building, Winnipeg. Excavation contractor, Andrew & McGrindy, Winnipeg; 3 storeys, 200 x 80, reinforced concrete, concrete foundation, electric lighting. Sub-contractors, with the exception of carpentry, not yet awarded.

Power Plants, Electricity and Telephones

Brandon, Man.

The Brandon Electric Light Co., Brandon, plan the erection of a 1-storey addition, brick and steel, concrete foundation, steam heating, electric lighting, cement work, structural iron. Structural alterations are being made preparatory to the installation of large new dynamo. J. E. Mooring, superintendent.

Lethbridge, Alta.

Plans are being prepared for adding another 1,000 kilowatt unit to the municipal steam generating plant. Town clerk, G. W. Robinson.

Niagara Falls, Ont.

The Queen Victoria Park Commissioners are preparing to illuminate boulevard from here to Fort Erie, 14 miles. Superintendent, J. H. Jackson, Niagara Falls.

Renfrew, Ont.

The Renfrew Power Company have a proposition before the town council to install a steam plant for supplying light and power to town until water can be secured to run plant in course of construction.

St. Thomas, Ont.

Work on a new hydro-electric line from St. Thomas to Port Stanley will be rushed and it is expected to be completed in a few weeks.

Vermilion, Alta.

Tenders are called until Oct. 16 for delivery and erection of the following: Section A steam boiler, feed pumps and heater, etc.; B, steam engine; C, electric generator and switch gear. Plans, etc., at offices of secretary-treas., engineers, "The Contract Record," B34-Bd. of Trade Bldg., Montreal, or Commercial Traveller's Bldg., Winnipeg. Sec-

treas., C. W. Caesar; engineers, Bowring & Logan, 34 Victoria street, Toronto.

Miscellaneous

Winnipeg, Man.

Tenders are called by chairman of Bd. of Control until Oct. 13th for manufacture and delivery f.o.f. Winnipeg, of the following: section (a) 75, 2-wire, 500-volt, 500-ampere D. C. fuse boxes; section (b) 75 2-wire, 230-volt, 200-ampere A. C. fuse boxes. Specifications, etc., at office of manager of the Light & Power Dept., 449 Main street, Winnipeg. Bd. of Control, Winnipeg. Secretary, M. Peterson.

Building Permits

Ottawa, Ont.

M. C. Neate, dwelling, Allan Keefer, architect, \$6,000; John S. Metcalfe Co., Ltd., Montreal, train sheds, for Grand Trunk, \$165,000; Isaac Cowie, dwelling, Mutchmore street, \$3,350; F. C. Campbell, four dwellings, Mutchmore street, \$12,500; Miss M. Williams, dwelling, Wilton Crescent, J. R. Howe, builder, \$3,300; Robert Edmondson, dwelling, Echo drive, \$2,700.

Toronto, Ont.

Thos. Hill, two pair 2-sty. semi-detached brick dwellings, on Hillsboro avenue, near Davenport road, \$6,800; Geo. A. Mackay, one pair 2½-sty. semi-detached brick dwellings, 79-81 Wright ave., near Sorauren, \$4,400; Henry Freeman, 2½-sty. brick dwelling on Perth ave., near Wallace ave., \$4,000; Alexander & Storzonwick, two pair 2-sty. semi-detached brick dwellings, on Maria street, near Gilmour ave., \$8,000; W. W. McDonagh, three attached 2-sty. brick dwellings, on north side Balmoral ave., near Avenue road, \$5,800; E. J. Sparkman, 2-sty. and attic brick dwelling, on Spadina road, near Dupont street, \$5,000; Walter Scott & Son, three attached 2-sty. brick dwellings at 210-12-14 Perth ave., near Wallace, \$5,800; T. W. Thompson, 2½-sty. brick dwelling, north side Pleasant Blvd., near Elgin ave., \$4,000; John Pherrill, 2½-sty. brick dwelling, on Edgewood crescent, near Summerhill ave., \$4,000; A. H. Mitchell, one pair 2½-sty. semi-detached dwellings, at 226-228 Lee ave., \$5,500; L. C. Sheppard, six 2½-sty. brick dwellings, on Binscarth road, near Glen road, cost \$30,000; Geo. E. Pearson, one pair 2½-sty. semi-detached brick dwellings, east side Perth ave., near Wallace, \$4,600; Ed. Eyre, 2½-sty. brick dwelling, north side Pleasant Blvd., near Avana ave., \$4,000; Morley R. Sherris, one pair two-sty. semi-detached brick dwellings, on Rainsford road, near Dixon ave., \$4,600; F. L. Beecroft, four attached 2½-sty. brick dwellings on east side George st., near Wilton crescent, \$11,000; J. W. Tafts, one pair 2-sty. and attic semi-detached brick dwellings, 22 and 35 Gormley ave., near Lawton ave., \$6,500; Nathan N. Butler, one pair two-sty. semi-detached brick dwellings, on Harvard ave., near Roncesvalles, \$4,400; Mrs. Julia K. Piper, 2-sty. and attic brick dwelling, at 31 Wells Hill ave., near Walmer road, \$6,500; W. Claude Fox, two-sty. and attic brick dwelling, at 119 Glen road, near Binscarth road, \$16,000; Wm. Summers, one pair two-sty. semi-detached brick dwellings, on

south side Kenneth ave., near Dundas, \$4,600; Rector and Wardens of the Congregation of St. Barnabas' Church, alterations and additions to church corner Halton and Givens street, \$12,000; Waters & Porter, two pair 2-sty. semi-detached brick dwellings, on Dupont st., near Shaw, \$8,000; T. J. Allen and J. Quarrington, one pair 2-sty. and attic semi-detached brick dwellings, east side St. Clarens ave., near College street, \$7,000; E. M. Biette, two pair 2-sty. semi-detached brick dwellings, on Rainsford road, near Queen street, \$8,000; Skippen Bros., three attached two-sty. brick dwellings, east side Greenwood ave., near Gerrard, \$5,600; Thomas Young, one pair 2-sty. semi-detached brick dwellings, at 41-43 Gormley ave., near Lawton ave., \$4,600; G. H. Webb, 2½-sty. brick dwelling at Keele street and Wright ave., \$4,000; H. J. Atkinson, 2½-sty. brick dwelling, St. Andrew's Gardens, near Glen road, \$10,000; G. H. McLaughlin, one pair two-sty. semi-detached brick dwellings at 611-13 Elmer ave., near Queen street, \$5,000; James Hunter, one pair 2-sty. and attic semi-detached brick dwellings on Glendale ave., near Wright ave., \$6,500; John Brown, four detached two-storey and attic brick dwellings on Baker avenue, near Lonsdale, \$12,800; A. Littler, three attached 2-sty. brick dwellings, south side Awde ave., \$6,900.

Winnipeg, Man.

Recent permits include: Dwelling, \$3,200, Home street, for T. Olson, 403 Home street; dwelling, \$4,000, Lenore street, for E. Russell, 305 Aubery street; three dwellings, \$4,500, Riverton ave., for V. J. Sullivan, 599 Bannatyne ave.; five dwellings, \$20,000, Lenore street; three dwellings, \$12,000, Lipton street; two dwellings, \$8,000; dwellings, \$5,500, Ruby street; dwelling, \$5,500, Lenore street, for West End Realty Co.; dwelling, \$3,000, St. Johns ave., for A. Simpson, 317 St. Johns ave.; dwelling, \$2,900, Athol ave., for Mrs. E. Marshall, 530 Flora ave.; two dwellings, \$5,000, Lansdowne ave., for C. E. Taylor, 418 McIntyre Block; dwelling, \$4,000, Dorchester ave., for G. F. Crauley, 530 Corydon ave.; dwelling, \$3,500, Greenwood Place, for J. Sangster, 601 Fleet ave.;

New Companies

West Valley Land Company, Limited Montreal, Que., incorporated, with a capital of \$70,000, to carry on a real estate business and sell and deal in timber limits, etc. Incorporators include Ernest R. Decary, Jean Baptiste Pelouquin and Edouard Napoleon Herbert, all of Montreal.

The Manitoba White Granite Pressed Brick Company, Limited, Winnipeg, Manitoba, incorporated, with a capital of \$124,000. Incorporators, John Smith, Edward Burdett and Lionel F. Wilan, all of Winnipeg.

Burrard Construction Company, Ltd., Vancouver, B.C., has been incorporated with a capital of \$25,000, to carry on a general building and contracting business.

Vancouver Marble and Tile Company, Limited, Vancouver, B.C., has been incorporated with a capital of \$50,000, to carry on business as marble and stone merchants, manufacturers of brick and tile, building materials, etc.

Contract Record

ESTABLISHED 1886

A Weekly Journal of
Building, Contracting, Engineering, Public Works
Municipal Progress, Advance Information

PUBLISHED EACH WEDNESDAY BY
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THOMAS S. YOUNG, General Manager.

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MONTREAL - Telephone Main 2299 - B34 Board of Trade

WINNIPEG - Telephone Garry 856 - 404 Travellers' Bldg.

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CHICAGO - - - - - 4059 Perry Street

LONDON, ENG. - - - - - 3 Regent Street, S.W.

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Vol. 25

October 11, 1911

No. 41

Contract Reform—An Opportunity for the New Government

We have no part in politics, but we have in contract matters, and it would seem that the dividing line between the two is sometimes drawn very faintly.

Take for example the action of the outgoing government in getting together three days after their defeat and passing an order-in-council awarding to Jos. Gosselin the contract for the G. T. P. terminals at Quebec for a sum of approximately three-quarters of a million dollars. Assurance is given that tenders were called for in the regular way and that the lowest was accepted, but we cannot help thinking that there might have been more deliberation in awarding a contract of this size; in fact it might have been left over for the new administration. The government has not been in the habit of showing such feverish haste in putting through matters of this kind. Then why now? We make these observations in the interests of the contracting community, not of the Conservative party. We do not doubt that the whole transaction was absolutely above board, but we think the activity shown in awarding the contract was rather ill-timed, although it is a precedent that we by no means wish to discourage. Every one knows that as a rule the government is far too dilatory in such matters. At time of writing there is a rumor that certain Intercolonial Railway contracts are also to be rushed through, and it is even said that the St. John harbor work, which involves an expenditure of \$8,000,000, is among the contracts in prospect of being awarded.

The in-coming government will have a clean slate to work upon and it is to be hoped that they will inaugurate many reforms in the contracting field. We are spending ever-increasing sums each year on the development of our harbors and railways and cities, and we must see to it that we are getting the best possible returns for our money and that everybody who wants to compete for the work has a fair field

and no favor. We ask no favors. Contractors are entitled to timely notification of all big work and to be afforded every facility in bidding on it. Particularly is this so in the case of British firms. The country has shown that it wants to develop on imperial lines and therefore it is up to the authorities to see that Old Country bidders get a fair show. If they are to compete with us on equal terms they must have adequate notice of impending work so that they can get their representatives into the field and make careful investigations.

Competition is the life of trade and we are open to take all we can get—but particularly British competition. There will always be lots of work in the country for our generation and many to follow, and the more competition we get the cleaner will be our records, the closer our figures and the better our work.

As noted in another column the British Trade Commissioner relates how a local contractor was allowed to address the council of a certain city after learning that a British firm's bid was under consideration. It is time we heard the last of this sort of thing. It is bad for our reputation,—and every one knows the old saying, "Give a dog a bad name and hang him." We want outside contractors to feel that in the Canadian field fair treatment will be meted out to them and that they will get equal consideration with others.

The new government, then, has a great opportunity—if only in the contracting field. There is room for wider publicity, a more adequate time allowance for tendering, improved specifications, and a reduction in the scale of deposits required.

Unnecessary Delays

Delay in signing contracts is cited in the annual report of the Toronto city engineer as a frequent source of trouble in the operations of his department. In some cases, it is reported, one and two months elapse after the awarding of the contract before the department is able to issue the order to commence the work. We are entirely in agreement with Mr. Rust in his contention that this matter could and should be remedied. His suggestion that the City Solicitor be asked to take the necessary steps to ensure the prompt signing of contracts is one that should most certainly be adopted.

Canadian Experts—The Stimulus of International Competition

Fame, if not fortune, awaits the successful designer of the new capital city for the Commonwealth of Australia. Details of the competition in which citizens of all countries are invited by the Department of Home Affairs at Melbourne to submit "Designs for Laying out the Capital City" before Jan. 31, 1912, have already been announced in these columns. The prizes offered, it will be recalled, are £1,750, £750 and £500, for first, second and third in merit respectively.

In spite of—or, shall we say, because of—the world-wide competition that will inevitably be encountered, the problem is one which will repay careful study on the part of Canadian experts. The prize money is by no means to be dispised but there is the greater consideration of the reputation that will af-

terwards set the successful designer upon the pinnacle of fame.

In these days it is not always enough to be a genius. There must be the faculty of aggressiveness, or enterprise, or ambition, which prompts a man to find an opening for his genius; and perhaps an even more elemental consideration is confidence.

We make these remarks as a sort of prefatory opening or by way of apology for saying that we hope Canada will have a part in this international competition. We would like to see the three first places within the British Empire,—with one of them assigned to Canada.

Canada Wants Her Own Expert Engineers, Architects and Builders

It may be argued that with the limited opportunities we have had in this branch of municipal work, we can hardly expect to produce experts to rank with the best of England, the continent and the United States. Here at any rate is just the needed stimulus. The study engendered by such competitions as these produces experts, and it is experts that Canada wants within her own borders. We have problems pertaining to water purification, sewage disposal and other branches of municipal work, to say nothing of this all-important city planning, and we should be able to find the solutions ourselves. Hitherto our people have not achieved a great deal,—not because they are deficient in brains or technical training, but because the opportunity of showing their skill on finer work has, to a great extent, been denied them. Whenever there arises a ticklish problem in the engineer's department, an American expert is called in,—and how often does not the same thing occur in the architectural field and in contracting circles! Why is it that so many of our big financial institutions, whose earnings have come directly from the pockets of Canadians, have handed over important building contracts piecemeal to the United States? Why is it that Montreal, Toronto, Ottawa, in fact all of our big cities, have to call in American experts for the solution of every little problem that arises in their engineering departments? The reason is because there is little or no confidence in the technically trained men of this country. Now we believe that with a few isolated exceptions the municipal problems that have arisen here could have been solved by our own engineers; and we are confident that many of the big buildings in Winnipeg, Toronto and other cities that have been designed by American architects, and built—in proper sequence—by American contractors, would have been executed creditably by Canadians. Moreover, all the big fees and contract monies would still have been in our own pocket.

The purpose of this digression is to show that our technical men must needs attract attention before they can gain confidence. Why not then in a competition such as has been inaugurated by the Commonwealth of Australia?

Concerning the Competition

The Commonwealth is offering a free hand and the restrictions that hedge in most competitions of this kind are conspicuous by their absence.

In the planning of a home for a nation, in such a manner as is set forth in the following details, the architect or engineer must above all be practical; there must only be a mild blend of the ideas inculcated by the art school.

The new federal district has been located in Yass-Can-

berra, New South Wales, and the site selected for the city has an area of ten square miles.

The advertisement for the competition states that as the city will be the official and social centre of Australia every effort should be made to design a city plan which will be worthy of the great state which the city represents. Special consideration should be given to the location of areas suitably situated for the government buildings and courts, churches, art gallery, library, university, city buildings, railway stations, military barracks, hospitals, national theatre, markets, stadium and parks and gardens. In addition to these, areas must be laid out for commercial, residential and industrial purposes.

At present no railway enters the city area, but the proposed route is given on the maps which accompany the competition and due regard must be taken in the design for the proper disposition of this railway within the city limits. It is proposed that the Molonglo River be dammed in the vicinity of the city in order to control the flood waters and to maintain ornamental water sites near the town. Water-supply is to be provided on the basis of 100 gals. per capita per diem, and it has been found in the surveys that there is available a sufficient amount of water which can be delivered by gravitation to a service reservoir outside the city limits. Sewage will be water-carried by gravitation and delivered to treatment works some six miles away from the city, while storm water is to be emptied into the river. All of these systems should be indicated, at least, in the design.

Finally, it is evident from the documents which have been issued, that it is the intention to provide for the Government of Australia as sightly and as modern a city as is possible in the present stage of the art. The Government recommends to the competitors a study of all the recent developments in city planning and expresses the hope that the designs submitted will not only allow the construction of the finest city in the world to-day but will so anticipate future needs as to be a basis for development through some centuries to come.

British Trade in Canada

Mr. Richard Grigg, British Trade Commissioner in Canada, in his recent report, while emphasizing the necessity for greater enterprise on the part of British manufacturers, points out that the successful development of closer trade relations between Canada and Great Britain will depend quite as much upon a reasonable goodwill and support on the part of Canadians being forthcoming. "Thus, for instance," says Mr. Grigg, "in connection with the large growing needs of the municipal authorities throughout Canada, the period allowed to contractors in England for sending in tenders is frequently too short, so that no effective British tender can be rendered, and it has happened on many occasions that excuses have been sought and found under which the lowest British tender has not been accepted; and in one case a local producer was allowed to address the council after learning that the engineer had recommended the acceptance of a British tender. The result in persisting in such a policy would obviously be that outside tenders would cease when the tendering firms were convinced that their labor was in vain; and there would follow an agreement among local producers as to prices which could not be to the advantage of the Canadian taxpayer, to say nothing of the reflection upon Canada's credit and fair play in the financial centre of the Empire."

A Bouquet for the Toronto Board of Education

Trustees Fairbairn, McTaggart and Ellis, after a study of the methods employed by the building department of the Toronto Board of Education, have unanimously reached the conclusion that the way in which the work is conducted prolongs building operations unreasonably, involves considerable unnecessary additional expense, and—"what is more to be deplored," they say—a disorganization of the schools immediately concerned. They attribute this to the enormous increase in the work, in keeping with the growth of the city, and to the policy of the board not being sufficiently aggressive.

A number of important recommendations are contained in the report of the special committee. Among the most interesting of these is a suggestion that in future all new work be placed in the hands of the architects of Toronto, in competition or otherwise.

Builders' Wages in Australia

According to particulars recently furnished the London Building News by a Melbourne builder visiting England, at least 500 bricklayers are urgently needed in the capital city of Australia, while altogether there is immediate employment awaiting 1,000 experienced men in the building trade. The following notes culled from the above authority may be of interest as throwing some light upon the conditions obtaining in the progressive Commonwealth.

"At least 500 bricklayers are urgently needed in Melbourne. It is a very conservative estimate, for it implies that the 110 builders who are members of the Master Builders' Association, want less than five men apiece, whereas every one of them could employ five, and many of the larger builders would gladly engage twenty and thirty if they were obtainable. By 'bricklayer' is meant a skilled tradesman. Every man who calls himself a bricklayer does not comply with that description. There are numbers of men who profess to be bricklayers whom no contractor will engage. Their work has to be all pulled down again. But even for these men there is abundance of employment, if skilled tradesmen could be obtained to do the better class work. The bricklayer is the essential tradesman of the building trade. A scarcity of bricklayers means that a great amount of work cannot be attempted, and that other branches of the trade cannot be as fully employed as they would otherwise be. It is estimated, however, that if 500 bricklayers could be obtained there would be room also for at least 150 additional bricklayers' laborers, 150 plasterers and 200 painters, carpenters, carpenters' laborers and plumbers.

"That means that there is immediate employment waiting for at least 1,000 experienced men in the building trade. In these estimates no account has been taken of the needs of the country districts, though the scarcity of labor there is greater than in the city, for tradesmen have gradually deserted the country to take up the more congenial work in Melbourne.

"Wages in the trade are high, while the hours are limited to forty-four per week. Bricklayers receive a minimum of 1s. 6d. per hour—66s. per week. Plasterers are paid 11s. 8d. per day. Painters receive 1s. 3d. per hour. Plumbers' wages are 1s. 7½d. per hour and tuck-pointers are paid 11s. to 12s. per day. Carpenters receive from 69c. 8d. a week for foremen, who exercise control over the work of three men or more, to 52s. 3d. a week for ordinary carpenters' laborers. The working carpenter receives 64s. 2d. per week. Their hours are forty-four a week. They do not commence work until a quarter to 8 o'clock in the morning (double

rates are paid for time worked before that hour), and do not work after a quarter past 5 o'clock on week days, and a quarter past 12 o'clock on Saturday.

"Although these rates are fixed by wages boards, they are only the minimum. Builders pay good tradesmen considerably higher rates. An increase of 1s. a day is gladly given to retain the services of good tradesmen. They are too valuable to lose, and builders both in this state and in others continually find themselves bidding against one another for the services of competent men. Instead of 12s. a day—the minimum rate of pay—there are numbers of good men obtaining 13s. and 14s. Builders resort to the most extraordinary means to retain their men. Often on small contracts tenders are put in at absurdly low rates. The builder wants the contract merely to keep all his hands in his employment, so that he may have them when some large job is to be executed. The constant dread of the builder is that he may lose some of his scanty staff, and be mulct in penalties because he cannot finish his work within the contract time."

Comparative Cost of Fireproof Construction

Mr. Philip H. Bevier, addressing a society at Orange, N.J., on "Fireproof Construction," gave the following figures as to the comparative cost and arguments as to public and private utility:

"At the present price of building material, fireproof construction can be erected in the States at a cost of not to exceed 10 or 15 per cent. more than non-fireproof, and when we consider that fireproof buildings deteriorate about one-ninth of 1 per cent. per year, as compared to 4 per cent. for ordinary buildings; that they rent better, and that money can be borrowed on them on better terms; that they are vermin-proof, cooler in summer, and warmer in winter, it would certainly seem a part of wisdom and self-interest to adopt a better method in every case when the building is to be of a permanent character.

"When a man builds a house in the country, it may be that he had a right to jeopardize his own life and property and those of his family and gamble with the insurance companies, but the owner of the property in a city or town has no right to erect a structure which will be a menace to the safety of the property of the adjacent owner.

"If one-half of the money spent by American cities for fire losses was spent for better building construction, the annual loss by fire would soon begin to decrease. Improvement along the line of better construction can only come gradually. It can and should be hastened in thickly settled communities, and the individual shown that his own pecuniary interests lie in lessening the fire waste. Old buildings cannot be torn down at once and rebuilt, but we can see to it that no more fire traps shall be built where they are a menace to other structures."

A patent on flat slab reinforced-concrete construction has been finally issued to Mr. C. A. P. Turner, M. Am. Soc. C. E., of Minneapolis, Minn., nearly seven years after the original application was filed in the United States Patent Office. The patent, numbered 1,003,384, has been delayed by several interference proceedings which resulted favorably to Mr. Turner. There are number of suits for infringement of this patent now pending which should soon be determined and the decisions in which should finally settle the scope of Mr. Turner's control over his so-called "Mushroom" system of construction.

A Small Reinforced Concrete Reservoir

**Furnishing Water Supply and Fire Service for Town or Village—
Details of Construction and Design—Applicable to Larger Work**

By Paul T. Leshner

Just at the present time the question of water supply in many localities is one of vital interest to a large community of people, and a few particulars relating to a reinforced concrete reservoir having a capacity of 55,000 gallons, an inside diameter of 28 feet and an inside height of 13 feet, which the writer has recently outlined for construction, may not be altogether devoid of suggestive value. The reservoir here described is intended to be located upon a hill or prominence of suitable elevation near a village or town and

tension due to water pressure.

The formula for the horizontal reinforcement in the walls has been taken from Taylor and Thompson's book on "Concrete, Plain and Reinforced," and is as follows: Let

H=height of reservoir in feet, above section considered.

D=diameter of reservoir in feet.

Ah=area in square inches of horizontal steel per foot of height at section considered.

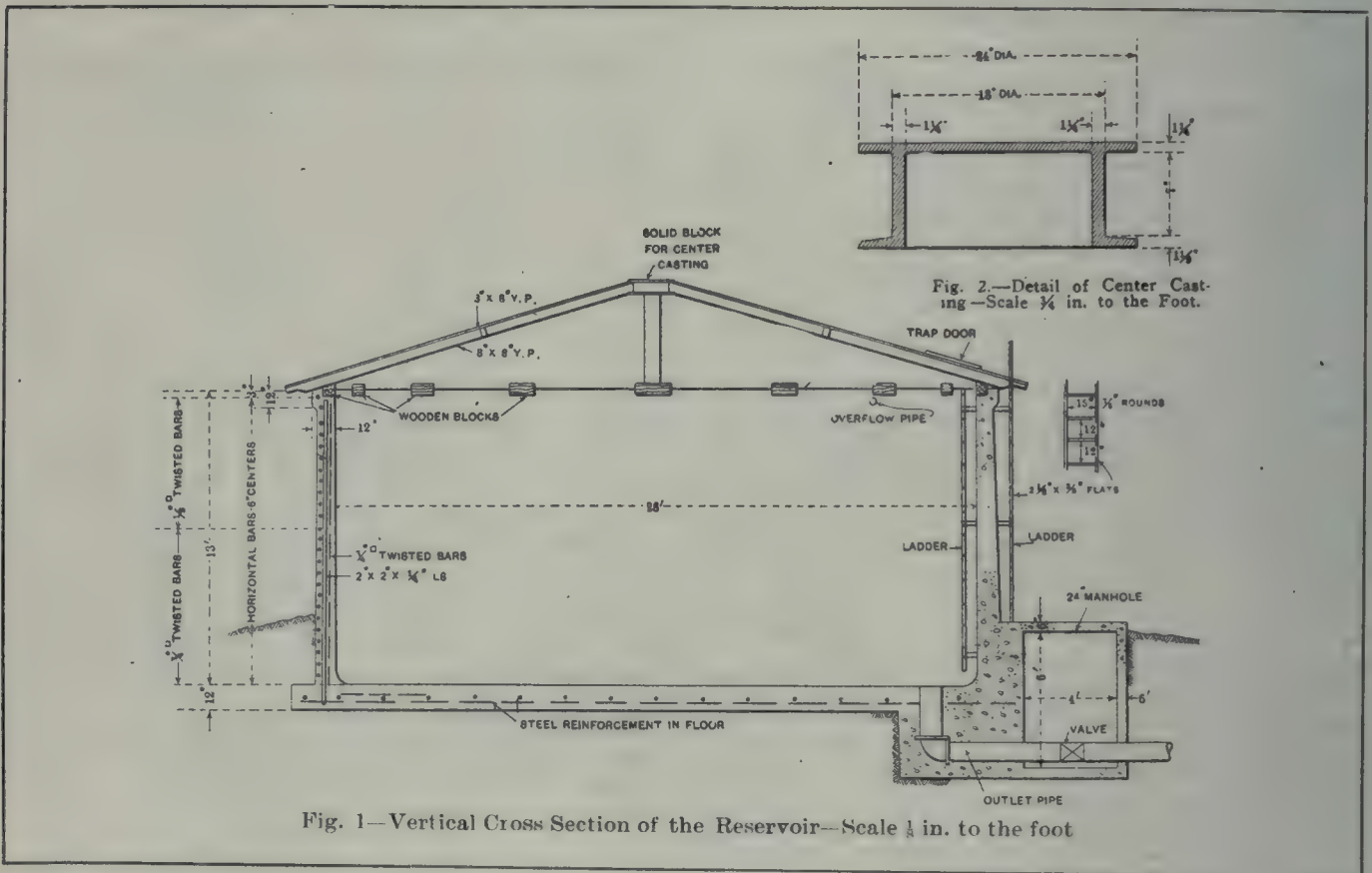


Fig. 1—Vertical Cross Section of the Reservoir—Scale 1/4 in. to the foot

may be used not only for water supply to the various houses, but for fire service as well.

Concrete reservoirs are without question the most satisfactory for the purpose, for the reason that they cannot rot, rust or be destroyed by fire; they are watertight and more economical than wood because of their durability. The expense, of course, varies with the price of the ingredients composing the concrete and the cost of the form-work. A reinforced concrete reservoir can be built cheaper than one which is not reinforced because of the thinner walls which can be used.

In circular reservoirs the thickness of the walls is usually based upon judgment, to insure the proper placing of the concrete for watertightness, while the horizontal reinforcement is designed to resist all the

f =allowable unit stress in steel in pounds per square inch.

At any horizontal section the total tensile force tending to rupture the reservoir on any diameter is 62.5 H.D. Since the area of the steel resisting this force is 2 Ah, we have 2 Ah f =62.5 H.D., or

$$Ah = \frac{31.3 H D}{f}$$

A comparatively low unit stress in the steel should be adopted, preferably not over 10,000 or 12,000 lb. per square inch, to prevent the formation of cracks in the concrete as it stretches, due to the water pressure.

For this reservoir a unit stress of 10,000 lb. per square inch was used.

The amount of horizontal reinforcement at various sections will vary with the water pressure, being

zero at the top and increasing toward the bottom.

By using the above formula, it is found that the horizontal steel shown in Fig. 1 is ample; in fact it is in excess at places, but for uniformity of construction and for extra precaution this construction was adopted.

The wall at the least thickness at the top will be 8 in. and 12 in. thick at the bottom. At the top of the wall the concrete is made 12 in. wide, as shown in Fig. 1, producing a corbel effect, which tends to improve the appearance of the wall and also to make the wall stronger where it is required to resist the horizontal thrust due to the roof and its live load.

Four horizontal reinforcing rods should be used in each ring, the ends of which should be lapped 30 diameters and clamped together at each splice by three wire rope clips.

The vertical reinforcement will consist of 2 x 2 x 1/4-in. angles spaced 5 feet on centres, with the lower ends embedded in the concrete of the floor slab. The angles will then stand upright and a falsework can be erected and templets set to which the vertical angles can be securely fastened. In this way the angles are firmly held in place, while the horizontal rods are bent around them, clamped together and drawn to a true circle with very little trouble.

In some reservoirs wire rope has been used instead of rods as the horizontal reinforcement.

The horizontal rods can be securely wired to the angles through holes which are drilled at the correct points in the angles; thereby the rods are sure to be in their proper location, which is an important feature in reinforced concrete work.

Midway between the angles place 3/4-in. square twisted bars, extending to the top of the reservoir and to have the lower ends bent so as to extend 4 feet into the floor slab.

A concrete of a 1:2:4 mixture, mixed very wet, is satisfactory for reservoir work.

For waterproofing the reservoir the following method has been successful. After the inside forms have been removed and the interior thoroughly cleaned, the walls and floor should be wet down and then a thin brush coat of neat Portland cement be applied, mixed to a thick creamy consistency. Apply this on alternate days until three coats have been applied.

The reservoir should then stand about 40 to 50 days before being filled with water. The floor of the reservoir should slope toward the outlet pipe and near the top of the wall an overflow pipe must be provided.

Reservoir walls higher than 15 feet are generally built in sections, each section being a complete ring about 5 feet high, which construction is more economical in regard to form-work.

If this method is followed, keyways about 4 inch wide and 5 inches deep should be left at each joint, to thus eliminate the possibility of leakage. Before starting the new section the surface of the old concrete should be thoroughly cleaned and wet down and a layer of 1:2 mortar spread over it before placing the new concrete.

Five per cent. of hydrated lime, based on the weight of the cement, increases the watertightness of the concrete.

When the forms are built in sections, the size of both the outside and inside form sections can be about 4 to 5 feet high and 6 feet in length. The forms can be constructed of 2 x 8 in. horizontal ribs spaced 2 ft. or 2 ft. 6 in. centres and 2 ft. x 6 in. vertical ribs at 3 ft. centres. Covering to be 7/8-in. sheathing.

The adjacent sections should be bolted through the ribs and 4 x 4 in. posts set vertically about every 6 feet, both inside and outside, and wired through the forms which are drawn up against spreaders to the proper position. The top and bottom edges of the forms should be beveled so as to form a tight joint and leave a smooth surface on the wall between the successive courses.

If the concrete is to set several weeks before removing the forms it is not necessary to coat them on the inside with crude oil or grease, as the cohesion of the concrete will be greater than its adhesion to the lumber, although it is well to thoroughly wet the planks before laying the concrete against them.

For a reservoir less than 15 feet in height it is advisable to build the forms to the full height at one operation, instead of building the reservoir in sections as outlined above.

The walls in the reservoir are straight on the inside and have a slight batter on the outside.

The floor slab is assumed to rest upon ordinary clay, so therefore it is necessary to provide steel rein-

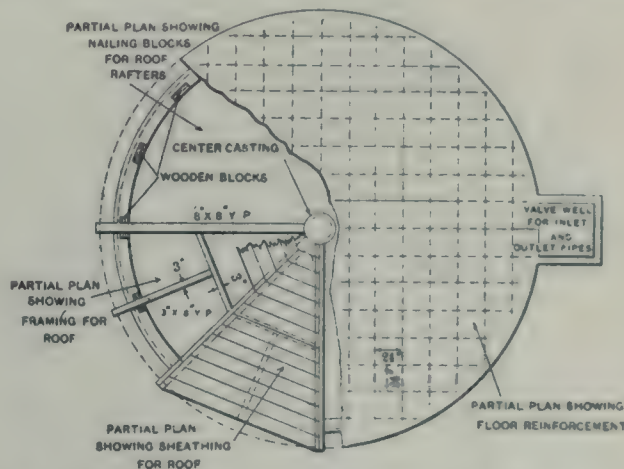


Fig. 3—Partial Plans for Various Parts of Roof Construction

forcement to sustain the weight of the water. However, the tensile strength of concrete is so low that it is necessary to have reinforcement to resist the shrinkage and temperature stresses.

A percentage of steel equal to 0.004 of the cross section of the concrete will be ample to resist these stresses.

Therefore a cross section of floor equal to 12 in. wide by 12 in. deep will require a cross section of steel equal to 12 x 12 x 0.004 or 0.576 sq. in. This is equal to a 3/4-in. square bar, spaced 12 in. centers, but, as the bars run in both directions, the required spacing will be 24 in. centers, as shown in Fig. 3.

The reservoir will be covered by a wooden roof, which is shown in Figs. 1 and 3.

The main rafters are 8 x 8 in. yellow pine beams and intermediate members are 3 x 8 in. yellow pine. The timbers should be securely spiked to the 6 x 8 in. wooden blocks, which are 18 in. long and are imbedded in the concrete wall. The sheathing is 12 x 1 in. boards, and is covered with one of the many patent roofings. The roof was designed for a dead and live load of 50 lb. per sq. foot. A wooden trap door should be provided in the roof. Two ladders constructed as shown in Fig. 1 are to be provided, one on the inside of the wall and the other on the outside.

The main rafters should have a snug fit at their

ends which go against the center casting, the detail of which is shown in Fig. 2. This casting is made of cast iron. The roof has a slope of 4 in. in 12 in. The construction of the valve well is clearly shown in Figs. 1 and 2. The method of construction and design given in this article can be applied to larger reservoirs than the one described above.

Foundation Loads

In an instructive lecture delivered several years ago Professor Boyd Dawkins discussed the relation of geology to engineering, with special reference to the utilization of subterranean water for the benefit of the population. The study of geology is naturally of much importance in other branches of engineering work involving operations at considerable depths. In architectural practice the science of geology affords less aid to the designer, who is usually occupied with glacial drift and comparatively recent accretions of surface material.

Hence a moderate knowledge of geology will carry the architect a long way—at any rate, so far as concerns building construction in countries not subject to serious earthquakes.

Numerous ancient buildings in all parts of the world show conclusively that early architects devoted much thought to the nature of the ground on which they were about to build, and that they adopted precautions which in principle are closely allied to modern methods.

One excellent illustration of this fact is afforded by the foundations of the Campanile of St. Mark, Venice, which, as originally proportioned, proved capable of sustaining enormous pressures for more than a thousand years, and still remain in the foundations of the new tower.

The original Campanile was a marked exception to the general rule that failures of masonry work are more frequently due to defective foundations than to weakness of the superstructure.

Other buildings of considerable age demonstrate the fact that early architects did not always carry the practice of applied geology quite far enough to ensure permanent stability.

Winchester Cathedral and St. Paul's Cathedral illustrate this point, for, as shown by recent troubles, a somewhat greater foundation depth would have rendered these structures independent of the causes which have gradually reduced the bearing power of the upper strata.

In mentioning these examples we intend no slur on the memory of the original designers, our object being merely to indicate the connection between geology and architecture.

Although the largest buildings erected to-day do not surpass in magnitude those constructed ages ago, the average dimensions, and particularly the height of modern buildings, has very much increased in cities and towns. Consequently, architects feel more than ever before the need for careful investigation into the design of foundations and the loads that may safely be imposed upon various kinds of rock and soil.

This attitude is denoted in a sense by the action of the Science Standing Committee of the Royal Institute of British Architects in asking members to furnish particulars of their personal experience concerning foundation loads.

Although heartily in accord with the movement in question, and believing that it will bring forth

much interesting information, we are not sure that the facts collected will be suitable for anything more than general guidance. One reason for this supposition is to be found in the fact that conditions vary considerably according to locality and even in the same locality, and another is the difficulty of obtaining exact data which lend themselves to comparison.

A somewhat kindred appeal on the subject was recently made by an eminent American civil engineer, with the result that out of 300 engineers in various countries who were asked to contribute information as to safe pressures on foundations, only thirty replies of any value were received. Even those were indefinite on important matters connected with the pressures and local conditions.

The architect who builds upon solid rock is free from the uncertainty attaching to the pressure that may be applied to many kinds of soil, for all but the softest varieties of rock are capable of sustaining with perfect safety the greatest load due to any form of masonry foundations. Table I. gives the minimum and maximum results of numerous tests on some representative varieties of British rock, and for comparison the results obtained between 1883 and 1905 at Watertown Arsenal, U. S. A.

Table I.—Compressive Resistance of Various Rocks Tested in the Form of Small Cubes. Results in Tons (2,240 lb.) per square inch.

Kind of Rock	British	American
Granites	144-1,614	131-1,780
Basalts	769-1,580	.....
Slates	658-1,052	.....
Sandstones.. . . .	70- 956	233-1,550
Limestones	156- 778	280- 965

Owing to the fact that available data concerning the compressive resistance of rock have been furnished by testing cubes of different sizes, it is impossible to collate the figures in the form of a table giving a reliable guide to the relative strength of strata occurring in various districts of the kingdom.

Moreover, it is known that a given volume of material under compression exhibits much greater resistance when incorporated in a larger mass of the same material than that shown by the same volume in the form of a test cube.

Thus, a 12-in. cube examined in the testing machine will not bear so heavy a pressure as can be applied to an area of 144 square inches, constituting part of the surface of a block measuring, say, 10 feet in every direction. The reason for this increased resistance is obviously to be found in the lateral support furnished by the surrounding material and the distribution of the pressure over a larger area. But it is not easy to compute with any degree of accuracy the greater strength so afforded.

Professor Ira O. Baker states in his standard treatise on "Masonry Construction," the results of experiments made by him with the object of establishing the rate of the crushing pressure distributed over the whole surface of a block and the crushing pressure concentrated on a small portion of a block.

Table II. gives the results of the experiments, where the concentrated pressure was applied by means of a steel die, with the area of 0.277 square inches at varying distances from the corner of a large block, and the ordinary crushing strength was obtained by

testing to destruction cubes of the same materials as used for the first experiments.

From this table it is clear that the resistance increases very rapidly with the thickness of the block, and with the distance of the concentrated pressure from the edge of the block.

These results, which are of special interest, should be found useful for guidance in various classes of design, as well as in connection with the bearing power of rock.

If any uncertainty exists with respect to the adequate strength of the rock which is to form the site for a building, the proper course is to have carefully-selected specimens tested, and to take the safe-bearing load at one-eighth the compressive resistance of the weakest cube.

Whatever be the nature of the soil revealed by the excavation of foundation-pits or trenches, it is always necessary for the designer to know something of what lies below. In the case of moderately-heavy buildings, examinations should be made to the depth of from 3 ft. to 5 ft., while for very heavy buildings trial borings should be carried down to much greater depths in order that the character of the underlying strata may be reliably gauged.

A simple and effective method of determining the

Table II.—Compressive Resistance of Various Materials under Concentrated and Distributed Pressures. (Ira O. Baker)

Number	Material	Thickness of Block	Centre of Dis. from Edge	Crushing Strength		Ratio
				Concentrated Pressure	Distributed Pressure	
		In.	In.	Lb. per sq. in.	Lb. per sq. in.	
1	Lime mortar	1	2	3,610	1,940	97
2	Marble	1	2	18,050	10,500	17
3	Marble	2	2	36,100	10,100	36
4	Brick	2 1/2	2	11,801	3,654	51
5	Limestone	3	2	31,046	3,453	90
6	Sandstone	3	2	51,900	3,696	140
7	Limestone	4	2	75,381	4,761	160
8	Limestone	7	2	94,077	3,453	185
9	Sandstone	3	2	51,900	3,493	140
10	Sandstone	3	3	39,304	3,696	160
		3	4	75,810	3,696	205
11	Limestone	4	3	75,381	4,761	160
12	Limestone	4	4	111,168	4,761	240
13	Limestone	7	4	94,077	3,453	185
14	Limestone	7	2	97,720	3,453	280

bearing power of the soil in doubtful cases is to apply a test load to a square foot or square yard of the surface exposed by excavation or at the bottom of the hole dug for the purpose. By observing the consequent settlement, it is easy to arrive at a trustworthy conclusion. At the same time the designer must take due account of attendant circumstances, such as the compactness of the soil, the probable influence of variations of the underground water level—practical experience and discrimination being aids whose value should never be overlooked.

No classification, even if accompanied by the most complete obtainable records of bearing power, could afford a true and precise indication of the safe load for soil in different localities. The various kinds of soil do not occur in standardized qualities like manufactured products, they are found in strata of varying consolidation and thickness, and are more or less intermixed one with another, and more or less permeated by water.—The Builder.

Scientific Cost Records in Construction Work

Ignorance of real costs is a danger whose seriousness every contractor will appreciate. What is

less clearly appreciated is the extent to which real costs are not known, and the degree to which construction estimates are based on gravely unreliable data. Discussing this matter, Sanford E. Thompson, consulting engineer, says:

Besides of being of use as a preliminary step toward the introduction of scientific management, cost keeping, that is, cost determination of work in progress, is of value to the engineer for making up estimates and checking the work of the builder, and to the builder in bidding on subsequent contracts and keeping track of the cost of the work as it progresses from day to day. In construction work based on the principle of cost-plus-a-fixed sum, and other similar systems, the accurate recording of detail costs on different parts of the work is absolutely essential for submitting the accounts to the owners.

To accomplish any of these aims, the cost records must be accurate enough to serve:

- (1) As records for estimating cost of subsequent jobs.
- (2) For immediate use.
 - (a) To determine whether the builder is making or losing money.
 - (b) To fix any point of loss or of too small profit.
 - (c) As an incentive to the foreman and workmen.

As generally practiced, cost keeping is so approximate and inaccurate as to be of comparatively little value for any of these purposes.

The point just made may be illustrated simply by a comparison of the methods now usually employed in estimating materials and labor. In estimating materials the engineer or contractor notes every item, usually taking the schedule from the plans, and by adding a percentage for contingencies, reaches a total which will check fairly well with the actual subsequent cost. Before he starts to do any work, he must order the required amount of each material separately, and the cost of each item is carefully looked into to see that the lowest figures are obtained consistent with the quality of the work required.

With labor, on the other hand, the plan heretofore adopted has been largely a system of guess work. Frequently one hundred or more carefully tabulated material items are set down while the estimate for labor is given in one lump sum, and yet the labor may amount to one-fourth or one-third the sum total of the materials. The variation in the actual cost of the labor from that given in the estimate almost always makes the difference between a profit and a loss to the contractor. These "guesses" at labor costs are commonly excused because it is claimed that the work done by different workmen varies to a great extent, or that it is impossible to provide for unforeseen contingencies. This, however, is merely dodging the whole responsibility. The real reason for such approximation is that the contractor usually does not know the time and cost of doing each kind of work with any degree of accuracy; and the fact is only just coming to be recognized that it is possible to determine in advance how fast each element of work should be done nearly as accurately as the cost of supplies and materials are now determined, and that once having the fundamental data, it is possible to estimate labor nearly as accurately as material.

A Unique Way of Handling Concrete

To demonstrate the practicability and advantages of steel forms, Milton Dana Morrill, a Washington architect, formed a company, purchased a tract of 1,000 home sites, 12 minutes out from the centre of Washington, D.C., and started the building of a concrete city. For one year the system has been thoroughly tested, on this development, and according to Concrete Age, these homes have been occupied and proven dry and warm and thoroughly successful.

In Chicago, 50 houses are under way for E. A. Cummings & Co., one of the largest real estate companies of the West. Contract of territory rights of Austria and Hungary have been placed, where 420 houses will be built by this system, and it has been adopted by one of the great coal companies for building 40 dwellings for miners.

The forms in which these buildings are poured are pressed of No. 12 sheet steel into flanged sections 24 in. square. These are put up by U-shaped clip and wedge connections, forming a trough, the sides being locked together through spacing pipes afford-



Steel Plates Being Raised in Panels.

ing any thickness of wall desired. The whole stands very rigid when assembled, but a stroke of the hammer loosens the wedges, or securely fastens them in line.

Perhaps the most unique and valuable feature of this invention is the system of raising or swinging the plates up as the walls progress. As soon as the two tiers of plates are filled and set, the lower tier is disconnected from the spacing pipes, and as many as 15 plates have been swung up in one operation. These have been placed and secured in ten minutes time by 4 laborers; in other words 60 sq. ft. of molds being set at one operation. This brings the cost of form work down to 0.5 cts. per sq. ft., and a wall is left by the greased plates as smooth as the steel itself, except for the fine ridges on joints left by the forms. This can remain, and these mold marks may be brushed off and the surface floated, to afterwards receive a cement wash.

Walls for two-storey houses are being cast only 6 ins. thick, reinforced by $\frac{1}{2}$ -in. steel rods spaced 2 ft. on centers. The total cost of these walls does not exceed 10 cents per sq. ft.

These same forms are used for floors and roofs as well as for columns and beams. The simplicity

of this outfit will affect a tremendous saving in the cost of concrete work.

Treatment of Soft Spots in Railroad Beds

Soft spots in a railroad roadbed may be treated best by first determining their cause in any specific instance and then taking steps to prevent their formation or to check their growth after formation, rather than by trying to overcome them by filling, according to a report of a committee of the Roadmasters and Maintenance of Way Association appointed to investigate this subject. The committee is of the opinion that preventive measures are more economical in the end than attempts to keep the track in surface over such places for long periods, followed by eventual necessity of extensive work on them. Methods of handling this difficulty, as outlined in the report are summarized below.

The usual cause of soft spots the committee finds to be the presence of clay from the bottom of borrow pits, stumps or other timber in the body of fills, and plastic material or depressions in the subgrade of cuts. On the fills the decaying timber or soft material gives way under heavy traffic, ballast is usually dumped in to correct it and a typical soft spot is formed. It is believed that the best practice is to remove stumps or timbers entirely when they are found to be the cause. Where rain water, collecting in depressions in gumbo on the roadbed, causes heaving and bulging at the base of the ballast, a trench dug entirely across the pocket on a slope from the far side of the pocket to the edge of the embankment, is stated to be a successful check. Such a trench should be 12 to 18 in. below the bottom of the pocket and 18 in. wide to provide free working. Coarse engine cinders to a height of 15 inches, and ordinary cinders above, should be used for filling and care exercised in keeping the outlet open at all times. Recovered ballast may be used for the top filling. The bottom slope should be at least 1 in 1,000. As many trenches should be dug as the subgrade formation demands.

In cuts, the practice frequently followed of blocking up the tracks over soft spots and repeatedly adding ballast results in forming holes 18 inches to 5 feet in depth, the clay forced outward and upward interfering with the proper drainage of the pocket. Many methods have been tried to eliminate this trouble, varying as to local conditions and money available.

In the simpler cases, surface drains along the top of the cut are effective. They should be deep enough only for the amount of water they are expected to carry, and should be kept clear. Where standing water cannot be handled in this way by ditches, tile drains may be used.

Where the bottom of a pocket has become too low to allow drainage to a good side ditch, the ballast and clay shoulder which has heaved out of place may be removed and hard material refilled. This should result in entire elimination of the pocket.

Tile drainage has been found to be most satisfactory where such means are available. One successful method is to lay a line of 4 or 6-in. glazed, bell-joint tile parallel to the track, 9 inches from the ends of ties, and to dig cross ditches under the track at intervals, leading to it. The tile line is sloped both ways from the centre of the cut or one way from the end, as required. It is laid in an 18-in. trench on a slope of at least 1 in 1,000 at a depth of 18 inches below the

pockets to be drained. The bottom is shaped into a cradle for the tile by a round-pointed tool, thus keeping them in good line. This trench and the cross trenches are backfilled with cinders. A concrete head-wall for the drain is effective in preventing its becoming backfilled.

Another method is to lay 6-in. or larger vitrified bell-joint tile on one or both sides of the cut, at the foot of the side slopes, draining the track by cross lines of 4-in. vitrified tile or preferably cast-iron pipe in short lengths. Where a drain is placed on both sides of the track the cross drain should alternate between them. Connections between cross drains and main drains are made by tees and the open ends of the former covered with broken stone to prevent clogging. These trenches are dug to any depth required below frost line and the earth removed to the ends of the cut. Cinders are then filled to a depth of 3 in. and tamped, the tile being laid on a carefully determined grade line. This grade is such as to permit all pockets to be reached by cross drains. Backfilling above the tile is with cinders. Such cross drains are placed wherever there are signs of water percolating from beneath the track.

Where there is a single track to which it is planned to add a second track later, a single longitudinal drain is laid, similarly to that described, the cast-iron cross drains being extended to catch basins at the foot of the slope on the far side of the track, thus taking care of surface water at that side. When the second track is put in, the surface-water ditch is partially filled with cinders for drainage between tracks and an additional tile line is laid beyond the new track, with cross drains to the middle. While in use, the catch basins are covered with gratings and upon completion of the second track, may be filled with broken stone.

In every case where tile ditches are employed, it is found that attention in cleaning them off is necessary to get good results, the amount of attention depending both on the weather and local conditions.

The medical health officer at Toronto has collected some startling facts about diseased meat, and emphasizes the public need for a large abattoir. Certainly we need the abattoir if it would make a good-sized building contract. But is one sufficient?

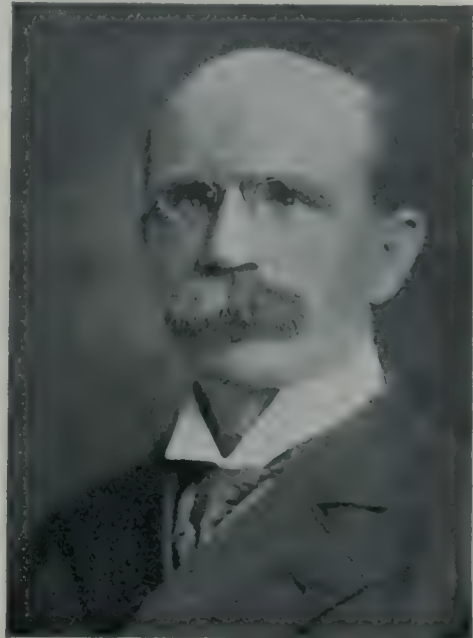
A remedy for electrolysis which is being tried in Karlsruhe is carried out by placing electrodes in the ground at suitable spots and connecting them to the positive pole of a low-tension source of electricity, a storage battery or dynamo, while the water mains are connected to its negative pole.

Concrete fence posts are being used by the Delaware, Lackawanna & Western Railroad in the Slateford-Hopatcong cut-off. The rock consists of small-size crushed rock, under $\frac{1}{2}$ -in. in size, taken from one of their quarries near Boonton, N. J., and is used in a mixture of one part of Portland cement to two parts of the fine and four parts of the coarse rock. The molds are of sheet metal, U-shaped, and the concrete is settled firmly by placing them about 2 feet from the ground on springs and vibrating longitudinally. After seasoning for at least sixty days the posts are transferred to cars and packed in shavings or sawdust for shipment.

Toronto City Engineer's Annual Report

City Engineer Rust, of Toronto, has just issued his annual report for 1910, and it is one of the most comprehensive and valuable reports of the kind that has ever come to our notice. The prefatory review contains some interesting statements concerning the city, its institutions and the equipment of its various municipal departments. The report itself contains 246 pages and is profusely illustrated with excellent half-tone illustrations and diagrams. The details given relate to every phase of the work of each department and are exhaustive and complete, while at the same time the report is a model of concise arrangement. Progress reports and constructional photographs are given in connection with all the more important works.

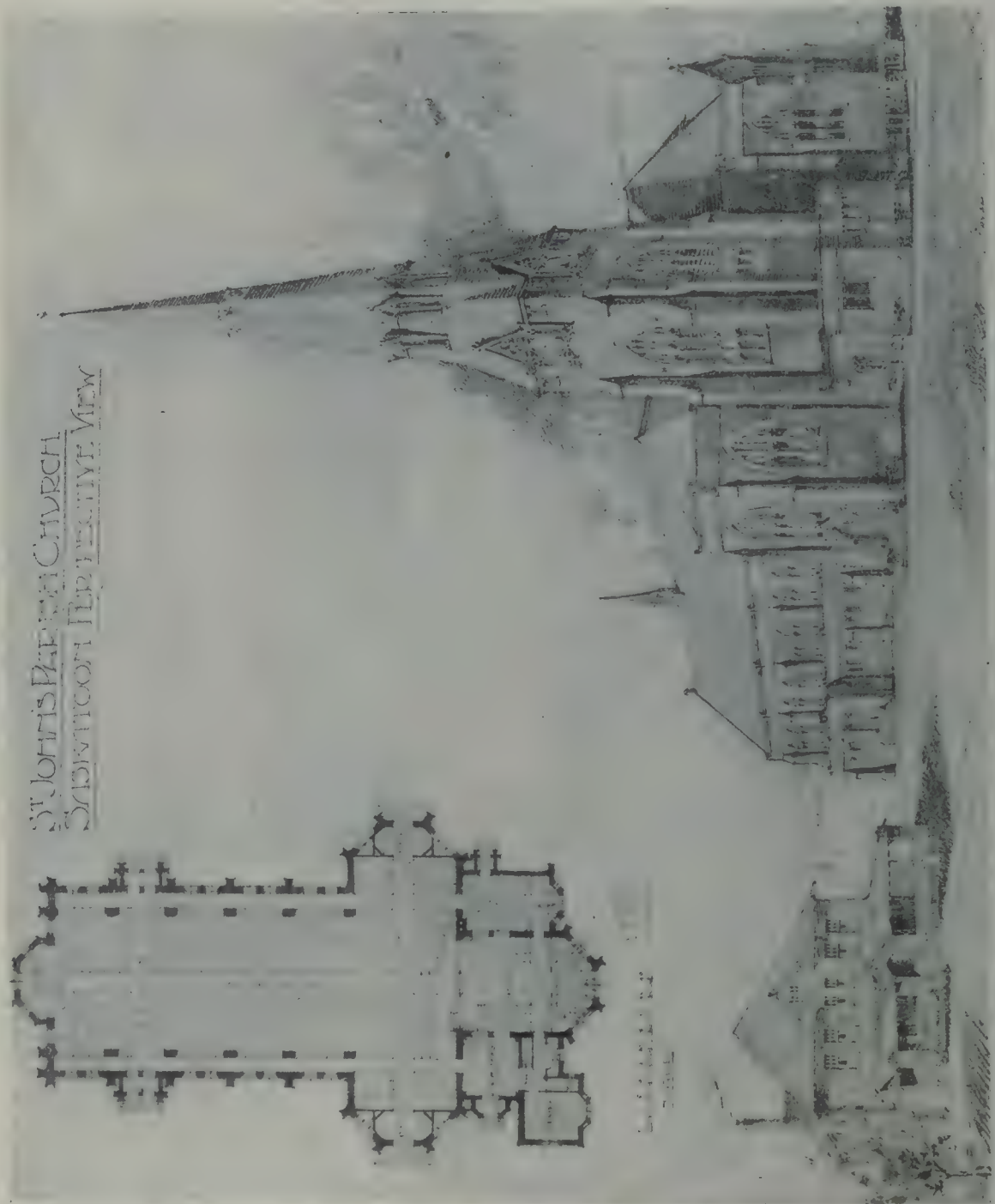
During last year 154,895 feet of mains of various sizes were laid. The number of house services laid was 5,871. The total number of works carried out by the Roadways Department was 683, of which 453 were undertaken by open contract, 198 by day labor



Mr. C. H. Rust, City Engineer of Toronto.

and 34 by private contract under city supervision. This included the construction of 32,600 miles of pavements of all classes and 54,679 miles of sidewalks. In addition there were constructed under special contracts 6,702 miles of curbs. The track allowance reconstruction during the year amounted to 9,279 miles, in addition to which there were 1,905 miles of new track allowance constructed, making a total of 11,184 miles of track. During the year about 17 miles of new sewers were constructed. This year is greatly in excess of the mileage constructed the previous year, and is owing to the demand for sewers in the recently annexed territories. The average cost per foot for a twelve-inch sewer laid during the year was \$1.42½ per foot; for 9-inch sewer, \$1.31½; two-pipe sewers, 18 inches in diameter, laid in sand, the excavation being very shallow, cost 93 cents per foot. This price includes all the excavation, manholes, etc.

The report will be most valuable for reference purposes. It is particularly illuminating of the city's progress.



Proposed St. John's Church and Rectory, Saskatoon.—Architects: Thompson, Daniel & Colthurst.

St. John's Church and Rectory, Saskatoon

The St. John's Episcopal Church is to be erected on the river front in the city of Saskatoon at a cost of approximately \$120,000. The building will eventually seat 1,150. It will be constructed in the foundation of reinforced concrete with the exterior walls of Menominee brick, with terra cotta detail and dressings. The tracery throughout and the entrances will be of terra cotta.

The whole of the interior of the building will be lined with a buff brick, with an ornamental roof of hammer beam construction.

The pews and choir stalls, organ fronts, etc., will be in oak. It is proposed to execute the rood screen, pulpit lectern, font and altar in white, dull glazed terra cotta.

The whole building is designed upon a cruciform shape in a period of transitional gothic following on the early English.

The Rectory, which will cost in the neighborhood of \$14,000, erected on the church property, will harmonize throughout in the exterior design.

The architects for this work and also for the Y. W. C. A. building are Messrs. Thompson, Daniel & Colthurst, of Saskatoon.

Uneven settling of a tall building on a floating foundation in Chicago has caused the building department of that city some apprehension, particularly on account of the fact that the columns are of cast iron. The Unity Building is sixteen storeys high, was erected in 1891, rests on a grillage of I-beams 30 to 40 ft. below street grade, and has settled 9 in. more on the south side alongside an alley than on the other side adjacent to lower structures. The uneven settlement has thrown the top 30 in. out of plumb. On

June 10, 1910, records indicated the building was $13\frac{3}{8}$ in. out of plumb at the twelfth floor. Levels five days apart, beginning Aug. 14, showed a slight settlement, but for the next ten days little movement was detected. While the building commissioner, Mr. Henry Ericsson, says he does not believe there is any immediate danger, he had an investigation made by Messrs. E. C. Shankland, Louis Ritter and Karl L. Lehman, who reported that the building was not in a safe condition. In consequence the owners were notified by the building department that the building was in such an unsafe condition as to endanger life, but by the immediate application of precautionary measures danger might be averted. Such measures were ordered put into effect as would place the building in a safe condition. Arrangements have already been made by the owners to straighten the building.

A reinforced concrete scow, 80 feet long, has recently been completed at Baltimore, Md. This vessel is 22 feet wide and 7 feet deep with the entire hull and deck, 3 inches thick, reinforced with $\frac{1}{4}$ -in. Havemeyer bars. The keelsons, which are 8 x 12 inches in size and supported by 10 x 10-in. posts spaced 7 feet 4 in. on centres are reinforced with 1-inch square twisted bars. Two bulkheads, each 3 inches thick, extending the full length of the scow, form the water tanks; these bulkheads are reinforced with $\frac{1}{4}$ -in. bars. The scow is designed to carry coal or other materials on deck and water in the hold, leaving a maximum capacity of 86 tons. As a test a mass of material weighing over 6 tons was dumped into the hold and, it is stated, no signs of failure occurred. The vessel was built to be used as a tender for supplying coal and fresh water to the river dredges of the Arundel Sand & Gravel Company, of Baltimore, Md.

PROPOSED Y. W. C. A. AT SASKATOON

The Young Women's Christian Association building at Saskatoon is fireproof, designed on the Kahn system of reinforced concrete, and will contain, when complete, laundry, dining hall, rotunda, gymnasium, assembly hall, class rooms and accommodation for sixty roomers.

The centre portion of the building is now being erected at a cost of \$40,000. The wings will be added at a later date at a further cost of \$35,000.

The exterior is of a modern domestic Gothic design and will be erected of brick of a dark tone, with green terra cotta dressings.



Proposed Y. W. C. A., Saskatoon.—Architects: Thompson, Daniel & Colthurst

Royal Architectural Institute of Canada

An Account of the Fourth General Annual Assembly, held at Montreal Oct. 3-4—Addresses, Discussions and Resolutions

A civic welcome and a discussion on town planning, city improvements and garden cities were the chief features of the opening day's convention of the Royal Architectural Institute of Canada, the members of which held their fourth general annual assembly at the rooms of the Province of Quebec Association of Architects, Montreal, on Tuesday and Wednesday, October 3 and 4.

Mr. F. S. Baker, F.R.I.B.A., Toronto, the president, occupied the chair.

The following members were present: Messrs. H. B. Gordon, J. P. Hynes, Toronto; A. F. Dunlop, G. A. Mo-



Mr. F. S. Baker, F.R.I.B.A., Toronto, who has been re-elected President of the Royal Architectural Institute of Canada

nette, Percy E. Nobbs, Alcide Chausse (hon. secretary), L. A. Amos, J. R. Gardiner, Montreal; J. W. H. Watts, C. P. Meredith, Ottawa; J. H. G. Russell, D. A. Ross, Winnipeg.

Addresses of Welcome

In the absence of Prof. Leigh Gregor, vice-president of the Montreal City Improvement League, Dr. W. H. Atherton, secretary of the league, extended a welcome to the delegates on behalf of that and kindred societies. He explained that the league was composed of lay members, and that it contained representatives of the city, including the mayor, who had done much in his public and private capacity for the forwarding of the movement. The desire of the league was to get the very best out of city life, and he suggested that members of the institute might consider the advisability of forming similar leagues in their own districts.

The mayor, the Hon. J. J. Guerin, M.D., in his welcome on behalf of Montreal, said he was aware of the great potentialities of their society, for architects were the builders, so to speak, of cities as well as of edifices—the layers out of homes of the people, and consequently were called

upon to do what was best in the interests of the people. There were many civic problems to be solved, and gentlemen who were professionally engaged in laying cities out could aid in their solution. Referring to the slum question, the mayor pointed out that in Europe much had been done to do away with this evil, and the governor-general had identified himself with the movement in England. His Excellency had urged the speaker when he was in England to see what had been done there to overcome this evil. As they knew, the British government had carried out a great deal in the way of social legislation. For instance, there were the old age pensions and the insurance against unemployment. The speaker went on to suggest that if the institute made representations to the government in the direction of asking for facilities for working men to put up buildings and to form model suburbs it might have a powerful effect. Such cities would do away with congestion and the consequent danger which arose from slums. Next to the medical profession—and as a medical man he naturally placed that first—architects were called upon to do more for the betterment of humanity than any other class. He hoped their deliberations would result in great good; and if their meetings did something to further the movement towards building up better habitations for the working man they would not have been in vain.

Mr. J. H. Sherrard, president of the Canadian Manufacturers' Association, and Mr. J. R. Gardiner, president of the Province of Quebec Architects' Association, also said a few words of welcome.

President's Address

The president replied to these welcomes. He said that this meeting was not perhaps as important as some they had had, as matters were in a state of development, owing to the condition they were in so far as the relations with the government were concerned. The president then referred to the death of the late vice-president, J. Z. Resther, whose demise was a great loss to the institute. The efforts to bring about a federation of all architects of Canada in this institute were coming to a completion, and as soon as some amendments were made to the charter of the institute the matter would be accomplished. They could look forward to the next meeting as being one of architects from the Atlantic to the Pacific. There had been considerable correspondence with various people as to competitions, and in all cases the institute had given advice with good results.

Referring to the town planning conference in London, where the president was the representative of the institute, Mr. Baker said he had never attended meetings where such enthusiasm was shown. Two gold medals had been awarded by the Societe Academic D'Histoire Internationale, one to Mr. Watts, and one to himself, the latter on the suggestion of the gentleman nominated by Mr. Baker. The institute had had some correspondence with the government on the question of good architecture, and the president expressed the view that some members of the government seemed to think it did not matter so long as they obtained well-built structures. There was also the question of the new St. Alban's Cathedral, Toronto. The institute asked that a Canadian architect should be employed, or in the al-

ternative, a British architect. The chapter, however, replied that they had decided to employ a foreigner, and had retained Mr. Cram, of Boston. It seemed a pity that in a country of this size that its professional men could not be looked upon with confidence in every respect. There had been a change in government since the last meeting, and he hoped that so far as architects were concerned it would be a change for the better. The Laurier government had cold-shouldered the architects on every occasion that he knew of. They had offered them advice which would cost the government nothing, but their own officials seemed to think they knew best. He hoped the new government would see the wisdom of consulting those who had spent their lives in studying these questions and were not always looking for fees. There were many buildings in contemplation by the government, and he trusted the architects would receive more consideration than they had done in the past. He was also sanguine that the government would do something for them in the way of education for architectural students; the government might establish a scholarship for architects or an academy in which architects or musicians might take a degree of a more permanent character than that obtained from the provincial governments. Mr. Baker in conclusion, suggested that other provincial governments might follow the example of the Ontario government and establish parks similar to that of Algonquin Park in the northern part of the province.

The financial statement, submitted by Mr. Watts, showed total receipts of \$137, including \$623 brought forward. The expenses were \$939, leaving a balance of \$798, in addition to \$107, a life membership fee and accumulated interest.

In the report of the council, it was stated that a design for the Royal Institute medal had been considered, and steps taken to have a suitable design prepared. In order to fill the vacancy caused by the death of Mr. Resther, Mr. G. A. Monette was elected vice-president, and the vacancy on the council thus created was filled by the election of Prof. P. E. Nobbs. Mr. E. Burke was appointed a member of the board of examiners to the Royal Institute of British Architects.

Government Grant to Architects

A long discussion followed the proposing by Mr. Hynes of the following resolution—that "A committee composed of members of this institute, representing the various provinces of the Dominion, be appointed to urge upon the provincial educational departments the establishment of adequate facilities for the study of architecture; and that this committee may also, if found desirable, enlarge its number from persons interested in other arts than architecture to urge upon the Dominion government the establishment of an academy for post-graduate work in art."

Mr. Hynes urged that the provincial governments should undertake to give architects every facility for better education in their profession. The only way to meet the influx of outside architects was for Canadians to properly qualify themselves. The provincial societies were taking too much upon themselves to supplement the education of architects—that was the business of the provincial government; and the institute should see that some feasible scheme was adopted.

Mr. Gordon seconded, while not agreeing with everything that Mr. Hynes had said. In some way or other the provincial governments should be stimulated to raise the standard and give facilities for education on architectural lines.

Mr. Russell stated that so far the Manitoba government had not done anything, but their university was only in the making.

Mr. Ross mentioned that the Manitoba Minister of Public Works had stated that ultimately they would have no cause to complain. Something might be done in a couple of years' time.

Mr. Dunlop suggested that perhaps the new government might be induced to give some assistance in the matter.

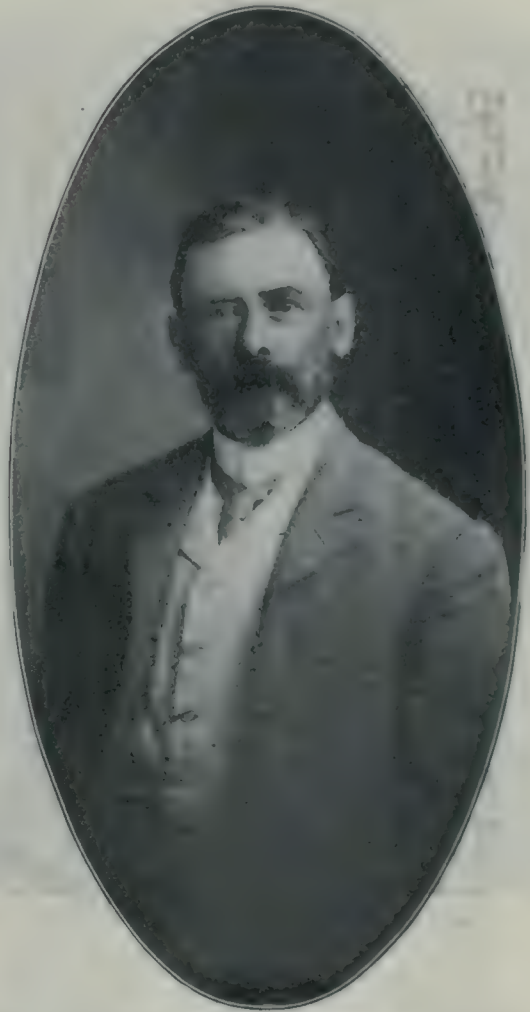
Mr. Gordon pointed out that government grants had been made for other educational work, and therefore there were precedents to go upon.

Mr. Watts supported the resolution, and advised perseverance until they achieved success.

After further discussion the resolution was carried.

Conference on Town Planning

The afternoon session was devoted to papers and speeches on various aspects of town planning. The speak-



Mr. J. W. H. Watts, Ottawa, Treasurer, R.A.I.C.

ers were not confined to the members of the institute, but included some of those who have been active in Montreal in urging upon the provincial government and the city council the importance of prompt action in this matter.

Dr. W. H. Atherton opened the discussion with a paper on the local aspect of town planning. He traced the history of the City Improvement League, formed to be a ready vehicle to concentrate public opinion on civic improvement of all those best elements of thought in the city, both of societies already working or of individual experts. Dr. Atherton spoke of the steps which led to the appointment by the provincial government of the Metropolitan Parks Commission with powers "to propose plans and seek the best means of establishment of parks, boulevards, re-

creation grounds, baths, streets and model dwellings for working men, and for the general improvement of Greater Montreal and its environs." The commission, after visiting other cities, had recommended what was known as the "city plan," which had most of the foregoing features, together with efficient transportation and the provision of garden suburbs. The Commission made various recommendations, but unfortunately the scheme had been sidetracked owing to legislative exigencies. But, said Dr. Atherton, the league had intimated to the provincial premier that the agitation would be continued, and the league and the architects of the province of Quebec intended to leave no stone unturned to obtain the appointment of a permanent commission for city planning.

Mr. W. D. Lighthall remarked that it was to the architects that they must look for a lead in the matter of town planning. This work was the growth of our time and



Mr. Alcide Chausse, Chief Building Inspector of Montreal, and Honorary Secretary of the R.A.I.C.

ought to be looked at from the general as well as the local point of view. The great point which they had been aiming at was not merely the aesthetic one—that would follow—but the humanitarian one. Commenting on the evil results of congestion, he said that in London it had been found that population had become extinct in four generations in the slums, and the same thing might happen in Montreal. The provincial government should take up this matter, and they should try to obtain immediate legislation.

Alderman Emard hoped that the Parks Commission had only been suspended. The commission did not go far enough in its work, and should have got more into touch with the municipal authorities.

Rev. Dr. Paterson Smyth advocated the movement from the humanitarian standpoint, and spoke of his knowledge of certain parts of his parish, where factories were being erected, but houses were not. "The case of these

people in their houses with big rents is awful," he said. He referred to an experiment in Dublin, where the council had borrowed some millions on a rebuilding scheme and made it pay four per cent. The rents were from 4s. to 6s. per week. The aesthetic point must be subordinated to the humanitarian side.

Lieut.-Col. Burland declared that conditions were different in Canada to those in the old country, and what might suit there would not necessarily apply here. It had been found that the proportion of deaths in districts where tuberculosis was prevalent varied according to the width of the streets.

Recorder Weir spoke on the noise nuisance in towns, and remarked that the diminution of these noises could certainly be classed as a town improvement.

Mr. A. Venne spoke upon the many schemes for improving Montreal that had been submitted, and said that if they had a committee at the city hall empowered to deal with such subjects there would not have been so many wild projects.

Dr. Pelletier and Alderman Dandurand also spoke.

Mr. C. P. Meredith read a paper giving his impressions of the recent National City Planning Conference at Philadelphia. He summarized the proceedings, and appealed for an awakened interest on their part as architects in regard to this vital question. "Since," he added, "we have exceptional qualifications, have we not also exceptional obligations? What a flood of civic reform would be let loose if the architects of this Dominion plunged into this question with whole-hearted enthusiasm! We have opportunity enough. Our towns, springing up mushroom-like, are they to go through the same process of degeneration and decay that is menacing the older cities, or are they to be built for the future, a tribute to the generation that reared them? We talk of the broad Dominion, but with our present nonsensical system of city planning apparently our Dominion is not broad enough to hold even its seven or eight million population. If it were, we surely should not be confronted with the incipient slum evil, which dooms men and women to herd like cattle amidst squalor indescribable. These conditions exist to-day principally as the result of lack of foresight a few generations back. What is going to be our heritage to prosperity? Are we going to shrug our shoulders and say that this is the business of some one else? I have confidence in the profession that it will rise to the call of opportunity, to make the civic life of this Dominion an example to the world in its striving after the ideal."

Mr. Hynes alluded to the various conferences on these questions, and to the basic points which had resulted. The first thing which stood out was the family, for it was the crowding of a great number of families which made the difficulty in town planning. The transportation question was also an important one; rebuilding was a solution of one portion of the problem, but it involved too much cost. Mr. Hynes advocated central bureaus, say the provincial governments—who ought to have departments to deal with all municipal questions, and compel municipalities to live up to a high standard in all matters appertaining to civic life.

The chairman said they were fortunate in having a governor-general who took such a deep interest in this subject. Mr. Baker was in favor of protecting the suburbs and making builders build to a plan. He would like to see an exhibition on this subject, and the institute would be happy to lead in obtaining the necessary plans and models, which could be exhibited in various centres.

Mr. Watts moved, and Mr. Chausse seconded the following motion:—

"That this assembly of the Royal Architectural Institute of Canada earnestly desires to urge upon the attention of

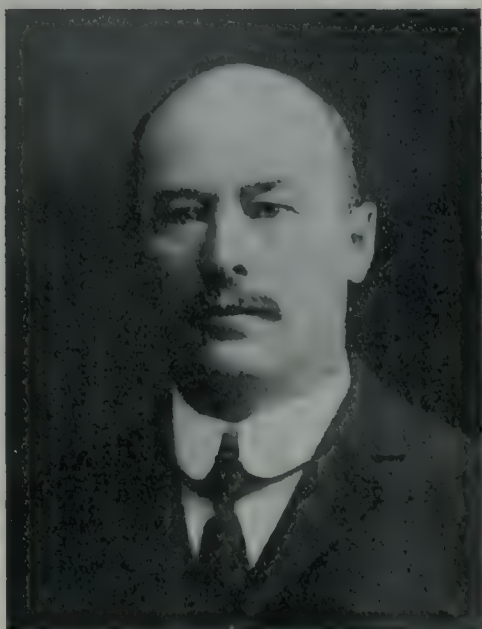
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MEMBERS OF COUNCIL



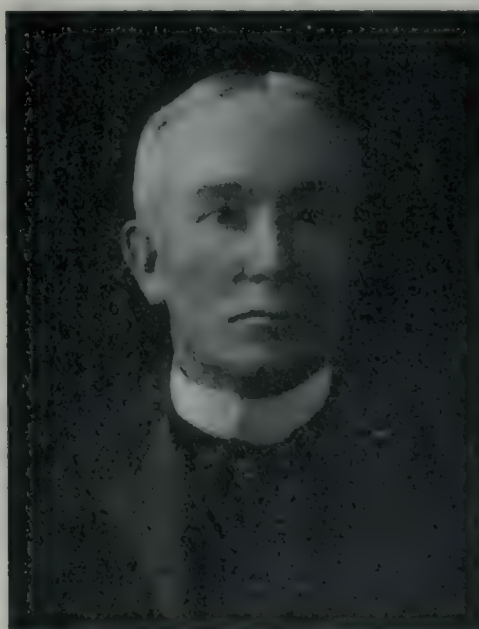
Mr. H. B. Gordon, Toronto, who has always taken an active interest in the work of the Institute.



Mr. H. E. Gates, a well known practising architect of Halifax, N.S.



Mr. C. B. Chappell, Charlottetown, P.E.I., who has served on the Council for several years.



Mr. W. H. Archer, whose name is a familiar one in professional circles at Vancouver, B.C.

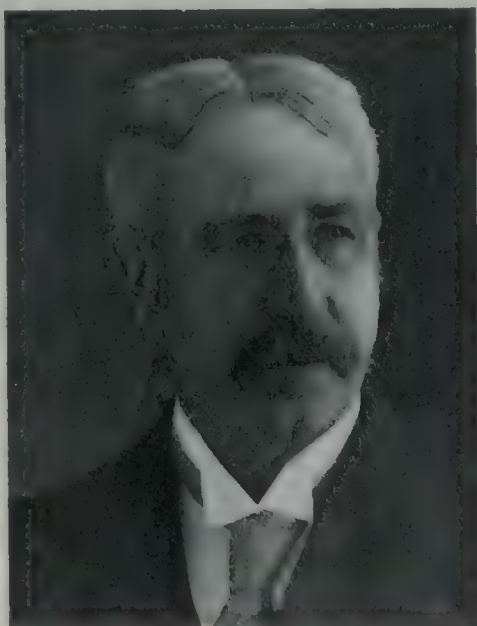
ROYAL ARCHITECTURAL INSTITUTE OF CANADA
MEMBERS OF COUNCIL



Mr. Sam Hooper, Winnipeg, the genial Provincial Architect of Manitoba.



Mr. David Ewart, Ottawa, Chief Architect for the Department of Public Works.



Mr. G. E. Fairweather, a leading architect of St. John, N.B.



Mr. E. L. Horwood, one of the representatives of the Federal Capital

the several provincial governments the necessity of providing without delay for Parks and Playgrounds, and Housing Commissions for each large city under their jurisdiction; especially with the objects of preventing excessive mortality and making provision for the health, comfort and recreation of the masses. That the government of the Province of Quebec is especially urged to appoint a permanent Metropolitan Parks Commission."

After further discussion by Mr. H. B. Gordon, Dr. Atherton, and Mr. Ross (who spoke of what was being done in Winnipeg to prevent slums); Mrs. Jane Radford, and Mrs. A. Grafton, the motion was carried.

The Annual Dinner

In the evening the annual dinner was held at the St. Regis Hotel, with Mr. Baker in the chair, when about fifty members and guests attended. It was a merry party, with much speech-making and some excellent music.

The loyal toast over, Mr. J. W. H. Watts proposed very briefly "The City."

Ald. Dandurand, in the absence of the mayor, replied for the civic authorities, speaking enthusiastically of Montreal and its future, especially when the various municipalities on the island will federate and become one great corporation.

Dr. Leigh Gregor also replied, touching upon the efforts of the City Improvement League to influence local opinion in the matter of town planning. Architecturally they were advancing, although there was yet a great deal to be done in the city.

"Architectural Societies," was proposed by Mr. Hynes, who quoted Sir Wilfrid Laurier's memorable phrase, declared that the twentieth century was to be one of town planning; it would also be a great architectural period.

Prof. Nobbs, representing the Royal Institute of British Architects, in his reply, dealt with the question of examination for architects, and expressed a hope that they would soon find a solution of this question. He remarked upon the many examinations held by the British Association and by the provincial and other educational authorities, and made a strong plea for a means by which they would have one examination and one fee only in Canada.

Mr. J. R. Gardiner, president of the Province of Quebec Association of Architects, supported Prof. Nobbs. He also affirmed the necessity of getting beyond the talking stage in the matter of town planning.

As representing the Manitoba Association of Architects, Mr. J. G. H. Russell expressed an opinion in favor of one examination for the whole of the Dominion.

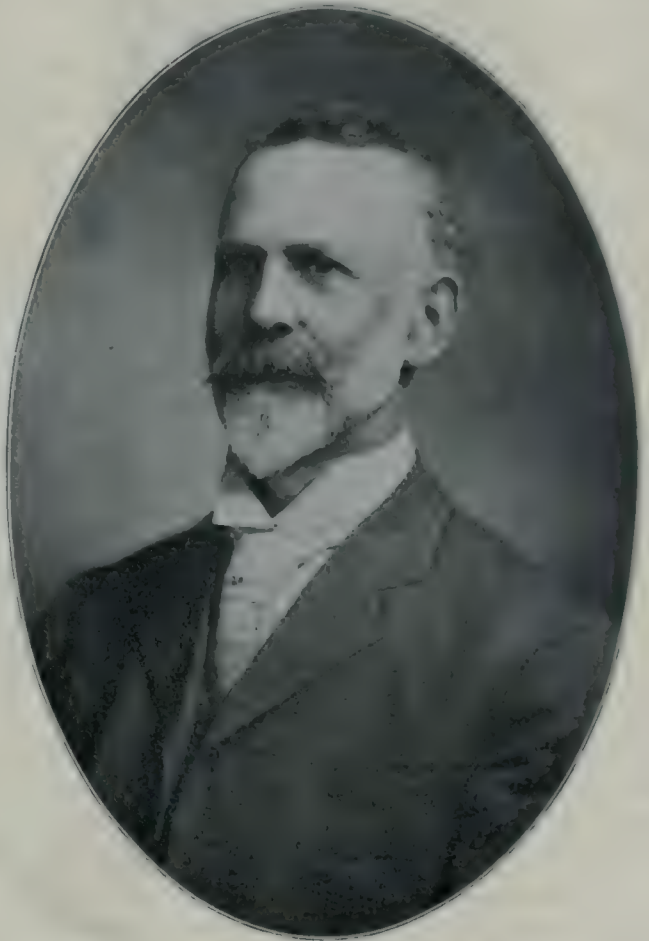
Mr. H. B. Gordon replied on behalf of the Ontario Association and gave some reminiscences of the Toronto Guild, the first architectural society in Canada. The present Ontario association occupied a middle position between the examination systems of the east and the west, a system which combined the old established idea of the English profession with that of the new idea of the United States. He hoped they would build up a distinctly Canadian architecture with distinctly Canadian ideas.

"Our guests," proposed by Mr. Meredith, was responded to by Dr. Atherton and Mr. Lauer, secretary of the Montreal Builders' Exchange. The latter remarked upon the remarkable expansion of the building trade in Canada as shown by the fact that four or five years ago the annual value of buildings was about \$45,000,000, whereas this year it will certainly be \$100,000,000. The builders of Montreal had no reason to be ashamed of their ability; they had gone outside the city and were executing contracts as far east as Halifax and as far west as Edmonton. In the west co-operation between architects and builders was very real, but in the east there was a great deal to be desired. He suggested that architects might specify Canadian material more freely,

instead of going over the border for it, as Canadian material could be produced at much less cost.

The toasts of the "President," and the "Press" (responded to by representatives of the "Contract Record" and "Construction"), concluded the list.

In responding, the President alluded to the examination question, and said it was doubtful whether the British Association would accept the Canadian examination. The number of applications by students was very encouraging. It was to be regretted that architects had to employ foreign material; no doubt in time Canada would be able to supply her own wants, but in the meantime they had to use United States material. England and Germany were making efforts to get into our market, but they were handicapped



Mr. Edmund Burke, Toronto, Vice-President of the Institute

by the distances. He was sure architects were always anxious to specify Canadian material whenever possible. He asked those present to give all the information possible to representatives of the press, having, of course, due regard to their clients' wishes and interests.

During the evening there was programmes of music by Messrs. LeBel, Monette, and Duquette.

SECOND DAY'S PROCEEDINGS

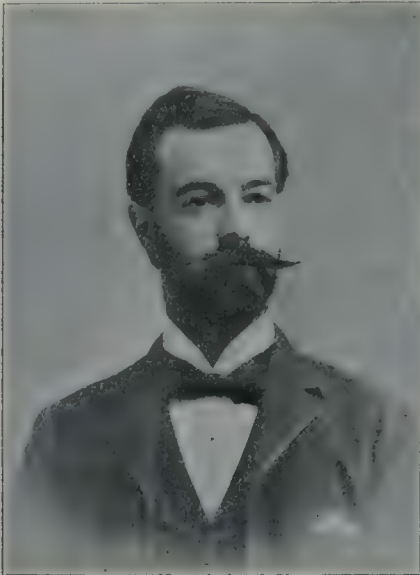
A formal reception by the mayor and the controllers was the first item on Tuesday's programme. From the City Hall the members and their friends drove to various points of interest in the city, including Mount Royal. The visitors also witnessed the unveiling by Earl Grey of the monument to Hon. John Young, a pioneer in the development of Montreal harbor. The Montreal Technical School was

visited, and the various departments were inspected. Luncheon was served by the members of the department of domestic science—the first ever provided by the school in its new premises. Mr. A. Venne, the architect, acted as guide in the inspection of the school.

Federation of Architectural Societies

In the afternoon the council of the P. Q. A. A. conferred with the delegates as to proposed changes in the charter of the Royal Architectural Institute of Canada, which will necessitate fresh legislative powers.

The president explained the amendments to the charter, under which it was proposed to form a federation of the



Mr. R. P. LeMay, Quebec, a Member of the Council

four provincial bodies. The charter had been approved by the various associations, but the Quebec association had reserved the right to approve the amendments. It was agreed that the name should not be changed.

The president stated that the members of the Institute who were not members of the provincial associations would be placed in a separate class, to be known as non-registered members. They would have no power; and any members joining the Institute hereafter would have to come through the provincial associations.

It was also agreed that the objects of the Institute shall be to act in all matters of an international or national character affecting the profession of architecture and to encourage investigation in connection with all branches and departments of knowledge connected with the profession of architecture.

The council of the Institute is to be composed of representatives appointed by each association from its membership; each association will have two representatives for every forty members, and one representative for each additional forty members or fraction thereof. This council will elect the officers of the Institute.

Election of Officers

The scrutineers reported that no change had been made in the officers for the ensuing year. The officers are as follows: F. S. Baker, president; Edmund Burke, S. Frank Peters, G. A. Monette, vice-presidents; Alcide Chausse, hon. secretary; J. W. H. Watts, hon. treasurer.

Council.—A. F. Dunlop, Wm. H. Archer, C. B. Chappell, David Ewart, H. E. Gates, H. B. Gordon, E. L. Horwood,

P. E. Nobbs, J. P. Hynes, R. P. LeMay, C. P. Meredith, Sam Hooper, C. E. Fairweather and Jas. E. Wize.

The auditors are Mr. Taylor and Mr. Alexander, of Ottawa.

On the motion of Mr. Hynes, it was decided that the next annual meeting shall be held at Ottawa.

Government Buildings at Ottawa

There was some discussion concerning the proposed government buildings at Ottawa, the following resolution being proposed by Mr. Gordon and seconded by Mr. Russell:—

"Whereas the federal government of Canada has for some years been distributing a certain amount of money with the laudable intention of beautifying the city of Ottawa and its environs; and whereas this work has been carried out without any comprehensive study or plan of the whole possible scheme of improvement; and whereas many things have been done which are unsuitable and inadequate and will require change, the Royal Architectural Institute of Canada, in their annual convention assembled, respectfully petition the federal government of Canada to appoint an advisory commission of not more than five persons, all of whom have artistic or technical knowledge directly valuable to the evolution of a general scheme of improvements, such gentlemen to serve without remuneration (their travel-



Mr. A. E. Dunlop, Montreal, a Past-President of the R.A.I.C.

ling expenses only being reimbursed); this commission to have authority to employ such technical help as may be necessary for the amplification of their ideas and the preparation of the necessary drawings. Also to consult specialists in regard to the feasibility and desirability of carrying out any or all parts of their proposed scheme; and that the Federal Government be asked to assume the expense of such commission as above outlined; also that the Federal Government be respectfully solicited to exercise their good offices in securing the co-operation of the authorities of the city of Ottawa and the present Ottawa Improvement Com-

mission in the carrying out of the suggestions of the proposed Advisory Commission."

Mr. Hynes hoped such a resolution would be presented in person to the Premier.

Mr. Nobbs made a strong protest against the sentence providing for voluntary services. They had given too much gratuitous service, and this ought to be stopped. There was plenty of money and expert service should be paid for. He moved an amendment leaving out the reference to the voluntary service. Mr. Dunlop seconded.

Mr. Gordon, Mr. Meredith and Mr. Watts contended that it was useless to expect to get this thing through if payment were to be made. Further, it would be said that the architects were looking out for positions for themselves. Payment would lead to lobbying by unworthy members of the profession.

The chairman was of the opinion that too many sacrifices were being asked of them. The Laurier government had been approached in this matter, on the lines of the institute nominating a commission to look into this question,



Mr. J. P. Hynes, a Past-President of the Architectural League of America, and a Councillor of the R. A. I. C.

and he thought the new government ought to be approached in the same way. If the government appointed a committee he was inclined to think that experts should be paid.

The amendment of Mr. Nobbs was lost on a division.

On the same subject, on the motion of Mr. Alcide Chausse, seconded by Mr. Watts, the following motion was carried: "That the council be instructed to approach the Federal Government with the view of having the matter of departmental buildings about to be erected, reconsidered with reference to site and the designs.

Votes of thanks to the provincial association and the city council concluded the proceedings of the convention.

During the month of September the Montreal building inspector's department issued 274 permits for new work, valued at \$1,058,016, and 72 permits for alterations valued at \$99,860. This makes altogether 346 permits representing property worth \$1,157,876 as compared with 444 permits representing \$993,386 for the same month in 1910. The total number of permits from January '1 to September 30, 1911, was 2,950, representing \$11,419,210, as against 2,825 permits, or \$13,043,392, for the same period last year. Last

year's permits included three million dollars' worth of building operations for the C. P. R.

City Halls of Montreal

In connection with the proposal to erect a new City Hall at Montreal it is interesting to recall that the first building of the kind was erected in 1698. The population was then 950. It was situated near St. Victor street, between St. Paul and Commissioner streets, and for 95 years was the seat of the civic administration of the island of Montreal, as well as of all the surrounding parishes. It measured one hundred feet by thirty.

Montreal's second city hall was built in 1793, when the city numbered 9,500. It was a stone building belonging to Madame de Beaujeu, on Notre Dame street, between St. Francois Xavier and St. John streets, of which no trace is to be found now. It was demolished in 1858. It was the meeting place of the city council from 1793 to 1844.

The third city hall of Montreal was built in 1844, when the population was 44,093. In 1844, the building of the Hayes Waterworks was acquired by the city and the municipal offices were transferred to it. It was a stone building, three storeys, built on the spot which was a few years later the site of the Mercier carriage factory, on Notre Dame street near Dalhousie square. The offices were on the ground floor and the reservoir was in the second and third storeys.

The fourth city hall of Montreal was built in 1852, when the population was 57,715. The Bonsecours market, built in 1845, sheltered the civic administration during 26 years—from 1852 to 1878.

Montreal's fifth and last city hall was built in 1875 and occupied in 1878. The population was then 155,337.

We have received from the Topley Company, importers of scientific and surveying instruments, Ottawa, a sample of their astronomical field tables, for the use of engineers and surveyors. Tables of the same kind have been in use for a number of years on the survey of Dominion lands, and are much appreciated by Dominion land surveyors, but they do not extend south of latitude 49 degrees. Since it is necessary in making the calculations to know the number of the township, these tables were not suitable in places surveyed otherwise than under the Dominion system. The Topley Company's tables extend from latitude 45 degrees to 53 degrees north, and as the latitude is shown, they can be used anywhere between those limits. The tables are for the determination of the meridian and local time. Their main object is to dispense with night observations and thus avoid the troubles and discomforts peculiar to artificial illumination.

Rumors continue to be circulated regarding the proposed tunnel under the St. Lawrence River, but as yet nothing of a definite character has developed. It is said that the Canadian Northern, the Delaware & Hudson, the New York Central and the Grand Trunk are all directly interested in the scheme. The Street Railway is also believed to be looking for business in this direction if the scheme ever goes through. The mysterious subject of the entrance of the C. N. R. into the city and that company's terminals appears to be no nearer a solution than ever, nothing definite having been announced on the subject. Talk of a tunnel through the mountain seems to have got a strong hold upon the public mind, but this is only due to the persistent rumors along this line and a statement attributed to one of the heads of the company that this would appear to be a good way of getting into the heart of the city.

A Talk on Heating and Ventilating at the Montreal Builders' Exchange.

By way of experiment, the Montreal Builders' Exchange on Wednesday last commenced the first of what is hoped will prove a series of business talks and noonday luncheons. The function was eminently successful—far more so than the directors of the exchange had anticipated. More than eighty leading representatives of the trade were present, including all the big supply houses.

The idea of the luncheon and business chats is to enable engineers and other recognized authorities to give brief and practical speeches which will be of value to builders and allied trades, and it is proposed to make the event a fortnightly one. It has the advantage of enabling men in the various branches to meet in a social way and discuss many business matters.

On Wednesday, Mr. Werner Nygren, of the firm of Nygren, Tenney & Ohmes, of New York, consulting engineers on heating and ventilation, was the speaker. He was introduced by Mr. James Ballantyne, the president, who was supported by the following directors: A. Bremner, D. K. Church, E. W. Sayer, J. E. Walsh, Frank Pauze, Thomas Gilday, and Mr. J. H. Lauer, the secretary. Mr. Ballantyne expressed his pleasure at the large attendance, and said it augured well for the future. Mr. Nygren was a member of one of the biggest firms of the kind on the American continent. He was not a stranger to Montreal, having done some work in the city.

Mr. Nygren dealt on broad, general lines with heating and ventilation, stating that while he did not wish to belittle science in any way—in fact he always availed himself of it—he wished to give the results of what he had learned by experience. There was no possibility of separating heating from ventilation. Ventilation as a problem represented nothing but bringing into rooms nature's own forces. As to any particular methods of ventilation, none could be used without a study of each particular problem. While ventilation could be calculated and determined scientifically, its application must be the result of experience. Ventilation should not be installed promiscuously and in places where it was not required; it should be distinctly understood that artificial ventilation was at best a make-shift, and should only be applied where they could not secure ordinary natural conditions. In a small room occupied by two or three people, with proper heating that would give comfort to the occupants, it was not necessary to have artificial ventilation. In New York City it had been found profitable to ventilate crowded rooms and offices; owners had benefited by larger rentals and tenants by increased comfort and health to themselves and employees. Ventilation was costly both to install and operate. To ventilate an ordinary public room like a school room cost, both to instal and operate, approximately three times as much as to heat it.

The speaker laid much stress on the importance of methods of controlling heating and ventilation. He was a believer in automatic heating and moisture regulation, not only from the hygienic point of view, but from the financial aspect. It would invariably be found that where steam was generated for heating, automatic control was a profitable investment. In combining a heating with a ventilating system it was generally best to install direct radiation for the heating and supply fresh tempered air at substantially room temperature, so as to avoid injurious draughts, and at the same time exhaust air by means of fans. To provide air supply without positive exhaust was, he considered, futile. It was far better to install exhaust ventilation alone and let sufficient air enter the room promiscuously than to force air into rooms and let it escape promiscuously. As

to the question of where the fresh air inlet should be located, it did not matter so long as it was located in a position where the cleanest air could be secured.

Mr. Nygren also spoke on the question of screening out all possible dust in the air, and concluded by describing some large installations of ventilating and heating systems.

American Society of Engineering-Contractors

The regular monthly meeting of the American Society of Engineering-Contractors was held recently in New York City. Mr. Myron H. Lewis was the speaker of the evening and delivered a very interesting lecture on "Waterproofing as a Means of Insurance." The lecture was illustrated by lantern slides, and at its close a general discussion was held among the members present. Mr. Lewis was formerly editor of the "Waterproofing Magazine," and is the author of a number of books upon similar subjects.

In reply to the assertion often made that concrete may be made watertight without the addition of special waterproofing compounds, Mr. Lewis pointed out that while that may be true when the concrete is properly graded, mixed and laid, this desirable result is seldom obtained. Furthermore, the greatest objection to concrete is that, even assuming that it is dense enough to prevent the passage of water in any appreciable quantity, capillary attraction makes it absolutely impossible to prevent the presence of moisture, which in itself is highly objectionable. No matter how dense the concrete, it will absorb water like sugar or other porous substances. The principal object of waterproofing compounds is to eliminate this porosity or to destroy capillarity entirely, thereby causing the concrete to repel water.

The paper and subsequent discussion will be reproduced in an early issue of the Journal of the Society.

Welland, Ont., Waterworks System

Good progress is being made in the construction of Welland's new waterworks system, which will cost approximately \$100,000. The site is on the island opposite Hellem's avenue, and the system when completed will be one of the most economical of operation in America. The pumps will be driven by water power, the head being on the canal side and the tail race running into the river. The water comes down the canal with a strong current from Lake Erie, only eight miles away, and will be pumped over to the mains on Hellem's avenue through a large fresh water main running underneath the river. The capacity of the plant will be:—

Old plant	2,000,000 gals. per day
New plant (present installation)	3,000,000 gals. per day
New plant (provision for future)	6,000,000 gals. per day

Total capacity	11,000,000 gals. per day
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Harry Weller, of St. Catharines, has the contract for the excavation and foundations. The contract for the pump house has been let to David Dick & Son, who will commence the construction as soon as the foundations are finished.

The finance committee of the Westmount City Council has made a recommendation for appropriations amounting to \$252,590. This will give the road department alone \$12,000 more than last year's appropriation. The city is making great improvements in its public services.

Building Progress at Toronto

A comparative statement issued by the City Architect of Toronto shows that for the period embraced from January 1 to September 30 the approximate value of buildings in the city has been increased by \$3,689,147, the figures for 1911 being \$18,508,655, as against \$14,819,508 for the same period in 1910. The increase in value of buildings for the month of September this year over the same month last year is \$572,276. The figures are as follows:—

Approximate value of buildings—		
	1910	1911
Jan. 1 to Sept. 30	\$14,819,508	\$18,508,655
For the month of September	1,332,535	1,904,810
Number of building permits issued—		
January 1 to September 30	4,744	5,752
Number of buildings for which permits were issued for month of Sept.	626	805
Number of new buildings erected		
Jan. 1 to Sept. 30	6,508	7,772

Lord Charles Beresford's Opinion on the Esquimalt Project

A recent visitor to the site of the proposed dry dock at Esquimalt, B.C., was Lord Charles Beresford, K.C.B., M.P., who discussed the project in enthusiastic terms upon his return to Victoria and after inspecting the plans prepared by the B. C. Marine Railway Company.

"I have seen the drawings and plans which were placed before me by Messrs. Bullen during my visit to their plant at Esquimalt," said Lord Charles Beresford, "and I consider them excellent. There is all the space required for building slips and plant, and I am satisfied that Esquimalt offers every advantage for the establishment of first class shipbuilding yards. The proposed dock is a necessity. With the construction of the Panama canal in the near future there will be a great development of shipping on the Pacific, and Victoria will be in a dominant position with regard to this trade. The port is splendidly located, and the people should make preparation by preparing their harbor, dredging and in every way getting ready for the development that is bound to come as soon as the Panama canal is completed."

New Supply Firm at Vancouver

In a recent issue of the Contract Record passing reference was made to the Standard Builders & Supply Company, Limited, of Vancouver, which was incorporated a short time ago with a capital stock of \$250,000. The building trade of Vancouver has of late reached enormous proportions, consequent upon the great influx of settlers. Throughout the length and breadth of the city substantial houses are under construction and the extraordinary amount of building in progress has opened up many avenues previously unknown to the building trade. The Standard Builders & Supply Co., appreciating the demand for the prompt supply of building material, purchased a site on Yew street, Vancouver, with trackage on the B. C. electric inter-urban system, and erected bunkers and warehouses. From this central location they hope to supply the builders of such rapidly growing sections as Shaughnessy Heights, Talton Place and Kitsilano. Gravel, sand, lime, brick, cement and other material will be furnished on the shortest notice.

The Board of Directors is composed of well known Vancouver business men. Mr. W. G. Rogers, of the firm of Rogers, Nesbitt & McRae, real estate brokers, is president; Mr. H. P. Falls, president of the Terminal Construction &

Manufacturing Company, vice-president, and Mr. C. L. Moore, secretary.

Mr. William Nesbitt, the managing director, reports a very busy month. He is very optimistic about the future of the undertaking.

Personal News and Notes

Great excitement prevailed in Guelph, Ont., last week when it was known that the building permits for September totalled upwards of \$100,000.

At the International Good Roads Congress held recently in Chicago it was decided to hold the next meeting in Montreal in September, 1912.

J. M. Fairbairn has been appointed assistant chief engineer of the eastern lines of the C. P. R. Mr. Fairbairn is a native of Peterborough, Ont.

At Edmonton, Alta., the building total up to the end of September was over \$3,000,000, nearly \$1,000,000 in excess of the total for the whole of 1910.

A continued scarcity of skilled labor is reported from Brandon, Man. One city firm alone wanting 30 bricklayers is offering 65 cents an hour but is unable to procure men.

Mr. J. W. Astley, engineer of construction for the city of Winnipeg, was a recent visitor to Victoria, B.C. It is rumored that Mr. Astley may shortly make a move coastwards.

First and second prizes of \$500 and \$250 are offered by the Windsor, Ont., Board of Education (Allan Black, secretary,) for competitive plans for a public school to cost \$40,000. Particulars may be obtained on application.

Hamilton building statistics last month show an increase over September, 1910, of \$504,725, the total being \$711,200. Mr. Anderson, the building inspector, estimates that the total for the year will be nearly \$5,000,000, the largest in the history of the city.

The building permits issued at London, Ont., last month totalled \$114,463, compared with \$148,950 for September, 1910. The total up to the end of September of the current year is \$739,851, compared with \$679,822 for the corresponding period of last year.

A visitor to Calgary last week was Mr. Kindersley, of London, a director of the Hudson's Bay Co. Mr. Kindersley stated that work on the company's new stores in Calgary will be resumed at an early date and pushed to completion. The building will be modern in every respect and will cost fully \$1,000,000.

Mr. C. R. Young, Lecturer in Structural Engineering in the University of Toronto, and late of Barber and Young, Structural Engineers, Toronto, has opened an office as Consulting Structural Engineer at 318 Continental Life Building, Toronto. Mr. Young will give special attention to examinations, investigations and reports pertaining to bridges, buildings and foundations.

The first regular meeting of the season of the Province of Quebec Architects' Association will be held in their rooms, Beaver Hall Square, on Tuesday evening, October 17th. A programme of papers on technical subjects to be read during the winter is being arranged. The first of the series will be read at the opening meeting by Mr. E. G. Burr, of McGill University, the subject being "Electric Wiring and the Illumination of Large Buildings."

The annual convention of the Canadian Clay Products Manufacturers' Association will be held at Toronto in December. The date and place of the meeting will be settled later by the executive committee, which will probably meet

some time in October. Every effort is being made by the secretary, Mr. D. O. McKinnon (408 McKinnon Building, Toronto), to make this session of direct practical value to the clayworker, and with this end in view he is inviting suggestions as to practical subjects for discussion.

It is said to be the intention of the Art Stone and Marble Builders' Limited, to construct a plant for the manufacture of their product at Chilliwack. This company which has secured the patent rights of a formula developed after many years' research work is producing an article composed of sand, gravel and sawdust and cement and claiming for it a strength and durability exceeding concrete 100 per cent. The material used for this plaster has stood 1700 degrees F. of heat, and showed no cracks when air or water cooled.

At a recent meeting of the Kamloops, B. C., city council the report of the engineers Dutcher & Maxwell, of Vancouver, relative to the proposed power plant at Barriere River, was accepted, and a supplementary report will be made on a plant of less power. As contemplated, there will be a plant with an initial capacity of 2000 horse-power, on the Barriere river, the estimated cost of which will be \$190,000, in which a centrifugal pump of 100,000 gallons daily capacity, and motor will be installed at a cost of \$5,500, and a reservoir with a capacity of 1,000,000 gallons, making a total cost of \$225,000.

At a recent meeting of the directors of the B. Greening Wire Company, Hamilton, Ont., Mr. H. B. Greening, who has been managing director of the company for the last twelve months, was appointed president in place of his father, the late Mr. S. O. Greening. The Board of Directors at the present time is composed of Messrs. H. B. Greening, John Maw, N. S. Braden and R. H. Merriman. The officers of the company are Messrs. H. B. Greening, president and managing director; R. H. Merriman, secretary; and F. J. Maw, superintendent. Mr. F. J. Maw is a son of Mr. John Maw who was superintendent from the incorporation of the company in 1889 until a few years ago when he retired from active management but who is still on the Board.

Recent Canadian Patents

The following is a list of patents relating to contractors' appliances and the building trades, recently granted by the Canadian Patent Office: (Furnished by Fetherstonhaugh & Co., 5 Elgin street, Ottawa, Ont.)

135,221, B. J. Nolan, Ottawa, Ont.; J. Pharand, Hull, Que.—street sweeping machines.

135,257, Wm. Geddes, Annan, Ont.—boring or drilling bits.

135,329, R. L. McIntyre, Toronto, Ont.—fireproof stair construction; McGregor-McIntyre, Ltd.

135,349, P. B. Motley, Westmount, Que.—hollow sections for culverts; Phillips B. Motley, Chas. N. Monsarrat and Jno. G. Sullivan.

135,364, Wm. C. MacKenzie and Jno. Keith, Toronto, Ont.—dust laying composition for roads.

135,416, M. J. Hynes, Victoria, B. C.—plaster securing means.

135,630, Jno. Callicott, Bradford, Ont.—steam and hot water furnaces.

135,706, H. Ed. Needham, Guelph, Ont.—beading tools for bricklayers.

Mr. G. Gray Donald, chief hydrographer of the British Columbia Lands Department, has been inspecting the watersheds of the Seymour and Capilano creeks as a possible source of water supply for the city of Vancouver.

Railroad Construction and New Work

The C. P. R. has started work on its new operations at Fort William and Port Arthur. The work for this year will consist chiefly in the erection of a huge new coal handling plant, but in connection with the other operations there is considerable dredging to be done. The Canadian Stewart Company has the contract for the building of the coal plant and it is stated that the appropriation for the work is in the neighborhood of one million dollars.

The Canadian Stewart Company has started work on the coal handling plant and freight terminals of the Canadian Pacific Railway at Fort William. It will require five years to complete that work.

Notice has been given that an application will be made to parliament at the next session for an act incorporating a railway company under the name of the Pacific Trans-Canada & Hudson Bay Railway Company, with power to construct and operate a line of railway from Edmonton to the Pacific coast.

The engineers of the Canadian Pacific Railway now expect to have the double-tracking of the line between Winnipeg and Brandon entirely completed and ready for traffic before the end of December. The grading is finished and most of the steel already laid from Brandon to Portage la Prairie, a distance of 77 miles, and the work is well advanced for the remaining section of 56 miles into Winnipeg. When this line is opened, the main track will be double all the way from Port Arthur to Brandon. It is thought likely the duplication will be continued west to Calgary within a year or two.

According to an announcement made in Winnipeg recently by C. P. R. officials, a great many new branches will be opened up through Saskatchewan in 1912. In that province the company has under construction 600 miles of track and surveyors are still out on other lines. The largest line now nearing completion is from Regina to Colonsay, 133 miles. From Outlook to Kerr Robert a stretch of over 100 miles is nearing completion and will form the middle of the Moose Jaw-Macklin branch, the other sections being already in operation. The whole branch will be 267 miles long and will be an outlet for centre Saskatchewan to Winnipeg to Minneapolis and the south. Branches are reaching out southeast and northwest from Swift Current. The former part is 36 miles and the latter 52. A branch of 55 miles is being laid from Estevan to connect with the Weyburn-Lethbridge branch at Forward.

There was a large attendance at the annual meeting of the C. P. R. shareholders last week in Montreal. Announcement was made that Calgary had been selected as the location of the company's western shops. Sir Thomas Shaughnessy presided, and in his annual address stated it was expected that the seventy-five miles of Georgian Bay and seaboard railway between Coldwater and Bethany, in Ontario, a portion of the shorter and more economical route between Georgian Bay and the head of ocean navigation, would be completed this autumn. In Western Canada about 374 miles of branches will be finished within the next couple of months, and year by year a good many miles of these branch lines would have to be built to provide present and incoming settlers with transportation facilities. A double track should be continued westward from Brandon to Medicine Hat, a distance of about 524 miles, and additional accommodation provided at points like Montreal, Toronto, Ottawa, Fort William, Winnipeg, Calgary and Vancouver. Nearly all of the requisite property had been acquired, and the various works would be carried to completion as soon as possible.

Change of Firm Name

The Canada Wire Goods Manufacturing Company announce a slight change in the firm name which hereafter will be known as Canada Wire and Iron Goods Company. The change is simply for the purpose of better designating their lines of manufacture and incidentally to break the similarity of their name with other manufacturers in Hamilton.

There has been no change in the management, which consists of Messrs. Wm. Holmes and Alexander Donald, who have been long and favorably connected with the wire industry.

The principal lines of manufacture by this company are double crimped wire cloth of all grades, coal and ore screening, perforated metals, metal clothes lockers, ornamental wire and wrought iron office and bank railing, grilles in all finishes and general wire work.

This firm specialize in all classes of prison work and have completed some very large contracts both municipal and provincial. At the present time they are engaged in fitting out the new county jail being erected at Guelph.

The plant of the Canada Wire and Iron Goods Company has been enlarged during the present year to fully one-half of its former capacity, this resulting in a greatly increased output. A new general catalogue just completed will be mailed on request.

The company's agents are: R. A. Ogilvie, P. O. Box 856, Vancouver, B. C.; J. S. Parkes, 446 St. Paul street, Montreal, Que.; D. Phillip, 291½ Portage avenue, Winnipeg, Man.

Fire Brick for House Building

In the search for an artistic, and at the same time very durable, brick for high class house construction, a number of architects have tried and found satisfaction in the use of the "Glenboig" fire brick. In combination with Canadian stone this makes a handsome building. "Glenboig" is a buff or light colored brick and is both permanent and attractive in appearance. In addition to its frequent use in private residences and churches in a number of towns and cities the C. P. R. is among the largest corporations that have employed it in hotel construction, the Chateau Frontenac in Quebec, the Place Viger at Montreal, and the Banff Hotel in the Rockies, affording excellent examples of its use. "Glenboig" while primarily and essentially a furnace brick and extensively used in the large iron and steel works in Great Britain, Canada, and elsewhere, is well suited to the Canadian climate both in summer and winter. It is slightly larger than the ordinary building brick and more costly per thousand; nevertheless it possesses features that make it more economical than many makes of pressed brick. It is manufactured by the Glenboig Union Fire Clay Company, Limited, Glenboig, Scotland, and Mr. Alexander Gibb, 13 St. John street, Montreal, is the manufacturers' selling representative in Canada.

In a 94-page book bearing the title "Heating and Ventilating," the Green Fuel Economizer Company, of Matteawan, N. Y., has brought together the information required for the designing and proportioning of hot blast outfits for heating, ventilating, drying, etc. The book contains some two or three dozen tables of temperatures required in rooms for various purposes; heat transmission through building materials; heat given off by occupants and by lights; standard sizes of hot-blast heaters; frictional resistance of air washers; relative humidities; humidities and temperatures throughout the United States; amounts

of air required for ventilation; equivalent air pressures, velocities and horse powers; total weight of air at various barometers and temperatures; pressure and power consumed in friction; speed, capacity and power of steel plate fans; friction of air through hot blast coils, etc. Copies of this book will be sent upon request to architects, heating and ventilating engineers and others concerned with the purchase, design, or operation of heating plants.

Trade Enquiries

The Dominion Government Trade and Commerce reports contain the following trade enquiries. Readers of the Contract Record may obtain the names of enquirers by writing to the Department of Trade and Commerce, Ottawa.

899. **Cement.**—A commission firm in Havana is open to handle cement.

991. **Solid drawn scrap steel locomotive tubes.**—A Birmingham firm is prepared to buy solid drawn scrap steel locomotive tubes, also the same in copper and brass.

1003. **Fire bricks.**—A Manchester firm of Engineers contracting for their plant in Canada, require prices on fire bricks.

1004. **Building bricks.**—A Manchester firm of engineers contracting for their plant in Canada, require prices on building bricks.

1021. **Fire extinguishing apparatus.**—A Danish firm interested in a new apparatus for extinguishing fires with dry powder ask to be placed in touch with reputable firms in Canada willing to assist in the introduction and sale of the apparatus in the Dominion.

1023. **Tar, turpentine, rosin and pitch.**—A London firm make inquiry for the names of Canadian exporters of tar, turpentine, rosin and pitch.

1028. **Railroad Materials.**—A leading Havana firm inquires for manufacturers of railroad materials.

1029. **Structural steel.**—A Cuban firm would like to correspond with Canadian manufacturers of structural steel.

1030. **Iron and steel.**—A Havana firm inquires for manufacturers of iron and steel.

1041. **Portland cement.**—A commission merchant in Havana is in position to handle Portland cement packed in barrels of 400 lbs., c.i.f., Havana.

1075. **Pulley blocks, travelling trolleys, &c.**—A Scottish firm manufacturing pulley blocks, travelling trolleys, runways, wall crabs, and cranes for every purpose, desires to do Canadian business.

1078. **Machinery and structural steelwork.**—A London firm of engineers, contractors and merchant shippers desires to hear from Canadian importers of machinery and structural steelwork, gas holders and gas works plant, steel framed buildings, cast iron, welded, weldless and riveted steel socket and spigot, gas and water pipes, &c.

1915. **Bath stone quarries.**—A West of England firm owning bath stone quarries wishes to open up business with seaport towns in Canada for the sale and distribution of their stone, and would be glad to hear from firms willing to take up agencies.

A Vancouver importing company desire to get into touch with United Kingdom manufacturers of contractors' dump cars, wheels and axles, etc.; porcelain lavatory basins, baths, etc., with fittings; enamelled metal tiles for bathroom walls; casement fastenings; brass goods, such as fenders, screens, vases, coal boxes and fancy artistic goods of all kinds; and window glass. Address office of High Commissioner for Canada, 17 Victoria Street, London, S.W.

Contracts Department

News of Special Interest to Contractors, Engineers, Manufacturers and Dealers in Building Supplies.

Information for insertion in these columns is invited from Architects, Contractors, Engineers, etc.

Waterworks, Sewerage and Roadways

Aylmer, Ont.

The town of Aylmer will, in a few days, award the contract for brick pavements on John street from Talbot to Sydenham and for extending the present pavement on Centre street.

Calgary, Alta.

The following by-law will be submitted at once: \$400,000 for waterworks; \$400,000 for street railway, and \$30,000 for electric conduit. Details later.

Collingwood, Ont.

Engineer, K. S. Macdonnell, C.E., is asking for supply of tile &c. on Second street 15 in. and 10 in. tile sewer, 4 manholes, 300 cu. yds. rock excavation, average depth 5.5 ft. Iron pipe under creek 28 ft. Cost \$2,700. Work will be done this year.

Fredericton, N. B.

The Provincial Government of New Brunswick have engaged John B. McRae, Ottawa, as consulting engineer on available water power for development at Meductie Falls, about 40 miles above this city, on the St. John river. Work commenced on Oct. 3rd, under the direction of Crown Land Office, Fredericton.

London, Ont.

Tenders are called for construction of tile sewers on (1) York street, (2) Harvard and Yale street, (3) Eva street. Plans, etc., at office of city engineer, Geo. W. Wright. Chairman No. 2 Committee, Neil Cooper. Tenders addressed to "Chairman and Members No. 2 Committee" received at City Clerk's office until 5 p.m. Oct. 12. Accompanied by accepted cheque for 10 per cent. of amount of tender.

Lethbridge, Alta.

Plans are being prepared and tenders will probably be called as soon as these are received for sewage disposal plant to cost \$100,000. City engineer, A. D. C. Blanchard; Engineer in charge, A. Aird Murray, Lumsden Building, Toronto.

Montreal, Que.

Tenders were called until Oct. 9th for construction of drains on several streets. Specifications, etc., at office of Supt. of Drains, City Hall. Address Bd. of Control, City Hall.

The council has been recommended to accept the tender of F. H. McGuigan, Windsor Hotel, Montreal, for concrete prefilter at \$485,000. This being the lowest tender. City engineer, Geo. Janin.

Peterboro, Ont.

Tenders are called until Oct. 16 for supply of material, labor and plant in connection with laying approximately 2,200 sq. yds. of asphalt block pavement. Plans, etc., at office of City Engineer, T. A. Stewart Hay. Chairman, Board of Works, Jos. R. Methers.

Penticton, B. C.

By-laws providing for \$16,000 worth of plank walks, \$1,500 for fire apparatus and for the purchase of sites for proposed municipal hall and improvements to parks will be submitted.

Saskatoon, Sask.

Plans are being prepared for intake to supply 4,000,000 gallon filtration plant. Plans are being prepared in New York. City engineer, G. T. Clark.

Toronto, Ont.

Tenders received by chairman Board of Education until Oct. 10th for construction of the following: asphalt pavements on 11 streets; bitulithic on 2 streets; brick block on Harbord street, cedar block on Scott street, concrete curbs on 8 streets, concrete walks on 21 streets and storm sewers on St. Clair avenue. Plans, etc., at office of city engineer. G. R. Geary, Mayor.

Wilkie, Sask.

Tenders are being asked for \$35,000 waterworks and electric light debentures. T. A. Dinsley, secretary-treasurer.

Winnipeg, Man.

Tenders are called until October 16th for construction of sewer connections and installation of plumbing to the property described on the schedule. Plans, etc., may be obtained at the office of city engineer, 223 James avenue, Winnipeg; Board of Control, Winnipeg; M. Peterson, secretary.

CONTRACTS AWARDED

Hull, Que.

Contractor Bisson & Carriere, Hull, Que., has been awarded contract for prolongation and improvements of waterworks system and supply of materials necessary. City engineer, J. P. Albert Laforest; city clerk, J. F. Boulton.

Hamilton, Ont.

Contracts for the pipe sewers have been awarded as follows: Huntley st., \$1.74 per ft.; Cannon street, \$1.35; Rosemount avenue, \$1.38; Somerset avenue, \$1.31; awarded to Fry & Thorold, Huntley street, Hamilton. Wood street, 93c to J. J. Armstrong, Burris street, Hamilton; Fairhold road, \$1; Hazel avenue, \$1.11; Beechwood avenue, \$1.34; Hilda avenue, 95c., to S. Cheeseman, King & Dundurn streets, and Slater street, \$1.40; Scott street, \$1.95; Douglas street, \$1.25, to the city engineer.

St. Lambert, Que.

The town council of St. Lambert, has awarded the contract for laying a new sewer on Front street to the Municipal Improvement Company for the sum of \$13,330. The nearest competitor was \$500 higher and the second over a thousand dollars higher.

Sewer to cost \$13,400. Contractor, Municipal Improvement Company, 230

Christine Building, Montreal. The sewer calls for concrete work, bricks, drain pipes, iron covers.

Sackville, N. B.

The contract for the construction of concrete sidewalks has been awarded to the Sackville Concrete Company, Ltd., Engineer in charge, J. Eddington, Moncton. N. B.

Vancouver, B. C.

The contract for the macadamizing of Broadway from Granville street to Trafalgar road has been awarded to M. P. Cotton & Co., Ltd., at \$37,630.

Railroads, Bridges and Wharves

Bridgeburg, Ont.

Railroad engineers are surveying for the overhead bridge to be built across the tracks as a continuance of Central avenue to Lewis street. The bridge will be built this fall, by the village. Grand Trunk and New York Central Railways. Cost \$5,000.

Calgary, Alta.

The Board of the C. P. R. have decided that two large car repair shops should be built at Calgary, if satisfactory arrangements can be made with municipal authorities.

City Commissioners are considering a proposal to construct a conduit through all the principal streets to accommodate sewers, gas mains, electric wires, etc. The matter will be gone into further after an estimate of the cost has been obtained. J. T. Child, engineer.

The Canadian Pacific Railway waiting rooms, etc., will be extended and a wing added to the east. Estimated cost about \$150,000.

Essex, Ont.

Plans are being prepared for the erection of a station, cost \$5,000 on Talbot street, for Windsor, Essex & Lake Shore Railway. President, W. C. Crawford, Tilbury; architect, Crane & Pennington, Windsor. 1 storey, 30 x 34, brick, shingle roofing, electric lighting.

Hamilton, Ont.

A committee will wait on the president of the Grand Trunk Railway to ask him to build a new station.

Application will be made by the city to the Dominion Railway Commission on October 11th for new steel bridge over Grand Trunk on James street; railway to build it; also for power to put a subway along Birch ave. under G. T. R. and T. H. & B. tracks.

London, Ont.

The City of London are contemplating the construction of 5 miles of ornamental driveway and a breakwater. Engineer in charge, Geo. W. Wright.

Minto, N. B.

Owner, The Fredericton & Grand Lake, Coal & Railway Co. Chief engineer, D. F. Maxwell, C. E., Fredericton, N. B. Surveys are now being made for the construction of a railway from Minto to Gibson village, 18 miles. Construction work will be completed early in the spring. Tenders have not yet been called.

Moncton, N. B.

Rails for the Moncton Street Railway have arrived and the work of laying them will commence at once. It is expected that cars will be running by the end of November.

Regina, Sask.

The Canadian Northern Railway Co. will erect freight sheds in this city of the dimensions of 300 x 40, estimated cost \$20,000, during the present year.

Silverton, B. C.

Another mining property will be in operation here according to James McNaught, a prominent capitalist of New York, who, with N. F. McNaught, of Bismark, N. D., own the Alpha and Anacortes mines. A tramway is to be built and ore will be shipped as soon as this is completed.

Saskatoon, Sask.

Plans are approved for a sub-way to cost \$130,000 on 23rd street, 623 feet long x 60 feet wide, two end approaches and one from Ontario avenue. Plans have been approved but contracts have not yet been awarded. Paving steel for superstructure required.

St. John, N. B.

Plans have been completed for car and ferry boats to run between St. John and Digby, N. S. Boats will be 250 ft. by 68 ft. beam with a draft of 18 ft. They will be capable of carrying thirty freight cars.

St. Lambert, Que.

Montreal and Southern Countries Railway are planning to erect concrete and brick car barns at St. Lambert, and new electric power sub-stations at Chambly and St. Lambert. Plans have not yet been completed.

The St. Lambert-Waterloo section of the Central Vermont Railway (which is controlled by the Grand Trunk) will be transformed from a steam to an electric road and operated by the Montreal & Southern Countries Railway. Electric locomotives will be required for freight purposes and large type motor cars and trailers for passenger traffic. The Montreal Heat & Electric Power Co. will furnish power.

St. Paul, Que.

Tenders are called until Oct. 13th for erection of two steel bridges, one over river Cuareau at "Pont Reil," the other over St. Pierre creek in the village of St. Paul. Sec.-treas., Jos. Venne; Mayor, J. M. Forest.

St. Norbert, Man.

Tenders are called until October 16th for construction of bridge. Plans, etc., at Public Works Department, Winnipeg, at Mr. Baribault, engineer's office. Builders' Exchange, No. 607, Winnipeg at the municipal office at St. Norbert, and at Mr. Arthur Lemorine's residence, St. Agathe. For municipality of Ritchot. Sec.-treas., G. V. Landry, St. Norbert.

Toronto, Ont.

Application has been made to the city by the Grand Trunk Railway Company for the construction of a spur line from the National Iron Works siding east to Leslie street with sidings serving A. R. Clarke & Co., east of Carlaw avenue, and the Imperial Varnish Co., east of Logan avenue; total length to be 6,282 feet.

CONTRACTS AWARDED**Coteau Landing, Que.**

Messrs. Haney, Quinlan & Robertson, Montreal, have been awarded, by the Department of Railways & Canals, the contract for the construction of the Soulanges breakwater, consisting of crib and concrete, \$150,000.

Dartmouth, N.S.

Construction of 72 miles of extension of railway from Dartmouth to Deane. Department of Railways & Canals, Ottawa; secretary, L. K. Jones; general contractor, M. P. Davis, Quebec, Que.

Guysborough, N.S.

Construction of 43 miles of railway, known as the Guysborough County line. Department of Railways & Canals, Ottawa; secretary, L. K. Jones; general contractor, the Nova Scotia Construction Company, Sydney, N.S.

St. John, N. B.

The Canadian Pacific Railway have awarded the contract for the erection of freight sheds to D. C. Clark, St. John.

West St. John, N.B.

Wharf. Owners, Department of Public Works. Secretary, R. C. Desrochers, Contractor, the Norton Griffiths Company. West St. John, N.B.

Public Buildings, Churches, Schools, etc.**Alvinston, Ont.**

By-law carried to raise \$7,800 for a joint municipal hall on River street for the Townships of Brooke and Alvinston. Reeve of Brooke, Alfred Darville, Alvinston; clerk, W. Willoughby, Walnut, Ont. Reeve of Alvinston, John McCallum, Alvinston; clerk, John Irving, Alvinston. Two storeys, brick, electric lighting, hot air heating, two vaults. Tenders will probably be called after December 21st.

Aldershot, Ont.

Tenders were called until Oct. 7th for erection of a school to cost \$3,000, for County of Wentworth. Architect, Munro & Mead, Chancery Chambers, Hamilton. 1 storey and basement, 30 x 40, brick and stone, stone foundation, steam heating. School furnishings required.

Brantford, Ont.

The Brantford Public School Board have purchased a site for a new school to the east of Rawdon street and lying between Sheridan and Marlboro streets.

The Public School Board have purchased site in Holendale bounded by Chestnut avenue, Spring and Edwin sts., and are contemplating the erection of an eight-room school to cost \$35,000.

Calgary, Alta.

Excavation is commenced on the erection of a church to cost \$8,000, on 14th avenue, for Unitarian Denomination. Architect, J. Hultgreen, 212 4th avenue W., Calgary. 1 storey, 38 x 60, frame

construction, concrete foundation, steam heating, electric lighting, shingle roofing. Church fittings required.

Grand Forks, B. C.

The walls are about completed for the new court house being erected by the Provincial Government, Victoria. Robert Gaw, Grand Forks, general contractor.

Hamilton, Ont.

A by-law will be submitted to the ratepayers in January to raise \$85,000 for a new hospital. County's share, \$15,000. Total cost \$100,000.

The city are looking for a site for a new jail. By-law to raise the necessary money will likely be submitted next spring.

London, Ont.

Plans will be submitted to the Board of Managers shortly for the erection of the new Presbyterian Church. Land has already been purchased on Dundas st., E. and it is expected work will commence in the spring. Estimated cost, \$100,000.

Montreal, Que.

Seminary of St. Sulpice, 66 Notre Dame W. has plans prepared by architect A. H. Lepierre, 30 St. James street, for building an auditorium to cost \$50,000. Foundations completed.

C. Edington has plans prepared by Architect D. J. Crighton, for erection of a picture theatre, \$5,500. A. Handfield, M.D., 833 Mt. Royal avenue, has started excavating for a picture theatre to cost \$7,000.

Maisonneuve, Que.

Ratepayers will vote on a by-law to authorize loan and expenditure of \$30,000 on site, construction and furnishings for public bath.

North Vancouver, B. C.

The following by-laws will be voted on by the ratepayers: \$3,000 for purchase of property for school purposes and \$63,000 for extension to waterworks system.

Nanaimo, B. C.

G. B. McMillan will build a new theatre to cost \$15,000; 1 storey and basement, reinforced concrete, hot air furnace, electric light, tar and gravel roofing, metal ceiling, roof and siding, electric work, steel beams, iron columns, ornamental columns, plate and art glass. Architect is in charge of operation. Work will be commenced at once. Architect, R. Robinson, 140 Aby Heights, Vancouver.

Nelson, B. C.

A by-law will be submitted to ratepayers to make a grant of \$15,000. The Hospital Board will raise \$25,000 and Provincial Government made a grant of \$40,000.

Oak Bak, B. C.

A by-law will be submitted to the ratepayers for the raising of \$20,000 for school purposes.

Strathcona, Alta.

Tenders closed for erection of university building to cost \$120,000 for University of Alberta. President, Dr. Torry; architect, A. M. Jeffers, Edmonton; 4 storeys, 50 x 200, brick, concrete foundation, steam heating, electric lighting, tar and gravel roofing, maple floors. Contract has not yet been awarded.

South Vancouver, B. C.

Lesser & Raphael, 915 Granville street, have plans before the municipal council of South Vancouver for a moving picture theatre for Cedar Cottage. Construction will commence as soon as plans are approved.

St. John, N. B.

The municipal council have authorized the commissioners of the General Public Hospital to go to the legislature and get permission to issue debentures to the amount of \$30,000 to build an annex to hospital building.

The building committee of the Municipal Council will recommend that the present court house building be sold and that a new building be erected at a cost of \$300,000. County Secretary, J. King Kelley, St. John, N. B.

The St. John County Council are considering the advisability of the erection of a municipal council building on the site of the present old court house.

South Wellington, B. C.

Tenders will be received by the Hon. the Minister of Public Works up to 12 o'clock noon October 11th for the erection of a large one-roomed school house at South Wellington, B. C. Plans, etc., at office of secretary School Board, South Wellington, the government agt., Nanaimo, B.C., and at the Department of Public Works, Victoria. Tenders to be accompanied by accepted cheque for \$350.

Strathroy, Ont.

Plans will be prepared at once for a new Baptist church to replace one destroyed by fire on Sept. 30th. Work will be rushed.

Saskatoon, Sask.

Plans are being prepared for erection of a theatre to cost \$60,000, on 2nd ave., architects, Thompson, Daniels & Colthurst; 3 storeys, 50 x 140, brick, fire-proof throughout. Work will commence as soon as plans are approved.

Architect, T. P. O'Leary, 23rd street, Saskatoon, has plans for a new theatre to cost \$17,000. 1 storey, solid brick, stone front. Part of the building will be occupied by Saskatchewan Trust & Investment Company who will probably require counters, desks, vaults, etc. Owner, King George Company, Saskatoon.

Toronto, Ont.

The Ontario Veterinary College have secured a site at the corner of University ave. and Anderson street. Plans have already been prepared and it is hoped to finish building within two years. \$25,000 was voted towards the erection of this college at the last meeting of the legislature.

Uxbridge, Ont.

Tenders will be received until Nov. 1 for the purchase of \$11,000 public school debentures, bearing 5 per cent. interest. Clerk, Dr. M. H. Crosby.

Windsor, Ont.

Public school, cost \$40,000. Owner, Board of Education; secretary, Alen Black; 2 storey and basement, brick, stone foundation, shingle roofing, hardwood finish, hard plaster, steam heating. Competitive plans called for. Prizes of \$500 and \$250 for 1st and 2nd.

Winnipeg, Man.

Tenders are called for supply of 1700 lineal feet wire fencing required for

Machray Park. Specifications, etc., at office of Public Parks Board. Tenders to be accompanied by accepted cheque for 5 per cent. of amount of tender. Public Works Board; Chairman, C. W. Sharp; secretary, J. H. Blackwood.

CONTRACTS AWARDED**Grand Forks, B. C.**

Work is in progress for erection of post office to cost \$44,000, on Bridge street, for Dominion Government, Ottawa. General contractor, B. Lequime. Grand Forks, B. C.; 2 storey, 56 x 66, brick construction, cement and stone, hot water heating, electric lighting, felt and gravel roofing, hardwood finish.

Hull, Que.

Fire station, cost \$7,000, in Ward 2. Contractor, Buisson & Carriere, Hull, Que., stone and brick, metal roof, concrete foundation, hardwood finish, hot water heating.

New Westminster, B. C.

The contract for the erection of the isolation hospital has been awarded to Hyslop & Lifebody, New Westminster, for \$5,775.

Ponoka, Alta.

Dormitory to cost \$100,000 for Provincial Government. Architect, A. M. Grifffers, Edmonton. Structural engineer, J. Chalmers, Dept. of Public Wks. 4 storeys, 60 x 175, brick construction, concrete foundation, steam heating, electric lighting, tar and gravel roofing, fire escapes, ventilating system. Work is being done under the supervision of structural engineer.

Residences**Chatham, Ont.**

Dr. H. J. Sullivan is contemplating the erection of a brick veneer apartment house. Cost \$3,500.

Calgary, Alta.

C. Traneveiser, 8th avenue, Calgary, is contemplating the erection of a residence. Architect, D. S. McIlroy, 118a 8th avenue W., Calgary. Cost, \$15,000.

J. Moscan, 49 Elma Block, will build an apartment house, 3 storeys, brick, concrete foundation, steam heating, electric lighting, tar and gravel roofing, fire escapes, electrical work. Cost \$40,000. Work will commence shortly.

Grand Forks, B. C.

Residence to cost \$5,000 on Winnipeg avenue, for Judge Brown, Grand Forks, B. C. Architect, R. McIntosh, Grand Forks; frame construction, stone foundation, hot water heating, hardwood floors. Plans are completed and tenders will be called shortly.

Montreal, Que.

Geo. Sleep, 20 Chatham street, will build 3 flats, \$6,000. Excavation is under way.

Come Frenette, 125 St. Edward street, is planning to erect 5 flats, to cost \$4,500.

A. Charbonneau, 2145 St. Urbain st., has plans for 21 flats, \$17,500. Work not started.

Jos. Vinet has had plans prepared by Architect J. A. Courval for erection of 5 flats, to cost \$6,000. Work to commence next week.

Brothers of Sacred Heart, Fullman st., have had plans prepared by Architect Alphonse Venne, 15 St. Lawrence street,

for a residence to cost \$14,500. Excavation is already started.

Jos. Allard, Hotel Gravel, Youville, will build 3 flats, \$3,000.

Rodolphe Racette, 1249 Sauquet St., is planning to build 3 flats to cost \$4,500.

H. Dubois, 1402 Parthenais street, will build three flats to cost \$2,500.

Jos. Delongchamp, 39 Christophe Colomb street, is planning to build 8 flats, \$6,000.

Dr. A. Haudfield, 883 Mount Royal avenue, has started excavation for 3 flats to cost \$3,500.

D. Deguire, 2132a Waverly street, will build a residence to cost \$5,000.

A. Desjardins, 33 Casgrain street, has plans for the erection of three flats to cost \$4,000.

A. Belanger, 620 Parliament st., will build six flats to cost \$3,500.

Tenders are called for erection of twenty-four apartments to cost \$55,000, on Dorchester and St. Matthew streets, for Alex. McKay, Dorchester and St. Martin streets, Montreal. Architect, J. E. Adamson, Molsons Bank Building, Montreal; 5 storeys, 170 x 60, concrete and steel, faced with pressed brick, concrete foundation, hot water heating, electric and gas lighting, gravel roofing, hardwood floors, hall floors marble. Tenders for excavation, steel, stone and brick work close Oct. 7th; carpentry, roofing and plastering to be called next week.

Maisonneuve, Que.

Work will commence at once on five flats for M. Limoges, Maisonneuve, stone and brick, metal roof, hardwood finish, concrete cellars, iron stairs, electric lighting, hot water heating.

Work will start shortly on the building of six flats, cost \$6,000, for H. O. E. Morin, Maisonneuve. Stone and brick, metal roofing, hot water heating, electric lighting, concrete cellar.

Work will commence shortly on the 5 flats for Mederie Limoges, 27b Orleans avenue. Building to be 3 storey, 34 x 50, pressed brick, stone foundation, stove heating, gas lighting, gravel roofing. Cost \$5,000.

Work will commence in a few days on the erection of six flats to cost \$9,000 for Jds. Grenon, Maisonneuve; stone and brick, metal roofing, hot water heating, electric lighting.

Work will be commenced shortly on the building of three flats to cost \$5,000 for Dr. Goyette, Maisonneuve; stone and brick, metal roof, hot water heating, electric lighting, concrete cellar.

Work will commence shortly on the erection of six flats to cost \$10,000, for J. Reaudur, Maisonneuve; stone and brick, hardwood finish, metal roof, hot water heating, electric and gas lighting, concrete cellar. Sewer pipes required.

L. Messier, Maisonneuve, will build 3 flats, stone and brick, metal roofing, hot water heating, electric lighting, concrete cellar, hardwood finish. Cost, \$6,000. Sewer pipes required. Work will commence at once.

Montreal, Que.

Henry Tessier, 624 Park Lafontaine, will build six flats, cost \$10,000. Excavation has commenced.

H. R. N. Veau, 43 St. Gabriel street, will erect six flats, \$5,000. Excavation is under way.

Outremont, Que.

F. J. F. Pick will build two flats, to cost \$3,000. Planking has started.

E. Laliberte, is erecting a cottage to cost \$5,000. Excavating finished.

A. Lemire has commenced work on the erection of a new residence to cost \$5,000.

L. Letourneaux has excavation under way for residences to cost \$10,000.

J. D. Langevin, Fairmont street, will build seven apartments to cost \$10,500.

Max Lebeau, Cote street, St. Laurent, has started work on three flats, to cost \$5,000.

St. John's, Que.

J. A. Daigneault, M.D., St. John's, Que., will build a new residence to cost \$5,000. Stone foundation, cement cellar, hardwood finish, metal roofing, hot water heating apparatus, electric lighting. Work will commence shortly.

Toronto, Ont.

L. J. Bland, 10 Vermont avenue, will build a residence, 2 storey, brick and stone, hot air heating, shingle roofing. Tenders are now being called for heating and plumbing. Cost \$2,700.

W. M. Robertson, 531 Dupont street, will build a 2-storey residence, brick and roughcast, hot air heating, combination lighting, shingle roofing. H. J. Paull, 399 College street, architect. Cost \$4,000.

Tenders are now being received by the owner, G. H. Webb, 35 Lynd ave., for the erection of a 2½-storey brick and stone residence, hot air heating, gas, gravel roofing. Cost \$3,500.

Tenders are called for three attached residences to cost \$7,500 on Glendale avenue, for J. G. McConkey, 88 Westminster avenue, Toronto. Architect, H. J. Wright; 2½-storey, brick and stone, hot air heating, electric lighting, shingle roofing. Tenders for heating and plumbing are now being received.

Vancouver, B. C.

Plans are being prepared by W. K. Macomber, Northern Bank Building, Seattle, for two residences, one to cost \$20,000 and the other \$35,000 to be erected either in the west end or Shaughnessy Heights.

Plans are being prepared for addition to apartment house on Victoria Court, for Peter Agren. Architect, Quandt & Preutner, Seattle, Wash. Addition to be 6 storeys, 66 x 132, pressed brick, elevators, ornamental iron, steam heating. Contract will probably not be awarded until spring.

Verdun, Que.

A. Prudhomme, 382 Church ave., will build ten dwellings, \$11,000. Foundation started.

N. L. Desrosiers will erect eight flats, \$10,000. Foundations are already in.

Paul Lalode, 4 Gordon ave., will build store and dwellings, \$11,000. Work on foundation is under way.

Windsor, Ont.

Tenders will be called until Oct. 18 for erection of a residence to cost \$4,500 on Oullette avenue, for John Twik, Oullette avenue, Windsor. Architects, Jacques & Co., Windsor; 2 storeys, 32 x 30, brick veneer, brick foundation, hot water heating, shingle roofing, hardwood finish.

CONTRACTS AWARDED**Brantford, Ont.**

Residence to cost \$10,000 on Dufferin avenue, for W. B. Preston, Brantford. Architect, L. D. Barber, Brantford. General contractor, P. H. Secord & Sons Brantford. Painting and glazing, Noble & Sons, Brantford; 3 storeys, 32 x 52, brick construction, brick foundation, hot water heating, electric lighting, slate roofing, hardwood finish. Heating and plumbing not yet awarded.

Brandon, Man.

E. Skinner, 1137 Lorne avenue, Brandon, has been awarded the contract for the \$3,700 residence being erected by George Longley, 541 15th street, Brandon; 2-storey, frame, concrete foundation, hot air heating, electric lighting, shingle roofing.

Fruitvale, B. C.

Contractor Dancy, of Nelson, has the contract for building a handsome new residence for E. Brewster, to cost \$5,000.

Saskatoon, Sask.

The contract has been awarded to G. C. Inskip, for the erection of a frame residence for J. S. Guine, Poplar Crescent. Cost \$4,000.

Business Buildings and Industrial Plants**Aylmer, Ont.**

The Aylmer Canning Co. are planning a large addition to their present factory. Modern packing house equipment will be installed.

Alliston, Ont.

The by-law granting a fixed assessment for ten years and free water service to the Degeries Woodwan Co. was carried by a large majority. They will establish a silverware factory, which is in the course of erection and will begin operations on January 1st.

Brandon, Man.

Wm. Atwood will build a business block on Ruth street; 3 storeys, 36 ft. frontage. Excavation will probably be commenced this fall and the building will be started early in the spring.

Cobourg, Ont.

The town council have under consideration an offer from an industry manufacturing tacks, nails and rivets, to establish their factory here. They ask the town to guarantee their bonds to the extent of \$65,000 and in return offer to erect a \$120,000 plant, employing from 200 to 500 hands.

Chatham, Ont.

The Chatham Gas Company are contemplating the expenditure of \$2,500 in making improvements to their present building.

Calgary, Alta.

Architect Leo Dowler, Alexander Blk., Calgary, is preparing plans for the erection of a business block; 10 storeys, 140 x 30; only 3 storeys will be erected at present.

Owner Dr. Hicks, 8th avenue W., has had plans prepared by Architect D. S. McIlroy, 1184 8th avenue W., Calgary, for the erection of a garage, 3 storeys, 130 by 50, brick construction, concrete foundation, steam heating, electric lighting, gravel roofing. Cost \$10,000.

Work will commence shortly on the erection of a garage to cost \$8,000, on 5th avenue, for E. W. Hume, 834 Royal avenue, Calgary; architects, D. S. McIlroy, 1184 8th avenue W., Calgary; 1 storey, 50 x 130, brick veneer, concrete foundation, steam heating, electric lighting, tar and gravel roofing. Garage equipment, gasoline tanks, etc., required.

City machine shop. Architect, City engineer; 2 storeys, 41 x 143, brick and mill construction, concrete foundation, steam heating, electric lighting, tar and gravel roofing. Motors, lathes, electric lighting, tar and gravel roofing, suitable for machine shop are required.

The Independent Order of Oddfellows will erect a business building to cost \$100,000. Architect, D. S. McIlroy, 1184 8th avenue W., Calgary; 4 storeys, 110 x 70, reinforced concrete, concrete foundation, steam heating, electric lighting, tar and gravel roofing, elevators, boilers, fire escapes and vaults.

Geo. Colgrove is organizing a company to develop a stone quarry about 150 miles west of Calgary. Equipment to be installed—two derricks, derrick engine, tracks and quarry equipment.

Metals Ltd., 9th avenue W., are contemplating the erection of a business block to cost \$50,000. Architect, J. McDonald, Dominion Block, Calgary; 3 storeys, brick and mill construction, steam heating, electric lighting, gravel roofing, fire escapes.

W. R. Hull, Grain Exchange, Calgary, is contemplating the erection of another building similar to the Grain Exchange 8 or 10-storeys high, 75 x 130, reinforced concrete, probable cost, \$500,000.

The Canada Bread Co. are looking over the principal cities of the West with the intention of establishing factories, and Calgary has been mentioned as a possible site for one.

G. Johnston, of Beveridge, is contemplating the erection of a 6-sty. business block. Hodgson, Bates & Butler, architects.

Plans are being prepared for the erection of a business block to cost \$25,000, for J. Dismorr, Harrow, England. Architect, Leo Dowler, Alexander Block, Calgary; 3 storeys, 50 x 40, brick, concrete foundation, steam heating, electric lighting, gravel roofing. Elevators will be required.

Excavation is started for stores and rooms to cost \$12,000, (Sunnyside) for J. R. Irwin, 520 10th street W., Calgary. Architect, J. D. Richards, Calgary. 2 storeys, 50 x 50, brick veneer, concrete foundation, steam heating, electric lighting, tar and gravel roofing, fire escapes. Boiler required.

Hon. J. A. Longheed, Clarence Block, is planning to erect a 10-storey business block, 75 x 130, corner 1st street W. and 8th avenue, at a cost of \$400,000.

Fort Frances, Ont.

The Virginia & Rainy Lake Lumber Co. have asked the Fort Frances authorities for a bonus of \$25,000 as an aid to the purchase of the proposed site just above the Shevlin-Clarke mills, but as site is in the municipality of McIlvaine they cannot comply. It is possible that the authorities of the latter municipality may come to satisfactory terms.

Grand Forks, B. C.

Work has commenced on the alterations to the jewelry store being made

(Continued on page 61)

Tenders and For Sale Department

CITY OF TORONTO

Tenders for Overhead and Pole Line Material

Separate or bulk tenders on prescribed forms, will be received by registered post only, addressed to the Chairman of the Board of Control, City Hall, Toronto, Canada, up to noon on **Wednesday, October 18, 1911**, for the supply of overhead and pole line materials, which include the following: No. 2-0 trolley wire; 300,000 c.m. feeder wire; steel tubular poles; span wire, hangers, cars, insulators and pins, etc.

Specifications and forms of tender may be obtained on application to the Department of Railways & Bridges, City Engineer's Office, Toronto.

Envelopes containing tenders must be plainly marked "Tender for Overhead and Pole Line Material" (on the outside).

The tenderers shall submit with their tenders, the names of two sureties (approved of by the City Treasurer, not members of the City Council or officers of the Corporation of the City of Toronto) or in lieu of said sureties, the bond of a guarantee company approved as aforesaid.

The lowest or any tender not necessarily accepted.

G. R. GEARY, Mayor,
Chairman of the Board of Control.
City Hall, Toronto,
August 31, 1911. 39-40

CITY OF TORONTO CANADA

Tenders for Subway Construction

Sealed tenders will be received by registered post only, addressed to the chairman of the Board of Control, City Hall, Toronto, up to 12 o'clock noon on **Wednesday, Nov. 1st, 1911**, for the construction of three miles of reinforced concrete subway and subway stations. No tender will be received for less than one-half mile sections.

Envelopes containing tenders must be plainly marked on the outside "Tenders for Proposed Subway Construction."

Plans and specifications may be obtained on application to the Department of Railways and Canals, City Engineer's Office, Toronto, also on file for inspection at the following points:

1. N. B. Colcock, Ontario Government Agent, 163 Strand, London, W.C.
2. Canadian Engineer, B/33 Board of Trade Building, Montreal.
3. Engineering News, 220 Broadway, New York.
4. Engineering Record, 239 West 39th St., New York.
5. Engineering Contracting, 537 S. Dearborn street, Chicago, Ill.
6. Canadian Engineer, Room 404, Builders Exchange Building, Winnipeg.
7. Commercial Department of His Majesty's Board of Trade, 73 Basinghall Street, London, E.C., Eng.

Each tender must be accompanied by a marked cheque for two thousand (\$2,000) dollars for each one-half mile section tendered on.

The lowest of any tender not necessarily accepted.

G. R. GEARY, Mayor,
Chairman of Board of Control.
40-43

Are You On ?

If not, get on our mailing list and be one of the 14,000 who receive SHAW'S BOOKLET as issued. The September number is now ready for mailing. Contains 44 pages of attractive offerings in released machinery and contractors' plant. Gives price, make, size, capacity, condition, etc. It's worth having. It's free. Send for it.

WILLIS SHAW MACHINERY CO.,
39 South LaSalle Street,
Chicago, Ill.

Debentures for Sale

The Corporation of the Town of Uxbridge will receive tenders up to **November 1st, 1911**, for the purchase of \$11,000 Public School Debentures, bearing five per cent. interest, payable in twenty-five equal annual installments of principal and interest.

Address, Dr. M. H. CROSBY,
Clerk.
40-41

Town of Vermilion

ELECTRIC LIGHT PLANT

Sealed tenders will be received up till noon of **October 16th, 1911**, by C. V. Caesar, Secretary-treasurer, Vermilion, Alta., for the delivery and erection of the following work covered by:—

Section "A" Steam boiler, feed pumps and heater, etc.

Section "B" Steam engine.

Section "C" Electric generator and switch-gear.

Plans and specifications can be obtained from the secretary-treasurer, Vermilion, or from the engineers, 34 Victoria street, Toronto, or the offices of the Contract Record, B34 Board of Trade Building, Montreal, or Commercial Traveller's Building, Winnipeg.

Secretary-treasurer, Engineers,
C. V. Caesar, Bowring & Logan,
Vermilion, Alta. 34 Victoria St., Toronto.
40-40

CITY OF LONDON

Tenders for Tile Sewers

Sealed proposals addressed to the "Chairman and Members, No. 2 Committee" will be received at the office of the City Clerk until 5 p.m., on **Thursday, October 12th, 1911**, for the construction of tile sewers on (1) York street; (2) Harvard and Yale streets; (3) Eva street.

Each bidder shall name a lump sum for the above works, and a separate price for any deduction or additions on main and side drains, and make his tender on the form furnished by the city engineer.

Plans and specifications covering the above-mentioned works may be seen at the office of the City Engineer.

Contractors to enclose a marked cheque for ten per cent. of the amount of their bids.

The City reserves the right to reject any or all bids and to accept any bid.

NEIL COOPER,
Chairman No. 2 Committee
GEORGE W. WRIGHT,
City Engineer.
40-41

Tenders for Paving

Sealed tenders addressed to the Chairman of Board of Works, will be received up to noon on **Monday, 18th October, 1911**, for supplying material, labor and plant, and executing all work in connection with laying approximately 2200 square yards of Asphalt Block Pavement in the City of Peterborough, Ont.

Plans, specifications, general conditions and forms of tender may be seen at the office of the City Engineer, Peterborough.

The lowest or any tender not necessarily accepted.

JOS. R. METHERAL,
Chairman Board of Works.
Peterborough, Ont.,
3rd October, 1911. 41 41

Architects Attention

The Windsor Board of Education offers a first prize of \$500 and a second prize of \$250 for competition by architects for plans for a twelve-room school to be erected in the City of Windsor. Complete working drawings and specifications unsigned to be forwarded to the Secretary of the Board on or before the 15th of November next. Cost of building not to exceed \$40,000 complete, exclusive of drawings.

The plans accepted to be the property of the Board, and in the event of the successful architect being employed the Five Hundred Dollars will be part of his fees. Rejected plans will be returned.

Architects tendering will mark the plan with some designation and mark same on sealed envelope enclosing name and address of the party competing.

Description of Building

Two storeys and basement, brick building with stone foundation, roofed with wooden shingles, hardwood finish, hard plaster, steam heating, modern system of ventilation, first-class sanitary arrangements, no artificial lighting.

Plans to conform to the regulations of the Education Department.

ALEX. BLACK,
Secretary-Treasurer.
40-41

CITY OF LETHBRIDGE ALBERTA, CANADA

Extensions to Power Station

Sealed tenders marked "Tender for Power Station," will be received by G. W. Robinson, secretary-treasurer of the city of Lethbridge, up to and including **Friday, November 24th, 1911**, for the supply, delivery, and erection of the following equipment for the Power Station Extension:

Section B.—Boilers and accessories.

Section C.—Mechanical draft and economizer.

Section D.—Steam turbo-generator set and condensing equipment.

Section E.—Steam engine driven exciter.

Section G.—Sub-station equipment.

Plans and specifications can be obtained from Arthur Reid, superintendent engineer, City of Lethbridge.

An accepted cheque for ten per cent. of the amount of the tender must accompany each bid.

The lowest or any tender not necessarily accepted.

G. W. ROBINSON, Sec.-Treas.,
Lethbridge, Alta.
39-40

Positions Wanted

Competent Engineer (Civil) solicits work on designing wharves, breakwaters and general harbor construction and surveying; also any kind of draughting. Box 341, Contract Record, Toronto, Ont. 41-43

TENDERS WANTED

Tenders will be received by the undersigned up to Thursday, October 12th, 1911, for the purchase and removal of the buildings and machinery of the MacLean Planing Mills at Meriton, Ont.

MONTROSE PAPER MILLS,
Thornold, Ont.

41-41

by A. D. Morrison, Grand Forks, 2 storey, 30 x 50, brick and concrete, stone foundation, stove heating, electric lighting, tin roofing. R. McIntosh, architect.

Gage's Inlet, Hamilton, Ont.

Tenders are called for erection of a factory to cost \$20,000 for Grasselli Chemical Co., Gage's Inlet, Hamilton and Cleveland. 2 storeys, 78 x 260, frame construction, stone foundation, steam heating, electric lighting, shingle roofing, electric work. Plans, etc., at office of T. Hobson, Bank of Hamilton Chambers, Hamilton. Company will bring machinery from Cleveland.

Hamilton, Ont.

The Oliver Chilled Plow Works, Hill-yard street, Hamilton, require machinery, lathes, derricks, belts and forges, for their new works. Cost \$5,000.

Lake Ainslie, N.S.

John C. Mahon, Halifax, and P. J. A. Lear, Hotel Great Central, London, Eng., are representing an oil concern that intend to start operations next summer. A large oil well to be in operation early in spring and sawmill to be started in six weeks' time. A railway will be built from Lake Ainslie to Orangedale. Engineer, Mr. Dalton, London, Eng.

London, Ont.

The Battle Creek Corn Flakes Co. will have plans prepared shortly for a new factory which will double the size of the present plant. New machinery will have to be installed.

Construction of a factory will be commenced at once for Petrolia Auto Co., Petrolia, and a fireproof building, 40 x 80, 1 storey, will be erected as temporary quarters for the winter. A much more extensive plant will be equipped in the spring.

The D. S. Perrin Company are planning to erect a 6-storey factory in the spring, on Carling street, to cost \$100,000. Large quantity of latest biscuit and baking machinery will be installed.

Maisonneuve, Que.

Work will commence shortly on extension to factory, cost \$5,000, for United Soap Co., stone and brick, metal roof, hardwood finish, electric light, hot water heating, concrete foundation, tile flooring.

Montreal, Que.

J. T. Morin, 2144 Ontario street, will build two stores and flats, \$5,000.

A. Bastieu, 178 Fairmount avenue, will erect 2 stores and 4 flats, \$11,000.

Isaac Frank, 118 Sherbrooke avenue, will build 1 store and 5 dwellings, \$5,000. Excavation started.

J. Rawson Gardiner, architect, 49 Beaver Hall Hill, Montreal, is calling for tenders privately for an addition to the warehouse of Drummond, McCall & Co., building to be one storey, brick, with an iron roof.

Niagara Falls, Ont.

Plans are being prepared for an addition to hotel to cost \$10,000, for Taylor & Bates, St. Catharines. Architect, Wm. Nichols, Niagara Falls; 20-room brick addition to the Hotel Trennick.

Machinery is required for a factory for Watson Gun Sight Co., Niagara Falls, Ont.; 1 storey, 25 x 55, concrete block. Motor, shafting, fine metal working.

New Westminster, B. C.

The Crown Timber & Trading Co., Dominion Trust Building, Vancouver, have purchased a tract of land at Mill-side, on both the Fraser and Brunette rivers, and are contemplating the erection of a sawmill. The buildings at present on the site will be utilized, with changes (plans for which are being prepared). Plans include installation of two planers, resaw, trimmers and dry kilns, for which they have part of necessary machinery. Remainder will be purchased. A. B. Pracna, architect, 821 Pender street, Vancouver.

Rodney, Ont.

Heinz Pickling Co. are planning to double their present factory, and plans will be prepared shortly for a large brick extension. Equipment for pickling will be installed.

Ruskin, B. C.

E. H. Heaps & Co., Ltd., Vancouver, are planning the establishment of a new wood-working plant, including sawmill, sash and door factory and planing mills.

St. John's, Que.

A bonus will be granted the Canadian Dairy Supply Co., 592 St. Paul street, Montreal, by the town of St. John's, Que., and they move next week. Additional machinery will be required for the manufacture of dairy supplies and cream separators. Steam power to operate plant. Machinery required.

Welsh's Holyoke Steam Boiler Works of Holyoke, Mass., intend to establish a large Canadian branch. Steam power will be used in the new plant.

The Lightning Furnace Co., Ltd., of Montreal, are manufacturers of heating furnaces, cooking combination stoves, vacuum cleaners, etc. They are to receive a bonus from the town of St. John's and will establish a foundry to employ 50 hands. Equipment for foundry will be required. Secretary-treas., E. Rodier; president, Romeo Houle, 204 St. James street.

St. John, N. B.

The civic committee appointed in the matter have prepared a report recommending that the city establish an abattoir. The report will be dealt with at a special meeting of the city council to be held in a few days. J. W. Kierstead, Robinson Building, is chairman of the committee.

St. John, N. B.

It is understood that a group of English capitalists have made a proposition to purchase the court house and jail.

The purpose is to secure a site for the erection of a large hotel.

T. McAvity & Sons have asked the city for the property recently turned over to F. C. Durrant to be used for an extension to their foundry.

Saskatoon, Sask.

Tenders are called until Oct. 10 for erection of a telephone building on lots 10 and 11 in block 149, Saskatoon. Tenders to be accompanied by accepted cheque for \$3,000. Plans, etc., with the Deputy Minister and with architects. Department of Railways, Telegraphs & Telephones. Deputy Minister, S. P. Porter; architect, Storey & Van Egmond, Regina.

Sarnia, Ont.

The Imperial Oil Co. of Canada will extend their refining plant to an extent involving the expenditure of at least half a million dollars. Local manager, Geo. J. Kilpin.

St. Thomas, Ont.

The General Gasoline Electric Motor Company, of New York, will establish a branch factory here.

St. Boniface, Man.

The Winnipeg Ceiling & Roofing Co. Winnipeg, are contemplating the erection of a factory in the spring. 80,000 pound press will be put in.

Stettler, Alta.

The International Harvester Company are looking for premises to lease for a distributing warehouse on Industrial spur, to distribute machinery north, south, east and west. Building should cover from half to whole block. J. A. Stringer, agent, Stettler.

Toronto, Ont.

A permit was issued by the city architect for erection of a \$20,000 office building in the immediate vicinity of their \$100,000 factory, which is now being built at the corner of Fraser ave. and Liberty sts. Owner, E. W. Gillette Co., Ltd., King street west, Toronto; architect, A. R. Dennison & Stephens, 18 King street west, Toronto.

Tenders are called for addition to factory for Delany & Pettit Co., Ltd., 113 Jefferson avenue, Toronto. Architects, Langley & Howley, 169 Bay street, Toronto; 3 storeys, 40 x 100, brick with a one-storey attachment, 60 x 17, steam heating, slate roofing.

The Union Bank of Canada is having plans prepared by Architect H. Bryan Gilbert for alterations and additions to the building, corner Clinton and Bloor streets.

W. G. Simpson, 426 Delaware avenue, Toronto, will build a new store and dwelling, 2½ storeys, stone and brick, hot air heating, electric light, shingle roofing. Plans, etc., with owner, who is calling tenders. Closing date not specified. Cost \$5,000.

Tenders are called for erection of an office building to cost \$100,000, on Victoria and Richmond, for Robins Ltd.; architect, Jno. M. Lyal, 14 Leader Lane, Toronto. Plans etc., with architect.

Rockwood & Co., chocolate manufacturers, of New York, will erect a six-storey factory building at the corner of Queen and Crawford streets.

The National Cash Register Co. have purchased a site and are contemplating the erection of a factory here in the spring.

Victoria, B. C.

Plans are prepared for erection of a business block to cost \$20,000 on Fort street, for A. Haynes, Victoria. Architect, James & James, Victoria. 3 storeys, brick store, office and apartment building.

Tenders are called for erection of an hotel on Yates street, for Challoner & Mitchell, Victoria. Architect, Thos. Hooper, Royal Bank Chambers, Victoria; 5 storeys and basement, brick hotel and store building. Plans, etc., at office of architect.

Vancouver, B. C.

The Tenino Stone Co., Tenino, Wash., producer of "Hercules" and other brands of stone, are seeking a site for the establishment of a branch plant. D. F. Russell is the manager. If the company locates in Vancouver they will ship rough stone and do their cutting here, for the entire province.

The E. H. Heaps & Co., Ltd., are planning the erection of modern machine shops for the building of engines, taxicabs, motor cars and trucks. The company also plan to erect a new mill, a duplicate of the present one at Victoria Drive and Powell street. Capacity of 30,000,000 ft. annually.

A deal has just been closed for about 12 acres of water front on Burrard Inlet on which will be erected a steel and concrete soap factory, which with machinery will cost about \$1,000,000. A wharf 60 ft. long, on the waterfront, and spur tracks from the main line of the C. P. R. will also be built. Tugs and scows will either be built or purchased. Plans will be prepared immediately. Owners, Lever Bros., Toronto and Winnipeg. General manager, R. S. School-ey.

W. D. Anderson, of Toronto, has formed a company for ship-building, and is seeking a site in or near this city to locate a plant.

The Canadian Van Emon Elevator Co., Pacific Building, are contemplating the erection of a factory here to cost \$500,000.

Tenders are closed but contract not yet awarded for an elevator to cost \$15,000, for McLellan, McCarter & Co., Ltd., 1605 6th avenue W., Vancouver, B. C. Engineer, C. H. Vogel, Dominion Trust Building, Vancouver; frame construction, 75 ft. in height, with a capacity of 30 to 40,000 bushels.

Winnipeg, Man.

Mr. Alex. McIntyre is contemplating the erection of a 12-storey business block on Albert street.

Claydon Bros., 444 McMicken street, Winnipeg, have applied for a permit to erect a factory on Furley street at a cost of \$10,000.

Windsor, Ont.

Tenders are called for erection of a factory to cost \$15,000 on Wellington avenue, for Canadian Winkley Co., Windsor, manufacturers of Brass Goods. Manager, W. M. Flood; 1 storey, 100 x 100, steel, frame and brick construction, concrete foundation, shingle roofing, cement floor. Tenders are now being received by manager. Date of closing not specified.

West St. John, N. B.

The Union Iron Foundry Co. have asked the city for lease of water lots in front of their foundry, which cover an

area of 400 x 100 ft. If land can be leased or bought they will probably use the entire space for erection of a foundry.

CONTRACTS AWARDED**Calgary, Alta.**

J. E. Slingsby, Riverside, Calgary, has plans prepared for business block to cost \$25,000. Architects, Lary & Mayor, Calgary; contractor, A. Daoidge; 2 storeys, 50 x 87, brick veneer and frame, concrete foundation, steam heating, electric lighting, gravel roofing, fire escapes, and vaults. Store fittings required.

Calgary, Alta.

Work is in progress for erection of a business block to cost \$120,000, for A. McDougall, McDougall Block, Calgary. Architect, A. A. Rose, Lindeham Block, Calgary. General contractor, Rose Bros., Calgary; 5 storey, 75 x 130, brick and mill construction, concrete foundation, steam heating, electric lighting, tar and gravel roofing, fireproofing.

Herald Western Co. will build a business block to cost, \$30,000. Architect, Albert Consulting & Engineering Co., Calgary. General contractors, Johnston & Johnston, 111 5th avenue, W., Calgary; 2 storeys, 75 x 192, brick and mill construction, concrete foundation, steam heating, electric lighting. Motors, printing machinery, freight elevator, boilers, etc., required.

The P. Burns & Co. Ltd., E. Calgary, will erect a business block to cost \$50,000, on 8th avenue E. Architects, Hodgson, Bates & Butler, Grand Exchange; general contractor, Norton Griffiths Construction Co., Vancouver, B. C. 2 storeys, 50 x 130, steel construction, reinforced concrete, concrete foundation, steam heating, electric lighting, tar and gravel roofing.

Hotel and stores to cost \$1,500,000 for Canadian Pacific Railway, Winnipeg. General contractor, P. Lyall & Sons, Montreal; 13 storeys, 228 x 146, fireproof, steel construction, concrete foundation, steam heating, electric lighting, gravel roofing. Excavation work commenced.

Departmental store to cost \$1,500,000, for Hudson Bay Co. Architect, Burke, Horwood & White, 28 Toronto street, Toronto. Excavation contractors, Carter, Hall & Aldinger, Calgary; 8 storeys, 245½ x 130, fireproof construction, concrete foundation, steam heating, electric lighting, boilers, engines, dynamos, switchboard, storage battery. electric wiring, vacuum cleaner, pneumatic tubes and sprinklers. Foundations are in.

Foundations are in for stores and apartments, to cost \$28,000, for J. A. Carson. Architect, D. S. McIlroy, 118a 8th avenue W., Calgary; general contractor, Cradock & Sweeney, Calgary; 5 storeys, 60 x 65, fireproof construction, concrete foundation, steam heating, electric lighting, tar and gravel roofing. Elevators will be required.

Fort William, Ont.

The contract for the erection of the cooorage for imperial Oil Co. has been awarded to Barnett & McQueen. Building to be 2 storeys, 175 x 50, frame construction. Cost \$11,000.

Grand Forks, B. C.

Excavation has been completed for erection of a meat market to cost \$10,000, on First street, for P. Burns & Co., Calgary. Architect, Ernest Carven,

Lethbridge. General contractor, H. J. North, Grand Forks; one storey and basement, 50 x 72, brick construction, concrete foundation, stove heating, electric lighting, felt and gravel roofing. Cold storage and refrigerators required.

Hamilton, Ont.

Factory to cost \$25,000 on Clark and Burton streets, for Climax Road Machine Co., Marathon, N. Y. Architect, Jno. Robinson, 46 Merrick street, Hamilton; general contractor, W. Hancock, 75 Locomotive street, Hamilton; 2 storeys, 60 x 72, steel and brick, stone foundation, steam heating, electric and gas lighting, tar and gravel roofing, concrete floors, dynamos, electrical work. Steel working machinery required.

London, Ont.

Work is in progress for erection of workhouse to cost \$12,000, on Piccadilly street, for Fireproof Warehousing Co., London. Architects, Moore & Heny, Richmond street, London; general contractor, Hyatt Bros., Egerton street, London; 3 storeys, 30 x 100, brick, concrete foundation, hot air heating, electric lighting, gravel roofing, freight elevators. Painting, glazing, plumbing, heating and roofing not yet awarded. Work has just started.

Montreal, Que.

Work will commence at once on a store and eleven dwellings, cost \$10,000, for F. T. Dumontier, Montreal, stone and brick, hardwood floors, plate glass, concrete cellar, hot water heating, iron posts and stairs, electric light.

Saskatoon, Sask.

J. Morrison, Saskatoon, has been awarded the contract for the erection of the horse repository for J. R. Wells, Saskatoon. Cost \$3,500.

The contract has been awarded to Jas. Prill, Saskatoon, for the erection of store and offices on 20th street for Bowman Bros., building to be 2 storey, brick and concrete, concrete foundation. Cost \$15,000.

Vancouver, B. C.

The contract for the erection of a building for the Bank of Montreal has been awarded to T. Cromwell, Vernon.

Victoria, B. C.

A permit has been granted for erection of a business building to cost \$125,000, corner View and Broad streets, for McPherson & Fullerton, Victoria. Architect, J. M. Warren, Victoria. Contractors, The Sound Construction Company, Victoria; 6 storeys, 120 x 60, reinforced concrete, fireproof, passenger elevators. Work will commence at once.

Power Plants, Electricity and Telephones**Brandon, Man.**

Tenders are called until October 12th for street lighting. City engineer, R. E. Speakman, Brandon; 100 electric light standards for street lighting and equipment.

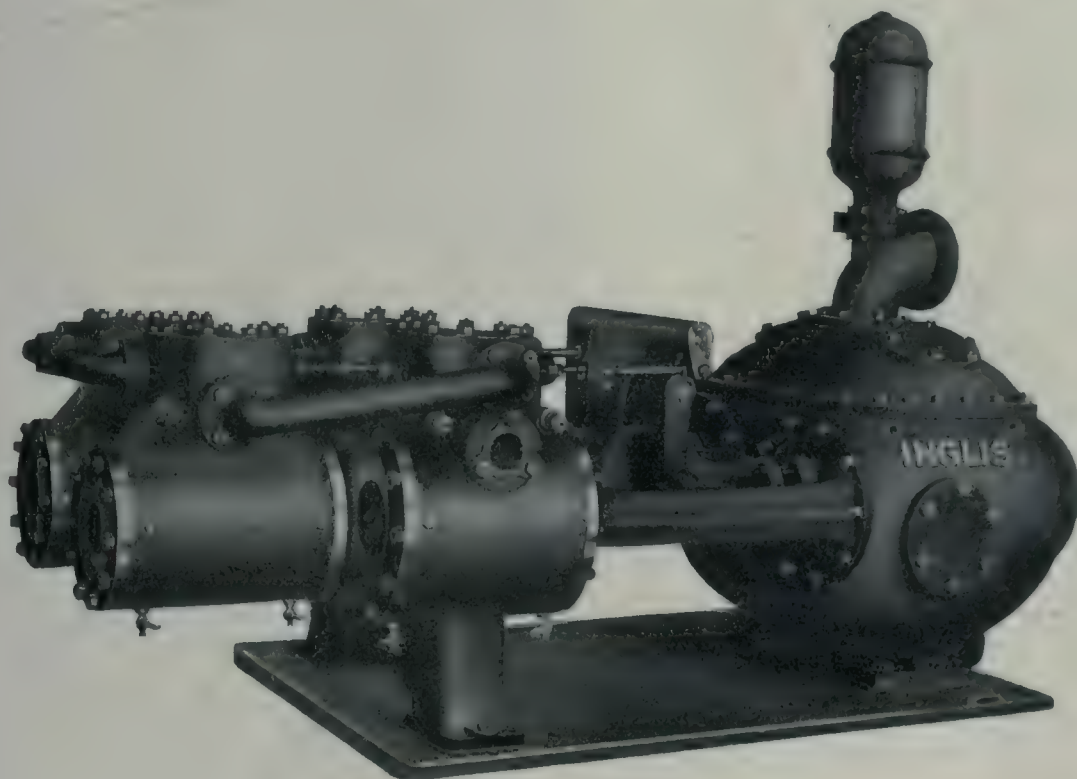
Beachville, Ont.

A by-law will be submitted to the ratepayers on October 20th for equipping a hydro-electric station. Farmers throughout the district want power and will need electric and other equipment.

(Continued on page 64)

Water-Works Plants

for Towns and Cities



"Inglis" 1,000,000 gall. Pumping Engine.

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Capacities from one to thirty million gallons per 24 hours.

Send us your inquiries.

The **John Inglis Company**

Engineers and Boilermakers

Limited

14 Strachan Ave., TORONTO, Canada

(Continued from page 62.)

Chelsea Green, Ont. (Suburb of London)

The municipality have decided to take hydro power and will install full equipment. 24 street lights will be put up. Electric equipment for houses will be required. Engineer, H. J. Glaubitz, London.

Fredericton, N. B.

Contemplated, power plant to cost \$300,000, for Eel River Heat, Light & Power Company, Fredericton. Secretary, R. G. Lee; engineer, H. S. Ferguson, New York, has reported that a \$500,000 development on Eel River, 50 miles above Fredericton, would render available 3,500,000 kw. per year. Transmission line to St. Stephen, Woodstock and Fredericton, to cost \$64,000.

Innisfall, Alta.

A by-law will shortly be submitted for the establishment of an electric light plant in the village. It is believed that with 1,000 lamps in operation the plant would be self-sustaining, and it is estimated that it could be installed for \$15,000.

Lethbridge, Alta.

Tenders are being called for power plant equipment and extension which will give the city an extra power capacity of about 1,500 kilowatts, sufficient to supply all the needs for the proposed street railway system. Boiler capacity will also be doubled, giving eight boilers where there are now four. Tenders for building extension will be awarded after machinery is contracted for.

Lindsay, Ont.

The by-law to grant a franchise to the Electrical Power Co., Ltd., was carried by a majority of 606.

CONTRACTS AWARDED**Portage la Prairie, Man.**

The contract for the erection of the addition to the municipal electric plant building has been awarded to Alex. McLarty.

Prince Rupert, B. C.

Engineer Ross, Seattle, has recommended the purchase of two Ridgeway units to cost \$14,590. Delivery to be made in December.

Miscellaneous**Coquitlam, B. C.**

The municipality will purchase a Mussels Co. Ltd. rock crusher at \$2-182.80, which will be operated by a steam plant to be secured.

East Lake Ainslie, N.S.

Work is in progress for erection of a crushing plant, to cost \$50,000, for H. H. Harrison, Halifax or East Lake Ainslie. Building to be used for crushing barytes, 2-sty., 150 x 55, frame construction, cement foundation, shingle roof. This is one of the largest barytes mines in America; and is just starting operations.

Hamilton, Ont.

The city of Hamilton will purchase a new boiler for steam fire engine.

16,000 gal. tank in connection with sprinkler system at Geo. E. Bristol Co.'s warehouse, 75 McNab street N. collapsed on October 3rd. New tank or electric pump for system will be required.

Montreal, Que.

Tenders are called for supply of 300 ton of raw asphalt required. Received by controllers about Oct. 5 or 6th, close 10 days later. Engineer, Geo. Janin.

New Hamburg, Ont.

One of the largest lager boilers of the Rau Brewing Company, New Hamburg, burst recently and was completely ruined. A new boiler will be installed.

Victoria, B. C.

A by-law will be submitted to the rate-payers shortly for the purpose of raising \$25,000 for motor fire apparatus for headquarters.

Business Notes**Fredericton, N. B.**

The Fredericton & Grand Lake Coal & Railway Co. has been formed. They have secured the control of a large number of coal areas in the Grand Lake district, near Minto, N. B., and are undertaking the development, on an extensive scale, of these coal areas. It is reported that a contract has already been signed to deliver 100,000 tons of Grand Lake coal annually to the C. P. R.

Hamilton, Ont.

The Ideal Concrete Machinery Co. of London, Ont., are moving to Hamilton. The company have taken over premises at corner of Shaw and Emerald sts. and may require new equipment.

Parrsboro, N. S.

The property and all rights and titles of the Colonial Copper are to be sold at public auction on November 2nd at the Town Hall, Parrsboro, N.S., pursuant to an order of foreclosure. The sale is to be conducted by Sheriff Davison of Cumberland County. J. L. Ral-

ston, solicitor for the plaintiff, the Trust Co. of America.

St. John, N. B.

The St. John directors of the Cornwall & York Cotton Mills Co., are again in control of the property and mills. The reported transfer of the control to Canadian Cottons Ltd, did not materialize.

New Companies

The Elgin Realty Company, Limited, Ottawa, Ont., incorporated with a capital of \$300,000, to carry on a general land and building business. Provisional directors, Norman Wood Lye and Montagu Grant Powell, both of the city of Ottawa.

Crouse-Hinds Company of Canada, Limited, Toronto, Ont., incorporated with a capital of \$100,000, to carry on business as engineers, machinists and general contractors. Provisional directors, Wm. L. Hinds and Huntingdon Beard Crouse, both of Syracuse, N.Y.

The Buffalo-Brickville Mining Company, incorporated in the State of New York, has been licensed to carry on business here as builders of reservoirs, wharves, sawmills, railroads, etc., and have appointed Chester A. Smith, of the towns of Brockville, Ont., attorney.

The M. J. Haney Realty Company, Limited, Toronto, Ont., has been incorporated, with a capital of \$50,000, real estate and building, etc. Provisional directors, Silas Warren Cheever Scott, and Samuel Casey Wood, both of Toronto.

The Lake Megantic Realty Company, Inc., Megantic, Que., has been incorporated with a capital of \$100,000, to carry on business as builders, contractors, to develop electricity and generating power, etc. Incorporators, Wm. Gardner Craig, David Murray and Wm. H. Craig, of Kingston, Ont.

The Peace River Trading and Land Company, Limited, Edmonton, Alta., incorporated, with a capital of \$1,000,000, to build and operate dams, wharves, mills, factories, roadways, etc. Incorporators, Wm. G. Pugsley, Ronald Cameron Grant and Geo. Williamson, all of Montreal, Que.

West Valley Land Company, Limited, Montreal, Que., incorporated, with a capital of \$70,000, to carry on business as builders, producers of electricity, etc. Incorporators, Ernest Remy Decary, Edouard N. Herbert and Louis O. Grothe, all of Montreal.

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Are Contracting Provisions Keeping Pace With Increased Volume of Business?

The evils resulting from an inadequate time allowance for tendering and other matters of live interest to the contracting community are discussed by the reader of the Contract Record on the next page. We are particularly impressed with the contention that the provisions made in recent years by public and municipal authorities have not kept pace with the business development of the country. In every department of construction Canada has excelled herself during the last decade. The story of progress in town and city, and the growth of industrial concerns, municipalities and railroads is too familiar to be touched upon except in a general manner, but withal the contracting community is hampered by the same lack of foresight under which it labored from the very beginning. Indeed, matters are becoming more acute, as may be judged from the example given by our correspondent, who is allowed the same time in which to turn out a hundred articles as he was given a few years ago to produce ten to fifteen. Manufacturers' facilities have or should have increased considerably in the intervening time, but not in the ratio of ten to fifteen to thirty. And then we have again the time-honored contention that municipalities should get through their preliminaries in the fall so as to give the contractor every chance at the opening of spring. The contracting interests of Canada are entitled to some consideration in this regard and if the Contract Record could arouse a little enthusiasm in this connection its efforts would not have been in vain. We are not getting the best out of public and municipal contracts; neither is the Canadian contractor who is looking for such work getting a fair show. We say the Canadian contractor advisedly, for thanks to the rush occasioned by present conditions outside firms are getting a far larger share of our business than they would otherwise obtain. In closing, it may be

said that the constructional interests of Canada can solve the problem of the Canadian winter in no other way than by securing the opportunity to prepare their tenders and arrange all preliminaries during the quiet months so as to be ready for the opening of the active season.

Motor Cycles for Field Work

Motor cycles for field work are coming into use by engineers and contractors alike. U. S. engineers engaged on inspection of work scattered over considerable territory have found these motor cycles extremely useful, enabling them to get about as quickly as with automobiles and at considerably less expense, according to the Engineering Record. More recently contractors have begun to adopt them. The difficulty experienced by contractors in sending a timekeeper over the ground more than once a day when several works are being carried on at different places has been overcome by the motor cycle. For instance, the A. S. Bentley & Sons Company, of Toledo, found its work so spread out in the spring of 1910 that time-keeping was quite difficult. Work was being done on the water filtration plant some distance from the city in one direction and at the Toledo shipyard in another direction, the distance between these two places being about 10 miles. The company wished to have its general timekeeper visit each job twice daily, and so it decided to experiment with a motor cycle. There were other jobs under construction in the city at the same time which it was desirable to have the timekeeper visit, and, as a result, the machine has been covering 75 to 80 miles daily ever since it was bought. This record has been kept up during the winter as well as during the summer, and the company estimates that the use of the machine has enabled its general timekeeper to do the work of three men and also take on the duties of a team superintendent as well. The company's opinion of the value of the motor cycle is shown by the fact that it has purchased three more since the first one was put in service. All of them have given the most thorough satisfaction and none has developed any vagaries of a mechanical nature. The expense of maintaining these machines has been nominal beyond the wearing out of tires, which, of course, was to be expected. Such an experience might well be taken into thoughtful consideration by other contractors who have hitherto overlooked the fact that between the somewhat expensive automobile and the slow buggy there is in the motor cycle an economical and speedy method of getting over the ground.

A recent visitor to Ottawa was Sir Robert Perks, of the contracting firm of MacArthur, Perks & Company. In the course of an interview Sir Robert Perks stated that he entertained hopes for the early construction of the Georgian Bay canal. The repudiation of reciprocity would expedite the carrying out of the project. The Panama canal, he said, would be completed in 1913 and the United States would make a desperate effort to divert Canadian trade to Canada's western ports, to the detriment of the East. With the completion of the Georgian Bay canal Ottawa would become a port in much the same way as Manchester became a port through the building of the Manchester ship canal. The construction of a canal from the St. Lawrence to Ottawa would take five years.

Evils of an Inadequate Time Allowance

Localizes Tendering and Freezes Out Reliable Firms—Effect of Unreasonable Deposits—Delay in Placing Municipal Work

Oct. 10, 1911

Editor, Contract Record:—

We note in your issue of September 27 a very interesting article, "Advertising Contracts for Public Works." We are pleased to see matters of this character being given the attention in your columns which present conditions certainly demand.

Altogether too little time is given contractors to procure data with which to figure intelligently on municipal and other like work. It is not unusual to find tenders advertised for but ten days before the date of letting. In many of these cases the contractor has to write to some engineer away out in the western provinces for specifications and other data, which very frequently, after all, do not give sufficient information to figure upon. Consequently another, if not several letters are necessarily exchanged before the contractor is in a favorable position to make up his tender, and by this time it is either too late, or the bid may have to be telegraphed and take the chance of being thrown out on account of irregularity in form.

The purpose of the advertisement should not be simply to comply with the by-law covering the letting of contracts. It should aim to give every one a chance to figure upon the work and to bring the advertiser in touch with as many as possible of those who are prepared to perform the work or supply the goods. Consequently the longer the advertisement runs, and the more complete the information it contains, the better service it will give to all concerned.

Unreasonable Deposits

Another thing that is very objectionable in many cases, is the very heavy marked cheque, or deposit, required with some tenders. The cheque does not require to be so exceedingly large in amount to insure the good faith of any reputable tenderer, and means can readily be found which will protect the advertiser from bids of unreliable parties without imposing what might be termed a penalty on those bidders who are thoroughly reliable and trustworthy. A good sound company may be put to serious inconvenience financially through having a number of large marked cheques outstanding on bids. We have known times in our business when we have had no less than a dozen out, running into a very large amount of money, which was taken out of the business from three to four weeks at a time. We have no doubt that some contractors, under similar circumstances, would have to forego tendering until some of the outstanding cheques were returned and their credit re-established.

Present Provisions Not Consistent With Increased Volume of Business

Another difficulty which manufacturers are meeting with to-day in Canada is occasioned through corporations and engineers not realizing that the volume of municipal and government orders runs two or three times the amount it did a few years ago, and consequently there is bound to be trouble from late deliveries unless the orders are placed well in ad-

vance, so as to give the manufacturer a reasonable time in which to manufacture these larger quantities, and effect a satisfactory delivery. A few years ago in our particular business it was a usual thing to get an order for from ten to fifteen articles, and get from thirty days to two months to deliver them, whereas to-day the order runs from fifty to one hundred of these articles, and very frequently the specifications demand that delivery be made in from three to four weeks—and this mark you, is for a line of goods which cannot be stocked and which must be manufactured to specification after the contract has been signed. Doubtless one reason for the delay in the placing of municipal orders is the fact that by-laws are usually voted upon, covering expenditures, after the city council is elected in January, this resulting in the placing of orders for the summer's supply of material as late as the months of May, June and July, whereas they should be arranged now for the supply of next spring's goods, and thus give the manufacturer time to make them up during the winter.

Take the matter of paving materials as an instance. There are many towns throughout Canada to-day with their streets torn up waiting for material with which to finish the paving simply because the letting of the contract was put off until nearly mid-summer. If these contracts had been let last fall the contractor would have arranged for his supply of material for delivery in the spring, and this paving would be completed now when the cold weather is coming on. It is the same way with waterworks and sewerage extensions and installations. It is to be hoped that those in charge of the awarding of contracts for these classes of work will soon begin to realize that the volume of business in Canada is daily growing larger, and that more time must be allowed for the production of the necessary materials and supplies.

The Best Man the Busiest

In sizing up the situation it is as well to remember also that the manufacturer making the best grade of goods is bound to be the busiest, and that, consequently, if sufficient time is not allowed for the production of goods, it will be impossible for many corporations to procure the highest grade of material since they will have to depend for their supply upon manufacturers having fewer orders on their books by virtue of a smaller demand.

Yours very truly,
"Contractor."

The eminent English engineer, Sir John Wolf Barry, K.C.B., has been appointed consulting engineer in connection with the proposed Second Narrows Bridge, Vancouver. The selection was made at a recent meeting of the directors of the Burrard Inland Tunnel & Bridge Company. The proposed structure is one of the most important engineering projects undertaken in British Columbia for some years. The total estimated cost is \$2,000,000. The name of S

John Wolfe-Barry has become connected with some notable structures. He was engineer for the well-known Tower Bridge in London, Eng., and he was associated with the construction of the Blackfriars Railway bridge. He was born in London in 1836. Among his many noteworthy appointments may be mentioned that of representative for Great Britain on the International Commission for the Suez Canal.

Calling In the Student

This is the period at which the up-to-date purveyor of education is beginning to realize the results of the publicity campaign of the last season, says the Engineering Record. The traditional college president has always until now been a bald-headed and bespectacled minister of the gospel, clad in shiny broadcloth and dividing his time between homilies to his assembled flock of students and instructing them in Paley's Evidences. But we have changed all that and to-day the personage chosen to head an educational institution is very likely to be a polished and smooth-spoken man of affairs, smartly dressed and ready to meet all sorts and conditions of men with the persuasive affability that leads to legacies. His chief function is administrative, and he is become, in fact, the manager of a species of educational department store, keenly anxious to advertise his wares and judging the success of his campaign by the number of customers who attend his bargain sales of learning. The change may be, on the whole, for the worse or better, but the thing which here concerns us is the nature of the advertising campaign which is carried on and the veracity of the claims made for the goods advertised. There is no educational pure food law which compels nostrums to be labeled with their percentage composition so that when a skilfully worded advertisement proclaims the virtues of mechanical engineering syrup, or electrical engineering cough mixture, the would-be customer knows as little of its real virtue as the man who reads the certificate of a centenarian to somebody's stomach bitters knows how far those bitters vary from ordinary whisky or whether the centenarian ever lived.

To be quite serious, the situation in technical education calls for comment, for the publicity methods adopted by some institutions, from the humble but profitable correspondence schools to the university with 4,000 or 5,000 students, are often open to somewhat severe criticism, chiefly because the respective courses advertised are proclaimed as nostrums, a few doses of which must inevitably lead to distinguished success, measured in dollars. Unfortunately, of course, those who take the medicine do not always or often reach the expected result, and learn too late that the published certificates of excellence are slightly misleading. It is the purpose of this comment to present some of the hard facts regarding the courses of treatment commonly prescribed.

A Common Delusion

As regards the engineering professions, nothing is further from the fact than the common delusion that they are especially promising and lucrative. They are honorable callings, very alluring to those whose tastes run in technical lines, and guaranteeing a decent livelihood which may rise to distinguished success if supplemented by extraordinary ability, rare good fortune or an exceptionally powerful pull, these three additional factors being here rated in increasing order of practical importance. Many statistics have been published in the last few years regarding the

earning capacity of technical school graduates at various periods after graduation. They sound well, but in point of fact they are no more encouraging than what could be derived from similar statistics gathered from the graduates of non-technical institutions of similar grade, or from men of similar ability and opportunities trained only in mercantile pursuits. The group last mentioned would practically be impossible of comparative investigation, for the simple reason that of late years it has been the fashion for young men of good ability and from well-to-do families to acquire a collegiate education of one kind or another.

There are certainly no large prizes to be drawn in the ordinary course of events from the engineering lottery, and investigation of the affairs of any large company would show that the big salaries do not fall to the lot of the engineering force, however competent. Now and then they may be drawn by men who have received technical training, but in virtue of circumstances quite apart from that training. If one were to judge education by pecuniary results, as shown by statistics, it is altogether probable that the supreme place would be taken by Harvard or Yale, not in virtue of any special excellence of the education there to be obtained, but from the simple fact that both these institutions have drawn in large numbers students whose antecedents have foreordained them to pecuniary success. A few men in any given class who inherit the great business interests which mean large apparent earnings raise the average to a point that bears no relation to the value of the course of educational training they may have followed.

The Fallacy of Statistics

As an example of the fallacy of statistics one may profitably examine the claims made in the last few years for the so-called business courses of the post-graduate variety. The nominal result indicates great rewards for the diligent student, but a little examination of the situation makes it perfectly evident that few or no young men have time or money to devote to post-graduate courses in finance, unless they have already within reach openings for which this additional training is merely a convenient preparation. Many men of large affairs proclaim bitterly and justifiably of the lack of trained men for positions of high responsibility, but save in very rare instances these positions do not go to young men whose sole recommendation is education and ability. The college-educated man who quickly lands in an important position generally does so because he has been trained with reference to putting him in that particular position.

The "business course" is not wholly a hollow sham, for it imparts information of which, with opportunity, great use may be made, but the opportunity is generally the cause rather than the result of training. Mental discipline in engineering or otherwise is, in and of itself, a good thing, and on the average the well-trained man stands a much better chance of making good when opportunity offers than the untrained man. In so far, institutions of learning do not either fail of their purpose or claim virtues that are not theirs, but the young man who is drawn to them by the publicity campaigns inaugurated of late years should enter without roseate illusions, and with full realization that the most he can hope for is the discipline and training that will enable him to make the best use of his abilities, if he ever gets the opportunity to display them.

Pensions for Civic Employees*

By Ald. W. G. Douglas, Winnipeg, Man.

The cities of the western world to-day have profited largely from the experiences of European cities, and are developing with abnormal rapidity. In order to keep pace with this development, and to ensure that the future is built on a solid and business-like basis, every city requires a staff of civic servants, who must not only be fully qualified for the work entrusted to them but must also be inspired by a feeling of esprit de corps, which will constrain them to give the very best service possible.

So complex has the economic system of the typical Canadian city become, that it demands a civic service of the most complete kind; and this can only be where the labors of the employees are adequately recompensed, and their future, to a reasonable extent, safeguarded.

Many of our great business and civic corporations are being forced to the conclusion that the time has arrived when there should be a pension system, by means of which the faithful employees, who have by their integrity and devotion to duty assisted very largely in the upbuilding of the country in general, and of their own business in particular, should be relieved from anxiety as to their future, when they have reached an age at which they can no longer be active.

A system which many mercantile corporations have adopted, because they know it to be to the benefit of their stockholders, may safely be adopted by city corporations, for the benefit of the men who serve them.

There are not a few reasons why a System of Pensions for civic corporations should be in operation in every well regulated city.

The man who enters the employment of any of our civic corporations is practically cutting himself off from following any mercantile pursuit. The character of the work in civic offices is altogether different from that in any ordinary business, and ten years spent in a City Hall is not a good training for any other work. The very nature of the work is narrowing; and, while a man might be a most valuable civic servant, it does not follow that he would be regarded in the same light by a business firm. The civic employee, unless in a few exceptional cases, has small chance of promotion, and an increase is seldom such as to form an attraction for an aspiring young man. Only under very exceptional circumstances can a civic employee expect to lay aside anything like a suitable provision for the day which must assuredly come, when he will be compelled to retire from active work.

Take the case of one who enters civic service at 20 years of age. He works in the same department for 5 to 6 years, acquiring a careful and intricate acquaintance with all details; his superiors recognize the fact that he is becoming more valuable, and give him from time to time an increase of salary, and for a time, he is satisfied and content; when his income seems to warrant it, he marries, and sets up a home. Children come; expenses increase; and he needs more than the city will pay him. He cannot, as a married man, go into another business, because in so doing, he would have to begin again at the lowest rung of the ladder. He can certainly try to get employment from another city, where his previous experience

would be of service; but the chances attending such a venture are usually small. Now, a man who sees little before him, by way of promotion in civic service, will often be quite ready to put up with what he has, and make the best of it, for a few years, if his labors are sweetened by the knowledge that when he has reached 60 or 65 years, he will be entitled to a pension, which will at all events provide him with the necessities of life.

If civic employees were working under a regularly graded system, in which promotion came steadily and regularly for the faithful servant, the tension of anxiety would be lightened; and if there were in addition to this the knowledge of a provision for old age, which was not a charity, but a right, the civic service would be rendered even more desirable than it is at present, and while the city would only be doing its duty towards its employees, there would be no infringing of the self-respect of the employee.

This matter has been before the City Council of Winnipeg for some time. It was referred to a special sub-committee who lately presented their report. In it they recommended:—

1. That pensions be paid to permanent employees or those working continuously for the year, whether paid monthly or otherwise.

2. Pensions to be payable after twenty years' service.

3. The age limit at which pension can be claimed to be fixed at 55 years, compulsory retirement at 65 years of age, unless otherwise decided by the Council.

4 The rate of pension to be based on one fiftieth of the salary for the year at the time of pension, multiplied by the number of years' service.

(after 20 years' service, the pension would be equal to 25-65 of the salary)

(after 25 years' service, the pension would be equal to 1/2 the salary)

In no case shall pension payable be less than \$25.00 per month.

The people of the West certainly believe in boosting their towns upon the slightest provocation. We have in hand a copy of a Nelson, B.C., newspaper, which devotes the greater part of a column to an article on the phenomenal building increase. The various headings are arranged in descending magnitude. The drop, however, from climax to anti-climax is rather too much. In the first line there is the announcement in bold type, "Huge Increase in Building Permits." The next line reads, "750 per cent. higher." The last of all states that the total for the year to date shows an increase of \$50,000, while the body of the article discloses the fact that the whole noise is occasioned by a jump of from \$2,425 in September, 1910, to \$20,620 in September, 1911. We wonder what stately edifices could have swelled the Nelson total to such proportions.

Miss Jeldness, a Spokane girl, who recently graduated from an eastern college as a mining engineer, has decided to take up the practice of the profession with her father in the western states and in British Columbia. Miss Jeldness obtained a considerable amount of her experience in the Canadian Northwest and attended a number of sessions of the western branch of the Canadian Mining Institute.

* Read before the Union of Canadian Municipalities



Forebay before water was let in. Looking along canal towards power house, showing intake gates.

Point Du Bois Hydro-Electric Development

Completion of the Plant an Event in the History of Municipal Progress—Expeditious Work in Final Stages—A Great Achievement

Special to the Contract Record.

Water has been turned on at the big hydro-electric power plant of the city of Winnipeg, and several of the machines have been given a test run. So far no troubles have developed and it is expected that energy will be sent over the wires from Point du Bois by the last week of this month. All that remains to be done is the adjustment of the governing mechanism and the connecting up of the recording panels.

This plant has had a rather remarkable history so far, and is unique in the annals of municipal ownership. A decade ago Winnipeg was suffering from the excessive charges imposed for electrical energy and a means of escape was ardently sought. Various companies came forward with proposals but all of them carried the idea of the city contracting for a block of power at a fixed rate. A section of the council favored this idea but it was fought almost single-handed by Controller Cockburn, then one of the aldermen. Year after year he kept at his campaign and finally succeeded in securing the passing of a by-law to permit the expenditure of a sufficient sum to build a plant on the Winnipeg River.

In the meanwhile, as a private individual, he secured from the Dominion Government the rights at Point du Bois, which, later he turned over to the city, free of costs. Still the fight was not won, for vested interests seemed well represented in the council and these assisted by a "financial stringency" campaign effectually put a stop to the work for one year.

But the citizens rebelled and by an overwhelming vote insisted on the work being pushed. Within a couple of weeks they hope to begin to reap the benefits of their heavy expenditure.

When the city decided to go ahead with their plant the Winnipeg Electric Railway Company, who then enjoyed the monopoly of the electric light and power supply, made a notable reduction in their charges, cutting the lighting rate to 9 cents per kilowatt hour and power in proportion. The city expects to be able to further reduce the rate to 5 cents per kilowatt hour, and ultimately to 3 cents. They have also offered power in large blocks at \$20 per horse power a year. When the complete installation is in operation it is expected that this figure will be reduced to \$14 or better.

For several months past gangs have been at work erecting pole lines, laying conduits and making connections. Throughout the business section all wires are carried in conduits and this system will be enlarged as rapidly as possible. Cedar poles, painted white with black bases, are used for other sections, and about 5,000 have already been erected. The transformer station at Winnipeg and two of the distributing stations are now ready and the third will be completed shortly, so that there is nothing to prevent a complete service throughout the city. A number of excellent contracts have been signed up and others are pending so that the city will have use for at least



Spillway where surplus water escapes to lower level



Rear view of canal wall and spillway

5,000 horse power as soon as it can be put on the wire.

At various times mention has been made of this plant in the Contract Record, but it requires a personal visit for one to fully appreciate what the people of Winnipeg have accomplished. The first installation consists of five 3,000 kilowatt generators, 6,600 volts at 164 revolutions. Four of these are now running on preliminary test and the fifth is on the floor ready for erection. In the present power house there are wheel-pits for three additional units, and pits are partially completed for eight more. The necessary buildings for the latter can be erected quickly and at moderate cost. The dams, canal and tail race have been completed for a 70,000 horse power installation, so that the expense of doubling the output will be comparatively light, and will reduce the cost of power at Winnipeg materially.

Though the first cut in prices announced by the city has been met by the Winnipeg Electric, it is felt that they will be unable to hold the pace long, and even with no further reductions in price the citizens realize that they will quickly save the cost of

which has been affected by frost, and then thoroughly wash the exposed surface with water, using a stiff scrubbing brush, until entirely clean. A 1:3 solution of muriatic acid is then applied with a brush, and the surface is again washed. As soon as possible after this is done a very wet mixture of new concrete is applied. Where the old surface has been thoroughly cleaned, and the new concrete kept damp for a week, it bonds nicely with the old surface, making it appear as solid as if the entire mass had been placed at the same time.

Water Density

Water presents the remarkable phenomenon that when its temperature sinks it contracts up to 4 deg. C. (39.2 deg. Fahr.), but from that point, although the cooling continues, it expands up to the freezing point, so that 4 deg. C. (39.2 deg. Fahr.) represents the point of the greatest contraction of water.

Greatest density of water $\left\{ \begin{array}{l} + 4 \text{ deg. C.} \\ 39.2 \text{ deg. Fahr.} \end{array} \right.$

This phenomenon is of great importance in the economy of nature. In winter the temperature of the



View of Point du Bois plant, showing outlet of draft-tubes and section of dam ready for power house extension

the plant in their smaller light and power bills. The fight for supremacy will be on within a few weeks and a number of Western cities are watching developments with keen interest for they are also planning for municipally owned hydro-electric plants. Winnipeg as a municipality is accomplishing what has been done in Ontario by the Hydro-Electric Commission. It has financed the proposition without outside assistance and is now willing to aid outside towns and municipalities by the sale of power at practically cost. The plant is efficient and the prices show that it has been built economically.

An outline of the design, construction and progress of the plant was published in the Contract Record of January 18, 1911.

Considerable trouble has been experienced in repairing concrete which has been exposed to freezing weather before acquiring final set. The following method, according to Engineering and Contracting, has been used quite successfully:

Chip off with a pick and bull point the concrete

lakes and rivers falls from being in contact with the cold air and from other causes, such as radiation. The cold water sinks to the bottom and a continual series of currents goes on until the whole has a temperature of 4 deg. C. (39.2 deg. Fahr.) The cooling on the surface continues, but the cooled layers being lighter remain on the surface and ultimately freeze. The ice formed thus protects the water below, which remains at a temperature of 4 deg. C. (39.2 deg. Fahr.), even in the most severe winter, a temperature at which fish and other inhabitants of the water are not destroyed.

Salt dissolved in water lowers the temperature of the maximum density, so that sea water exhibits such a maximum.

Water expands at the moment of solidifying, or contracts on melting, by about 10 per cent. One volume of ice at 0 deg. C. (32 deg. Fahr.) gives 0.9178 of water at 0 deg. C. (32 deg. Fahr.), or 1 volume of water at 0 deg. C. (32 deg. Fahr.) gives 1.102 of ice at the same temperature. In consequence of this expansion ice floats on the surface of water.



Domestic Science Building, University of Toronto



Museum Building, University of Toronto

Building Construction and Progress

Noteworthy Features of Important Works under way or projected at Toronto, Vancouver, Victoria, Etc.—Notes on Practical Topics

The new Domestic Science Building at the corner of Bloor and Queen's Park, erected for the University of Toronto was designed by G. M. Miller & Co., Toronto. The architectural style is Greek and the exterior is built of cut stone. Much might be said about the interior of this building, the floors and walls of which are finished for the most part in marble and tile work. The walls and ceiling of the splendid gymnasium are executed in panelled oak and the swimming pool will be about the finest in the city. The contractors on this work were Thompson Bros., masonry and brick work; Reid & Brown, structural steel work; A. Matthews, roofing; Bishop Construction Co., fireproofing; Hanna & Nelson, plastering; Hughes & Co., painting.

Satisfactory progress is being made in the construction of the new Museum building for the University of Toronto. A view is shown of that portion of the work now in progress. This is only a fourth part of the total undertaking. The dimensions of the west wing, now in course of erection, will be 400 x 66 feet. It is to be four storeys high. The construction is brick with stone trimmings. The architects

are Messrs. Darling & Pearson, and the contractors for the masonry, Messrs. R. Robertson & Sons, Toronto. The architects' plan of the west elevation was published in the Contract Record for June 1, 1910.

The new Victoria College Library, a view of which is shown herewith, is built of Credit Valley ashlar with Indiana limestone trimmings and is the design of Messrs. Sproatt & Rolph, Toronto. The contractors on the building were as follows: masonry, Page & Co.; carpentry, J. C. Scott; roofing, A. B. Ormsby, Ltd.; marble work and plastering, Hoidge Marble Co.; plumbing, heating and wiring, W. J. McGuire, Ltd.; painting, Faircloth Art Glass & Decorating Co.; hardwood, steel windows and glazing, Aikenhead Hardware Co. The style of architecture is what is known as Collegiate Gothic. A feature of the building is the cut stone tracery of the windows. Over the main entrance there is a niche containing a statue of Queen Victoria, designed and executed by the Broomsgrove Guild, of Worcestershire, Eng.

The grandstand erected by the University of Toronto on their new athletic grounds presents a number of features of interest. It was built by Mr. W. E. Wag-



Victoria College Library, Toronto



University of Toronto's New Grand Stand

ner, B.A.Sc., of Toronto, according to his own system and to that by which the well known stadium at Toronto Island was erected. The University stand is, in the main, of wooden construction with reinforced concrete slabs built on the outside. Its dimensions are 320 ft. by 48 ft. and its seating capacity is 3,150. The total estimated cost of the structure is \$30,000. The space underneath the stand is utilized for players' dressing rooms, shower baths, etc. At the south end there is a caretakers' living room. From every corner of the stand an uninterrupted view is obtained of the whole field. The means of ingress and egress are also well planned, there being three main entrances from Devonshire Place leading up to the central landing, thus removing all possibility of obstructing the view. The alterations on the field and the construction of the grandstand were carried out under the supervision of Mr. C. R. Redfern, B.A.Sc., of the University of Toronto.

Good Progress on Burwash Hall

Construction is rapidly advancing on Burwash Hall, the building which will be the students' residence for Victoria College. This building is another example of the Collegiate Gothic style, also from the

in the form of a tax lower than on such construction as tends to increase the risk. The present method of taxation tends to encourage the cheaper form of construction, and also to penalize the safer construction by making it bear a proportion of its share of the cost of fire protection which the construction does not require.

An enormously high building has been designed in a preliminary way for New York parties by Mr. C. H. Blackall, the Boston architect. The base is a structure with a 275-ft. street front and a height of 250 feet. Rising from the centre of this base is a tower 125 feet square at its bottom, 98 feet square at the top, with the base of its flagstaff 1,500 feet above the sidewalk. There will be about 3,800 offices in the structure; the great Metropolitan building in New York, covering an entire city block, has about 2,000. Below the sidewalk there will be five stories, making 105 in all. The total weight of the structure is estimated at about 180,000 tons, which will rest on rock. The most interesting things about such a structure are the elevator service and the water supply, says the Engineering Record. The



Burwash Hall, Students' Residence, Victoria College.—Architects, Messrs Sproatt & Rolph

design of Messrs: Sproatt & Rolph, Toronto, and the construction is similar to that of the Victoria College Library. The contractors for the work are as follows: masonry, Page & Co.; carpentry, J. C. Scott Co., Ltd.; plastering, Hoidge & Sons; plumbing, etc., Bennett & Wright Co., Ltd.; roofing, H. Williams & Co.; painting, Faircloth Art Glass & Decorating Co., Ltd.

In a recent suggestion on the growing recognition of the general need for fireproof construction, some ideas are embodied which at least contain food for thought, and which might possibly be worked out for the practical betterment of building construction methods and materials in general, says Cement World. The suggestion is this:

If a fire tax were levied separately, the tax to be graded in proportion as the structure involved increased or decreased hazard, the net result would be to encourage forms of construction which would decrease the fire risk. There could be no objection to admitting the public benefit by decreasing the risk

elevators in a tower of such height cannot, of course, be like those now in general use, for a single car in each shaft would require too many shafts, so a system of several cars in each shaft, forming a train, is being studied. As for the water supply, it is manifest that the delivery of water to the upper part of such a tower is much like mine pumping; it is proposed to have a number of services, each of a certain number of stories, with a supply tank for each one. Sketches of the tower show that it will have less effect on the lighting of neighboring buildings and the street level than structures of the usual skyscraper type, because the tower rises well back from the street and from adjoining property. In this respect it resembles the structure planned some years ago to replace the present Equitable Building in New York, which was terraced backward as it rose, thereby avoiding the clifflike appearance of the usual practically vertical front.

The death occurred last week at St. Catharines, Ont., of Mr. Samuel G. Dolson, a well known building contractor of that city. The late Mr. Dolson was born in 1827.

The St. Augustine's Seminary, Toronto

One of the largest building contracts under way in Toronto is the St. Augustine's Seminary now under construction on the Kingston Road, according to plans prepared by Mr. Arthur W. Holmes. The whole of the work has reached an advanced stage and it is expected that the building will be completed by next May. The seminary is the gift of Eugene O'Keefe, Esq., and the total estimated cost is \$400,000.

The buildings have been designed for a total accommodation of about 300, and when completed will comprise the main building facing west having a total frontage of 340 feet, with wings at each end extending 190 feet eastwards. The chapel, connects with the centre of the main building and extending parallel with the wings, will divide the grounds at rear into two large quadrangles, on all sides of which will run

The floor below the refectory will be fitted up as a gymnasium.

The plumbing arrangements have been made as complete and perfect as possible, each Professor's suite having complete bathroom accommodation and each student's room being provided with basin and hot and cold water. In the towers flanking the main building are lavatories on each floor, and adjoining the gymnasium are shower baths, etc.

The heating and lighting will be provided for in the power house which is built at the south of the kitchen wing and is connected to the main building by a concrete tunnel.

The building is to be of fireproof construction throughout, the interior being of reinforced concrete and steel with terra cotta partitions, etc., and the ex-



St. Augustine's Seminary, Toronto, which will be completed next spring—Architect, Mr. A. W. Holmes

spacious cloister passages, forming connections with the main buildings, chapel and the refectory. The great dining hall or refectory, 104 feet by 40 feet wide, is entered from a corridor connecting with the cloister passages, at the rear of the chapel. The refectory with its adjacent kitchen buildings, etc., thus form practically a separate group of buildings. The ground floor of the main building is taken up by a spacious entrance hall, reception rooms and Professors' apartments; in the wings will be a large hall of exercises and class rooms. A Professor's suite of rooms will be located at each end of the main building on each floor.

The chapel, having principal entrances from main building and also entrances from the cloisters, is 105 feet in length by 35 feet wide, with four side chapels and large sacristy.

terior of brick, with stone dressings. The floors will be finished in terazzo and tile. The main buildings have the basement and ground floor faced with Indiana stone, the work above being faced with red stock bricks with stone trimmings to windows, and finishing at roof with stone cornice and balustrade. The portico of the principal entrance has eight granite columns, with stone cornice and balustrade. The roof of the main building and wings will be utilized as a promenade and roof garden. A magnificent view of many miles of the surrounding country and across the lake will be obtained from the gallery in the dome, which will have an altitude of fully 350 feet above the level of the lake.

The height from the ground to the top of the dome will be 150 feet. The dome will be constructed of steel and concrete and finished in white cement. Elec-

tric lighting will be arranged so that the cross and dome can be illuminated.

The contractors for the masonry and reinforced concrete are Wickett Bros. Other contracts were awarded as follows: structural steel, McGregor & McIntyre; carpentry, Madden Bros.; plumbing and heating, Thos. Norris; electric work, J. Fallon; plastering, W. J. Foley; painting, M. J. Phelan.

The consulting engineers engaged on the work are Messrs. Bowman & Connor, for reinforced concrete and steel; Arthur E. Freeman, for the heating, plumbing and ventilating, and Jas. Shields for electric and gas plant.

New Union Club Building at Victoria

The new home of the Union Club of Victoria, B.C., will be erected on the N.E. corner of Gordon and Humboldt streets, with a frontage of 146 feet on Gordon and 125 feet on Humboldt. The building will be a handsome structure, four storeys in height, of brick and terra cotta, in a modified Italian Renaissance style of architecture. The main entrance on the Gordon street front is approached by a broad flight of granite steps from sidewalk level, which leads to a large terrace, 50 feet in length. This ter-

as this main reading room will be used as a ball room at times. In a projecting bay the silent reading room is located.

The main dining room on ground floor will be approached from first floor by a handsome carved oak staircase. The ladies' dining room is connected to main room by large sliding doors, and when these are opened will give a grand banquet room 32 by 90 feet. Ladies' parlor, in connection with ladies' dining room, will have separate entrance on Humboldt street. Provision has also been made for a private dining room, with special entrance on Gordon street, which also gives direct access to main dining room.

The large foyer on ground floor will communicate with four large card rooms. The two upper storeys will contain 48 bedrooms and suites for members, each room provided with private bath and telephones, with outside connection through exchange on first floor.

The kitchen service will be modern and spacious in its equipment, and will communicate with a yard 25 feet wide to the north of the building with driveway where tradesmen's wagons may enter. The mechanical equipment will be located in the basement, which will provide refrigeration, vacuum cleaning, heating and exhaust ventilation systems for the building.



Proposed Union Club House, Victoria, B. C.—Architect Mr. L. P. Rixford, San Francisco.

race commands a magnificent view towards the Empress hotel, the Parliament building and the harbor.

From the terrace one enters through vestibule into a spacious foyer, leading to a centrally located lounging room 50 feet by 27 feet, the walls wainscoted in wood to a height of nine feet, ornamented plaster ceiling, and lighted from above by leaded glass; a handsome carved stone mantel being the main feature of this room. In the rear of the lounge is placed a large billiard room, which will accommodate six English billiard tables, also lighted from above as well as from the side, which will provide an abundance of light, which is so essential in a room used for this purpose. A large fireplace at the north end of the room will harmonize with the general interior treatment. To the left of the lounging room a bar is located, also visitors' room, coat room, lavatories, etc. At the right, and entering from the foyer, the architect, Loring P. Rixford, of San Francisco, has provided a magnificent reading room 90 feet by 33 feet, on the Humboldt street front. This room will be paneled in wood the full height to plaster beam ceiling, and with handsome fireplace at either end of room will be the main feature of the building. A specially constructed dancing floor will be provided,

The entire building will be of fireproof construction, with reinforced concrete frame, thoroughly modern in every respect; and the interior beautifully finished in hardwood. It will cost in the neighborhood of \$200,000. The contract has been awarded to the Sound Construction Company, of Seattle, and will be rushed to early completion.

When the bridge to carry Monroe street across the Spokane river in the business district of Spokane is completed the latter part of October, the largest single span of reinforced concrete in the world will be opened to traffic. The central span is 281 feet, or 12 inches longer than the bridge over the Rocky river, under construction at Cleveland, Ohio, and 48 feet longer than the Walnut Lane Bridge over the Wissahickon at Philadelphia, which holds the distinction of the longest span of its kind. The cost of the Spokane bridge will be about \$550,000. In addition to the car tracks, there is a team roadway, as well as walks for pedestrians. A span of 285 feet has been adopted to carry the New York barge canal over the gorge near Medina, N. Y., and the span of the proposed Hudson memorial bridge is to be 710 feet. With the exception of the Hudson bridge, the other

largest single span yet proposed is one of 328 feet to be built by the municipality of Rome. A bridge under construction in New Zealand will have a 320-foot span.

Vancouver's New Sports Arena

According to our Vancouver correspondent there will be no better equipped building of the kind in Canada than the new artificial skating rink now being erected at the corner of Georgia and Denman sts., Vancouver. The building will cover an area of 66,000 square feet, being 331 feet long, by 200 feet wide, and will have an elevation of 95 feet from the street level. The area of the ice surface will be 85 by 210 feet, which is about equal to any ice surface in the Dominion, and the total seating capacity of the main auditorium will be 10,300.

The main front of the building will be parallel with Georgia street, on a 20-foot private lane, besides the main entrance, separate gallery entrances will be placed at each end of the building, which unlike many rinks, gives protection to the public in case of fire, by providing thirteen exits.

of Vancouver, is the architect, and the promoters of the scheme are the Vancouver Arena Company. Mr. Gillett, the manager, has already awarded contracts for most of the work.

The building will cost \$94,000 when complete. Similar rinks on a smaller scale are being planned for Victoria and Edmonton by the same architect.

Pressure of Loose Cement

The pressure of loose cement against bin walls is a very indeterminate quantity, according to the paper on "Cement Stock Houses," recently presented to the Western Society of Engineers by Mr. Josiah Gibson.

Portland cement, when it comes from the mill, is a loose, dry powder weighing about 95 lbs. per cubic foot. When dropped into the bins it becomes very freely charged with air, and stands up with a level surface, like a liquid. After standing a few days, its weight causes it to settle into a more compact mass from which practically all air has been expelled. Unfortunately its properties of internal friction are not constant, and it is impossible to predict the degree of its angle of slope. When the cement is drawn from



New Sports Arena now under construction at Vancouver—Architect, Mr. Thomas Hooper.

The construction will be a combination of reinforced concrete, steel, brick and wood. The basement wall will be of concrete, with reinforced concrete piers supporting 16 steel columns upholding the steel lattice trusses, which in turn support the gallery and roof trusses. In the basement will be situated four modern curling rinks, large swimming tank and dressing rooms, the ice plant and storage. The plant will be the most modern in America, based on the gravity system. The brine tank is situated 18 feet above the ice surface at the rear, and is 85 feet by 8 feet by 9 feet. This and the condensers are supported on a steel frame. In winter the ice plant will be used to manufacture ice for the rinks, and in summer ice will be manufactured and stored for selling.

On the ground floor are dressing rooms capable of accommodating 3,000 skaters, a large dining room, which can be used for dancing purposes if required, hockey dressing rooms, bowling alley, and skating and curling ice surfaces. The galleries surround the rinks, and contain some 96 boxes.

The exterior of the big building will be faced in red pressed brick with stone and marble trimmings. The elevations are harmonious and Mr. Thos. Hooper,

the bottom of the bin, sections of the storage space may be emptied, leaving the remainder standing with almost perpendicular sides, which, without warning, will cave in against the bin walls.

In one of the earlier bins to be built, a series of experiments were made whereby it was decided that it would be safe to assume the cement to be a liquid of 10 lbs. per cubic foot weight. It was soon found, however, that there was an excess deflection of the walls so designed, and the assumption was increased to 20 lbs. per cubic foot. Later experiments were made by interposing some plank-backed I-beams across an opening in the bin, and computing the pressure from the deflection of those beams. This experiment showed that a hydraulic pressure of 20 lbs. per cubic foot would be safe.

In the discussion of the paper, this value was objected to as being too small, first, because the experiments did not care for the arching action of the cement, and second, because the shock of the falling cement, noted above, was not considered. It was generally thought that a somewhat higher assumption should be made.

Alberta Methodist College, Strathcona

The building shown herewith is the Alberta Methodist College, at Strathcona, Alberta. It has a frontage of 150 feet and is built of local brick. The concrete stone trim in the entire building was made on the first dimension stone machine made at the factory of the Ideal Concrete Machinery Company. The building is plastered throughout with wood fibre manufactured by the Manitoba Gypsum Company.

On the ground floor, near the main entrance (which is shown in the above illustration) are the offices, deposit vault and other small rooms used for executive and business purposes. Directly opposite the main entrance is the large assembly hall with stage and wings. The class rooms are in the right and left wings of the building. In the rear wing on the first floor are the kitchen and dining-rooms. The main stairs are carried in the two towers and go the entire distance to the top. The girl's gymnasium is situated in the basement and the boy's gymnasium is on the fifth floor. One of the features of the building is the fine call system with which it is provided. The corridors and the principal rooms are connected with

this point. The power house is built of concrete and its length of 394 ft. constitutes a section of the dam. Four openings 57 ft. in width are provided in the dam in which gates are hung on chains arranged to be operated by electric motors. The gates are in two parts so that one may be lowered a few feet below the water surface to prevent the passage of ice and floating debris. Granite facing is used on the piers and a casing of steel plates is added outside this facing to protect exposed parts.

Considerations in Heating Concrete Buildings

A hint to heating contractors that is well worth while to take into consideration the manner in which a building is constructed when determining the size of the proposed heating plant is contained in an article by B. A. Howe in a recent issue of *Cement Age*. The contribution deals with the advantages of furring the walls in concrete building and the most efficient depth of air space in relation to heating generally. The article is as follows:

It has been the usual custom in masonry wall construction to build an interior false surface, as it were,



Alberta Methodist College, Strathcona, Alta.

the office by a system of telephones and call bells. Each table in the dining-room is equipped with a call bell, the bells centreing in an annunciator in the serving room.

The building is heated by steam, supplied by two 30 h.p. tubular boilers. Ventilation is provided by flues built in the walls with steam coils at the top. Electric lighting is installed. There are 256 electric light openings, six transformers and each bedroom light is equipped with a Perkins flush push button switch

A 50,000-h.p. development on the Rhine at Laufenburg, Switzerland, is well under way, according to "The Engineer," and will be completed in 1913. The work was commenced in 1908. The head developed will vary from 9.8 to 36 ft., the floor ranges from 990 to 176,600 sec.-ft., and ten 5,000-h.p. units are to be installed. An important feature of the work is the removing of projections and leveling of the river bed above the dam for the purpose of concentrating the fall at one point. In this work it was deemed necessary to blast out the promontory on which the old Rhine bridge stood, removing 393,000 cu. yds. of rock and constructing a retaining wall and new bridge at

held out from the wall itself by furring strips. In a usual practice, the lath and plaster coat becomes this false wall, and the furring strips hold it away from the wall, and produce the air space.

Furring is used for three purposes: As a heat (or cold) insulator. To intercept dampness percolating through the walls. To obtain architectural forms.

The last is self-explanatory. The other results are obtained in one of two ways—by introducing an air space in the construction of the wall or by a waterproof medium. For any first-class construction of heat insulation to be dealt with in detail, and this subject requires careful consideration for all residences, or buildings of a similar nature, which are exposed at any season of the year to a damp or cold climate. This consideration applies in damp climates not only to outside walls, but to any massive masonry interior work, as will be shown later.

Heat insulation is required, first, to keep the building warm. Second, to prevent condensation of dampness from the air or cold surfaces, as one may see, for instance, the condensation of moisture on cold water pipes in a damp cellar. Third, to prevent the unpleasant chill which radiates through a room from a cold wall.

The heavy masonry pier or wall will become cold clear through in cold weather. The atmospheric temperature may suddenly change to warm and damp, in which case moisture will deposit on the cold masonry before it has warmed up as is seen on the window pane when dampness from the room is deposited because the glass is kept cold by outside air.

This is the kind of dampness that people are afraid of when they see it on the inside walls of stone palaces, for instance, in Italy; and that they misunderstand when they occasionally see it on solid concrete walls, thinking it has percolated through. In general there is a great deal of popular confusion as to the dampness that percolates through, and that deposited from the air.

Any method of heat insulation resolves itself into air space. The air spaces may be obtained by the use of cork, mineral wool, cellular terra cotta blocks (or furring blocks); or by an air space left in the wall construction, such as hollow walls; or by lath and plaster, furred out or supported separate from the main wall. The practical requirements are (1) that the dear air space should be separated from the room by as thin a wall as possible, and (2) that the connections between the main and the interior wall, or plastering, while strong, should be as non-conducting of heat as possible. This is necessary, because the surface exposed to the room, in order to do its work, should change in temperature as nearly as possible exactly with the change in the room temperature. The last requirement is that the deader the imprisoned air, the more effective will be the furring. In other words, if the air is imprisoned as it is in fur, it cannot blow around from the cold surface of the main wall to the warmer surface of the interior wall, and transfer the heat. Such currents of air are known as "convection currents." These considerations are undoubtedly at the bottom of the use of hangings and tapestry on cold stone walls, in ancient times, these hangings acting as fur for furring.

Another curious, and at first sight contradictory, fact, which has been demonstrated by careful investigation is that a 1-in. air space is more efficient than a 4-in., one reason being that the 4-in. air space gives much more freedom for the convection currents. An actual test gives in the case of a 2-in. brick wall, loss of heat 48½ for 2-in. air space as against 35 for 1-in. air space, the figures being the number of B per sq. ft. of surface per hour for 100 deg. F. difference in temperature on opposite sides of the wall.

The above considerations indicate why hollow concrete blocks and hollow terra cotta blocks, for wall construction have been found far from a perfect substitute for furred walls—partly because of the large actual cross-section of connecting ribs, and partly because the large cross-section of air space giving free play for convection currents. The question of heating is therefore one of paramount interest.

The weight of pure water has been investigated by the International Bureau of Weights and Measures, which has reported that 1 liter, free from air and measured at 4 deg. C., weighs 0.999973 kg., which is equivalent to saying that the volume of 1 kg. is 1.000027 cubic decimeter.

"Another Dam Disaster" may be expressive, but it is certainly not an elegant heading for a daily newspaper man to put over a paragraph chronicling the recent occurrence in Black River Falls.

Failure of the Roof of a Reinforced Concrete Building, Winnipeg, Man.

On Sept. 7, 1911, nine bays of the roof of the reinforced concrete warehouse of the Canadian Fairbanks-Morse Co., under construction, at Winnipeg, Man., collapsed while props were being removed and two workmen were killed by the falling material. The floor below the roof held firm under the impact, and all structural damage was confined to the section of the roof that fell.

The building is four storeys in height above street level and is of reinforced concrete skeleton throughout, with floors and roof of similar materials. The main floor is designed to carry 250 lbs. per sq. ft. live load, the three floors above each to carry 200 lbs. per sq. ft. and the roof to carry 40 lbs. per sq. ft. The reinforcing used was manufactured by the Trussed Concrete Steel Co., and excepting in the roof columns, was of deformed steel; in the beams and girders the Kahn trussed bars and "cup" bars and in slabs the "cup" bars alone were used. The beams were built as continuous girders. Each panel of the roof that failed is 23 ft. long and 19 feet wide, c. to c. of columns, and divided into two 9½ x 23 ft. bays by a longitudinal beam, spanning between the short girders. The size and reinforcement of the members are as follows:

Member	Section ins.	
Long girder	14 x 18½*	.....
Short girder	12 x 18½*	.....
Intermediate girder	12 x 14½*	.....
Column	12 x 12	.....
Slab	3½	.....

*Exclusive of 3½-in. floor slab.

Reinforcement

3—¾ x 2-in. trussed bars.

2—5⁄8-in. cup bars over 2⁄3 length.

Inverted over columns; 2—¾ x 2-in. trussed bars over ½ length.

2—¾ x 2-in. trussed bars.

1—¾-in. cup bar over 2⁄3 length.

Inverted over girders; 2—¾ x 2-in. trussed bars over ½ length.

4—½-in. round rods at corners, wrapped every 12 ins. with ½-in. wire.

3⁄8-in. cup bars, 10-in. c. to c. short way and 24-in. c. to c. long way.

Into the bottom of each column the rods from the column of the floor below projected 12 ins. The slab rods were permitted to stop at the intermediate beam, thus allowing only 4-in. bearing, without lap, of the slab reinforcement here.

The concrete of the roof was poured on August 18 and 19. The columns supporting the roof were poured on August 15. The proportions of aggregate were as nearly as possible 1:2:3 in the columns, about 1¾ bbls. of cement being used per cubic yard of concrete. The floors were poured from a mixture of 1:2:4. The aggregate consisted of water-washed gravel not screened, the particles of gravel being rather smooth and round, and of screened sand. The

*Abridged from particulars published by Eng. News.

forms were stripped from the columns on August 25, the general practice throughout the building having been to strip the forms from the columns in from four to eight days after pouring concrete. The forms were stripped from the sides of the beams and girders and from the slabs of the roof in about 11 days from the time of pouring. The shoring, which consisted of 4 x 4-in. pine posts with crossheads and wedges, was being removed on Sept. 7, when the collapse took place. Upon the shoring and under the bottom of the forms two wedges were used and the



Fig. 1—Roof of Concrete Building, Winnipeg, Collapsed Sept. 7, 1911

method of removal of the shoring involved first the slackening of these wedges, the foreman being under explicit instructions to be warned by the tightening up of the wedges once loosened, and to refrain from further disturbance of the shoring. This warning seems to have been neglected. At the time of the collapse, there lay upon the concrete a triple layer of tarred felt and pitch placed on Aug. 21 and 22, and over that a 1-in. boarding on 2 x 4-in. nailing pieces. It is probable that this covering, placed so soon after the concrete was laid, served to retard the free access

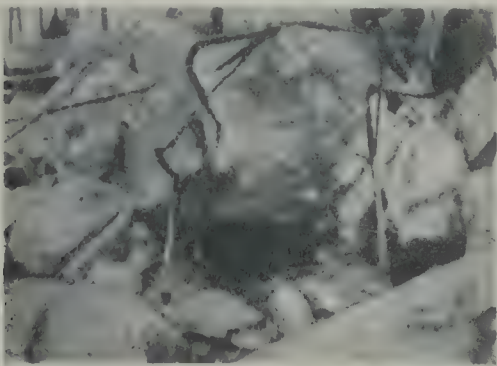


Fig. 2—View of Broken Columns

of air to the floor and consequently the set of the concrete.

Examination of the concrete in the failed slab indicated considerably less of setting than should have been expected, and the process of hardening and setting has since continued in the collapsed material. The concrete at the time of the collapse was dead, that is, it did not have a ring such as good concrete should have, and evidently had been delayed in setting by the cold weather prevailed during its setting period.

Throughout the remainder of the building the concrete seems to be quite dense and the forms have been well filled. There is no evidence of a skimping of cement or of anything but the best practice on the part of the contractor. So far as can be noted, none of the reinforcing steel failed.

Fig. 2 is a view of the columns found within the fragments of the collapse. It will be noted that the fractured ends of these columns show the outlines of typical crushing, and that the reinforcing steel which projects from the columns is curled down and inward as would be the case with this kind of failure. It would seem fairly evident that the columns were the first to fail. With the shores removed, each column was called upon to bear about 22,000 lbs. or a trifle over 150 lbs. per sq. in. The evidence is not clear that the shores were altogether released. The evidence of one workman engaged upon the removal of the shores is to the effect that the wedges were not loosened by hammering, but seemed to tighten up again after each blow. A succession of extra heavy blows finally loosened them and the collapse followed.

A coroner's jury rendered a verdict of unavoidable accident, with recommendations that there be an enforced testing of all cement used on structures whose failure might endanger life.

The above account has been prepared from information received from two different Winnipeg engineers, who are familiar with the facts in the case.

Flow in Brick-Lined Conduits

In a paper read before the Western Society of American Engineers by Mr. John Ericson, city engineer of Chicago, the conclusion was drawn that for brick-lined conduits a value of n in Kutter's formula of 0.0130 is readily attainable. This is a coefficient due to roughness, and is applicable to tunnels or sewers of ordinary sizes and velocities of flow, lined with sewer-brick laid in cement mortar, if the brick is properly selected, and not too warped or uneven, laid in a workmanlike manner, and true to line, not disturbed in blasting, and the mortar joints scraped off flush with the brick.

Under some circumstances, especially if there has been any disturbance whatever of the brick on account of blasting, it will be found advisable and profitable to have, in addition, the entire interior surface of brick conduits washed with neat cement, the strokes of the brush applying the wash to be always along the geometrical axis of the conduit. By this method a coefficient of roughness n , considerably smaller than 0.130, should be obtained in well-constructed tunnels of the sewer brick-lined class.

In relation to blasting in the excavation of trenches for brick-lined conduits, Mr. Ericson pointed out that if the lining is thereby at all disturbed, whether such disturbance is especially noticeable or not, it will have the effect of increasing the resistance to flow, and consequently decreases the capacity of such a tunnel. The jarring of the brickwork undoubtedly disturbs the mortar joints more or less, so that the bond with the brick will be broken. Slight projections and irregularities will be caused by this shaking of the brickwork, and, irrespective of any visible disturbance or distortion of the same, resistance to the flow of water are created.

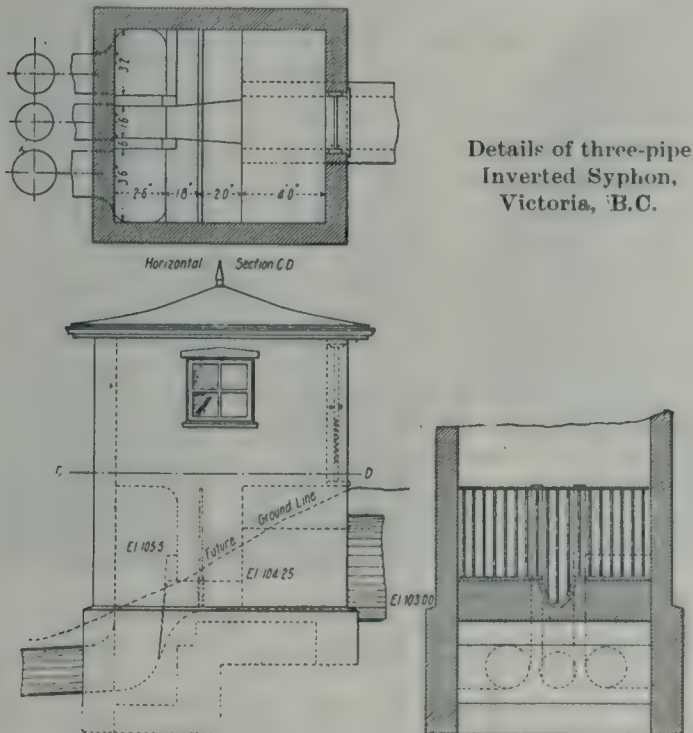
A brick tunnel in rock should not be lined until after the completion of the entire excavation, or at least the brick lining should be kept far enough back

of the face, and be so protected as to be unaffected by the blasting.

In an earth tunnel, blasting should preferably not be permitted at all, and if anywhere found to be necessary, care should be taken to protect the brickwork from the effect of such blasting, and to remedy any defects in the brickwork that, upon close inspection, may be discovered.

A Three-Pipe Inverted Syphon for Sewers in use at Victoria, B. C.

Details and description of an inverted syphon for sewers used by the Sewer Department at Victoria, B. C., are given by J. B. Holdcroft in a recent issue of *Engineering & Contracting*. The drawings show the side elevation of the syphon; a horizontal section on the line CD, and a vertical section on the line AB. The dimensions here shown were somewhat increased in the final design to provide capacity for a large district outside the city limits. The conditions which



suggested such a form of construction are as follows:

The sewer of which this is the outfall is to follow generally the course of a creek running through the Oak Bay Municipality, adjacent to the city of Victoria, and will discharge at or near its mouth into Oak Bay, around and near which is much high class residential property.

This necessitates carrying the sewage out to a point 2,200 ft. from the beach on the outside of a small island in the bay well into the tidal current. The sewer will here discharge into 20 ft. of water at low tide. As the elevation of the sewer at the beach is 103 or 3 ft. above mean high water, it is evident that the effective grade of the submerged sewer will be $\frac{3}{2200}$, or .136 per cent. for the minimum flow.

The effect of this flat grade with the small proportion of flow to the full capacity of the sewer which must be expected in the first years of its use, would probably be gradually to silt up the submerged part of the sewer, which would naturally always be full of

water, and have therefore a still lower velocity than if flowing only partially full.

It was to offset this that the idea was conceived of dividing the sewer into three pipes of different sizes calculated to carry respectively the flow from the lower, middle and upper thirds of the egg-shaped main sewer. The lower third discharges into a channel or regular shape. When the flow becomes too great for this, the water rises over the floor of the lower chambers and falls into the second pipe. A further increase in volume will allow the sewage to discharge over the weir shown into the third pipe.

Development of "Bitucrete" Surface

Some interesting practical observations were made by Mr. A. E. Schutte in the course of a paper under the above heading delivered before the American Society of Municipal Improvements. Starting with a concrete foundation, while the latter is still plastic; the wearing surface under description is prepared by the application of a layer of uniform-sized stone, say $\frac{1}{2}$ to 1-in. in diameter, which has been previously coated with a Portland cement grout, either of neat cement or else of cement with a slight amount of sand. It is possible to coat this stone in place. After this layer has been down two or three days, a tough bituminous compound is poured upon it, sufficient to fill the voids and leave a layer spread over the surface of the cement-coated stone. Upon this bituminous surface $\frac{1}{2}$ -in. stones are spread, apparently so rolled as to key into the stone already placed. Finally, sand or stone screenings are spread over the whole in order to make a non-slippery surface. By the means described, the author claimed that there is formed a "waterproof, non-absorbent, semi-elastic surface, which can be made as smooth or as rough as the conditions, or rather the engineer, may require." No special machinery is needed; first cost is low and repairs are easily made.

A deep stand pipe for diamond drilling driven at an inclination of 30 to 46 deg. from the vertical near Ogdensburg, N. Y., was advanced through sand, gravel, boulders, clay and quicksand to a depth of 372 feet in 111 working days, resort being made to blasting and cementing to meet some of the more difficult conditions. The hole was started at 30 deg. from the vertical and reached the ledge of an inclination of 46 deg., which was then maintained with very slight alteration for 800 ft. additional through rock. Boulders 3 to 4 ft. in thickness required the use of the diamond bit to place shots to break them, 2 to 3 lb. of explosive being used at a blast. At one point in clay cementing was tried in an attempt to hold open the hole until the ledge was reached, but the diamond drill did not follow the cement core, deflecting into the soft clay instead, so that it was necessary to advance the pipe through this material. Upon reaching the ledge the casing was sunk into the limestone and cemented in place. The drilling then proceeded with the diamond drill at a more rapid rate, 836 ft. being driven in thirty-seven days of two ten-hour shifts, or 11.3 ft. per shift. A Sullivan diamond core drill, type "B," was used on the work, and the sizes of pipe were only such as ordinarily used for holes through a 50-ft. depth of overburden, since the drilling of a 25-ft. and a 50-ft. hole near the site led to the expectation that this one would necessitate drilling only to a similar depth.

Personal Mention

City Engineer Macallum, Hamilton, Ont., was appointed Chairman of the Sewerage and Sanitation Committee of the American Society of Municipalities at the recent annual meeting of that body at Grand Rapids.

Mr. V. Osborne, of Messrs. F. H. Hopkins & Company, Montreal, has recently been on a trip through Western Canada. They have completed arrangements with the General Supply Company, of Winnipeg, to handle their agencies for wire rope, mixers, etc., in Manitoba.

Among those recently elected to membership in the American Society of Civil Engineers, we note Mr. Ralph S. McCormick, chief engineer, Algoma Central & Hudson Bay Railroad, Sault Marie, Ont., and Mr. Augustine H. Ayers, division engineer, Southern Alberta Land Company, Limited, Suffield, Alta.

Mr. Walter S. Painter, chief architect of the Canadian Pacific Railway, has severed his connection with the company and entered into a partnership with Mr. Francis S. Swales, of London, England. Mr. Painter, who is an entirely self-made man, has been many years with the C.P.R., and has designed many of the company's largest buildings, including the Windsor Station extension, the Place Viger extension, Montréal; and the Chateau Frontenac, Quebec.



Mr. W. S. Painter, Chief Architect of the C. P. R., who is going into private practice.

The head office of the firm will be in Montreal, but much of their work will be in British Columbia. Mr. Painter will be, for the present, located in Vancouver to look after the executive end of the work of the firm, while Mr. Swales will remain in Montreal in order to be in direct communication with the officers of the C. P. R. The company has awarded the firm the designing and execution of all its building in the West of Canada, and their offices will be in Montreal, London and Vancouver.

Mr. C. W. Vollmann, who for the past fifteen years has been carrying on business in Canada under the firm name of "The Linde British Refrigeration Company, Limited, of Canada," is continuing the same business under the style of The Linde Canadian Refrigeration Company, Limited, with offices at 37 St. Peter street, Montreal. Sixteen years ago Mr. Vollmann made an arrangement with the Linde British Company by which he was to have the exclusive right to manufacture "Linde" machines in the Dominion for a stated period. This agreement expired last February. The

British company then decided to send a representative to Canada to look after their interests and Mr. Vollmann changed the style of his firm name to prevent confusion. Mr. Vollmann is the president of the Linde Canadian Refrigeration Company, Limited, which is financed by Canadian capital and managed by a Canadian board. This firm will continue to sell and install the Linde type of refrigeration plant.

F. J. Cole, of the Garden Cities Association of England, has been appointed secretary to the City Planning Association of Winnipeg. For some time past there has been a feeling among the progressive men of Winnipeg that there is need for expert influence in planning the growth and development of the city. The City Planning Association has been organized with a view to providing that influence and to attain the most satisfactory and economical solutions, so that the costly errors of older communities may be avoided in the western capital.

Mr. William Wainwright, formerly second vice-president of the Grand Trunk Railway and Grand Trunk Pacific, has been appointed senior vice-president of the Grand Trunk Railway and second vice-president of the Grand Trunk Pacific.

In an announcement of a reorganization of the executive department of the Grand Trunk Railway, Mr. Howard G. Kelley, formerly chief engineer, is named as vice-president in charge of construction and maintenance and Mr. H. R. Safford as chief engineer with headquarters at Montreal. Mr. Kelley has been in railway service since 1881, having entered the construction department of the Northern Pacific Railroad in 1881, after graduating from the Polytechnic College of Pennsylvania. He was then successively resident engineer, superintendent of bridges and buildings and chief engineer of the St. Louis South-western Railway System. He then became chief engineer of the Minneapolis & St. Louis Railroad in 1898 and shortly afterwards also chief engineer of the Iowa Central Railway, remaining consulting engineer for the St. Louis Southwestern. Mr. Safford was for a number of years with the Illinois Central Railroad, entering its service in 1895 immediately after his graduation from Purdue University. In 1903 he became principal assistant engineer and two years later assistant chief engineer in charge of the maintenance department. In 1907 he became chief engineer of maintenance of way. He resigned several years ago and has recently been chief engineer of the George B. Swift Company, general contractors of Chicago.

At the annual meeting of the Ottawa branch of the Canadian Society of Civil Engineers held at the offices of the Society, 177 Sparks street, Mr. Victor Brayley, secretary of the branch, presented his annual report, which showed a present membership of 251, compared with 212 last year. There had been added one full member, 14 associate members, 14 student members and 12 Ottawa associates. The financial report showed that the position of the society had considerably improved during the past year. The officers were elected as follows: Chairman, S. J. Chapleau, in place of A. A. Dion; managing committee, Messrs. George J. Desbarats, R. F. Uniacke, John Murphy, Nolan Cauchon, R. de B. Corriveau; secretary-treasurer, Mr. Victor Brayley. During the past year two business meetings, 17 meetings at which papers were read and two informal dinners were held.

It is stated that the contract for the construction of all the stations, freight sheds, watertanks, and other buildings on the new Canadian Pacific Railway line from Victoria Harbor to Bethany, near Peterboro, a distance of about 100 miles, has been awarded to G. T. Martin, Smith's Falls, Ont.

The London, Ont., Builders' Exchange

Its History, Work and Aims—A Progressive Body That Has Done Much to Consolidate Contracting Interests in Western Ontario

One of the most practical and progressive trade organizations of its kind in eastern Canada is the London Builders' Exchange, which was incorporated, according to its present constitution, in 1898. Some years previous to that date there had been formed a Builders and Traders' Exchange, which started with a large membership and gave promise of excellent things. This body opposed successfully many of the unreasonable demands put forward by the labor unions and also managed to curb the somewhat arbitrary power exercised by the practising architects of those days. Like similar organizations that had preceded it, however, it became disrupted by internal disagreement and jealousy among its members, and its greatest achieve-

to be a benefit to every one of its members, and that this was to be accomplished not by assisting them to advance prices for work, but by enabling them to make a reasonable margin of profit on their contracts by improving the conditions under which they were required to do the work.

The London Revised Contract was the result of the first aggressive work taken up by the Exchange. Two of the most eminent jurists of the Dominion assisted in the compiling of its conditions and when completed it was generally conceded to be just to all parties. The Exchange succeeded in having it established in all of the city architects' offices only after a long drawn out fight with the profession, and great credit was due to the committee in



Mr. John Jones, President



Mr. E. R. Dennis, Representative
Director C. N. A. B.



Mr. Geo. S. Gould, Secretary

Officers of the London, Ont., Builders' Exchange

ment perhaps was the paving of the way for the establishment of the present Exchange.

The London Builders' Exchange has been singularly successful in promoting harmony and good fellowship among its members and in unifying the various branches of the trade. This is due largely to the fact that the social as well as the business possibilities of the institution have always received careful attention. Neither trouble nor expense has been spared in making the quarters attractive and in providing the most up-to-date facilities, so that the Exchange has come to be regarded not in the hard and fast manner of the business body but rather as a builders' club, where profitable half hours may be spent either in the library or recreation rooms, and where business may be transacted in a congenial atmosphere.

One very important feature of the Exchange is that the city architects and also the Public Works Department send plans to the rooms for estimating purposes. This is not only a benefit to the members but it also relieves congestion in the architects' offices.

At the commencement of its career the London Builders' Exchange quickly grasped the fact that it was formed

charge of that business for their patience and tact in bringing it to such a successful issue. Since its adoption no complaints have been heard concerning it.

The next matter to be dealt with was the Mechanics' Lien Act. For three successive parliaments the London Builders' Exchange fought for an amendment to that Act, securing to a contractor the right to establish a lien on a contract job within a limited time after he had received his final certificate from the architect. These efforts were at last successful and the amendment was placed in the statutes some years ago.

Since the formation of the Canadian National Association of Builders some five years ago the oversight of some of the more important branches of exchange work, such as legislative measures (both parliaments), labor troubles, etc., was transferred from the local to the national organization where they can be disposed of more quickly and effectively.

Realizing that the weakness of contractors lies in their carrying on operations as so many independent units, the London Exchange has devoted much effort in bringing home to the builders of western Ontario the necessity for

efficient organization in every city and large town in that district. The Exchange feels very strongly that every contractor who is not affiliated with a properly constituted exchange is not only suffering loss, directly or indirectly, but is retarding the progress of those who desire to present a united front in times of opposition, instead of having to submit meekly to whatever terms may be dictated. Last year the Exchange succeeded in inducing the contractors and supply men of St. Thomas to organize an exchange, which is now operating on a most efficient scale.

At a joint meeting of the Exchange members of London and St. Thomas, held in the latter city last summer, a resolution was adopted advocating the formation of a provincial association,—under the control of the Canadian National Association, to take care of purely provincial affairs. It is hoped that arrangements will be made for a

contends that, so far, higher education has resulted in nothing but over-production in the professional class and it feels that it is high time for the general public to realize that it is as important to turn out competent mechanics as architects and engineers: that there is dignity and honor in the trades just as there is prominence in the professions.

The executive of the Exchange for the current year is as follows: president, Mr. Jno. Jones; first vice-president, Mr. Wm. Nutkins; second vice-president, Mr. E. R. Dennis (representative Canadian National Association of Builders); secretary-treasurer, Mr. Geo. S. Gould; assistant secretary, Mr. A. C. Nobbs.

Montreal—Activity in the Contracting and Engineering Field

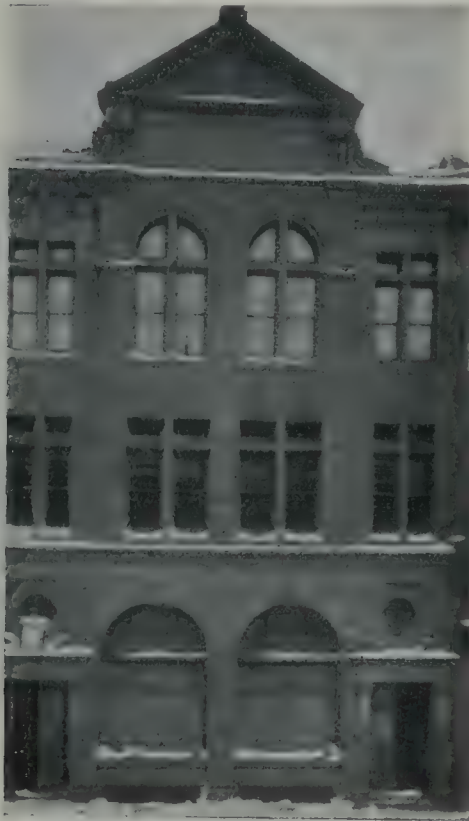
Office of the Contract Record,
Montreal, October 14, 1911.

Contractors are now rushing the exterior work on buildings, in order to get this part completed before winter. Below we give a resume of the progress on some of the principal buildings:

Operations on the addition to the Windsor Station of the C. P. R. have reached the stage where the public can obtain a general idea of what the building will look like. Practically all the stone work is done, except on the tower. The concrete roof is finished and a start has been made with the copper sheathing. Carpenters are at work on the interior erecting partitions, three of which are completed; the heating system is being installed; a section of the elevators has been put in; the fire escape stairs are being put up, and the plumbers and electricians are at work. The foundations for the heavy electrical machinery are under way. Mr. C. E. Deakin is the contractor.

The C. P. R. is also expending large sums on the Place Viger Terminus. Work is now being done on the yards, which when finished will be among the largest on the continent, covering 700 acres. Three main lines lead into the yards, where there will be forty tracks; from 22 of these goods can be loaded directly from the cars. The freight sheds are three in number, one for inbound and another for outbound traffic, as well as one for bonded goods. The latter is being constructed under a new viaduct upon Notre Dame street, the floor of the viaduct being utilized as a roof. The sheds are of concrete and steel, and are fireproof. One of the lines into the yards is for the incoming and another for the outgoing traffic, and a third for the freight. Both passenger tracks have their own platforms, which are to be covered with arched roofs.

Appearances point to the new Ogilvie store on St. Catherine street west being ready for occupation in about five weeks. D. G. Loomis & Sons, the contractors, are putting the final touches to a structure which will be the largest exclusively dry goods store in Canada. The ornamental iron work is being completed and the store floor has been finished. Men are at work on the permanent fixtures and the interior decorations; the boilers are in, and the heating apparatus near completion. The engines, dynamos, switchboard and all the electrical work are installed, while the elevators are about ready. Messrs. Loomis & Sons have also other important works in hand. A building for the United Shoe Machinery Company at Maisonneuve will be ready in about three weeks, while a tender and truck shop for the C. P. R. at the Angus shops is nearly completed. The brick work on a mill at St. Henri for the Dominion Flour Mills Company is up to the second floor. A beginning has just been made on a factory at St. Urbain street for W. V. Dawson & Co.; the building will be 103 by 153 ft. and will consist of four storeys.



Bank of Nova Scotia Building, London, Ont.,
Headquarters of the Exchange.

meeting of delegates from every exchange and contractors' association in Ontario at Toronto a day previous to the C. N. A. B. convention to be held there next February; meantime every effort is being put forth to get every town in western Ontario interested in the matter of local organization. This matter is now in the hands of Mr. E. R. Dennis, of London, C.N.A.B. organizer for the district, assisted by a sub-committee from the St. Thomas and London Exchanges. There is every prospect of satisfactory results being achieved.

Arrangements are now being made by the London Exchange to receive as associate members contractors doing business in the smaller places where it is not possible to form a local organization.

The ever-increasing call for skilled artisans in all branches of building work has brought home to the London Exchange the matter of technical education and the greatest interest is taken in the efforts that are being made to establish industrial schools in Canada. The Exchange

At Birks new building, Union avenue, for which John Stewart & Co. are the contractors, the concrete work, by F. J. Jago, is up to the eight floor and the masonry has just been started. J. Stewart & Co. are also making considerable progress with the brick and terra cotta work on the new store on St. Catherine street to be occupied by W. H. Scroggie, Limited. It has been decided to alter the plans by adding another storey to the building.

The Coronation building (contractor, G. W. Nicholson) is up to the fourth floor. The structure is of stone and brick.

A commencement has been made with Montreal's latest theatre, the Gayety, on the corner of St. Urbain and St. Catherine streets. Men are at work on the foundation which is being rapidly proceeded with. Foundations for a new moving picture theatre and store for Alderman Gauvin, St. Catherine street, and for the East end post office, St. Catherine street, are being put in.

Work on the new art gallery, at the corner of Sherbrooke street and Ontario avenue, has reached the roof stage. The massive 26-ton pillars at the entrance have been placed in position, giving the building a very imposing appearance.

Workmen are drilling and blasting out the foundations of the new Ritz Carlton Hotel, Sherbrooke street West; they are now about 26 feet below the sidewalk, and on one side the excavation has been completed.

Report on Filtration Plans

Mr. Meadows, sanitary engineer of the Provincial Board of Health, has reported on the plans of the Montreal City filtration system, an account of which was given in the Contract Record of September 27. While asking the board to approve the plan, Mr. Meadows criticizes them from the point of view of not providing for future requirements. He points out that the plans show the filter basins as having a combined capacity of 50,000,000 gallons per 24 hours. Montreal at present has a maximum consumption of about 45,000,000 gallons during the 24 hours, and the yearly increase for the city amounts to between two and three million gallons per year. The time necessary for the completion of the filtration plant is estimated to be between two and three years, and with the normal rate of increase the water consumption at the time when the filtration plant is completed will be as much, or more than, the capacity of the plant. In practically every large city where filtration plants have been installed the rated capacity of the normal installation has been figured in excess of the present water consumption so as to handle the natural growth of the city for several years to come. Such a procedure, said Mr. Meadows, is considered a very good business policy.

In the report a list of recent installations of water filtration in the United States is given, and Mr. Meadows concludes by saying "It is to be noted in this connection almost without exception, that in the case of nearly all these plants the rated capacity is practically double the consumption at the time the filtration was installed."

Controller Wamblyn has replied to this that he is quite satisfied that the plant will meet the requirements for several years to come. He says that the 50,000,000 gallons is the nominal rate at which the first installation will treat the dirtiest water at the slowest rate of filtration. With the new intake the general quality of the crude water has materially improved, and will still further improve when the farthest intake, 1250 feet from the shore line is in operation. There will then be no difficulty in treating from 55,000,000 to 60,000,000 gallons per 24 hours, which will be ample for the city for many years; the daily average consumption at the present time of the year does not exceed 40,000,000 gallons daily.

Mr. Fuller, of Hering and Fuller, the New York filtra-

tion engineers, who are responsible for the plans, stated to the Board of Control on Thursday, that his firm had provided for a plant with a capacity to meet the needs of the city for many years to come.

The question of a new city hall in Montreal has been discussed by the aldermen, and referred to the controllers for study. The present building is quite inadequate for civic purposes, the acquisition of outside municipalities and the increase in population, with the consequent addition to the staff having rendered necessary enlarged accommodation. To meet this the controllers suggested the purchase of a site for an annex to the city hall on Gosford street, at a cost of about \$90,000. The idea was that the Recorder's Court and the police and detective departments should be housed in this addition.

At a meeting of the council, however, Alderman Marcil suggested the construction of an entirely new municipal building on the site of Fletcher's Field, the largest public playground in the city. In order to compensate for this appropriation of playing space he proposed that \$2,000,000, its estimated value, should be spent in acquiring public parks and playground in different parts of the city. The question will come up later on.

The controllers have also been asked to examine a project for excavating the entire surface of the Champ de Mars and having an outlet between the city hall and the court house, down Jacques Cartier Square, to the river front. The scheme is to provide accommodation for farmers and traders where they can sell their produce without the present discomfort of Bonsecours market. Part of the plan is to have sixty small stores on both sides of the mouth of the causeway, which it is estimated would rent for \$300 each per annum.

It is proposed to gradually substitute gasoline power for horse traction in hauling the fire engines of the Montreal brigade. A beginning has been made in the recommendation of the controllers to purchase an automobile hose wagon and two motor trucks. The latter are intended to be attached to fire engines and extension ladders, the motors thus supplying the motive power. It is estimated that the motors will prove more economical than horses. The controllers are in favor of the tender of the W. E. Seagrave Company of Walkerville, Ont., at \$20,650 for the trucks. They also recommend the tender of the Hugh Cameron Company, representing the Waterous engines, of Brantford, for two ordinary engines at \$11,500. Although the Seagrave tender was higher than that of another company the controllers reported in its favor on the ground that the Seagrave company are regular manufacturers of fire apparatus.

Two tenders have been received by the city of Montreal for improvements to the Champ de Mars. John Quinlan & Company tendered at \$99,850 and \$87,500 according to the materials used, and Labelle & Lessard put in three alternatives at \$85,450, \$77,645, and \$85,000. According to the plans a main stairway 70 feet wide at the bottom and 60 feet wide at the top is to be constructed, together with an observation terrace, subsidiary stairways, retaining wall, underground public lavatory, etc. The tenders only cover part of the work.

The name of the new hotel at Winnipeg, designed by Messrs. Ross & Macfarlane, of Montreal and Winnipeg, for the Grand Trunk Pacific Development Company, is to be changed from "The Selkirk" to "The Fort Garry" hotel.

International Municipal Show at Chicago

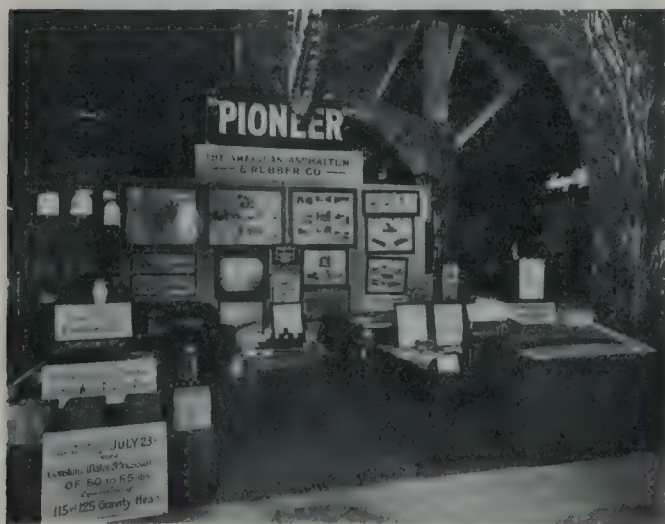
Instructive Exhibits from England, Germany, Italy and other countries—Valuable Papers and Discussions—Canada Well Represented

Office of the Contract Record,

Chicago, Oct. 7, 1911.

America's first International Municipal Exposition and Congress which was held in the Coliseum in Chicago from September 18th to the 30th was marked by many features indicating municipal advancement along practical lines.

The city of New York made an extensive exhibit of photographs showing its most modern developments. There were photographs showing the operation of the high pressure water system for fire protection with twenty-six streams coming from the hydrants and shooting up sixteen stories in the air. Another valuable exhibit from New York was a photograph of the battery search lights, twenty in number, aggregating 4,000,000 candle power, which light the famous Riverside Drive. Other pictures of the new Croton dam, new aqueducts for New York's water system, sewer system, hospitals, charities, schools, parks and playgrounds, were shown to be of instructional value.



American Asphaltum & Rubber Company's Interesting Exhibit at Chicago

The city of Montreal was given prominence in the Exposition galleries through the efforts of the Quebec Association of Architects. Large wash drawings graphically pictured the Prince Arthur Drive, the Montreal River Front, the Boulevard de la Confederation, and Atwater Avenue Boulevard. There was also a design suggesting traffic relief for Montreal streets.

Toronto was represented by a large civic guide map showing the existing parks and parkways, and the proposed parks, playgrounds and thoroughfares.

The Health Department of Chicago made an exhibit which was highly educational. A working laboratory was installed on the exhibition floor, furnishing information on public baths, municipal lodging houses, ventilation, contagious disease inspection, hospitals, etc. Chicago was also pictorially represented by oil paintings from the time the Chicago river was first discovered by the French until the present day. A relief map of the proposed Chicago outer harbor was on exhibition to show the possibilities of developing the lake front not only for pleasure grounds, but into a commercial harbor as well.

Both American and foreign cities were encouraged to exhibit their most notable accomplishments in city building, free space being given for this purpose. These exhibits were of practical benefit to the exhibitors and valuable object lessons to other cities. Exhibits pertaining to public schools, public libraries, police and fire departments, park and playground associations, the city departments of paving and street cleaning, road making, health and sanitation, public utility boards and all other departments of real assistance to city governments were given free space.

All the exhibits used at the city planning exposition at Philadelphia were on view at the Chicago Congress.

The exhibits were of great interest, as they comprised all of the important drawings of model municipal plans made since city planning began to develop a few years ago. Cities of all sizes and prominence made exhibits of their most remarkable developments in city building. Minneapolis made photographic displays of the labor-saving devices now used in building in that city. Cleverly constructed models enabled Pittsburg to show the complete results of its surface street car experiments, showing the comparison between American and European street car management and operation. Columbus, Ohio, displayed drawings and photographs of its lighting and park systems. This city has what is considered the best organized lighting plan in the country. Denver, Rochester and Cleveland made interesting displays of proposed civic centres. San Francisco's new water front and system of docks were shown by photographs and drawings. Such cities as Cedar Rapids, Detroit and New Orleans exhibited drawings and photographs of the most distinctive features of municipal improvement. Savannah, Ga., made an elaborate display of its short ballot organization. One exhibit in particular, which attracted much attention was a large stucco model of a civic centre of Des Moines, Iowa, which was one of the first cities to adopt the commission from the government. The model is four feet square and is an exact reproduction. It shows the post-office, public library, and Coliseum completed, and a new city hall now in course of construction.

Foreign cities made exhibits equally as interesting as those of American cities. Liverpool made a display of her system of docks; Port Sunlight, England, which is held up as the model workers' city of the world, showed models of the homes of workingmen; Antwerp, Belgium, exhibited photographs and drawings of new dry docks, new port, parks and playgrounds.

Various plans of civic development were shown by Milan, Italy; Hamburg and Cologne, Germany; and Amsterdam, Holland.

During the congress there were general meetings every afternoon. In the evenings there were displays of moving pictures to illustrate the talks held earlier in the day.

Among the subjects discussed by municipal experts and authorities were:—"City Charters;" "Municipal Accounting and Efficiency;" "City Planning;" "Paving;" "The Business End of City Government;" "The City For The People;" "Public Utilities;" "Police and Fire Service;" and in fact every subject relating to proper city management.

Among the exhibits of manufacturers may be mentioned street paving materials and machinery, adding and calcu-

lating machines of various kinds, technical magazines, office supplies, plumbing supplies, many kinds of building supplies, street washing machinery, concrete machinery, sanitary and heating appliances, fire apparatus, vacuum cleaning machines, water meters, pitometers, various dust laying compounds, sewage disposal and cleaning apparatus, bridges, street lamps, voting machines, chemicals and sanitary specialties.

Canada was well represented at the Congress. Among those in attendance noted by the Contract Record were his Worship Mayor Geary, of Toronto; Mr. M. H. Dandurand, acting Mayor of Montreal; Aldermen C. P. Monahan and M. LeClair, Montreal; Chas. J. Hastings, medical health officer, Toronto; Alderman Clark, Hamilton; C. J. Brown, Winnipeg; F. J. Reynolds, Regina; D. C. Denault, Sherbrooke; Jas. Smart, Calgary; C. W. Gardner, Hamilton; W. Hollingworth, Hamilton; R. Pritchard, Chatham; Geo. H. Lees, Hamilton; Jos. Haynes, Montreal; Theo. Haynes, Montreal; J. W. Graham, Ottawa; A. Henderson, Ottawa; W. B. Doherty, Ottawa; Fred. Guist, St. Thomas; W. H. Munro, Sault Ste. Marie; R. D. Waugh, Winnipeg; Jno. Harris, Winnipeg; W. G. Douglas, Winnipeg; W. F. Tallman, Winnipeg; Mr. Kerr, Winnipeg.

The Congress was one of the notable progressive events of the year. City experts of the old world and the new participated in this great international municipal event. Discussions of municipal administration were engaged in by the ablest educators in all lines. This, in conjunction with the exhibition of every article and appliance entering into municipal construction, constituted a valuable conference. The wide variety of exhibits emphasized the importance of the subjects discussed by municipal experts from all parts of the world.

Construction News and Notes

North Vancouver building permits for the nine months of the year ending September 30th totalled \$641,083.

Standard specifications for brick and other asphalt pavements, differing but slightly from those of the association for standardizing paving specifications were adopted at the 18th annual convention of the American Society of Municipal Improvements held recently at Grand Rapids, Mich. The society also adopted the standard methods of testing asphalt already approved by a sub-committee of the American Society of Testing Materials.

It is announced that the Proceedings of the Congress of Technology held in Boston, April 10-11, will be published. The single volume of about 500 pages, which will be sold at a moderate price, will contain the seventy odd technical papers relating to many fields of industry which were read at the celebration of the Fiftieth Anniversary of the granting of the Charter of the Massachusetts Institute of Technology.

The city council of Montreal has authorized a loan of \$500,000 to continue operations upon the filtration plant. The statement of expenditure on this project until the present is as follows: purchase of land, \$318,669; expenses for filtration plant, plans, fees for engineers and sundries, \$827,000; reserve for other work, \$425,000; total, \$1,570,844.80. The consulting engineers received \$65,000, and the plans cost \$31,428, with an additional outlay of \$15,000 for their completion.

The building permits at Edmonton, Alta., for the first nine months of the current year totalled \$3,076,750, an increase of 69 per cent. over the corresponding period of 1910, the total for which was \$1,820,555. According to information received from Mr. F. T. Fisher, secretary Board of Trade, the C. P. R. are reported to have recently acquir-

ed 140 acres in the north-west portion of the city for their terminal facilities. It is also understood that the G. T. P. have obtained a large area for passenger station and local freight yards.

The American Asphaltum & Rubber Company, Chicago, have sent us a copy of a well illustrated little booklet devoted to "Pioneer" products. These are so familiar to the trade that it will suffice to enumerate but a few of the lines mentioned, such for instance as mineral rubber pipe coating, reservoir waterproofing asphalt, road asphalt, filler asphalt, paving cement, structural paint, and mineral rubber roofing cement. The application of these various products is shown by excellent photographic views. The company's plant is located at Grand Crossing, Ill.

The contracts now being executed by the Nova Scotia Construction Company, Sydney, N.S., amount to several million dollars. The most recent of these is that for the Halifax and Eastern Railway. This line is 43 miles long and the contract is for approximately one million dollars. The other contracts are the Brookland Piers, Shelburne County, \$120,000, fifteen miles of railway in Quebec, and the International sheds and piers at Halifax. In addition, the company has a large amount of work for the Steel Company at Sydney.

An offer of \$2,000,000 has been made for St. James Methodist Church, St. Catherine street west, Montreal, by Mr. J. C. McGreevy, of Winnipeg. This is for the site alone, the edifice being left for the church to remove if it wishes to do so. The price works out at just over \$26 per foot, and is another indication of the rising value of land in this district. Rumor credits the C. N. R. with making the offer but officials of the company deny that it is proposed to build a terminal on the site.

Work on the construction of the Grand Trunk Railway's second palatial hotel has been started at Winnipeg, and it is definitely announced that the new hostelry, which will be of the same style of architecture as the Chateau Laurier at Ottawa, is to be named the "Fort Garry." The name is considered a peculiarly appropriate one, and is designed to perpetuate the romantic early history of the great prairie city which had its rise in a small military garrison and which Winnipeg, in its wonderful growth during these recent years is almost inclined to forget.

Main street, Winnipeg, is to have a new structure for the Confederation Life Association, plans for which have been prepared by Mr. J. Wilson Gray, of Toronto. The building will have a frontage of 100 feet and will be ten storeys high. The front of the building will be executed in terra cotta, the materials throughout being fireproof. The foundations will rest on concrete caissons, placed on the solid rock, which at this point is 55 feet below the level of the street. The interior finish will be of quarter-cut oak, with floors laid in Terazzo marble. The stair railing and elevator grills will be of iron and bronze.

Terra Cotta Hollow Tile Fireproof Construction is the title of a valuable publication issued from the offices of the National Fireproof Company of Canada, Limited, Toronto. In presenting this catalogue to the building interests of the country the company is also presenting a wide and varied experience which has involved practically every system of successful fireproofing. In the preparation of the catalogue it has been the aim of the company to present concisely all the data the architect will ordinarily require in designing a thoroughly fire-resisting building. The catalogue is amply illustrated with excellent half-tone illustrations and diagrams, and the information contained therein will prove of direct practical value to builders and engineers.

Contracts Department

News of Special Interest to Contractors, Engineers, Manufacturers and Dealers in Building Supplies.

Information for insertion in these columns is invited from Architects, Contractors, Engineers, etc.

Waterworks, Sewerage and Roadways

Berlin, Ont.

The County Council of Berlin and Waterloo will purchase \$3,000 worth of road machinery shortly. A by-law to raise money is now being prepared. County clerk, H. T. Bowman, Berlin.

Tenders will be called shortly for a 6-in. water main to be laid at Woodside Park and through the factory district. Town engineer, W. H. Johnston.

Chatham, Ont.

A special meeting of the Board of Works will be held to select a new pavement which is to be laid this fall on Raleigh street. Meeting will be held next week after conference with members of Chaplin Wheel Works firm who will pay part of the cost.

Dorion, Que.

Tenders are called until Oct. 25th for construction of 30 acres macadamized road, including preparation of road, supplying, crushing and placing of stone—about 300 tons.

High River, Alta.

Plans are being prepared for waterworks and sewerage. Engineers, Chipman & Power, Mail Building, Toronto, 47 Canada Life Building, Winnipeg, and Dauphin. Man. Debentures amounting to \$125,000 will be advertised for. As much as possible will be done this fall.

Montreal, Que.

Tenders are called by the Board of Commissioners until Oct. 23 for the construction of sewers on Pine avenue from Cedar avenue, to western limits of Redpath property. City of Montreal. Secretary, L. N. Senecal, City Hall.

Tenders are called until Oct. 18th for sewers. Secretary, L. N. Senecal. Plans and specifications with Supt. of Sewers, City Hall, for the construction of St. Denis Ward steel outlet into Black river. Evans avenue from Sherbrooke street to Notre Dame de Graces avenue.

Prince Rupert, B. C.

Tenders are called for supply of about 1,800 tons of C. I. pipe, 6 in. to 18 in. in dia.; 38 tons special castings and quantity of gate valves, valve boxes and hydrants. Received by City Clerk until Nov. 20th. City Clerk, E. A. Woods, City Engineer, W. M. Davis.

Sarnia, Ont.

Cromwell street will be paved with wooden blocks. Tenders will be called at once. Town clerk, J. D. Stewart; town engineer, H. A. Maclean.

Sandwich, Ont.

Tenders will be called shortly for new sewer mains to cost \$7,000. Treasurer, Ferdinand Pare. Sandwich West. Mains will be laid on Wellington avenue. Concession Road and Bridge avenue. Hydrants, water mains, etc., required.

St. Lambert, Que.

Tenders called for laying of concrete sewer pipe on Front street. Plans and specifications at the offices of town engineer and secretary-treasurer. Received at the town hall up to 8.30 p.m. Oct. 12th.

South Vancouver.

Tenders were received until 5 p.m., Oct. 13th for grading Manitoba street, River ave. Plans, etc., at the engineer's office, cor. Fraser street and 43rd avenue.

Toronto, Ont.

Tenders are called for construction of asphalt, bitulithic and concrete pavements; grading, macadam roadway, concrete walks and curbs; sewers. Received by chairman Board of Control, G. R. Geary, until noon Oct. 24th.

Victoria, B. C.

Tenders are called until Oct. 27th for supply of waterworks material, gate valves, pig lead pipe, galvanized pipe, brass goods, galvanized fittings. Specifications etc., at purchasing agent's office. Purchasing agent, W. W. Northcott.

Vancouver, B. C.

Tenders for the 1,258 feet of 30-inch continuous steel riveted pipe required by the water department has been opened and referred to the engineer. They are as follows: Masdougall-Jenkins Co., \$5.20 per foot; Evans, Coleman & Evans, \$4.20; W. N. O'Neill & Co., \$7.97 and \$9.57; McDonald & Godson, \$4.65 and \$5.40.

A committee has been appointed to arrange for option on 7,000 acres surrounding Seymour creek watershed, until a regular by-law can be passed for purchase. The property extends about 10 miles above the present intake, and will form an ample watershed for many years.

CONTRACTS AWARDED

Montreal, Que.

Sewer to cost \$36,991. Engineers, Geo. Janin; contractor, J. Toussaint & Co., 1101 Huntley street. Montreal; 100 yds. on Notre Dame street; 2,081 on St. Peter street arranged for. Contract awarded Oct. 9th.

Sandwich, Ont.

Contract for sewer extension has been awarded to Elliott & Reid, Brantford, \$10,000. Owen McKay, Windsor, engineer; E. R. North, clerk.

St. John, N. B.

John E. Kane has been awarded the contract for the Lancaster sewerage. The figure was \$3,586.

Railways, Bridges and Wharves

Boswell, B. C.

James Johnstone and A. L. McCulloch are doing some surveying in connection with the new wharf which is to be built at this point.

Burnaby, B. C.

An appropriation will be sought from the provincial government for the construction of the proposed high level bridge over the North road. The engineer has been instructed to prepare estimates, and the B. C. E. R. has agreed to begin the construction of the Barnet extension one month after the necessary by-law is passed.

Escuminac, N. B.

Tenders are called for construction of a breakwater at Escuminac, Northumberland county, N.B. Plans, etc., at the Department and at the offices of district engineers at Chatham, and St. John, and on application to the local postmaster. Tenders to be accompanied by accepted cheque for 10 per cent. of tender. Received by secretary until 4 p.m. Oct. 25th.

Hamilton, Ont.

On Oct. 11th permits were granted by Dominion Railway Commission for erection of G. T. R. bridge, James street North, to Toronto, Hamilton & Buffalo Railway; for five switches to factories, and to the city for a subway under the G.T.R. and T.H. & B. on Birch avenue. Details G.T.R. bridge will be handled in Toronto. Engineer of T. H. & B. is R. L. Latham, office, T. H. & B. depot, Hamilton.

Malakwa, B. C.

The provincial government has appropriated \$12,500 for improvement of roads and building of new ones in this vicinity. Two bridges will also be built this fall, one across Eagle river and the other over the same river at Baul.

The Canadian Pacific Railway, Windsor street, have started work on the erection of freight sheds to cost \$48,000. 2 storeys, 176 x 600, brick and concrete construction, concrete foundation, hot water heating, gas and electric lighting, concrete floors, tar and gravel roof.

Simcoe, Ont.

A by-law is contemplated to guarantee bonds of the Lake Erie & Northern Railway to the extent of \$300,000 for railway from Brantford to Port Dover.

Shediac Island, N. B.

Tenders were called until Oct. 17th for construction of a wharf at Shediac Island, Westmoreland county, N. B. Plans, etc., at the department and at the offices of the District engineers at Chatham and St. John and with the local postmaster. Tenders to be accompanied by an accepted cheque for 10 per cent. of amount of tender. Department of Public Works, Ottawa. Secretary R. C. Desrochers.

Vancouver, B. C.

City Engineer Fellowes is to bring in a report on a canal 100 feet wide, extending from Coal Harbor, through Stanley Park to English Bay. This canal is to be three-quarters of a mile long

and not dredged to any great depth. The engineer will also make a report at the same time on a trunk sewer through Stanley Park from Coal Harbor to the Third Beach, and sewers from the English Bay and Kitsilano bath houses to deep water.

Nanaimo, B. C.

Construction of an additional 37 miles of the Esquimalt and Nanaimo Railway from McBride Junction on the Alberni branch, to Campbell river, has been authorized, and it is intended to call for tenders for the clearing within a few weeks. Tenders for clearing the right-of-way from McBride Junction to Comox, 20 miles, have already been called. The proposed line will traverse the east coast of Vancouver Island.

Vancouver, B. C.

The Burrard Inlet Tunnel & Bridge Co., Exchange Building, have appointed Sir John Wolfe-Barry, K.C., L.L.D., F.R.S., V.D., to the position of consulting engineer for the proposed bridge across the Second Narrows. The engineer is expected shortly, and will begin preparing plans for the bridge immediately after his arrival.

The vote of the ratepayers may be taken re purchase of B. C. Electric Railway. The city clerk has been authorized to offer a price of purchase to the B. C. Telephone Company. W. McQueen, city clerk.

Plans were submitted for construction of four bridges, Hastings, Pender, Keefe and Harris streets. City engineer, F. Fellowes; engineers, Waddell & Harrington have submitted plans for above bridges over Great Northern Railway tracks. Cost ranges from \$223,600 to \$435,100.

Windsor, Ont.

The Windsor, Essex & Lake Shore Railway Company will purchase a new mogul engine and a quantity of new cars both passenger and freight. Matter will be gone into at once.

CONTRACTS AWARDED

Cranbrook, B. C.

A contract has been awarded by the C. P. R. to Burns & Gordon for 24 miles between Fort Steele and Shookumchuck, and plans have been filed for an additional 60 miles from the north, leaving a stretch of between 30 and 40 miles unprovided for between Golden and Crow's Nest Pass.

Port Stanley, Ont.

Breakwater and dredging to cost \$210,000. Department of Public Works, Ottawa. Contractor, M. J. Hogan, Port Colborne, Ont. As much as possible will be done this fall in the way of getting crib work etc., in shape but main part of work will be done in spring. Large quantities of stone, cement, etc., will be purchased.

St. Catharines, Ont.

The Federal Government has awarded the contract for lock of St. Peter's Canal to W. H. Weller, St. Catharines, Ont. Cost, \$250,000.

Windsor, Ont.

Bridge to cost \$25,000, on Sandwich street, for Michigan Central Railway Co. Engineer in charge, G. H. Webb, Detroit, Mich, U.S.A. Re-construction—reinforced concrete 300 ft. in length. Work will be started in a few days by company.

Public Buildings, Churches, Schools, etc.

Burton, City, B. C.

The new St. Andrew's Presbyterian church has been decided on. Instructions have been issued for the purchase of lumber, stone, etc. A. Sunstrom's tender for the work has been accepted.

Brandon, Man.

The Brandon Curling Club have decided to erect a rink on McTavish ave. at a cost of \$10,000. At present it is probable that the new rink will be 1 storey and large enough for 8 sheets of ice. 7 lots 33 ft. each purchased.

Contemplated assembly hall, to cost \$3,000 on McTavish avenue, for Brandon School Board. Secretary, J. B. Beveridge, 1030 Victoria avenue; frame, 1 storey, concrete foundation, shingle roof, hot air heating, electric lighting. Date not set for receiving tenders.

Berlin, Ont.

Tenders are called until Oct. 19th for addition to hospital. Chairman Hospital Board of Governors, Mr. Hughes. Brick, electric lighting, steam heating, plumbing, telephones, elevator.

The whole interior of the theatre will be renovated; new entrance and lobby, mahogany woodwork inside, new decorations throughout and new ceiling, new stage and settings and new scenery. Owner, Mr. Phillips, Oheara House.

Campbellton, N. B.

Plans are being prepared for erection of a church. Architect, F. Neil Brodie, St. John, N. B. Owner, Church of England Congregation at Campbellton. Building will be 40 x 75, brick and free stone. Tenders will be called about the 1st of February.

Calgary, Alta.

Church to cost \$100,000 for Grace Congregation; architects, Smith & Gemmell, Bank of Commerce Building, 23 Jordan street, Toronto. Stone and brick, electric light, oak interior finish, shingle roof, steam heating. Tenders called—contracts not yet awarded.

The Church of Christian Science contemplates erection of church to cost \$35,000. D. McDougall, McDougall Blk. contemplates erection of block 50 x 130, to cost about \$150,000.

Edmonton, Alta.

The school board have authorized the erection of two new schools, one in Parkdale and the other in Hudson Bay Reserve. Construction on both will be pushed next year. Excavation tenders to be called at once.

Hamilton, Ont.

Plans will be prepared for erection of a church to cost \$60,000, for First Methodist Church, King street East Hamilton. Secretary Quarterly Board, Cal. Davis, c/o "The Times," Hamilton. Architect, W. E. Hunter, Detroit, Mich. U.S.A. Steel, brick, 80 x 160 approx. stone foundation, steam heating, electric lighting and gas, slate roof, Georgia pine finish. Tenders called after end of year; received by Quarterly Board. If enough money can be raised a school to cost \$15,000 will be built. Church will want ventilating system, electric work, heating apparatus, lavatories, pews, and chairs.

Kamloops, B. C.

Anderson & Feggara, the latter of Vancouver, have purchased property at Victoria street and state their intention of building a large frame roller rink, plans for which have already been drawn.

Montreal, Que.

Tenders are called until Oct. 16th for fire and police station on Notre Dame de Grace Ward, for Corporation of Montreal. Architect, Theo. Daoust, St. James street, Montreal. Brick and cement construction.

Moose Jaw, Sask.

Work is in progress for erection of an opera house on Fairford street West. Parties interested, Mayor Paul and Mr. W. E. Seaborn. 50 x 100 ft., foundation of semi-glazed brick with cut stone, marble walls and mosaic tile flooring.

Tenders were called until Oct. 13 for a college basement, for Saskatchewan College Board of Governors. Architect, R. G. Bunyard, Room No. 6, Bank of Commerce Chambers, Moose Jaw. Excavation and concrete work. Tenders to be accompanied by marked cheque for 5 per cent. of amount of tender.

New Alberni, B. C.

Tenders are called until Oct. 25th for the erection of a school. Department of Public Works. Engineer, J. E. Griffith, Victoria; 2 room, frame. Plans at the offices of A. D. Cooper, Esq.; secretary of the school board, Port Alberni, B. C.; government agents, Nanaimo and Alberni, B.C., and at the Department. Received by Minister of Public Works.

Niagara Falls, Ont.

A vaudeville theatre will be installed in Buckley Block, seating, stage, lighting and decorating not arranged for. Owner, W. J. Hamilton, Niagara Falls.

North Battleford, Sask.

Architect G. J. Stephenson has plans for the erection of a rink, lumber (double trussed circular roof) with iron rods and ties, hardwood floors for roller skating in summer. Cost, \$7,500.

Tenders are being called for erection of a brick Separate school to cost \$10,000, for Roman Catholic School Board. Address Father Payette. Architect, Geo. I. Stephenson, N. Battleford.

Sketches are being prepared for a theatre, to cost \$7,000, for W. Owens & Co. Architect, Geo. I. Stephenson, N. Battleford; 1 storey, 25 x 110, brick and terra cotta, concrete foundation, steam heating, electric lighting, pitch and gravel roof, hardwood sloping floor.

Owen Sound, Ont.

The council will be asked to vote \$10,000 for new school.

Ottawa, Ont.

A Jewish synagogue will probably be built in Ottawa in the spring. Mr. H. Levin, Banks street, has the matter in hand.

Point Grey, B. C.

It is reported that the provincial government will appropriate \$1,000,000 out of next year's budget for the construction of the first of the buildings to comprise the Provincial University. Plans for the group will shortly be under way, and it is understood that construction will be begun before next summer.

Prince Rupert, B. C.

Plans are being prepared for erection of a fire hall to cost \$5,000, on Fulton street. City Clerk, E. A. Woods. Assoc. architects, Lailey & Potter, Prince Rupert; 2 storeys, 50 x 65, frame, electric lighting.

Plans have been prepared for the erection of a parochial hall and residence for the Roman Catholic Church. Architects, Munro & Lailey, Prince Rupert. Hall 30 x 50 ft. Residence, 33 x 50, 2 storeys and attic, conservatory at rear, hot water heating.

Peterborough, Ont.

Contemplated schools, \$85,000. Bd. of Education have instructed their solicitor to expropriate for one in East Ward; option obtained in West Ward. Chairman Building Committee, Dr. M. A. Morrison.

Red Deer, Alta.

Plans are being prepared for a modern theatre to seat 1,000. Tenders will be called locally for concrete, basement likely put in this fall. Temporary quarters have been secured in the meantime. Owner, The Schierboltz Theatre Co.

River Glade, N. B.

Plans are being prepared for an addition to sanitarium for New Brunswick Provincial Government. Architect, F. Neil Brodie, St. John, N. B.

St. Mary's, Ont.

Trustee Lovell of the School Board has been instructed to confer with architects regarding improvements to the Central school and will report at the next meeting of the council. It is probable that an addition will be built as more room is required. Owner, St. Mary's School Board.

Toronto, Ont.

The City Architect has been instructed to prepare plans for the new fire hall on Greenwood avenue.

Tenders are called for erection of hospital on Humber river, near Weston for National Sanitorium Association, 374 King street West, Toronto. 2 storeys, brick, stone and concrete. Tenders on construction received until Oct. 11th. Tenders on heating, plumbing, laundry and kitchen equipment not called yet.

Victoria, B. C.

The Williams Stock Company are contemplating the erection of a 2-storey reinforced concrete building if a suitable site can be secured. Cost, \$45,000.

Vancouver, B. C.

The Sisters of Ste. Anne have instructed A. F. Heide, 214 Metropolitan Bldg., to prepare plans for erection of a Convent school on King Edward avenue. It is understood that the building will be 4 storeys, steel and fireproof construction and will cost about \$300,000. Plans ready for figuring on by spring.

St. Saviour's Parish Church, First avenue east and Semlin drive, will be enlarged to a seating capacity of 450 as soon as necessary funds can be obtained.

By-law is proposed that \$50,000 be included in the 1912 by-laws, for the purpose of building an old men's home and infirmary on government blocks in Hastings townsite.

Representatives from Hastings Townsite and D. L. 301 are making an effort to secure \$100,000 from the provincial

government for school purposes; It is intended to built at least two new schools in those municipalities.

Weston, Ont.

The by-law carried to raise \$30,000 for the erection of high school. Board of Education; chairman, Mr. Cruikshanks; principal of school, Mr. Fairchild. Building will begin as soon as possible.

Windsor, Ont.

The North Essex Agricultural Society contemplate erection of new building, steel, wood and cement, 2 storey. Secretary, H. J. McKay.

Ursuline Sisters, Chatham, Ont., have purchased 27 lots in the Davis Farm sub-division and plans will be prepared at once for the erection of an academy, &c. Cost \$30,000.

CONTRACTS AWARDED**Bridgeburg, Ont.**

Church to cost \$4,500, on Gilmore Road. Owner, St. Joseph's Roman Catholic Church. Priest in charge, Rev. Father Murray. General contractor, Oscar Teal, Bridgeburg, Ont. 42 x 30, concrete foundation, brick, gas heating, electric lighting, hardwood interior finish.

Essex, Ont.

Post office. Contractor, A. MacDonald, Sarnia; stone and brick required. Heating, lighting and other contracts to be let.

Grand Forks, B. C.

The contracts for the erection of the school house by the Provincial Government have been awarded as follows: general contractor, Allan & Norris; carpentry, Wm. Bonthron; painting and glazing, A. Michner, all of Grand Forks.

London, Ont.

Work is in progress for erection of a Masonic Temple to cost \$55,000. Carpenter contractor, W. Davidson, London; brick work, Thomas, W. Copp, London; plastering, Scott & Son, London; plumbing, Noble & Rich, London. 3 storeys, brick and stone, Roman pillars will be used for ornamental purposes. 1st floor will be stone, remainder red pressed brick. Lighting and heating contracts not yet awarded.

Montreal, Que.

Church to cost \$25,000, on Beaubien and Christophe Colomb streets, for Methodist Church of Canada. Architect, Peden & McLaren, 20 St. Alexis street, Montreal. Masonry, Reid McGregor & Reid, 668 St. Catherine street, Montreal. Plain brick, electric light, gravel roof. Contract awarded Oct. 10th; other contracts in a few days.

Ottawa, Ont.

Incinerator. Contractors, Laurie & Lamb, Montreal, Ottawa. City Council awarded the contract for the incinerator to the above contractors. It will be of the Heenan-Froude type concrete building. Incinerator will be started immediately. Contract awarded October 5th.

Port Hope, Ont.

The contract for the erection of a covered rink at Trinity College has been awarded to L. E. Hall, Port Hope. Building to be wooden, covered with Manitoba sheeting, 228 ft. x 90 ft.

Red Deer, Alta.

Parish Hall basement to cost \$2,500, for St. Luke's Anglican Church. Sec-

retary of Building Committee, J. W. Hey, Red Deer. General contractor, W. W. Webb, Red Deer. Painting, plumbing, and heating contracts not given out yet.

Toronto, Ont.

Excavation contract let for College to cost \$350,000 on St. George street. Owner, Board of Governors, Knox College. Architect, Chapman & McGiffin, 59 Yonge street, Toronto. Concrete work in charge of Leach Concrete Co., 76 Albert street, Toronto.

Tenders have been called for a rink to cost \$200,000 on Mutual street, for Arena Garden Co., Montreal. Architects, Ross & Holgate, 80 St. Francois Xavier, Montreal. General contractor, Peter Lyall & Sons, Ltd., Montreal. 1 storey, steel and cement, seating capacity, 8,500 people. Heating, plumbing and electric work required. Plans, etc., with contractors.

Westmount, Que.

Fire station to cost \$26,000 for Corporation of Westmount. Architect, Archibald Currie, town engineer. 2 storeys, concrete and brick, concrete foundation, steam heating, tile roof, hardwood and glazed tile finish. Plumbing contractor, M. J. Quigley, 4228 St. Catherine street. Heating contractor, John Watson & Co., 4145 St. Catherine street. Sanitary conveniences, steel frame windows, and fire hall fittings not contracted for.

Residences**Amigara, Ont.**

Tenders are called for erection of a residence to cost \$3,000 for Reuben Tisdale, Amigara. 2½ storeys, frame, shingle roof, gas lighting and heating, hardwood finish. Owner will supervise all work, is in the market for supplies; final date set for receiving them Dec. 1, 1911.

Brandon, Man.

Two residences to cost \$4,000 will be erected on Victoria avenue for W. H. Shillinglaw, F.A.I.C., 831 Rosser Ave., Brandon. 2 storeys, frame, shingle roof, electric lighting, probably hot air heating. Owner will supervise construction himself.

Hamilton, Ont.

Bennett & Thwaites, 246 Cumberland avenue, will build 19 houses on Holton avenue; 2 storeys, 30 x 40, brick foundation, electric light and gas, shingle roof, georgia pine interior finish. Electrical work to be installed. Cost \$38,000.

Plans are being prepared for erection of a residence, to cost \$10,000, on Queen street S., for Roy Moodie, 115 Delaware avenue, Hamilton. Architect, Stewart McPhie, Bank of Hamilton Chambers, Hamilton. 2½ storeys, 40 x 50, stucco construction, stone foundation, hot water heating, electric light and gas, slate roofing, Georgia pine finish. Electrical equipment will be installed.

Montreal, Que.

Owner, H. Dagenais, 3 Beauchamp street, four flats, \$3,500. 2 storeys, 50 x 40, brick and wood, stone foundation, stove heating, gas and electric lighting, gravel roofing.

Four flats, \$3,000, for B. Boyers. 2092 Labelle street, 2 storeys, 25 x 42, pressed brick, stone foundation, stove heating, gas lighting, gravel roofing.

Three flats, \$4,000, for Rodrigue Blanchet, 284 Marguerette street. 2 stor-

eys, 24 x 42, pressed brick, stone foundation, hot air heating, gas and electric lighting, gravel roofing. Arsene Frenette, 212 Fabre street, contractor.

Owner, Arthur Mongeau, 1242 Bordeaux, four flats, \$3,000, 2 storeys, 48 x 38, brick construction, cement foundation, stove heating, gas and electric lighting, gravel roofing.

Owner, W. Dubois, 2260 Waverley, two flats, \$3,500; 2 storeys, 18 x 56, stone construction, stone foundation, stove heating, gas and electric lighting, gravel roofing.

Owner, Pelligrine Del Sole, 730 Frontenac street, 3-storey residence, 25 x 54, wood and brick, stone foundation, gravel roofing. Alex. M. Ross & Co., Montreal, contractors.

Work is in progress for erection of six flats to cost \$5,500, on Labelle street, for E. Verbanise, 2081 Labelle street, Montreal; 2 storeys, 51 x 43, wood and brick, cement foundation, gas and electric lighting, gravel roof.

Tenders will be called for erection of an apartment house on St. Luke street for L. W. Chaput, St. Catherine and Fort streets. Architects, C. Dufort. La Patrie Building, Montreal. 4 storeys, 29 x 106, concrete foundation, brick and glazed terra cotta. Specifications not quite ready.

Excavation has started for erection of 11 flats to cost \$10,000, for F. X. Dumontier, Galt & Rielle streets, Montreal; 3 storeys, 60 x 34, pressed brick, hot water heating, gas and electric light, gravel roof.

Excavation has been completed for six flats to cost \$13,000, for Oliva Denault, 2348 Esplanade avenue; 3 storeys, 48 x 72, brick, stone foundation, hot water heating, gas and electric lighting.

Work to commence shortly on the erection of 3 flats to cost \$4,000 on St. Hubert, for O. St. Denis, 2291 St. Hubert street, Montreal; 3 storeys, 25 x 40, wood and brick, stone foundation, gas and electric lighting, gravel roofing.

O. Lavoie, 778 Clarke street, will build six flats on Cowan street, 2 storeys, 50 x 50, pressed brick, cement foundation, gas and electric lighting. Cost \$6,000.

Ottawa, Ont.

Tenders are called for erection of an apartment house to cost \$15,000 for O. Higman. Architect, A. Leb. Weeks, Canada Life Building, Ottawa. 2 storeys, 80 x 30, brick veneer, concrete foundation, hot water heating, electric lighting, tar and gravel roofing. Tenders received until October 14th.

Red Deer, Alta.

Four residences, to cost \$4,000. Owner, W. Bredin Galbraith, 5th street; 1½ storeys, frame, concrete foundation, shingle roofing.

Sydney, N. S.

The Dominion Coal Co. have under consideration the erection of a number of houses for their employees.

St. Catharines, Ont.

Work is in progress for erection of a residence to cost \$3,000 for W. H. Moyer, 8 Frank street, concrete block construction, hot air heating, shingle roof. Concrete blocks being erected by T. A. Rogers, Homer, Ont., the manufacturer. All modern improvements to be installed.

Toronto, Ont.

A permit has been issued to R. H. Schultz for the erection of a 3 storey apartment house at the north-east corner of Bloor street and Spadina road. Cost \$35,000.

W. & A. Hutchins, 167 Pearson ave., will build an apartment house, 2 storeys, semi-basement, brick, asbestos, felt and gravel roofing, on Dowling avenue. Cost, \$12,000.

Verdun, Que.

Foundations are in for the three tenements for W. Proulx, 160 Rockland avenue, 2 storey, 25 x 35, brick, concrete foundation, gravel roofing. Cost, \$3,500.

Residence, \$3,000; owner, C. Dube, 1139 Galt avenue, Montreal, Que.; 3 storey, 20 x 25, concrete foundation, hot air heating, electric lighting.

CONTRACTS AWARDED

Montreal, Que.

Nine flats, \$6,000; owner, Miss Rose Bienvenu, 2081 Notre Dame west, Montreal; general contractors, Joseph Dabec, 640 St. Joseph Blvd. east, Montreal; 3 storey, 25 x 30 each, concrete foundation, brick, gas and electric lighting, hot air heating, gravel roof.

Work will commence shortly on a residence to cost \$35,000 on Pine avenue for A. E. Holt, 148 Mansfield street, Montreal. Architect, Hogle & Davis, 80 St. Francois Xavier street, Montreal. General contractor, John Wighton, 19 Sussex avenue, Montreal. 4 storeys, 55 x 45, rock foundation, hot water or steam heating, gas and electric lighting.

Residence to cost \$50,000 on Pine avenue, for Clarence I. De Sole, Coristine Building, Montreal; architect, Saxe & Archibald, 59 Beaver Hall, Montreal; general contractor, Laird Paton & Son, Ltd., 485 James street, Montreal. Electric wiring, the Sayer Electric Co., 87 Bleury street; lath and plaster, R. D. Clark & Sons, 26 Lincoln avenue; painting and glazing, Murphy & Son, 140 Mansfield street; plumbing and heating, T. O'Connell, 183 Ottawa street; roofing, G. W. Reed & Co., Ltd., 37 Autoive street, all of Montreal; iron works, National Bridge, Longue Point, Que.

Excavation has started on erection of a residence to cost \$10,260 on Bellevue avenue, Westmount, for T. H. Prissick, Bank of Montreal, Montreal. Architects, Hobbs & Hyde, 49 Beaver Hall Hill, Montreal. 2 storeys, 55 x 26, concrete and brick, concrete foundation. General contractor, Morton & Moore, 4842 Sherbrooke street.

Excavation has commenced for a dwelling to cost \$15,000 in Ahuntsic Ward. Owner, Treffe Bastien, Ahuntsic Ward, Montreal; architect, J. W. McGregor, 5 Beaver Hall Square, Montreal. 2 storeys, 92 x 60, brick and wood, cement foundation, slate or asbestos roof.

9 Flats to cost \$8,000, 1681 St. Dominique street, for C. Chausse, 17 Place d'Armes Hill, Montreal; masonry, J. D. Larose, 892 Mt. Royal avenue, Montreal. 3 storeys, 42 x 68, brick, gas and electric light, gravel roof. Foundations are in.

Ottawa, Ont.

Residence for D'Arcy McGee, Carleton Chambers, Ottawa. Architect, C. P. Meredith, 126 Sparks street, Ottawa; masonry contractor, Felix McCullough, 181 Waller street, Ottawa; carpentry, W.

G. Adamson, 126 Sparks street, Ottawa; brick construction. Contracts awarded October 5th. Contracts for all other work not yet let.

St. Catharines, Ont.

Work is under way for erection of a residence to cost \$3,000 on York street, for John Richardson, 81 Albert street; general contractor, Chas. Richardson, Meriton, Ont., 2 storeys, shingle roof, hot air heating, electric light. Foundation completed. Owner in the market for bath room equipment.

Verdun, Que.

Four flats, \$3,500; owner, Mr. Janin, Galt avenue, Montreal; general contractor, L. Levigne, 36 Gordon avenue, Verdun; electric lighting, gravel roof, hot air heating. Brick not purchased yet.

Westmount, Que.

Work is in progress for the erection of a stable to cost \$7,000, Boulevard ave., for G. Hogg, Longue Pointe. Architect, Hutchison, Wood & Miller, Place d'Armes, Montreal; general contractor, Murray & Gray, 4427 St. Catherine street, W. Montreal. 2 storeys, solid brick, hot water heating, electric lighting, slate roof, concrete and hardwood interior finish.

Excavation has commenced for a residence to cost \$11,000 on Mountain avenue, for Mrs. Heward, 212 Melbourne street, Westmount. Architects, Hogle & Davis, 80 St. Francois Xavier street, Montreal; 3 storeys, 25 x 40, stone and brick, stone foundation, hot water heating; general contractors, Gray & Wighton, 244 Pine avenue, Westmount. Sub-contracts not yet awarded.

Residence to cost \$100,000 on West Crescent Heights, for H. Timmis, 631 Coristine Bldg., Montreal. Architects, E. & W. S. Maxwell, Beaver Hall Sq., Montreal; brick and stone, stone foundation; general contractor, John Stewart & Co., Bethune street, Westmount; sub-contracts not yet let. Work will start in a few days.

Business Buildings and Industrial Plants

Avonport, N. S.

W. H. Chase, Wolfville, N. S., contemplates erection of apple storage building next season, \$2,500. Brick, foundation, metal roof, 75 x 35.

Botha, Alta.

A 30,000 bushel elevator will be built. Further particulars from John Skoedopole.

Berlin, Ont.

The Foster-Armstrong Piano Co. are contemplating the removal of its plant to Toronto, owing to lack of building accommodation here.

A new \$3,000 abattoir for Dumart Bros. will be erected and present cold storage plant enlarged. Tenders to be called shortly.

Clandeboyne, Ont.

Mr. Wetherspoon's garage and two autos were destroyed by fire. Loss, about \$4,000. Building will be rebuilt and new auto purchased.

Cobourg, Ont.

Bonds to the extent of \$65,000 will be asked from the town for a tack factory.

Cookshire, Que.

M. M. Tracey, Connecticut, has a proposition before the council in regard to the establishment of a large match factory here.

Chatham, Ont.

The McGeachy Dairy Co., Chatham, will instal boiler and engine and latest dairy machinery and electric fittings and steam heating in the new factory. Building now in course of erection.

Calgary, Alta.

D. Ackland & Son, Ltd., 73 Higgins avenue, Winnipeg, have purchased site for erection of a 3 or more storey warehouse, 50 x 130. Not likely anything will be done before spring. Firm handles blacksmiths' supplies and hardwoods.

Southam, Limited, Hamilton (Publishers) have secured sites for two buildings—100 x 130 ft. for business block to include Herald offices, etc.; 100 x 130 ft. on Revillon corner for another block to be erected later. Foundations to support ten storeys to be laid.

The Crown Lumber Co., Grain Exchange, will build a new store, cost, \$5,000; frame, 32 x 125, electric light will be installed and mill machinery required.

Work is in progress for erection of a laundry to cost \$10,000 for Christie Bros. Ontario Laundry; 2 storeys, 50 x 130, solid brick and concrete, concrete foundation, steam heating, electric lighting, gravel roof, concrete interior finish, boilers, engines, dynamo, laundry machinery. Excavation being done. Contract for superstructure not settled yet.

Plans are being prepared for erection of a business block, to cost \$500,000, for J. S. Mackie, 507 2nd avenue W. Excavation to start preparatory to erection in spring of block, 130 x 140, 8 storeys. All inquiries directed to owner.

Delhi, Ont.

The Delhi Canning Co. contemplate extensions. New machinery required.

Galt, Ont.

Machinery required for a factory for Canadian Motors, Limited; engine, boiler, presser, lathes, etc. Brick and concrete; architect, Wm. Scott, Galt.

Hespeler, Ont.

Hall & Zoyd contemplate the erection of a brick addition to moulding and grinding shop.

Harrietsville, Ont.

The matter of building a new central office for the Harrietsville Telephone Association, Limited, was considered. President Doan, Secretary, C. B. Adams.

Hamilton, Ont.

Plans will be prepared for erection of an addition to store to cost \$8,000 on King and Hughson streets, for T. W. Watkins, 252 Park N., Hamilton. Architect, A. W. Peene, King and James streets, Hamilton; 1 storey, brick and steel, steam heating, electric and gas lighting, slate roof, burlap interior finish. Elevator and safe will be required.

A. M. Soutar & Co., King and Parke streets, Hamilton, require store and electric fittings for store to cost \$3,000. Architect, Stewart & Witton, 2 Hughson street S., Hamilton. Specifications with owner.

The Tremayne Hotel Co., Buffalo, N. Y., have under consideration the erection

of an hotel here. Estimated cost, \$500,000. Industrial commissioner, Mr. Henderson, City Hall.

Ingersoll, Ont.

The Stone Manufacturing Company are contemplating the establishment of a plant here.

Kingsville, Ont.

Hotel to cost \$100,000 for Mattawas Co., Ltd. (W. C. Crawford, Tilbury; John Peggort, Windsor;) architects. Crane & Pennington, Windsor, Ont; 3 storeys, frame, hot water heating, electric lighting, shingle roof, hardwood interior finish. Date of calling of tenders not decided yet.

Lake Nominigue, Que.

Sawmill destroyed on the 5th inst.; loss, \$30,000. It will probably be rebuilt. Company will require hydraulic turbines, dynamos, steam power plant, saws, planers, piping, hose, etc.

Moncton, N. B.

The Maritime Hat & Cap Co. of Truro, N. S., are to move their plant here in order to take advantage of the natural gas. A building site has been purchased. They will use the old lock factory building in the meantime.

Meaford, Ont.

By-law to grant loan to Meaford Manufacturing Company in return for which a 3-storey building, 200 x 60, equipped with sprinkler system and steam heating, will be erected. A sawmill is also in the plan; said mill to have capacity of 15,000 feet hardwood per day.

Montreal, Que.

Factory (aerated waters), cost \$4,000, will be built for W. G. Proulx, 99 St. James street, Montreal; architect, F. & O. Proulx, 99 St. James street, Montreal; concrete and stone foundation, concrete and brick construction, hot water heating, electric lighting, concrete interior finish, gravel roof. Work not started yet.

Excavation is completed for 1 store and 7 dwellings to cost \$10,000 on St. Jerome and Papineau avenue, for E. Richard, 841 Mount Royal avenue, Montreal; 3 storeys, 50 x 67, wood and brick, cement foundation, gravel roof, furnace heating.

Tenders called for rebuilding storage building to cost \$5,000, on St. Etienne street, for Canadian Oil Companies, Ltd., 123 St. Etienne street, Montreal; 1 storey, 50 x 60, old foundation, concrete construction. Private bids received until Oct. 11th and also for 5 coal oil storage tanks of 12,000 imperial gallons each, until Oct. 12th.

E. Lamy, 557 Lasalle avenue, will build a store and dwelling, 3-sty., 31 x 50, stone, concrete foundation, gravel roof, gas and electric light. Cost \$6,000. light.

Nanaimo, B. C.

Architect Alex. Forester has completed plans for a 4-storey brick and concrete store and office building, for Victoria Crescent, to cost \$60,000. Tenders for the construction are now being taken.

Niagara Falls, Ont.

Negotiations are in progress for erection of factory for Stolls Railway Signal Co. Fiscal agents, Richlieu Securities

Co., Buffalo, N. Y. If satisfactory arrangements can be made, factory to employ 75 men will be erected. Matter referred to committee of which Mayor J. E. Dores is chairman.

New Westminster, B. C.

The Schaae Machine Works, 325 Front street, have made application for lease of several water lots on Lulu Island as site for machine works, to cost \$50,000.

North Battleford, Sask.

Work is in progress for erection of an hotel, \$50,000, King and First ave., for Coad & Graves. Architect, Geo. J. Stephenson, N. Battleford. 3-sty., 80 x 70, concrete foundation, pressed brick, stone dressings, pitch and gravel roof, steam heating, hardwood interior finish. Equipment required, fire escapes and refrigerators; also Spencer boiler for heating.

Otter Lake Station, Ont.

Work will commence shortly on the erection of an additional sawmill for Hocken Lumber Company. President, Norman Hocken, Otter Lake Station. Construction of mill. The mill will operate the year round; capacity 15,000 to 20,000 feet per day.

Petrolea, Ont.

Brewster's store syndicate have completed arrangements for the establishment of a large branch here. It is understood that all the ground floor of the Archer block has been leased for a term of years and that extensive alterations will be made at once.

St. Stephen, N.B.

The Buffalo Fertilizer Company are preparing to erect a plant here, a survey is now being made.

Simcoe, Ont.

Lea's, Limited, contemplate erection of pickling factory. W. C. McCall, town clerk.

Simcoe, Ont.

Work is under way for erection of a store, cost \$7,000, for H. S. Falls; steel and brick, electric light, steam heating. Shelving, telephones, heating and lighting equipment, show case, etc., will be purchased shortly.

St. Thomas, Ont.

Work is in progress for erection of an office building for Ald. E. C. Saunders; 3-sty., pressed brick, electric lighting, steam heating. The office equipment will be modern throughout. Required, latest fixtures and equipment.

St. John, Que.

Machinery required for factory for J. E. Moller, St. Johns, Que, straw hat manufacturer; 3 or 4 stys., 72 x 72, solid brick, stone foundation, metal roofing, steam power, electric lighting, concrete cellar. Sewing machines, presses, piping required.

Franklin Baker, of Philadelphia, has made application to the city council of St. John for certain lots at the foot of Broad street for a site for a cocoanut factory.

St. John, N.B.

R. Max McCarty, acting for an English syndicate, St. John, N.B., has secured an option on the Greenhead property for \$26,000. It is intended to put up a cement plant with a capacity of 2,000 bbls. per day.

Toronto, Ont.

A new company has been formed with head office at Toronto and a capital stock of \$200,000 to be known as the Porcupine Hotel Co., Ltd., for the purpose of building hotels and boarding houses in Porcupine.

Tilbury, Ont.

Work is in progress for erection of a factory for W. C. Crawford Co., Tilbury. Firm manufactures handles. Boiler, engine and general machinery for wood turning and handle work.

Trout Creek, Ont.

The Dominion Wood & Lumber Co. are contemplating the erection of chemical plants, etc. Officers, protem: President, J. Kaufman, Berlin, Ont.; vice-president, E. Clark, Stair Bldg., Toronto; capitalization, \$250,000. Chemical plants and other necessary buildings for distillation of wood will be erected. Timber limits include pine, spruce, birch, hemlock and maple, and embrace 80 square miles.

Trout Creek, Ont.

The Trout Creek Logging Co., Ltd., are planning the erection of mill. President, Ed. Clark & Sons, Stair Building, Toronto; vice-president, Jacob Kaufman, Berlin, Ont.; secretary-treasurer, G. Trussler, Trout Creek. Four miles of track already graded; rails on completed track before winter; balance of work in spring. Mill to have a capacity of 30 to 40,000 feet a day and will cut mixed hard and soft wood.

Vancouver, B.C.

C. W. Bongard, manufacturer of electrical supplies, 70 King street west, Toronto, Ont., contemplates the erection of factory in the near future.

The Vancouver Financial Corporation, Limited, Dominion Trust Building, is calling for tenders for the purchase of the property and plant of the Sechelt Brick & Tile Company, Limited, Storm Bay, Sechelt Inlet. The property consists of 160 acres of land, accommodation for housing 25 men, a wharf, machinery sheds, buildings, stic and soft mud machines, all other machinery, etc. Tenders close October 18th.

Excavation tenders called for a factory on 7th ave. and Ontario street, for R. S. Irvine, care Cross & Company, bottlers, 1067 Richards street, 50 x 100 ft., probably 4 storeys, brick and concrete elevator, plumbing and probably heating required.

Verdun, Que.

House and store, \$3,000, Gertrude st.; owner, W. Cartier, 87 Mullarkey street, Verdun; 2-sty., 25 x 35, gravel roof, gas lighting.

Victoria, B.C.

Plans are contemplated for erection of a store and office building, cost \$20,000, for Hook Sin Tong Charity Association. Architect, C. E. Walkins, 1 Green Bldg., Victoria; 75 x 90, ornamental iron, marble columns. Tenders being called on general contract.

Welland, Ont.

The Bratton Automatic Scale Co. are about to locate here. This firm manufactures peanut, weighing and gum machines. The site for the factory has not yet been selected.

The Canadian Automatic Transportation Company, head office, 703 Confederation Life Bldg., Toronto, C. H.

Craigie in charge, require lathes, drills, shapers, etc., all machine shop appliances, for their factory. Shop is electric driven and has electric heating.

Frank V. Lacey & Clarence Kabelin, of Warren, Pa., have just closed a deal with Industrial Commissioner McCormick to locate a factory in Welland for the manufacture of ice cream. They will erect a 2-sty. building east of the G. T. R. Tenders not yet called.

Weymouth, N.S.

The Blackaders Lumber Mills, near Weymouth, N.S., was totally destroyed by fire October 4th, loss \$25,000. They intend building at once a wooden structure, to equip it with all required machinery in their line, steam plant, turbines, steam heating, dynamos, piping, saws, planers, etc.

Winnipeg, Man.

Tenders are being called for the excavation of 300 yards of earth for basemen for Harrison Bros., 800 Main st.

Walkerville, Ont.

Work is in progress for erection of a factory for Auto Top Company, 3-sty., 250 x 81, electric lighting, steam heating. Machines for making auto tops, engine, boilers, etc.

Equipment is required for extension to factory, cost \$70,000, for the E. M. F. Company. Manager, G. E. Lindsay, Walkerville; general contractor, H. R. Havercorn; plumbing and heating. Walkerville Hardware Company; iron work contractor, Canadian Bridge Co., Walkerville; excavation contractor, T. Check, Windsor; roofing, P. Dresch, Walkerville; 4-sty., 100 x 60, brick and steel. Required, sprinkler system, telephones, elevators, \$30,000 of mill machinery.

Westmount, Que.

Tenders are called for erection of a bakery, cost \$15,000, Prince Albert st., for D. Harrison, 323 Prince Albert st., Westmount. Architects, Comber & Comber, 4113 Dorchester street, Montreal; extensive additions to present building, concrete and brick, concrete foundation, gravel roof. New machinery has been arranged for.

Yorkton, Sask.

Option has been secured by the Massey Harris Co., Toronto, on a site for a warehouse.

CONTRACTS AWARDED**Brandon, Man.**

Cold Storage Building, cost \$15,000, for Brandon Creamery Co., Brandon; contractor, A. Newert, Brandon; 2-sty., brick exterior, electric lighting, gravel roof, steam heating, fire escapes, refrigerators, telephones, dynamos, motors, etc.

Cadboro Bay, B.C.

Work will commence shortly on the erection of hotel, cost \$60,000. Architect, Hoult Horton, 216 Pemberton Block, Victoria; general contractor, Norton Griffiths Steel Construction Company, Vancouver, B.C. Frame, 40 bedrooms with bathrooms attached. A large garage will also be built.

Calgary, Alta.

Business block, cost \$25,000, on 15th ave., for M. Healy, Alberta Hotel, Calgary, 3-sty., 40 x 90, solid brick, concrete foundation, steam heating, gravel roof, oak finish. Work not commenced.

M. Healey supervising building personally. Elevators, boilers, and extensive electrical work required.

Chatham, Ont.

Work is in progress for erection of a creamery, cost \$12,000, on Forsythe street, for W. E. MacGeachy, Chatham, two storeys and basement, 35 x 45, brick, stone and frame, stone foundation, steam heat, gravel roof, pine finish. Refrigerators, dynamos, motors, boilers, engines required. This building will be used as an apartment house, the large basement as a creamery. General contractor, Wm. Carswell, Chatham.

Florenceville, N.B.

B. Mooney & Sons, St. John, N.B., have been awarded the general contract for the erection of a new building for the Bank of New Brunswick; cost \$14,000. Architect, F. Neil Brodie, St. John, N.B.

Hamilton, Ont.

W. Harris, East ave. and Barton, will build a store, cost \$3,300. Contractors, J. Pogue & Co., Westinghouse ave., Hamilton. Two and one-half storeys, brick, hot air heating, electric and gas lights, shingle roof, hardwood interior finish. Electrical work to be installed.

Machinery required for factory, Clark and Burton streets, for Climax Road Machine Co., Marathon, N. Y.; architect, John Robinson, 46 Merrick street, Hamilton; general contractor, W. Hancock, 75 Locomotive street, Hamilton. Two-sty., 60 x 72, steel and brick, stone foundation, steam heating, electric and gas light, tar and gravel roofing, concrete floors, dynamos, electrical work. \$21,000 to \$25,000 will be spent on machinery; \$4,000 on building.

John E. Brown, 77 McNab street N., will rebuild the warehouse at 77 McNab street north; architect, W. A. Edwards, 2 Hughson, street south, Hamilton; masonry, G. E. Mills, 614 King st. east, Hamilton; carpentry, A. Milne, 67 Mary street, Hamilton. Three storeys and basement, mill construction, electric light. Permit issued for \$3,400.

Kamloops, B.C.

Telephone exchange, cost \$25,000, for the B. C. Telephone Co., Vancouver; general contractor, R. MacKay, Kamloops; red brick, 1-sty., 29 x 68, concrete foundation, gravel roof, electric light, plaster walls, central station—maximum capacity 5,000 phones.

Montreal, Que.

Store and two houses, \$5,000, St. Denis street; owner, T. Peladeau, 66 Bonsecours street; architect, J. O. Turgeon; general contractor, J. Jacob, 115 Convent street, Montreal.

Alterations to carpenter shop, cost \$4,000, for Simpson & Peel, 10 Benoit street, Montreal; masonry, James Mousin, 207 Guy, street, Montreal; roofing, Richardson, Simard & Co., 159 Elgin st., Montreal; iron work, Dominion Bridge Co., Lachine. Boilers, dry kiln and heating system, Ross & Greig, 412 St. James street; brick, electric lighting. Work started on foundation.

Work will commence shortly on the erection of addition to factory, Ste. Elizabeth du Portugal, for Tooke Bros. Ltd., 302 St. Elizabeth du Portugal; architects, MacDuff & Lemieux, Merchants Bank Building, St. Catherine street w., Montreal; general contractor, Jos. Mar-

cotté, 965 St. Antoine street, Montreal; brick and mill construction, concrete foundation, steam heating, electric light, gravel roof.

Two stores and two houses, cost \$8,000, Mount Royal and Parthenais street, for Mrs. J. D. Latour, 1159 Mount Royal east; architect, J. A. Godin, St. Denis street, Montreal; general contractor, A. Leblanc, 1138 Delorimer ave., Montreal. Three sty., 42 x 50, stone and brick, cement foundation, gravel roof, gas and electric light, hot water heating.

New addition to factory, cost \$9,000, on Parthenais street, for Dominion Oil Cloth Co., Ltd., 1192 St. Catherine's st. west, E. Montreal; architect, Hutchison, Wood & Miller, Royal Insurance Bldg., Montreal; general contractor, Reid, McGregor & Reed, 668 St. Catherine street west, Montreal. Brick, cement foundation, steam heating, gravel roof. Work not started yet.

Two stores and moving picture hall, cost \$8,100, on St. Lawrence Boulevard, for J. Ettenberg, 131 St. Dominique st., Montreal; architect, D. J. Crichton, Jacobs Bldg., St. Catherine's street; general contractor, Beaulieu Construction Co., 653 Mentana street, Montreal. Brick and cement, hot water heating, electric and gas light, gravel roof. Foundation started.

Stationery factory, cost \$56,000, on St. Urbane street, Montreal, for W. V. Dawson & Co., 16 De Bresoles street; architects, MacVicar & Herriot, Union ave., Montreal; 4-sty. and basement, 103 x 153, brick construction, tar and gravel roof. General contractor, D. G. Loomis & Sons, P. O. Box 1449, Montreal; plumbing contractor, J. W. Hughes, 367 Craig street west; sprinklers, the Vogel Company of Canada, Ltd. Work on building not started.

Sarnia, Ont.

Work is in progress for erection of a telephone building, cost \$25,000, for Bell Telephone Co. of Canada; general contractor, F. Gutteridge; carpenter, Geo. Carpenter; plumbing and heating, Goodwin & Co., all of Sarnia; roofing, Meyers & Co., Stratford. Telephone equipment for extension into Moore Tp. will be required, also general office equipment.

St. Catharines, Ont.

Warehouse for St. Catharines Cold Storage Co.; mason contractor, Longley & Rymmer, 154 Geneva street. Two-sty., 48 x 60, frame with iron roof, frame work of a barn to be used. Contract for carpentry not awarded yet.

St. John, N.B.

Business block, cost \$16,000, for the B. A. Mowatt Company, St. John, N.B. General contractors, J. & D. A. Harquail, Campbellton, N.B.; architect, F. Neil Brodie, St. John, N.B. Building is 35 x 80, 2-sty., brick, concrete foundation, electric elevators, steam heating, electric lights.

Victoria, B.C.

Work is in progress for the erection of a business building on Douglas st., for Bradshaw, Martin & Marymont; architect, H. S. Griffiths, 1006 Government street, Victoria; contractors, Atkinson & Dill, Homer & Davie streets, Vancouver. Facing, white glazed terra cotta, elevators, steam heating, wire glass, oak interior finish.

Vancouver, B. C.

Office building on Richards street, for Canada Permanent Mortgage Corporation, 543 Granville street, Vancouver; architect, T. S. D. Taylor, 543 Granville street; general contractors, Ferro-Concrete Construction Co., Pacific Bdg. Vancouver. Campbell Bros., 1623 Bismark street, have commenced operations on preparation of site. Two-sty., granite facing, reinforced concrete, marble panelling and counters, hardwood floors, hot water heating, electric wiring. Keast & Allen have contract for stone work.

Walkerville, Ont.

Wells & Gray, Toronto, general contractors. Owner, Dominion Stamping Co., W. Cape, manager; 1-sty., 105 x 86, electric lighting, brick foundation, brick mill construction. Firm manufactures automobile parts. Hardly any additional machinery required.

Winnipeg, Man.

Office building for Confederation Life Association Company, 467 Main street; general contractor, Carter-Halls-Aldinger Co., Ltd., 1010 Union Bank Building, Winnipeg; 10-sty. and basement, 100 x 150, fireproof, steel and hollow terra cotta front, concrete foundation, steam heating, electric light, composition roofing. Ventilating system, telephones and passenger elevators will be installed. Fire escapes and vaults required. Sub-contracts not yet awarded. Building to be completed December 1st.

Power Plants, Electricity and Telephones

Berlin, Ont.

The Ontario Railway & Municipal Board has approved of the application of council to have the by-law to raise \$20,000 for improvements to lighting plant. Debentures will be called.

Calgary, Alta.

The proposition of the Canada Light, Heat and Power Company to pipe gas to the towns on main line of C. P. R. between Bow Island and Calgary is being considered by the different municipalities interested. Even should the verdict not be favorable, it is probable Calgary will be supplied. Solicitor for company, W. H. McLaws, Calgary.

St. Mary's, Ont.

A by-law to raise \$15,000 for extension of the hydro-electric system is being prepared and will be voted upon shortly.

St. John, N.B.

New Brunswick Hydro-electric Company have prepared plans and are ready to proceed with development and are awaiting the decision of a committee of the council re entering the city. For information address Walter E. Foster, vice-president Vassie & Co., St. John, N.B.

Ridgetown, Ont.

Councillors Craig, Stokes & Sterling were appointed a committee to investigate the matter of buying out electric light plant owned by W. H. McMackon; it is thought large expense can be saved if new waterworks and electric light are combined. May be run with hydro later.

Thamesford, Ont.

The by-law carried for hydro-electric transformer and full lighting equipment

required. Village will take 600 h.p. and intends to supply Kintore also.

Vernon, B.C.

Tenders are called until October 25th for supply of a.c. watt meters for a period of one year from November 1, 1911, to October 31, 1912.

Walkerville, Ont.

Equipment is required for power plant for Ford Motor Co., brick construction. Telephones and elevators, boiler and engines to be purchased.

Winnipeg, Man.

Tenders were called until October 16 for the overhead line materials for city light and power department; cross arms, Lucust pins, insulators, guy wire, line hardware, tapes and solder. Specifications at the office of the general manager, 449 Main street. Secretary of Board of Control, M. Peterson.

Tenders are called until November 3 for supply of carbon and tungsten lamps. Specifications, etc., at the office of the city light and power department, Main street, Winnipeg. Secretary of Board of Control, M. Peterson.

Miscellaneous

Chatham, Ont.

The Chatham fire department contemplate purchasing a complete set of motor propelled fire fighting apparatus.

Halifax, N.S.

The contract for the construction of two granite gatehouses at Chain Lakes, Halifax, have been awarded to E. Maxwell, 3 Jubilee road, for \$5,651; W. W. Doane, engineer, Halifax.

Hamilton, Ont.

Spectator Printing Company are considering the purchase of electric pumps to take the place of tanks in sprinkler system. Managing director, W. J. Southam, Sanford C., King street east. Hamilton.

Moncton, N.B.

The contract for 2,000 gross tons of steel rails delivered at Moncton for Transcontinental Railway, has been awarded to the Dominion Iron & Steel Company.

Montreal, Que.

The Board of Control, Montreal, has just awarded the contract for two steam pumps at a total cost of \$11,500, to the Watrous Engine Co., Brantford.

Quebec, Que.

Tenders are called for fire apparatus; 2 automobiles, combined chemical and hose wagons; 2 aerial extension ladders, 75 feet; 2 city hook and ladder trucks, 65 feet; one 800 gallon steam fire engine; 2,000 feet of fire hose, 3-in. in diameter. Received at city clerk's office until October 25th. Secretary of fire committee, Aug. Malouin.

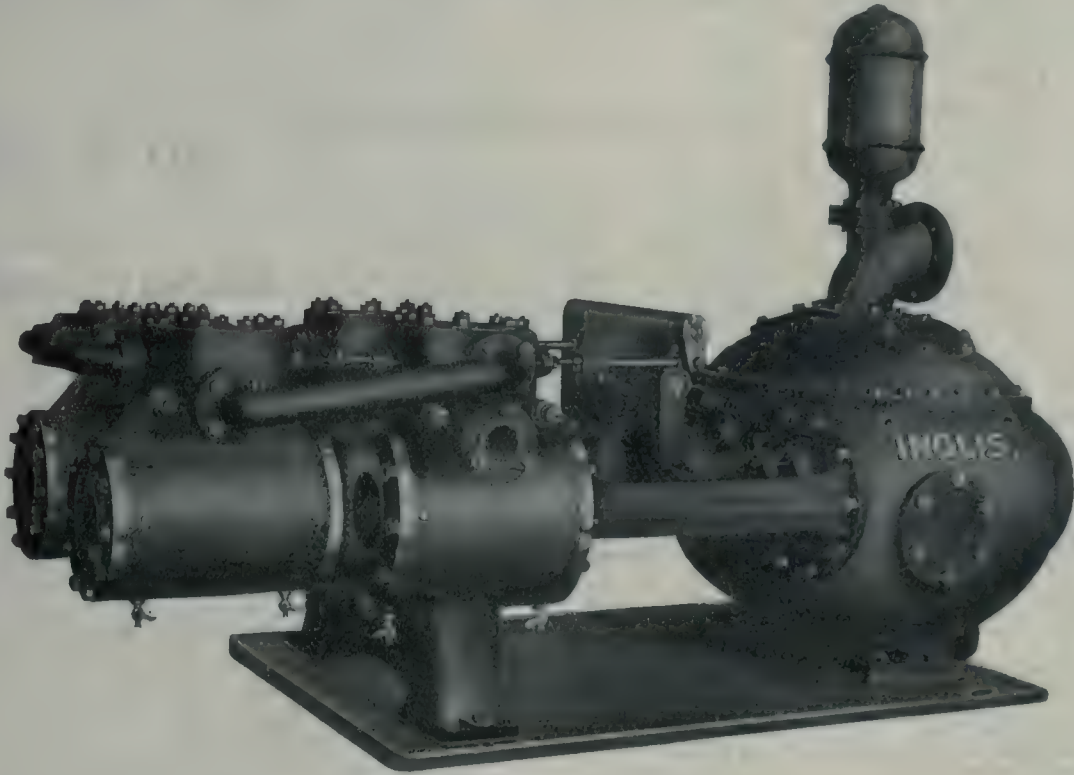
Winnipeg, Man.

Tenders called for supply and delivery f.o.b. Winnipeg, 1,500 cedar poles. Specifications at office of general manager, 449 Main street, Winnipeg. Received by chairman, board of control, until Oct. 16th. City Light & Power Department; secretary, board of control, M. Peterson.

Tenders were called for supply of street name plates and sign posts. Specifications, etc., at office of city engineer, 223 James avenue. Received by chairman, board of control until 11 a.m., October 13th. Secretary, M. Peterson.

Water-Works Plants

for Towns and Cities



"Inglis" 1,000,000 gall. Pumping Engine.

Our long and successful experience in the building and installation of Pumping Engines and Water Works Machinery should be a strong argument in favour of "Inglis" products. During the fifty-two years (52) our plant has been in operation, we have built many Pumping Engines, all of which have given entire satisfaction.

Capacities from one to thirty million gallons per 24 hours.

Send us your inquiries.

The John Inglis Company

Engineers and Boilermakers

Limited

14 Strachan Ave., TORONTO, Canada

Tenders and For Sale Department

Tenders for Street Railway Supplies

Sealed tenders marked "Tender for Street Railway Supplies," addressed to the City Commissioners, Calgary, Alta., will be received up to 12 o'clock noon, November 15, 1911, for the supply and delivery of the following street railway material, via lake and rail or all rail:

Track

25,000 standard 6 x 7 fir tamarac ties.
300 tons 6-in. high T. 60 ft. No. 60 rails,
800 tons A.S.C.E. standard 60 ft. No. 60
rails; or their equivalent in A.S.C.E. 60, 30
or 33 ft. rails with necessary angles, bolts, etc.
quoted separate.
15,000 lbs. 5½ x 9-16 in. track spikes.
3 double 3-part Y branch off with crossings.
1 double track, left-hand branch off.
6 standard A.S.C.E. ordinary T rail spring
tongue switches.
6 standard A.S.C.E. ordinary T rail solid
mates.
6 standard A.S.C.E. ordinary T rail frogs
filled.
3,200 10-in. bonds, ¾-in. plug, flexible, 4/o.
2,500 13-in. bonds, ¾-in. plug, flexible, 4/o.

Line Material

250 wood poles, 6-in. top, 12-in. butt, not
over 4 in. def. 30 ft. standard spec.
250 wood poles, 8 in. top, 12-in. butt, not
over 4 in. def. 35 ft. standard spec.
Tenders will also be considered on 30-ft.
poles 7-in. tops 10-in. butts, and 35-ft. poles
8-in. tops, 10-in. butts. All to be peeled.
80 steel poles 28 ft. long, maximum load 1000
lbs.
20 steel poles 30 ft. long, maximum load 1000
lbs.
18,000 ft. 500 M.C.M. 600-volt conduit cable
(Underground).
30,000 lbs. 2-0 trolley wire, round.
7,000 lbs. 5-16 single galvanized soft steel
span wire.
1,200 ¾ eye bolts galvanized.
400 9-in., 400 10-in., 400 12-in.
1,200 wood strain insulators 1-in. galvanized.
500 standard strain insulators 2-in.
100 standard strain insulators 2½-in.
800 straight line hangers one piece, galvan-
ized, round top ¾ stud.
1,200 straight line clips 12-in. for. 2-0 trolley
(clinch).
300 double curve cap and cone pullovers, gal-
vanized, comp.
300 single curve and cone pullovers, galvan-
ized, comp.
25 R. H. trolley frogs, malleable.
25 L. H. trolley frogs, malleable.
12 right angle cross overs.
20 adjustable crossovers.
10 rigid crossings.
25 feeder hangers, O. B. 2417 or similar.
12 section insulators, 2-0 round wire.
6 Y-trolley frogs.
36 metropolitan strain plates, galvanized.
36 metropolitan strain ears.
10 200 amp. section switches, with boxes.

Each tender must specify clearly the capacity
and type of article quoted on with full speci-
fications.

For further information or particulars, before
submitting tenders, address City Commissioners.

W. D. SPENCE,
City Clerk.

42-44

Positions Wanted

Advertisements under this heading one cent a
word per insertion. Box No. ten cents extra

Competent Engineer (Civil) solicits work on
designing wharves, breakwaters and general har-
bor construction and surveying; also any kind
of draughting. Box 341, Contract Record, To-
ronto, Ont. 41-43

Debentures for Sale

The Corporation of the Town of Uxbridge
will receive tenders up to November 1st, 1911,
for the purchase of \$11,000 Public School De-
bentures, bearing five per cent. interest, pay-
able in twenty-five equal annual installments of
principal and interest.

Address, Dr. M. H. CROSBY,
Clerk.

40-42

Architects Attention

The Windsor Board of Education offers a
first prize of \$500 and a second prize of \$250
for competition by architects for plans for a
twelve-room school to be erected in the City of
Windsor. Complete working drawings and
specifications unsigned to be forwarded to the
Secretary of the Board on or before the 15th
of November next. Cost of building not to
exceed \$40,000 complete, exclusive of drawings.

The plans accepted to be the property of the
Board, and in the event of the successful archi-
tect being employed the Five Hundred Dollars
will be part of his fees. Rejected plans will be
returned.

Architects tendering will mark the plan with
some designation and mark same on sealed en-
velope enclosing name and address of the party
competing.

Description of Building

Two storeys and basement, brick building
with stone foundation, roofed with wooden
shingles, hardwood finish, hard plaster, steam
heating, modern system of ventilation, first-class
sanitary arrangements, no artificial lighting.

Plans to conform to the regulations of the
Education Department.

ALEX. BLACK,

40-42 Secretary-Treasurer.

CITY OF LETHBRIDGE ALBERTA, CANADA

Extensions to Power Station

Sealed tenders marked "Tender for Power
Station," will be received by G. W. Robinson,
secretary-treasurer of the city of Lethbridge, up
to and including Friday, November 24th, 1911,
for the supply, delivery, and erection, of the
following equipment for the Power Station Ex-
tension:—

Section B.—Boilers and accessories.
Section C.—Mechanical draft and economizer.
Section D.—Steam turbo-generator set and
condensing equipment.
Section E.—Steam engine driven exciter.
Section G.—Sub-station equipment.

Plans and specifications can be obtained from
Arthur Reid, superintendent engineer, City of
Lethbridge.

An accepted cheque for ten per cent. of the
amount of the tender must accompany each bid.

The lowest or any tender not necessarily
accepted.

G. W. ROBINSON, Sec.-Treas.,
Lethbridge, Alta.

39-44

Sewer Excavator

For sale for immediate use, a Vulcan "Little
Giant" Steam Shovel with extra long dipper
handle for excavating to 16 feet below sur-
face, mounted on traction wheels, dipper 1¼ yd.
capacity. Machine just overhauled; new chain,
and extra large new boiler; weighs 32 tons;
low price. Address

WILLIS SHAW MACHINERY Co.,
39 South LaSalle Street,
Chicago, Ill.

42-t.f.

CITY OF TORONTO CANADA

Tenders for Subway Construction

Sealed tenders will be received by register-
ed post only, addressed to the chairman of the
Board of Control, City Hall, Toronto, up to
12 o'clock noon on Wednesday, Nov. 1st, 1911,
for the construction of three miles of rein-
forced concrete subway and subway stations.
No tender will be received for less than one-
half mile sections.

Envelopes containing tenders must be plain-
ly marked on the outside "Tenders for Pro-
posed Subway Construction."

Plans and specifications may be obtained on
application to the Department of Railways and
Canals, City Engineer's Office, Toronto, also
on file for inspection at the following points:

1. N. B. Colcock, Ontario Government Agent,
163 Strand, London, W.C.
2. Canadian Engineer, B/33 Board of Trade
Building, Montreal.
3. Engineering News, 220 Broadway, New
York.
4. Engineering Record, 239 West 39th St.,
New York.
5. Engineering Contracting, 537 S. Dear-
born street, Chicago, Ill.
6. Canadian Engineer, Room 404, Builders
Exchange Building, Winnipeg.
7. Commercial Department of His Majesty's
Board of Trade, 73 Basinghall Street, London,
E.C., Eng.

Each tender must be accompanied by a mark-
ed cheque for two thousand (\$2,000) dollars for
each one-half mile section tendered on.

The lowest of any tender not necessarily ac-
cepted.

G. R. GEARY, Mayor.

40-43 Chairman of Board of Control.

Business Notes

Guelph, Ont.

The offer of the Dominion Casket Co.
to purchase Canada Furniture Com-
pany's factory has been approved by
council.

Fredericton, N.B.

Stanley Douglas has purchased what
is known as the Fleetwood block, an ex-
tensive timber property near the village
of Stanley, which contains about 3,000
acres of valuable timber, both hard and
soft wood. Price paid, about \$10,000.

Quebec, Que.

No. 4 fire station, together with fire
engine, two reels, ladder and 2,000 feet
of hose, destroyed by fire. Building
alone cost over \$24,000. Also Shand &
Mason's furniture, dry goods and
grocery store, loss \$150,000.

Contract Record

ESTABLISHED 1886

A Weekly Journal of
Building, Contracting, Engineering, Public Works
Municipal Progress, Advance Information

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VANCOUVER - Tel 2010 - 26 Crowe & Wilson Chambers

CHICAGO - - - - - 4059 Perry Street

LONDON, ENG. - - - - - 3 Regent Street, S.W.

SUBSCRIPTION RATES

Canada and Great Britain, \$2.00. U. S. and Foreign, \$2.50

Vol. 25 October 25, 1911 No. 43

Canada's Fire Waste

In 1909 Canada's fire loss amounted to \$18,905,000; in 1910 it increased to \$23,593,000. The first eight months of the present year saw a total fire loss of \$15,381,000. This is at the average of \$1,922,000 per month, or over \$63,000 per day, or over \$2,600 per hour, or \$44 per minute. During the same eight months of the present year 250 lives were sacrificed by fire. Since the first of January, 1909, a total of 728 lives were lost by fires in Canada alone, an average of almost 23 per month, or almost 1 a day for two and one-half years. Last year the per capita fire loss in Canada was \$3.14. The average per capita loss for the continent of Europe is 33c. Our loss is therefore almost ten times as great per capita as it is in Europe.

With this appalling loss of life and property staring us in the face, Canada should not be indifferent to any means which will lessen both the fire waste and loss of life. We are burning up nearly \$2,000,000 worth of property per month and destroying 23 lives per month. If for no other reason than a humanitarian one in one case and an economic one in the other we should put a stop to these losses. This is a question which should be taken up by insurance companies, our Boards of Trade, our School Commissioners and our Provincial and Federal Governments. It is big enough to deserve the best attention of our public men everywhere. Canada simply cannot afford to let things continue as they are.

In our last issue we published an account of the failure of the roof of the Canadian Fairbanks-Morse Company's reinforced concrete warehouse under construction at Winnipeg. The writer of the article in question, it will be remembered, stated that so far as could be noted no failure occurred in the reinforcing steel furnished by the Trussed Concrete Steel Co. It is noteworthy that although there are occasional fail-

ures in reinforced concrete it is seldom, if ever, that accidents occur after the concrete is set and the building or other construction has been turned over to the owner. Concrete invariably increases in strength with age, and a building which has stood for six weeks after the forms have been removed and after a reasonable test load has been imposed can be guaranteed to the owner beyond all question of doubt. This is one of the great advantages claimed for this type of construction.

Business Conditions and the Supply Market

With Thanksgiving Day almost at hand, activity in all lines of engineering and contracting continues apace. A noteworthy feature of the situation is the fact that operations are not confined to finishing up work but that many important new projects are being started in every section of the country. Each year contractors are clipping a little more off winter and the approach of this season is no longer heralded with the old time apprehension. Amongst the largest of the building contracts commenced recently may be mentioned the Grand Trunk Pacific Railway's new hotel at Winnipeg, estimated to cost \$1,300,000. Much of the larger work in Montreal, Toronto, Winnipeg and other cities will be so far advanced by the time cold weather sets in that the interiors can be practically finished during the winter months.

A good volume of residential work is maintained at both Montreal and Toronto, whose combined permits continue to roll up on an average of half a million dollars a week. Winnipeg is surpassing all previous records. Up to date the building permits issued are considerably in excess of \$16,000,000,—more than \$3,000,000 in excess of the corresponding period last year. Vancouver's total is only about \$2,000,000 behind that of Winnipeg—an advance of \$4,000,000 on the first three-quarters of 1910. At Regina there is noteworthy activity, the volume of business this year being easily 100 per cent. higher than last year.

The general prosperity of the building community is a fair barometer of trade conditions in the whole country and the new records are all the more gratifying when it is considered that there has been no "building boom" and that the increased business is the natural outcome of continuous expansion and development. It would be hard to particularize this activity or to state that it runs within certain channels. As a matter of fact it extends through every department over the whole country, with the single exception perhaps of the Maritime Provinces. The season has been a busy one in municipal work all over Canada, and it is only to be expected that side by side with municipal expansion there will appear new records in commercial and residential building. So that the season has been one of general activity in all lines, a period remarkable for great progress and the total absence of undue inflation.

With the passing of the season there passes also the possibility of further labor troubles during 1911. In some sections of the country there has been something like a dearth of skilled mechanics. In places, notably in Medicine Hat recently, these were not obtainable for love or money. The bait of increased wages which is often offered in such cases tends to disorganize the trade and to make the general situation still more acute. It is to be hoped that the authorities will be able to attract more skilled labor from the Old Country. Even more it is to be hoped

that greater facilities will be provided in Canada for the training of artisans.

If there is any truth in the assertion that coming events cast their shadow before them, 1912 should be the greatest year Canada has ever known. In addition to the activity promised by the preparation of by-laws authorizing the raising of large sums, there is every indication that the crop situation will have a most favorable effect upon the financial side of the contracting business, as well as upon the volume of work. The crop will be a great one, and the influence of this element upon the business of next year is already being regarded as a favorable one.

In the supply market there have been no important changes of late. Dealers report normal activity with a continued and steady demand.

According to reports from Montreal, prices in the iron and steel trade are steady, but the demand is poor and whatever business offers meets keen competition on the part of the various companies in the field. A noteworthy feature are the quotations for plates and heavy structural steel which are now below the price of steel rails. Cement is quoted at Montreal as follows: car lots f.o.b. Montreal, \$1.35 to \$1.40 per 350-lb. barrel, bags extra.

At Toronto, bricks are in good demand, but particularly the higher grades. Don Valley quotations are given under our current price list. Lumber finds a ready sale with little variation in prices. Pine for dressing is quoted, according to width, at \$32 to \$40 per M; common stock boards, \$28 to \$33; cull stocks, \$20; cull sidings, \$17.50. Southern pine dimension timber is bringing from \$30 to \$45. Hemlock is held firmly at \$17.50 to \$20. Spruce flooring in car lots is worth from \$22 to \$24 and B. C. shingles are steady at \$3.60. A good general business is being done in paints and oils, the demand being chiefly for goods used in interior decorating. Stocks of window glass are light and increased prices are anticipated due to the difficulty there has been in securing deliveries from Belgium this season.

Winnipeg reports a slackening tendency in orders, but this is offset largely by the brisk movement at outside points. The following quotations of building materials, as furnished by our Winnipeg correspondent, may be interesting.

Winnipeg Prices of Building Materials.—Building paper, No. 1, tarred, per roll, 62½c to 75c; building paper, plain, per roll, 45c to 60c; bricks, common, per thousand, \$11; bricks, pressed, per thousand, \$20 to \$30; cement, Portland-per bbl., \$2.40 to \$2.50; Roofing felt, per 100 lbs., \$2.35; fire brick, per thousand, \$45; lime, per bushel, 32c; sewer pipe, per foot, 4-inch, 6c; sewer pipe, per foot, 6-inch, 8c; Plaster of Paris, per bbl., \$3.25; putty, per lb., bladders in 100 lb. cases, \$3.40; hard wall plaster, per ton, \$12; nails, wire, per keg, \$3.00; nails, cut, per keg, \$3.25; mixed paint, per gallon, \$1.90 to \$2.00; boiled linseed oil, gallon, in barrels, \$1.18; boiled linseed oil, per gallon, \$1.23; hair fibre, per ton, \$12.50; fire-clay, per ton, \$15; lath, No. 1 pine, \$5.75; B. C. cedar shingles, No. 1, \$4; B. C. cedar shingles, No. 2, \$3.50; hair, plasterers', per bale, \$1 to \$1.15; lead pipe, per lb., 6½c. Dry colors: white lead, per lb., 7c; red lead, per lb. kegs, \$6.50; white lead, per 100 lbs., \$6.25 to \$7.00. gasoline, in barrels, per gallon, 24c.

Good prices are the order at Vancouver, where an excellent volume of business has been maintained throughout the whole year. There is the usual scarcity of building brick. With the rapid extension of the local yards, however, the situation promises some

improvement next year. For the purpose of comparison with the prices given above we append the following quotations:

Vancouver Prices of Building Materials.—Building paper, tarred, per roll, 90c; building paper, plain, per roll, 75c; bricks, common, per thousand, \$12; bricks, pressed, per thousand, \$40 to \$57.50; cement (Vancouver), per bbl., \$3.20; roofing felt, per 100 lbs., \$2.45; fire brick, (Scotch), per thousand, \$45; fire brick, small quantities, \$48; lime, per barrel, \$1.35; sewer pipe, per foot, 4-inch, 15c; sewer pipe, per foot, 6-inch, 25c; plaster of Paris, per ton, \$18.50; putty, per pound, 5c; tar, 4-gallon tin, \$1.25; tar, per barrel, \$7.50; hard wall plaster, per ton, \$15; nails, base, \$3.25; nails, cut, \$4; mixed paint, per gallon, \$2.50; mixed paint, half-gallon, \$1.30; quart, 75c; boiled linseed oil, gallon, \$1.50; boiled linseed oil, bbl. lots, per gallon, \$1.40; white lead (genuine) 100 lbs., \$8.50; white lead, No. 1, per 100 lbs., \$8; sash cord, pound, 50c; sash weights, 100 pounds, \$3; Tacoma hair fibre, per ton, \$15; fire clay, per ton, \$20; plate glass, (40 per cent. off local tariff); sheet glass, (10 per cent. off local tariff); expanded metal lath (Hays'), per square yard, 28c; herringbone lath, per square yard, 17c; ready roofing, (Sendor brand) ½ ply, \$2.25; 1 ply, \$2.65; 2 ply, \$3.40; hexagon floor tiling average, per square foot, \$5; wall tiling, average per square foot, 55c; beaver plaster board, per 1000 feet, \$32.25; sacket plaster board, per yard, 25c; mantel bricks, per 1000, \$75 and \$100.

City of Toronto's Law Suit

Toronto has been pretty well occupied of late with the suit which Mr. E. J. Lennox, architect, is bringing against the city to recover \$208,000 as his commission on the city hall. Some interesting particulars came out in the course of the evidence. Mr. Lennox stated that the time he gave up business to superintend operations on the city hall he was making \$20,000 a year out of his private practice and that after leaving the city's employ he made \$40,000 a year. One of the items in Mr. Lennox' account was for \$5,200, this representing a charge of \$10 a time for attending 520 committee meetings. The value of the work carried out under the supervision of Mr. Lennox was \$830,000, upon which he claims 15 per cent., the "amount to which a contractor would be entitled." Mr. Lennox stated that since the erection of the city hall the cost of labor and material had increased about 30 per cent. In his opinion the building would now cost from three to four million dollars. The actual cost was about two million dollars. Mr. Lennox specifies his bill as follows: Fees on percentage basis on plans accepted, \$67,000; extra plans, trips, etc., \$30,000; original Court House plans, not accepted, \$9,000; and supervision of work after contractors were dismissed, \$102,000.

The secretary of the National Transcontinental Railway Commission has issued an order to all contractors engaged on contracts in connection with the railway, entered into subsequent to the dissolution of Parliament to temporarily cease work. The principal reason for the order is the fact that no funds are available to continue payments on progress accounts. When Parliament dissolved, only five-twelfths of the total vote for the National Transcontinental had been passed. This partial vote was only sufficient to authorize payments up to the end of last month, and pending the passing of further supplies when the new Parliament meets, or other provision for providing funds

by way of Governor-General's warrants, the work on the most recent contracts has been held up. The order does not apply to contracts entered into prior to the dissolution of Parliament. To stop work on the whole line would throw thousands of men out of work and involve the loss of tens of thousands of dollars by the contractors.

Cost of Industrial Buildings

A useful comparison given in a paper contributed by Mr. J. P. H. Perry to the National Association of Cement Users, relates to the cost of reinforced concrete, protected steel-frame, and "mill construction" factory buildings. The figures quoted were furnished by the tenders for buildings erected in various parts of the United States. Neglecting "mill construction," Mr. Perry's data show that the cost of reinforced concrete ranges from 2.8 to 13 per cent. less than that of fire-protected steel, the exterior walls being assumed to be of equal value.

The author justly urges, however, that initial outlay is not the only consideration, and that owners should also take into account the fixed annual charges, including interest, insurance, depreciation, the effects of vibration, and sanitation. Some saving in the first two items can probably be effected by reinforced concrete, and as the depreciation of the same material is not more than about 0.5 per cent. per annum, maintenance charges ought to be considerably reduced, while they would be vastly less than in buildings where steelwork is exposed to the air.

Freedom from vibration is one of the chief points of superiority characterizing reinforced concrete as compared with steel-frame construction, and on this count Mr. Perry estimates the saving in machinery repairs to be one well worth attention. Among hygienic advantages he places resistance to the attack of vermin, and increased facilities for the admission of light.

Taking all things into account, the author urges that it would pay owners to adopt reinforced concrete even if the initial cost of the building were higher than that of a protected steel structure, and that the advantages of reinforced concrete construction are still more pronounced when compared with buildings erected in accordance with ordinary methods.

Workmen's Wages in England

Some interesting figures regarding the rates of wages paid to workmen in certain sections of England are given in a recent issue of *The Surveyor*. The figures relate to the wages paid regularly employed workmen in the districts in the West Riding of Yorkshire.

The wages paid a district road foreman range from a maximum of \$12 per week to a minimum of \$5.28 per week, the average probably being about \$8. The wages of teamsters employed regularly by the district average about \$6 per week. Road laborers are paid from 10 cents to 12 cents an hour. Pavers receive 15 cents to 18 cents an hour and pavers' helpers are paid from 10 cents to 12 cents an hour. Masons average 17 cents to 20 cents an hour and the pay of their helpers ranges from 10 cents to 12 cents per hour. Pitch boilers engaged in tarring macadam or in constructing tar macadam are paid at the rate of 11 cents or 12 cents per hour. Street sweepers are paid as little as 8 cents an hour and much as 12 cents an hour, while night-soil scavengers receive 96 cents to

\$1.02 per day. The pay of sewage works laborers ranges from 80 cents a day up to \$6.96 a week for a "thrower out." Night watchmen receive the minimum wages, the pay averaging about 72 cents per night. The average number of working hours in a week in summer is about 49; in winter the average is about 45 hours.

In considering the above figures it must be borne in mind that the cost of living, so far as the working classes are concerned, is at least 33 per cent. lower in England than in Canada.

Canadian Experts

Montreal, 18 October, 1911.

Editor Contract Record:

Respecting your editorial, "Canada Wants Her Own Expert Engineers, Architects and Builders," I wish to say that I am strongly in favor of your stand in the matter. I believe that Canada has all the experts necessary to carry out all the technical work in this country of ours.

Yours very truly,

ALCIDE CHAUSSE,

City Architect and Supt. of Buildings, Montreal: Hon. Sec., Royal Architectural Institute of Canada.

"All things must change to something new, to something strange." Montreal, the erstwhile offender in every department of municipal administration, is become the model city of Canada. Those who run may read in another column how tenders are now being awarded in Montreal for supplies required next spring. And still another marvel! A stamping clock is in operation! Tenders must be strictly on time or they are thrown out. Only last week a bid for some sewer work was rejected because it was two seconds late. Some people would say that there was reason in all things.

The death of Mr. S. R. Poulin, chief engineer in charge of district F at Winnipeg, will further complicate the suit now pending against the government by the Grand Trunk Pacific and the contractors on construction work, relative to the differences as to classification and overbreak. The amount involved is upwards of half a million dollars. Most of the cases in dispute are in district F, and Mr. Poulin as chief engineer of the district would have been the principal witness for the government in resisting the contractors' claims for larger payments than were allowed them according to the classification of the Commissioners' engineers.

At a celebration held last week in Chelsea in commemoration of the defeat of reciprocity in Canada, Mr. Page Croft, a member of the British Parliament, said that the greatest bribe which had ever been offered to a young nation was that which the United States had offered to the Dominion. Canada had to consider an enormous pecuniary gain but to the glory of the community the soul of the nation had triumphed. Canadians had taken the road that led to a greater nationality and closer imperial union.

Thirty-one cities reporting building statistics, show a total for September of \$12,481,851, compared with \$7,561,078 last year, the increase reaching 65.08 per cent.

Oil-Mixed Concrete

Oil-mixed concrete, of which so much has been asked and so little said during the past year, is described by its originator elsewhere in this issue. There has been no attempt at secrecy about this new kind of concrete, says the Engineering Record in an editorial comment, for its preparation is covered by a patent the use of which has been given to the public by Mr. Page. It was believed, however, that although the properties of the material are extraordinary and its usefulness is widespread, if much attention were drawn to it in trade and technical journals uses of it might be attempted which would prove disastrous and throw undeserved discredit upon it. Accordingly, Mr. Page has been conducting investigations in the laboratory of the Office of Public Roads at Washington which have revealed the important physical properties of oil-mixed concrete, so far as tests for a year or so can indicate them. These show that, with the single exception of reinforced concrete, oil-mixed concrete, can be safely employed for all important purposes for which ordinary concrete is used. The presence of oil prevents good bonding between steel and concrete, unless deformed bars are used, and consequently extreme caution must be exercised in attempting to employ the new material in reinforced work. It should be noted, moreover, that this new concrete hardens far more slowly than the ordinary material, which is a very important matter where waterproofing work is done. It is evident from Mr. Page's statements that unless the material can be kept free from water for some hours it is likely to be seriously injured. Some important waterproofing work has been done with oil-mixed concrete, but in every case it has been laid in a dry situation. While fair results might be obtained by using a very quick-setting cement, until actual trial has been made to determine the facts in these important matters it is well to confine the use of the material to those purposes for which the investigations already made show it to be well suited.

Radial and Diagonal Streets

In the many recent discussions of city planning, particularly the planning of improvements in places which have been well built up, the emphasis laid on the need of radial streets deserves consideration by American municipal engineers, for the prevalence of the gridiron system of street location in this country makes radial or diagonal thoroughfares even more important than in Europe, where the street plan rarely has any symmetrical form. The purpose of the radial streets, as advocated by many engineers, is to connect the centres of important municipal districts by a direct broad thoroughfare. Another purpose sometimes advocated in cities very closely built up is the junction of the heart of the city with a ring boulevard, partly or entirely around it, both radial streets and the boulevard being wide enough to accommodate heavy travel. The underlying thought in every case is the necessity of providing for heavy travel some quick means of communication. This does not necessarily mean the most direct route between two points, but rather the most direct practicable route. In a city of narrow, winding streets, the construction of straight radial thoroughfares and a boulevard encircling the streets, thereby relieving the old winding roadways of much of their travel, may

be a more practicable solution of the problem of vehicular traffic than any other. Comprehensive projects of this nature are not undertaken, for self-evident reasons, yet from time to time some European city carries out partial improvements of this type which seem to be quite successful.

In the case of American cities, with their rectangular street plan, it is now manifest that diagonal thoroughfares are very desirable. In places which are so built up that the construction of such roadways is financially impracticable, little or nothing can be done, of course. But there are many suburban districts where extensive street improvements must soon be undertaken, districts which will inevitably become important, which may still be provided with diagonal roads at an expense by no means prohibitive, particularly if the owners of the property in the vicinity of such thoroughfares are educated to the increase in value of their land which will follow the construction of such a main street in its vicinity. It is almost impossible to persuade the average property owner to look well ahead in matters of this nature, as in most other municipal problems, because there is little or no interest in anything affecting conditions which will obtain more than ten years hence. Yet the one thing that is most clearly brought out in all the discussions of municipal planning, one might say the only thing generally applicable to American conditions, is the desirability of diagonal or radial roads in our usual gridiron street system.—Engineering Record.

Since 1905 the manufacture of drain tile in the United States has had a remarkable growth. In that year the first factory was established and to-day there are 372 plants. From a light production in 1905 to a total of 148,800,000 feet of tile per year at the valuation of \$5,300,000 per annum, is a history of its development. There has been a market for practically all of this product that the combined tile plants of the country could turn out, but the greatest demand is for a frost resisting and true shaped tile and these are inherent properties of the cement tile. With the field continually enlarging and with a material so superior for the purpose, there is no reason why the cement drain tile industry should not go forward with still greater strides than it has in the past six years.

There is one satisfaction to be gained out of the census figures. Though they do not present a total as large as was expected, they show a greater increase of percentage in population for the decade than any similar increase in the United States. The highest percentage ever reached by the Republic was 24. The percentage of increase in Canada for the decade is 32.

According to the assessment department, the total value of property in Montreal is \$499,926,049, the exemptions amounting to \$119,228,417. This is a gain of \$61,356,016 in assessable property and \$9,975,918 in exempted property over last year.

If the city of Toronto got a \$4,000,000 city hall for \$2,000,000 it can surely afford to pay the architect a beggarly commission of \$208,000.

Proposed Subway for Toronto

In this number and in previous issues there have been published advertisements for tenders "for the construction of three miles of reinforced concrete subway and subway stations" for the city of Toronto. The object of calling for bids at this time is to enable the city to arrive at the actual cost of a subway system, so that a by-law to raise the required amount may be submitted to the ratepayers, upon whose approval the contract will be awarded.

The subway is to be a double track reinforced concrete structure, as shown in the sections, Figs. 2 and 3. It will be built of reinforced concrete. The side

This platform is of reinforced concrete and is cantilevered out to within 2 or 3 inches of the line of the car.

The grades of the subway are quite heavy, the minimum being 0.5 per cent., which is the grade established at all the stations. (See Fig. 1). The grade continues upward from the business district for a distance of $2\frac{3}{4}$ miles where at Ransden Park, the point at which the car barns will be located, the grade runs in the opposite direction for about $\frac{1}{4}$ of a mile. Near the end of the line a very heavy grade of 4.36 per cent. is carried for a distance of about 1,100 ft. The sharpest curve is on a 400-ft. radius and the maximum radius used is 2,000 ft.

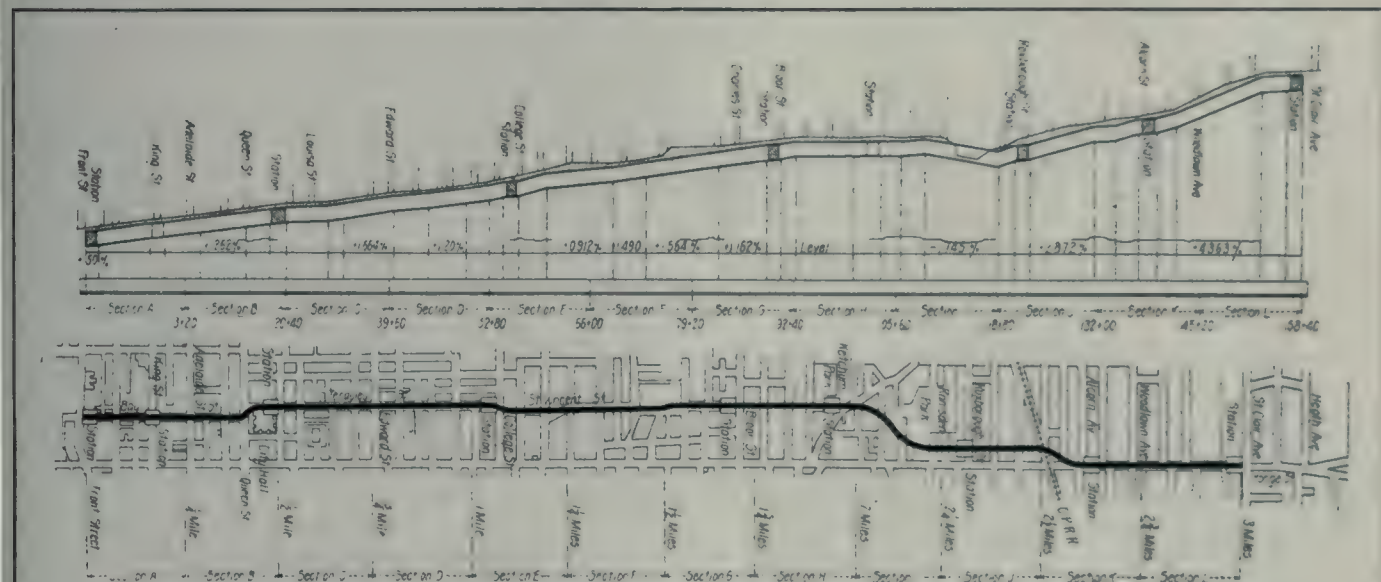


Fig. 1.—Map Showing the Location of Proposed New Three-Mile Subway for the City of Toronto.

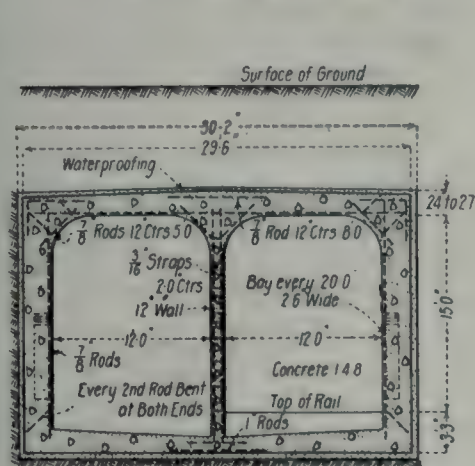


Fig. 2.—Standard Section of Subway.

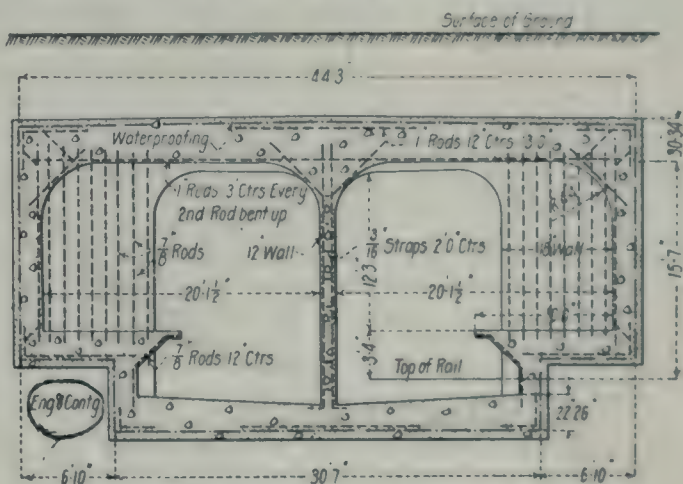


Fig. 3.—Standard Section of Subway at Station.

walls are 2 ft. 7 ins. thick and the partition walls 1 ft. thick. There will be a clearance of 15 ft. in the tunnel from the top of rail to the roof and a clear width of 12 ft. between side walls and partition wall. There will be a waterproofing layer at or near the outside of the concrete around the entire section of the structure.

There are 9 stations in the 3 miles, and the section of these conforms to its general lines to that of the main subways. The side walls are set back 8 ft. 1½ ins. on each side and carried down only as far as the platform which is at the level of the car platforms.

According to the 30 borings, which have been made, there is no rock to be encountered in the excavation. The greater part of the material to be handled will consist of blue clay, which will be encountered at from 3 to 17 ft. from the surface. There will also be a small amount of quicksand near the upper portion of the work. The top ground consists of filled ground, red-clay, and of yellow sand.

The quantities of material and excavation will vary according to the depth below the ground surface. The depth below ground surface to the roof of the structure varies from 3 to 10 ft. and the quantity of ex-

cavation per lineal ft. of structure runs accordingly from 26.91 cu. yds. to 35.01 cu. yds.

The concrete of 1:2:4 mixture varies from 7.71 to 8.03 cu. yds. per ft. and the 1:4:8 mixture from 1.42 to 1.44 cu. yds. per ft. according to the depth of the subway below street surface. The variations occur in the thickness of the arch and invert. The reinforcing material will consist of square steel and runs from 509 to 551 lbs. per lineal ft. There will be about 11.10 sq. yds. of waterproofing per lineal foot.

The quantities of material and excavation for the stations average about as follows per lin. ft.: Excavation, 44.30 cu. yds.; 1:2.4 concrete, 11.57 cu. yds.; 1:4:8 concrete, 1.84 cu. yds.; steel, 1,210 lbs.; waterproofing, 14.83 sq. yds.

The plans were prepared in the office of City Engineer Rust.

Bituminous Pavement Definitions

The sub-committee on Bituminous Paving Nomenclature of the American Society of Municipal Improvements at its September convention reported for adoption definitions of the terms "sheet asphalt," "bituminous concrete," "bituminous macadam," and "oiled or tarred macadam." These definitions are as follows:—

Sheet Asphalt, the well-known pavement commonly called by this name, normally consists of two layers; the first, a binder course of broken stone, coated with asphaltic cement; the second layer, a mortar wearing surface of graded sand and mineral dust cemented together with an asphaltic cement. It is generally but not necessarily a two-layer pavement deriving its lateral stability principally from the binder course or foundation and what may be termed a surface stability from the correct grading of sand in the second layer or wearing course aided by the cementing quality of the asphalt. It is commonly laid on a hydraulic concrete base but may be supported on a macadam base.

2. Bituminous concrete is a pavement consisting of a combination of broken stone and sand, or fine mineral matter, cemented together with a bituminous cement, and which has all its ingredients mechanically mixed before being laid. To be termed a bituminous concrete it must partake of the well-known characteristics of concrete, that is, there must be stone enough in its composition to form an important part thereof and add to its strength and durability; also there must be enough of the mortar constituent, that is, the sand and bituminous cement to properly support and bond together the largest particles. It is normally a one-layer pavement, all parts of it having equal stability, due both to the structure of stone and the bond of the bituminous cement, and depending on the base for vertical support only. It may or may not be finished with a skim coat and top dressing of sand or stone chips. It is adapted to be laid on either a hydraulic concrete or macadam base which may or may not have a light coat of bitumen to increase the adhesion.

In the paving mixture, gravel may wholly or in part be substituted for crushed stone, and fine crushed stone for sand. Mineral dust also may be added to increase the density and stability of the mixture.

3. Bituminous macadam is a pavement consisting principally of crushed stone which retains its integrity of structure mainly by the mutual support of the various particles of stone, aided by the slight bonding value of the fine mineral matter in its composition, and

protected from surface disturbances by an upper bonding layer of bituminous material. It is a one layer pavement and there is no definite distinction to be made between the wearing surface and the base, as in their nature they must be knit together in one structure. Practically all the horizontal stability as well as vertical support is from the macadam base. The pavement may be produced by adding the bituminous top to the macadam base by either the penetration method or the mixing method. In the former the bitumen is applied in a liquid state and a top dressing of stone or sand is spread over the surface and thoroughly rolled. In the latter the bitumen is mixed with the mineral, consisting of comparatively fine stone or sand, or a mixture of both, and forced into the macadam body of the pavement by rolling. In either case, whether the penetration or mixing method is followed, the macadam base must be specially prepared, with voids in the upper portion into which the bitumen or bituminous mixture penetrates, leaving a coating of the desired thickness over the surface.

4. Oiled or tarred macadam is a macadam or telford pavement treated with a comparatively light coat or coats of oil or tar for the purpose of laying dust and preventing surface disintegration. It merits the name of bituminous pavement only when the oil or tar supplies a bitumen of a practically permanent bonding nature to the surface of the macadam.

In view of the advancing state of the art of paving it can hardly be expected that the nomenclature will be accepted as finally conclusive. Variations of the above mentioned forms of construction may be devised which are combinations of any two and the results indicated may be obtained by other means. For instance, a bituminous macadam may be made by forcing the bitumen up into the stone of the wearing surface from below under the roller instead of from above downwards; but nevertheless it is a bituminous macadam. An attempt has been made to classify only the more widely accepted forms of construction, and that the reasons for the classifications may be understood, it was thought proper to attempt a definition of each class. The term "bitumen" is used in its broadest sense, meaning all hydrocarbon products suitable for use in pavements, no matter from what source obtained. Likewise "asphalt" is taken to include all so-called natural asphalts, oil asphalts, and other similar petroleum products that may be used as binders.

No new or unfamiliar names have been given to the various classes of pavements, but only those offered which have already by usage attached themselves thereto, or which seemed most nearly descriptive of the pavement.

Repairing concrete floors which have been chipped or cracked by hard usage is done in the following manner by the Aberthaw Construction Company. The damaged portion is chipped out with a chisel and mallet to a sufficient depth to reach the bottom of the deepest break. The rough surface is then treated with acid so as to bring out the solid aggregate, or a stiff brush is used to remove all the loose dust. The surface is washed out with a hose, and when all the dust and traces of acid have been removed, the recess is grouted with cement. Before the latter has set the granolithic finish is applied and leveled up with the rest of the floor. This method of making repairs is stated to have proved entirely satisfactory in many cases.

The Paving and the Care of Streets*

By Edwin A. Fisher, City Engineer of Rochester, N. Y.

Guaranty.—Much has been said and written upon the subject of pavement guarantees. A few years ago a long guaranty was thought to be the one thing needful in street paving. New York city laid many pavements under a 15-year guaranty period. Many other cities, unless prevented by charters, exacted ten years. Of late, however, a reaction has set in and many engineers and other municipal officers argue that the guaranty should be abolished entirely. I believe that some guaranty is essential but that it should not cover an extended maintenance but be limited generally to the material and workmanship.

Where a large amount of underground work is done, scattered as is usual, over a considerable distance, it is absolutely impossible, with ordinary inspection, to know that the trenches are properly back-filled. The contractor should be responsible for this work.

We have fixed the guaranty period for standard pavements at five years, and for resurfaced streets and sidewalks at three years. I do not think a uniform length of guaranty of all kinds of pavements is right. It ought to be only long enough to detect defects of material and construction and should vary with the different kinds of pavements, and other conditions. I recently told a committee of citizens that any contractor who would sign a contract with a maintenance guaranty for a macadam pavement on a street of considerable traffic ought to be sent to a lunatic asylum.

Contracts.—Two methods of letting contracts are practiced: the lump-sum bid and the unit-price bid. If the exact quantity and character of the work can be fully and clearly described, and changes are not probable, the lump sum is the most satisfactory. On the other hand, as is usual in the case of a permanent pavement, especially in the older portion of the city where many of the quantities are not positively known, the unit-price method is preferable. I have used this method altogether for pavements. What is wanted is a method that will eliminate the gambling element and enable the engineer to pay the contractor a fair price for satisfactory work. Care should be exercised, however, in making up the bidding sheets, that the estimated quantities correspond as nearly as possible with the actual, else you will get unbalanced bids. I have found it better in the case of items where the quantity was uncertain, to fix the price in advance, or leave it out altogether, and treat such items as extra work, rather than to put in estimated quantities which might vary materially from the actual, and thus tempt the contractors to make unbalanced bids.

Lowest Bidder.—The charter provision compelling the letting of all contracts for public work to the lowest bidder that will furnish adequate security results, in many cases, in turning over municipal work requiring special knowledge and skill to ignorant or inexperienced men, deficient in every quality required for the successful execution of the work. Nothing has so tended to bring the business of municipal contracting into disrepute as the lowest bidder. From a large experience in both public and private work, I am clearly of the opinion that the contracting board should have discretion to let contracts as in its judgment is for the

best interests of the municipality. In nearly all cases the lowest bidder would get the work. Honesty, ability, intelligence and special knowledge would be recognized, and the business of city contracting be placed on a higher plane. The work would also be better and more economically done.

For 25 years prior to the year 1900 municipal contracts for the City of Rochester were let by an elected board of three members having authority to award contracts as in its judgment was for the best interests of the city. While this board, on account of its large powers, was made the central figure in every municipal campaign, and all sorts of criticism and abuse heaped upon its members during the heat of the campaign, I do not recall that its acts, with respect to the letting contracts, were ever questioned.

Bitulithic.—Mention may be made of the bitulithic pavement that has come rapidly and extensively into use in the last ten years. This pavement is correct in theory, and its extensive and generally satisfactory use indicates that its theory is sustained by actual practice. It combines very many of the qualities of an ideal pavement. Its success, however, depends, more than any other kind, upon extreme care in the selection and grading of the materials, and in the proper execution of the work. It is therefore perhaps an actual advantage that its use is covered by broad patents, preventing its construction except under the skilled supervision of the patentees.

Street Railway Track.—Two methods of construction are followed: Wooden tie construction, consisting of a concrete foundation 12 ins. thick, extending the entire width of the space, between lines drawn 6 ins. outside the outside ends of the ties, put in at the same time and connected with the 6-in. foundation outside. Wooden ties about 30 ins. c. to c. are left embedded in this concrete. This form is favored in streets where recent excavations have been made under the track space.

The other method, and one now practiced, is the use of steel ties of 3 ins. depth, spaced 4 ft. c. to c., embedded in a 12-in. Portland cement concrete foundation extending entirely across the space between lines drawn 6 ins. outside the end of the ties and connected with the 6-in. foundation under the pavement. Old rails have been used for ties in some streets.

Proposed Pipe-Line Project

The Canadian Western Natural Gas, Light, Heat and Power Company, of Calgary, which has absorbed the Prairie Fuel Gas Company, the Calgary Natural Gas Company (with wells in East Calgary), the Calgary Gas Company, and a number of other companies, is planning a huge gas distributing system. It is the intention of the company to lay a large main from Bow Island across to Lethbridge, thence to Macleod, and thence northward as far as Calgary, taking in all intermediate points and supplying gas to all these places at a cost that will be, it is asserted by the company, about one-quarter that of coal under present conditions. The company has obtained the right to lay its mains along the right-of-way of the Canadian Pacific railroad, and has further obtained all right to supply gas to the railway company at all points where it may be required. Eugene Coste is president of the company. He will leave shortly for Europe to purchase a portion of the piping used. It is estimated that 200 miles of piping will be required.

* From an address before the Williamsport Board of Trade.

Noteworthy Construction at Winnipeg

Excavating Methods Employed at Site of Proposed G. T. P. Hotel— Progress on Transcontinental Viaduct and other Interesting Contracts

Winnipeg, October 19, 1911.

Rapid strides are being made in the excavation for the foundations of the new G. T. P. hotel, the Fort Garry, as it will be called. The huge area covered by this structure has made it possible to introduce excavation methods never before attempted in the city, and despite the unfavorable weather encountered during the past two weeks a tremendous amount of earth has already been removed. The building, in addition to being the highest in Winnipeg, will be carried a greater depth below street level, a sub-basement being provided for.

Speed is one of the first considerations in this work for it is the expectation that a start will be made on the main supporting piers before winter frosts put a stop to the work, and the sub-contractors, Messrs. Rigby & Kellett, have introduced two new factors in getting out the earth. The first few feet they handled with an ordinary road grader, the motive power be-



Steam Shovel employed in excavating at site of Hudson Bay Company's proposed warehouse.

ing furnished by a 35 horse power gasoline tractor. The plow of the grader was set to a depth of about eight inches and cut a furrow fourteen inches. The furrow was turned over on a carrier belt which dumped the earth directly into dump wagons. A string of twelve two-horse wagons were able to look after the plant handily and in one morning took away 450 cubic yards of material. A spoil dump is being formed at the south of the hotel site one hundred yards away, for the surface layer, which later will be used in back-filling and improving the courts and grounds. The balance of the material is being used in the G. T. P. dump, south of the new Union Depot.

The grader, in removing the earth, was driven in an oval course, the dimensions of the site being such as to permit of continual operation, though heavy rains were a considerable drawback. Three men were sufficient to operate the grader and engine.

When the heavier subsoil beneath was reached, a steam shovel was introduced, and this is now almost down to bottom on its first cut across the site. It is of the swinging type with half-yard bucket, and is

able to fill a wagon with three cuts in about two minutes. This machine will be able to continue at work well after the first frosts.

The outside dimensions of the excavation are 185 by 105 feet, and the extreme depth at one point will be 42 feet, though the greater part of it is but 30 feet in depth. The estimated amount of material to be removed is 30,000 cubic yards. The contractors have on order a second steam shovel which will be delivered within a week or so. This shovel will have a yard and a half bucket, and a 30-foot boom, so that the first cut may be made from street level. This will permit the general contractors to proceed at once with the laying down of the concrete retaining wall. The foundations and piers are to be carried on piling and it is hoped that this work will also be under way before winter sets in.

Progress on the Transcontinental Viaduct

Final touches are now being placed on the Transcontinental Railway between the Red river bridge and the new Union Depot at Winnipeg. This is an exceedingly heavy piece of work and has now been in progress for over two years. Completed it will give an entry into the city from the east along the new line. There has been some trouble on the work on the St. Boniface side of the river, but this is being rectified.

Where the viaduct approaches the bridge, from the south, it is on a long curve and carries double tracks. It crosses several streets and a number of commercial tracks and warehouse spurs of the Canadian Northern Railway, so that there were many fine points to be met in the designing. A double track line passes under just at the end of the bridge and there through plate girders have been used. But a few yards south the trouble begins, for at that point the line crosses two streets just a little inside the corner, and a short distance beyond a spur cuts up a lane at a wide angle. Through this section of the city the viaduct is carried on steel columns, and considerable ingenuity has been developed in the fabrication of the girders and braces beneath. The accompanying illustrations will give an idea of what the erecting gang had to encounter.

The deck of the viaduct is bedded with solid concrete between the I-beam supporting members, with a cushion of 18 inches of gravel above. This concrete is now being laid, and the rivetting gangs are at work putting on the steel plate side supports ahead of the concrete gangs.

Where the line crosses blocks between streets the viaduct is of concrete filled with earth, but at the street crossings, through plate girder spans, centrally supported on steel columns, have been put in. These crossings have all been completed and there remains but a short section of the work, across where the old C. N. R. depot tracks formerly ran, to be tied up.

Brown and Brant Street Bridge

Winnipeg is divided into two sections by the main line of the C. P. R., which a decade ago cut the popu-



Two 250-ft. Spans of the Brown and Brant Street Bridge across the C.P.R. yards.

lation centre almost exactly. When the present period of growth started it was the south half which first felt the impetus as the shopping and wholesale districts were contained in it. Since that time the "North End" as it is called has suffered considerably. At the present time the city is at work on a series of viaducts and subways which will result in linking these more closely. A general plan of work has been suggested, which when completed, will give adequate connections across the town at intervals of only a few hundred yards, for all kinds of traffic. The street railway system will be worked out to take advantage of these crossings and it will link the two sections so

was not designed for street railway traffic and is now at a stage when the city must either spend a large sum on repairs or rebuild it entirely. It is probable that the latter scheme will be adopted and that a new location will be selected a couple of blocks farther west, where the bridge would be more suitable to traffic conditions.

A little over a year ago a subway was started at McPhillips street, once the western boundary of the city. This will shortly be placed in commission. It is similar to the Main street subway and will provide facilities for a much-needed car service.

What is probably the most extensive piece of work



New McPhillips Street Subway at Winnipeg

closely that the future development of the city should be more uniform.

The first step taken was the construction of the Main street subway, which carries seven C. P. R. lines. It provides in the central section for two street car lines and roadways on either side. At a higher elevation are the two footpaths. The structure is of ferro-concrete with groined arches. Next came the Higgins avenue subway near the point where the avenue crosses the Red river into Elmwood. This structure, like the one at Rachel street, farther west, is of plate girders.

A little to the west of Main street a viaduct was built across the railway yards at Salter street, but it



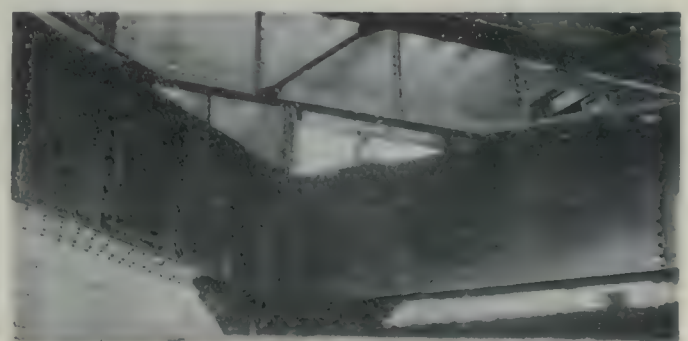
Road Grader employed on the Excavation for the Fort Garry Hotel.

to be undertaken, however, is the Brown-Brant street overhead bridge. This connection runs across one of the widest parts of the C. P. R. yards, connecting two dense centres of population, and gives access to the main entries of the Exhibition grounds. This bridge, completed, will be 2,200 feet over all and is planned to carry a live load of 4,000 pounds per linear foot.

When this project was first mooted it met with considerable opposition from the C. P. R. as it ran through one of the most congested sections of their huge terminal yards, where space was at a premium. The plans as finally approved by the railway commission, however, are such that there will be no interference from the piers, and 22 feet 6 inches head-room



Typical Viaduct on the Transcontinental work.
—The Water Street Crossing.



Under frame of a complex corner where clearance had to be provided for street and warehouse track.

has been provided over the tracks. The roadway on the bridge provides for two car lines and is 26 feet in width with two footways of 6 feet each. There is a clearance of 15 feet on the roadway.

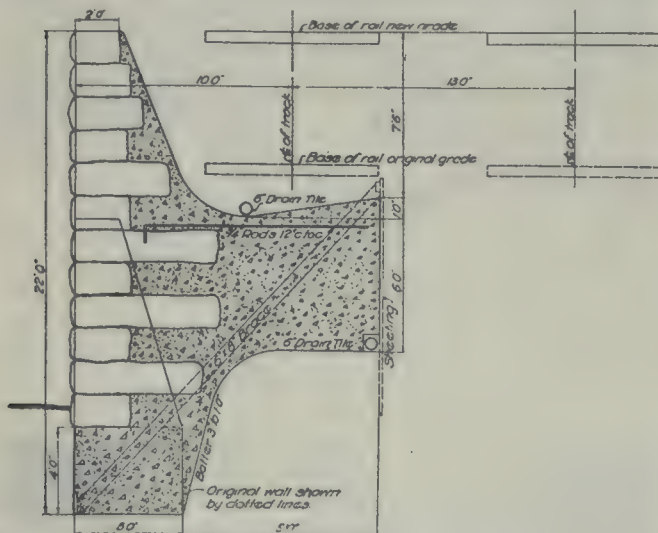
Some idea may be gained as to the size of the structure from the fact that there are five spans of 80 feet each, two of 250 feet, one of 340 feet, one of 59 feet and one of 40 feet. The balance of the bridge is of steel girders carried on steel trestles. The spans are a combination of Pratt and Petit trusses. The deck is carried on steel I-beams and consists of a layer of 4-inch creosoted planking paved with 3-inch creosote blocks and tar filler. The footwalks are of reinforced concrete.

The sub-structure consists of 37 concrete piers carried on piling driven to bed-rock. A total of 33,000 linear feet of piling was driven. In the piers there is 5,500 cubic yards of concrete and the steel weighs 2,100 tons. The design was worked out by the city engineer.

The general contractors for the work are the Cleveland Bridge and Engineering Company, of Darlington, England, the firm who built the bridge across the Zambesi at Victoria Falls, and the Blue Nile bridge at Khartoum. Many remarks have been made in regard to the way in which the erection is proceeding, for the shop work on the steel is perfectly executed and there has been no trouble experienced in getting the parts together. The railway strike in England caused a few delays, but all of the steel is reported at Montreal. The sub-structure was erected by William Newman & Company.

A Unique Type of Retaining Wall*

The accompanying drawing illustrates an unusual section of retaining wall which was built during the construction of the new Chicago & Northwestern Ry. terminal station, Chicago, Ill., along the Wisconsin Division tracks for a distance of about one-



Retaining Wall for Track Elevation

quarter mile. These tracks were cleared some ~~an oval go~~ and were a part of the old right-of-way as to permit as at that time the streets were all rains were a maximum clear headroom of only were sufficient ten, a further elevation became neces-

When the heathese tracks with the new terminal a steam shovel waft. of headroom was given without down to bottom c

is of the swinging r by W. C. Armstrong before the Western Society

The old retaining walls were built of rubble limestone on a natural cement concrete base. The face of the wall was vertical and on the right of way line. Outside of this line was private property. There was no projection of the concrete footing beyond the face of the wall. The base was too narrow to permit of raising the wall higher by additional masonry, and the natural cement concrete had disintegrated so badly in places as to be unfit for sustaining a greater pressure. Furthermore, to have excavated for a new base of a standard wall, of the proper width for the increased height, would have necessitated either the temporary removal of two tracks or the use of very heavy shoring to hold back the embankment. The former was objectionable, for the traffic was heavy at this point and it was desired to avoid increasing the congestion as much as possible. The latter was also objectionable on account of the cost that the work would involve and the danger that would attend any scheme for shoring in such a restricted space; for it must be remembered that shores could not be placed outside the right of way line. It was impracticable to rebuild the wall entirely of concrete unless the face was set back from the right of way line a distance equal to the thickness of the forms; for in many places houses were built snug up against the face of the old wall.

To meet these conditions a special type of wall was designed and constructed. One track was temporarily removed and the sand filling excavated as shown. The old wall was then removed entirely. The concrete footing under the toe of the wall was then put in place. The face of the new wall was built of stone from the Duck Creek quarries in Wisconsin. This is a dolomite limestone of a very good quality for heavy masonry if protected from percolation of water. But like all limestones, it will disintegrate more or less when used in damp places and is subjected to freezing and thawing.

The face of the wall was laid with alternate headers and stretchers, while the backing was of concrete. No headers were allowed to be used with tapering points, and if a header was wider at one than at the other, the narrow end was made the face. In that way the header was dovetailed into the concrete backing.

The heel of the wall was at a considerable distance above the toe, and the peculiar form shown in the figure was given to the rear portion. "Hammer Handle" is the nickname that has been applied to this construction, suggested by its peculiar shape.

The thickness of the tail was usually made about 5 ft. at the shallowest point, which was about 5 ft. from the rear end. The upper surface of the tail was given a concave finish to facilitate drainage. A 6-in. tile drain was laid in the trough thus formed which carries the water to manholes at the street lines connected with the city sewers. Six-inch drains are also placed under the heel of the wall which connect with the same manholes.

In order to bind the tail more firmly to the body of the wall, and to prevent rupture through the tail, due to the downward pressure on the upper part of the wall, $\frac{3}{4}$ -in. reinforcing bars spaced 12 ins. apart were placed horizontally within about 6 ins. of the upper face of the tail. These bars were bent down at one end and anchored into stone headers.

Careful records have been kept since the completion of these walls and the resumption of traffic on

the tracks over them, but no movement of any kind has been detected. Some of them have now been in use nearly a year.

It has occurred to the writer that there is one feature of this type of wall that might frequently be employed as a measure of economy. That is, the saving in excavation and masonry effected by setting the foundation of the heel higher than the foundation of the toe. There are usually but two reasons for carrying the foundations of a retaining wall lower than the surface of the ground. The first is to reach a material that will sustain a greater pressure; and the second to get the foundation below the action of frost. The first is usually only necessary under the toe of the wall, for almost any good soil will sustain the heel pressure. The second also is only necessary under the toe for the heel is protected from frost by the embankment.

Illumination and Wiring of Large Office Buildings

A paper on the above subject was read by Mr. E. G. Burr, on Oct. 17, before the Province of Quebec Association of Architects, Montreal.

Mr. Burr confined his paper to the illumination of interiors, and stated that the proper solution of problems involved required the heartiest co-operation between the architect, who has in mind the various aesthetic results desired, and the engineer who, with a knowledge of the physical basis of light, is able to produce and direct that light in a proper way and in the cheapest manner possible, having regard to the results desired. Discussing physiological considerations in lighting problems, Mr. Burr laid it down, (1) that beyond a certain illumination intensity the improvement of vision is not commensurate with the increase of illumination; (2) that a high intensity area will not be so evident if the surrounding areas are fairly well illuminated, so that a diffusing globe which in a room with poor general illumination caused considerable discomfort by glare would be quite unnoticed in a brilliantly lighted room. A somewhat similar trouble results from the adoption of indirect lighting from the ceilings in rooms with dark walls, where an annoying glare is experienced, with a distracting tendency to look at this brightly illuminated area. The increase of the general illumination by direct lighting may be a remedy.

In addition to the seeing of objects by light and shade, we also see them by shadow. As architects they were deeply concerned in the proper appearance of objects by their having shadows, and any scheme of illumination which causes these shadows to lose their proper relation to the objects or to become distorted is inadequate, although it must not be forgotten that if desired by proper design objects may be made to assume different but not less beautiful aspects under artificial light. The adoption of modern scientific principles in the design of reflectors has been made possible by careful control of the light flux to obtain identically the same intensities at the different parts of a room as obtain at any given period of the day, and the color even may be closely stimulated, but owing to the fact that the light sources by daylight are of large area and by artificial light are of relatively small area, the resulting shadow effects must necessarily be widely different. It must not be forgotten that while two light sources may be combined so as to give identically the same illumination in-

tensity at a given point as is given by one source of higher power, yet in the matter of shadow cast, the results will be entirely different in the two cases.

It would appear that in most cases the readiest solution of the difficulty would be to compromise by providing a certain proportion of light well diffused by reflection and counter reflection from ceiling and wall, such as is the case in daylight illumination, and further provide a certain proportion of light directed from at least two sources located so that at most places in the room some directed light is obtained incident on the object at sufficient angle to give shadows bearing some semblance to those obtaining by daylight.

The design of the illumination for a given building requires the consideration of 1, the light flux; 2, the quality of the light; 3, the direction and diffusion of the light, and in considering these attention must be paid to the following: the character of the illuminant, the intensity of illumination, the system, location of light sources, selection of fixtures, globes, shades, reflectors, glare, specular reflection, contrast, shadow, aesthetic considerations, and efficiency.

The concluding part of the lecture was devoted to the explanation, by means of slides, as to how illumination calculations were made; and also the peculiarities of certain electric panels.

At the invitation of the chairman, Mr. Bennett, chief inspector of the Canadian Fire Underwriters' Association, said a few words. Architects, he remarked, had certain laws to follow with regard to lighting, but these were very rarely adhered to. Inspectors now advised proprietors to have wires installed in conduits, so that a better rate of insurance could be obtained. The general feeling among inspectors was that conduit construction was the only proper one that should be followed.

Mr. Burr, in his final remarks, alluded to certain architects' specifications in which it was laid down that only two wires should be put in one pipe. This he considered illogical, as there were certain circumstances under which several wires could be safely laid in one pipe.

Lecturing before the Canadian Society of Civil Engineers, Montreal, Mr. Newman, chief engineer of the Universal Transmission Company, described the construction of the Janney Universal Variable transmission device. The paper was chiefly of a technical character, and was illustrated by lantern slides and by a working model. Mr. Newman stated that the device, which has been adopted by several governments for operating guns on turrets, was applicable to cranes, automobiles, cars, vessels, locomotives, elevators, and numerous other machines, and he claimed that it was more efficient, and in the end, more economical, than other transmission devices. During the discussion, approval of the idea was expressed, but it was suggested that more experience was necessary before its application could be made commercially possible.

An electrically operated blue print machine is used for making prints for all municipal departments at St. Louis, Mo.; during the past year 15,900 prints were made. The cost per square foot, including labor, material and depreciation of machine, for making blue-prints was 1.5 cents; for blue-cloth prints, 6.4 cents; for brown prints, 3.4 cents; for black prints, 5.4 cents.

Proposed St. Andrew's Church, Regina

A pleasing example of the Gothic and an evidence of the artistic as well as material progress which is being made in the West.

Architects: Clemesha &
Coltman, Regina.



A Glimpse of the Interior



Proposed St. Andrew's Church, Regina, Sask.

St. Andrew's Church, Regina

The excavations for the proposed St. Andrew's Church at Moose Jaw, Sask., are now well in hand and actual building operations will be commenced in the spring. The estimated total cost of the St. Andrew's Church is \$100,000. The style of architecture is Gothic. The main building will occupy a space of 125 ft. by 80 ft., and the annex, 50 ft. by 80 ft. The seating capacity on the ground floor is 760 and in the galleries 360, making in all 1,120 seats. The galleries are approached by spacious staircases and the gallery seats are arranged or grouped in three bays, which are approached through triforium galleries. The annex consists of a Sunday School, on the same floor as the ground floor of the church proper, recessed into one side, and which, when not required, can be entirely shut off by revolving or roller partitions. The Sunday School provides accommodation for sixteen classes, eight on the ground floor and eight on the upper floor, so arranged that the superintendent can address all the occupants.

In the basement the following accommodation is provided: banquet hall (to seat 660 persons), containing stage and two dressing rooms and most ample means of access to all its parts; men's club room, lavatories, bath room, kitchen, pantry, fuel room, ladies' parlor, lavatories, bath room, heating and ventilating space, janitor's quarters with living rooms, bath room, etc.

The building will probably be constructed of red brick with stone dressings and will be one of the finest churches in the province of Saskatchewan. The architects are Messrs. Clemesha & Colman, of Regina.

Mediaeval Reinforced Concrete in Paris

A strange discovery lately made in the walls of the old palace of the Louvre shows that reinforced concrete was by no means unknown in Paris as far back as the sixteenth century, when the rebuilding of the Louvre was undertaken by that industrious builder, Francis I. The Figaro states that when executing works in connection with the application of a modern lift the workmen employed found it necessary to cut through some of the old walls; which were apparently of dressed masonry. But, to the surprise of the contractors, it was found that the stone was nothing but the outer shell of construction largely composed of a kind of reinforced concrete. In view of the generally entertained belief that this is an essentially modern variety of structural material, the proof of its employment between 300 and 400 years ago is distinctly interesting. Our contemporary states that some one with archaeological tastes has taken the trouble to search the archives for records left by the architects of the epoch in question, with the result that no mention was found of anything but dressed stone for use in the walls. It seems, therefore, that the original contractors, with more wisdom than honesty, decided to make sure of reaping the benefit attending the adoption of reinforced concrete as a substitute for stone masonry.

A large concrete statue of the Indian chief, Blackhawk, has recently been completed at Oregon, Ill. The statue is 48 feet high and stands on a base four feet high by 18 feet square. Invisible windows, approached by stairs inside the hollow body, are built

in the head. The statue is on a hill 250 feet high, overlooking the Rock river. Lorado Taft was the sculptor.

Waterproofing a Concrete Floor

Waterproofing the basement under the 60 x 400-ft. factory building of the Velie Motor Vehicle Company in Moline, Ill., has finally been accomplished after long endeavor, according to the Engineering Record. The structure is situated on the bank of the Mississippi River at the foot of a hill which rises to a height of about 100 feet. Seven springs were encountered within the area of the basement, which extends the full width of the building for a length of 80 feet. The floor is 14 feet below the street grade and laid on seamy rock through which the springs and seepage produce a flow equivalent to a foot in depth over the basement area during a twelve-hour period, or approximately 50 gal. per minute.

Originally a concrete floor 6 inches thick covered with a 1½-inch top coat was placed, but the water pressure was so great it raised the floor in places as much as 8 inches and cracks developed through which the water spurted out two feet high. On sealing one of the springs around a 5-ft. length of 3-in. pipe the water was found to flow over the top. Further tests were not carried out on account of the possible danger to the floor, but it is believed the water would rise nearly to the street level.

To anchor the floor down holes were drilled each side of the cracks through the concrete and into the solid rock for a distance of at least 12 inches. Hook bolts, 1 inch in diameter, were then grouted into the holes, the bolts hooking over reinforcing bars inserted into holes drilled sideways into the old concrete floor. These horizontal bars were bent to get them into place and then straightened. The cracks were cut out down to rock to a width of 1 to 2 feet and grouted with a mixture of cement and 10 per cent. Ironite. There was then laid over this repaired floor a 3-in. layer of 1:2:3 concrete reinforced with ¾-in. bars spaced 10 inch centres both ways. A bond between the old and new floors was secured by treating the floor with Ironite on the day previous to depositing the concrete and also slushing the surface with a grout of cement and Ironite immediately ahead of the concreting gang.

On the river and hill sides there is a basement court with a wall 8 feet outside of the foundation wall. The former carries the earth pressure load surcharged with train loads, as tracks are laid alongside the court. To waterproof the court wall and the other outside walls two coats of 1:1½ cement plaster ¾ to ½ in. thick were applied. Each coat and the original wall received three brush coatings of Ironite. A concrete quarter round filler about 6 inches in radius was placed at the bottom of the wall to strengthen the angle. As a precaution against the water coming up through the footing of the wall supporting the building two plaster coats were carried up 18 inches above the floor on both inside and outside.

While the waterproofing and repair work was going on and also as a permanent installation the water from the seven springs and the worst leaks was carried to a sump through 3-in. pipe laid in grout in trenches cut in the old concrete floor. Repairing the basement floor and waterproofing it and the side walls were done by the Chicago Ironite Waterproofing Company, of Chicago.

The Properties of Oil-Mixed Concrete

A Description of a New Type of Concrete for Waterproofing Pavements — Interesting Details of Laboratory Tests

On November 1, a paper by Mr. Logan Waller Page bearing the above title, will be read before the American Society of Civil Engineers in which the remarkable properties of oil-mixed concrete are explained at much length. The paper, which was printed in the Society's "Proceedings" for September, is the first public statement concerning the material which the author has made since his preliminary announcement before the Association of American Portland Cement Manufacturers, nearly two years ago. It records the progress made in the laboratories of the Office of Public Roads at Washington in ascertaining the physical properties of oil-mixed mortar and concrete, and has been presented in the hope that engineers with better facilities for experimental work than those of the author would take part in the investigations which must be carried out before the character of the material is fully ascertained.

Materials.—The materials employed in the tests described in the paper consisted of Portland cement, river sand, and $\frac{3}{4}$ -inch crusher-run gneiss. The oils were usually fluid residual grades, but a cut-back oil asphalt was also employed. The cement complied with the specifications recommended by the Special Committee on Concrete and Reinforced Concrete. The sand contained 37 per cent. of voids, the stone 43 per cent.

The percentage of moisture in the sand and stone was determined every day that a concrete mixture was made, and the proportion of sand and stone in the mixture were corrected for the moisture content. All concrete was proportioned by volume, but the materials were measured by weight. In all cases the percentage of oil used is based on the weight of the cement in the mixture.

The proper quantities of cement and sand were mixed dry until of uniform color. Water was then added and the mass was turned as often as was necessary to produce a rather wet mortar. The water added to the mortar was not weighed, the appearance of the mix being the criterion for determining the proper quantity. In general, however, the total quantity of water, including that in the sand, was about 17 per cent. of the total weight of the cement and sand. After having mixed the mortar, the desired quantity of oil was added, and the mass was turned over as many times as was necessary to break up the oil and incorporate it thoroughly with the other ingredients. The previously moistened stone and the oil-cement mortar were then combined and turned until thoroughly mixed. The percentage of water required to make a rather soft mixture was determined from the appearance of the first batch, and every batch of the same proportions made thereafter contained the same gross quantity of water.

1:3 Mortar.—Tests made on 1:3 mortar containing oil show that the tensile strength is influenced very little by the oils at 7 days, 28 days, or 6 months, and furthermore, there is a decided gain in strength at 28 days and 6 months over that at 7 days.

Time of Setting.—The addition of oil retards both the initial and final set. The effect of 10 per cent. oil is to increase the time of initial set about 90 per cent. and the time of final set about 60 per cent. The importance of this characteristic of oil-mixed concrete must not be overlooked in considering its use on water-proofing work.

Crushing Strength.—Specimens of mortar and concrete were molded in cylindrical forms, 6 inches in diameter and 6 inches high. The molds were removed after one day, but the specimens were not disturbed until the second day after molding. Air-cured specimens were kept moistened for 7 days after molding. The crushing strength decreases in general with increasing quantities of oil. In the case of oil-mixed mortars, in only one instance is there a serious decrease of strength with the addition of oil up to ten per cent. At 28 days water-cured mortar specimens containing ten per cent. of oil are at least eighty per cent. as strong as the plain mortar specimens. In every instance there is a substantial gain in strength at six months over that at twenty-eight days; this is equally true of the one-year specimens. Specimens cured in air are somewhat erratic in behavior. In some instances a considerable gain in strength occurs, in others, a noticeable decrease.

Concrete, like mortar, when mixed with oil, shows a decrease in strength, that containing ten per cent. of oil having roughly seventy-five per cent. of the strength of plain concrete when stored in water. Air-cured concrete, mixed in proportions of 1:3:6 and 1:3:5, containing ten per cent. of oil, has 65 and 75 per cent. respectively of the strength of the plain concrete mixtures. At the completion of the one-year tests on compression, a marked increase in strength is shown over similar tests at six months.

Modulus of Elasticity.—Tests for the modulus of elasticity were made on specimens 8 inches in diameter and 16 inches high. Loads were applied in 2,500 and 5,000-lb. increments, and were released to the initial load of 500 lb. after each increment of 5,000 lb., thus permitting of the deterioration of the amount of permanent set.

The results indicate that the addition of oil to concrete has very little effect on its stiffness, the initial modulus of elasticity, with a few exceptions, showing but little change. The effect of storing in water is to increase the modulus of elasticity to more than that of air-cured specimens, and is as true with oil as without it.

Permanent Set.—In the endeavor to discover the effects of oil on the elasticity of concrete, micrometer readings of permanent set were taken after releasing the load to its initial value of 500 lb. In 1:3:5 concrete, containing as much as ten per cent. of oil, the permanent deformation existing after the application of 500 lb. per square inch was less than that in the specimen containing no oil. This was true of both air-cured and water-cured specimens. The elasticity of 1:3:6 concrete appears to suffer with the addition of oil, the permanent set of the ten per cent. oil mixture, air-cured, being 0.00076 inch per inch of length, as against 0.00019 inch for the plain concrete specimens. The corresponding ratio appears to exist for the water-cured specimens. The permanent set of the ten per cent. oil mixture was 0.00017 inch after the application of 500 lb. per square inch.

Absorption.—In order to determine the water-proofing qualities of oil-mixed concrete, compared with those of a plain mixture, absorption tests were made on 1:3:6 concrete cylinders, 6 in. in diameter and 6 in. high. The cylinders were dried to constant weight in an oven, after being cured for fifteen days in air. They were then completely immersed in water, and were weighed every day

until they had attained constant weight. The addition of oil decreases greatly the percentage of absorption, a cylinder containing ten per cent. of oil absorbing but 1.7 per cent. of water, based on the dry weight, while 6.25 per cent. was absorbed by the cylinder containing no oil. In almost every case the maximum absorption was attained within one day after immersion, and, furthermore, the rate of absorption seemed to be inversely dependent on the quantity of oil added. There was approximately only 0.5 per cent. difference between the absorption of the cylinders containing respectively 10 and 25 per cent. of oil. The inference to be drawn from this fact is that 10 per cent. of oil is nearly as effective as 25 per cent., as far as waterproofing is concerned.

Four vessels of 1:3 mortar, each $2\frac{1}{2}$ in. high, about $\frac{1}{2}$ in. thick, and having an outside diameter of 8 in., after hardening in moist air for one week, were immersed in water to a depth of 5 cm. Vessel 1 was made with no admixture of oil. A damp spot appeared inside about one minute after immersion. In one hour it was completely water-soaked, the moisture having climbed by capillarity above the level of the surrounding water. Within a few days after immersion, water had penetrated the plain mortar vessel until its level inside was the same as that outside. Vessels 2, 3 and 4 contained respectively 5, 10 and 20 per cent. of oil. After an immersion of six months the interiors of the oil-mixed vessels were as dry as they were on the day they were placed in the water. A corresponding series of tests was made on mortar vessels, made to contain water, with like results. The plain mortar vessel leaked, and those of oil-mixed mortar were perfectly tight. These results show with certainty the waterproofing qualities of oil-mixed mortar and concrete.

Permeability.—The following tests were made on specimens of 1:3 mortar, 3 in. thick and 6 in. in diameter: Plain 1:3 mortar, at the age of twenty-eight days, under a pressure of 30 lb. showed dampness in about one-half hour. Under a pressure of 40 lb., applied for twenty-four hours, the leakage amounted to 146 cu. cm. Specimens of the same mixture, but containing 5 and 10 per cent. of oil remained perfectly dry for twenty-four hours, under a pressure of 40 lb.

A $\frac{1}{2}$ -in. coat of 1:3 mortar containing 10 per cent. of oil, applied to the surface of a very porous concrete, was absolutely effective in preventing all leakage, even under comparatively high pressure.

Bond Tests.—Tests were made to determine the relative strength in bond of oil-mixed and plain concrete. Specimens were made of 1:2:4 concrete, mixed with 23½ per cent. of water, based on the weight of cement and dry sand, making a rather wet mix. Rods 12 in. long were embedded in the centre of cylinders 8 in. in diameter and 8 in. long, one end projecting about $\frac{1}{2}$ in. through the bottom. The specimens were bedded in plaster of Paris on a cast-iron plate mounted on a spherical bearing block. The test consisted in pushing the rods through the concrete, the point of failure being taken at the drop of the scale beam.

Two kinds of bars were used, plain and deformed. All specimens were tested at twenty-eight days. The results show that the bond between plain bars and concrete is affected so seriously by the admixture of oil that it would be extremely inadvisable to use such a combination. The bond of deformed bars is not affected so seriously. With an admixture of 10 per cent. of oil, which is as much as is necessary to use, the bond strength is 84 per cent. of that attained by the mixture containing no oil.

Service Tests.—During April and May, 1910, two bridge surfaces of oil-concrete were laid at Ridgewood, N. J. In the borough of Richmond, New York City, during May

and June, 1910, about 400 ft. of street surface was laid with different aggregates. About 300 ft. of street in Washington, D.C., was surfaced in June 1910. Numerous inspections of this work have been made, and, up to the present time, it is all in very good condition. About $\frac{1}{2}$ mile of roadway, laid with 10 per cent. oil-concrete in the suburbs of Harrisburg, Pa., in the summer of 1910, is also reported to be in very good condition.

A vault, 112 ft. long and 18 ft. wide, in the United States Treasury Department, was built in the autumn of 1910. The side walls of this vault contain 10 per cent. of oil. Its roof was constructed of ordinary reinforced concrete with about 3 in. of 10 per cent. oil-concrete on top. For several months this roof was subjected to a head of water of several feet without showing any signs of leakage. Another vault, in the north end of the Treasury, on account of leakage, has never been available for storing anything of value. Its roof was treated with oil-concrete, and is now perfectly dry. Numerous floors in the sub-basement of the Treasury Department, and a floor in the Office of Public Roads, have been constructed with 10 per cent. oil-concrete and have remained absolutely free from dampness. A tank, about 12 ft. long, 4 ft. wide and $4\frac{1}{2}$ ft. high, constructed in the Office of Public Roads during the winter of 1910, has been continually full of water, and has not shown the slightest signs of leakage.

C. P. R. Construction in Prairie Provinces

Many miles of new railway lines are being opened up for transportation into new sections of the prairie provinces. In Saskatchewan alone the Canadian Pacific Railway has at present under construction nearly 600 miles of new branch lines. The largest of these is that between Regina and Colonsay. This line runs almost directly north from Regina until Craven is reached, when it branches off in a westerly direction to the Winnipeg-Edmonton line. It is 135 miles from Colonsay to Regina, and on this a service will soon be inaugurated between Colonsay and Imperial, a distance of 49.7 miles. South of Imperial track-laying has advanced another twenty-five miles. This line passes through a splendid farming country, which will be thickly settled before long.

Another of the new C. P. R. branch lines in Saskatchewan, of over a hundred miles in length, is that between Outlook and Kerrobert. This is really the middle division of the Moose Jaw-Macklin branch. Services have been operated for some time between Macklin and Kerrobert and Outlook and Moose Jaw, but there are still a number of miles of middle division to be built. When it is finished the entire branch will be 267 miles long and will eventually form a junction with the Eacombe-Castor branch at Kerrobert. This new line will be a great boon to all classes in Saskatchewan, for not only will the farmers along the right-of-way benefit, but it will give the towns and cities in its territory direct new connection with the main line of the Canadian Pacific to Moose Jaw, Regina, Brandon, Winnipeg, Minneapolis, St. Paul and Chicago.

A third big branch under construction is from Weyburn to Lethbridge. Up to March of this year track on this line had been laid as far as Ogema, 52 miles from Weyburn. There is now a through service between Weyburn and Ogema. On the rest of the line from Ogema westward grading was commenced in May of this year, and up to last month 50 per cent. of it had been completed up to mile sixty. This line, when completed, will permit of a new route from Portland, Oregon, to St. Paul, Minneapolis, Chicago, and it will also open up a very fertile country.

From Swift Current there are being built two branches, northwest and southeast. Both of these branches were only

started three months ago, but on each fifty per cent. of the grading is now completed. The first-named branch will give good transportation facilities to the farmers near the South Saskatchewan river.

There are also two branches being built from Wilkie. One of these branches reaches out in a northwesterly direction, and the other in a southeasterly direction. On the former, which is 36 miles long, there is 75 per cent. of the grading completed, while on the latter out of 32 miles there is fifteen per cent. of the grading completed.

On the Estevan Northwest branch there are fifty-five miles of new track under construction by the Canadian Pacific Railway. This branch connects with the Weyburn-Lethbridge branch at Forward. On the Regina-Bulyea branch, forty-two miles, track-laying has been completed, and a service will shortly be instituted. On the double-tracking from Pasqua to Moose Jaw 85 per cent. of the

summer. The reason for the early acceptance of the tender is a reduction in the cost of material, and also the opportunity that a good supply gives of starting on repair work and new work as soon as the season of 1912 permits such work. Present indications point to the Roads Department being unable to complete this year's work for which a supplementary grant of \$200,000 was passed by the council.

Trade Enquiries

The Dominion Government Trade and Commerce reports contain the following enquiries. Readers of the Contract Record may obtain the names of enquirers by writing to the Department of Trade and Commerce, Ottawa.

1098. **Spades and shovels.**—A Lancashire firm dealing in the above lines requests communication in October.

1110. **Concrete, brick and block machinery.**—A South African manufacturer's agent desires to correspond with Canadian manufacturers and exporters of concrete, brick and block machinery.

1118. **Mosaics and tiles.**—A Midlands firm manufacturing mosaics, encaustic and plain flooring tiles, and also glazed tiles of various kinds, would like to get into touch with Canadian firms who could handle their specialties.

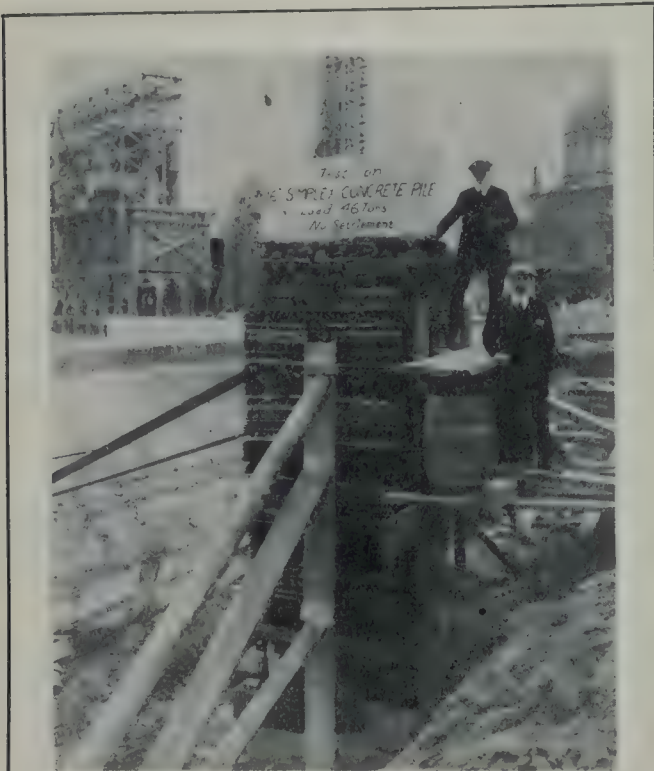
1137. **Hardware goods, locks, brass foundry, &c.**—Birmingham firm is desirous of appointing agent for hardware goods, locks, brass foundry, etc.

The Montreal Council has decided to purchase a site at the corner of Gosford street and Champ de Mars for \$94,500 on which to erect a building for the Recorder's Court and the Police and Health departments. The property is just across the street from the present municipal building, and consists of three lots, having a frontage of 90 feet on Gosford street with a depth of 139 feet on Champ de Mars street and 125 on St. Louis street. The area is 11,665 square feet. The present buildings will be demolished. It is possible that the City Hall will be connected with the new offices by a tunnel under Gosford street. The controllers are of opinion that with this accommodation the present City Hall will answer all purposes for the next fifteen years. Building operations will commence next year.

The Canadian Pacific Railway Company has just concluded a contract with the Dominion Tar & Chemical Company under which this concern will creosote for the railway one million ties a year. The work will be done at the new plant near the town of North Transcona, the location of which was announced for the first time last week. The English company has unlimited capital behind it, and this plant is so extensive that 1,000 ties may be treated simultaneously. The creosoting of railroad ties to preserve them is long past the experimental stage, and the Winnipeg company that does the work is a branch of several concerns located throughout the British Isles.

Officials of the Montreal city council have refused to accept a tender owing to its being two seconds late. The tender was for some work on the sewer outlet at the Back river. Being the only one it would have been accepted had it not been the two seconds behind time. Tenders in Montreal are now stamped with a machine which registers the exact time at which they were received.

It is expected that operations will shortly be commenced on the new Union Station at Toronto. The railway viaduct, however, will not be begun until next spring.



Noteworthy Test made for Montreal Harbour Commissioners—16 in. Simplex Concrete Pile subjected to load of 46 tons.—No settlement.

grading is completed, but no steel has as yet been laid. About equal progress has been made on the track between Moose Jaw and Caron.

The other C. P. R. branch in Saskatchewan, on which construction work is being done is from Moose Jaw southwest to Mile 35. Grading is going ahead on this branch at a rapid rate.

The controllers of the Montreal City Council are making preparations for public works next spring. With this in view the council has accepted the tender of the Elder Ebano Co. for five hundred tons of refined asphalt at an average price of \$26.74 per ton. The other tenders were: The Bithulithic Company, at \$27.90; Barber Asphalt Company at \$22.10 and \$27.10, and the Mineral Rubber Company, \$26.64. With this five hundred tons and the large quantity on hand there will be sufficient to last until next

The Nova Scotia Society of Engineers

An Active Young Organization which is Achieving Excellent Results in the Maritime Province — Gratifying Progress in Five Years

On November 8th, 1906, a number of engineers met in the Board of Trade rooms at Halifax, N.S., and appointed a committee to ascertain the feeling of the profession as to the advisability of forming an engineers' society, and further, as to whether such a body should be an independent organization or a branch of the Canadian Society of Civil Engineers. This committee was composed of Roderick McColl, Provincial Engineer of Nova Scotia; F. W. W.



Mr. J. W. MacKenzie, of Halifax, President

Doane, City Engineer of Halifax, and E. Brydone-Jack, consulting engineer, and Professor of Engineering at Dalhousie University. The question was placed before the engineers of the province, who decided in favor of an independent provincial society, the organization of which was accomplished on January 4th, 1907.

From the above it must not be assumed that the Society is in any way in opposition to the Canadian Society of Civil Engineers. On the contrary its policy is to induce its members to join the national body in order to obtain the status in the profession thus attainable. The main object in view in the organization of the Nova Scotia Society of Engineers was to consolidate the professional interests of the province, to bring together the various engineering branches and to deal with matters of peculiar or special provincial concern.

An organization meeting was held on Jan. 22nd, 1907, at which a constitution was presented and adopted as revised. At a subsequent meeting on Feb. 6th, 1907, at which there was a large and representative attendance, the following officers were elected: president, Roderick McColl, provincial engineer; 1st vice-president, J. H. Winfield, Manager Nova Scotia Telephone Co.; 2nd vice-president, P. A. Freeman, Chief Engineer Halifax Electric Tram Co.; secretary, E. Brydone-Jack, consulting engineer and Professor of Engineering at Dalhousie University; treasurer, S. Fenn, Supt. United States Direct Cable Co. Councillors: District No. 1,—Capt. Bogart, Royal Canadian Engineers; District No. 2,—W. G. Yorston, City Engineer of Sydney; District No.

3,—J. J. Taylor, Halifax & Guys Ry. Survey; District No. 4,—L. H. Wheaton, Chief Engineer, Halifax & South Western Ry. Auditors: H. W. Johnstone, Assistant City Engineer, Halifax; J. Lorn Allan, Provincial Engineer's Office, Halifax.

The first annual meeting was held at Halifax on May 7-8, 1907. The report submitted by the secretary then showed that the membership at the time of organization was as follows: members 52; associates 8, juniors or students 12. Dr. Martin Murphy, formerly Provincial Engineer, was elected an honorary member. The present membership is as follows: members 86; honorary members 1; associate members 6; juniors 43; associates 6.

The objects of the Society as given in detail in its constitution and by-laws are as follows:

- (a) To act as a bond between all engineers in the Province of Nova Scotia.
- (b) To bring together the engineers, architects, contractors and those interested in engineering work.
- (c) The advancement of engineering knowledge and practice.
- (d) The exchange of ideas between members of the same branch, as well as between members of the different branches of engineering.
- (e) To conduct investigation in regard to the engineering materials found or made in Nova Scotia.
- (f) To collect data as to costs of engineering materials and supplies in the Province, as well as costs of various



Mr. J. Lorn Allan, of Dartmouth, Secretary-Treasurer

kinds of engineering work, in order to determine if costs can be reduced, and still maintain the efficiency desired.

- (g) To investigate the resources of Nova Scotia.
- (h) To raise the standing of the engineering profession in Nova Scotia, and to make it better known as a profession.
- (i) To solidify the engineering profession in Nova Scotia, and make it a power in business and financial undertakings.

The Society holds regular meetings from October until

April. The fourth annual meeting took place on Aug. 18, 1910. We understand that arrangements for the fifth annual meeting are now in progress.

The head office of the Nova Scotia Society of Engineers is at Halifax, N. S., and the secretary is Mr. J. Lorn Allan, Dartmouth, N. S.

Officers for 1910-11

The directorate of the Society is at present composed of the following gentlemen.

President,—J. W. MacKenzie, Assistant Road Commissioner, Halifax, N. S.

Vice-Presidents,—P. A. Freeman, Chief Engineer, Halifax Electric Tram. Company, Halifax; W. G. Yorston, consulting engineer, Liverpool.

Secretary and Treasurer,—J. Lorn Allan, Halifax & Eastern Railway, Dartmouth, N. S.

Councillors,—Hiram Donkin, Deputy Commissioner of Works & Mines, Halifax; A. R. MacCleave, Assistant Road Commissioner's Office, Halifax; R. W. MacKenzie, Crown Land Surveyor, Sydney; D. McD. Campbell, City Engineer, Sydney; A. G. Robb, Robb Engineering Company, Amherst; J. G. MacKenzie, Nova Scotia Technical School, Westville; L. C. Gelling, Town Engineer, Bridgewater; Percy G. Brown, mining engineer, Wolfville.

The Association is loyally upheld by the engineering profession in Nova Scotia and it would appear to have a wide field of usefulness. With such a well organized body in the province we may hope to hear more about engineering work in the Maritime Provinces. In the past, with a few notable exceptions, the particulars published in connection with quite important works have been all too scant and doubtless the professional interests have lost thereby.

C. N. R. Programme of New Alberta Lines

At the next session of the Alberta legislature the Canadian Northern will seek the right to build and operate no less than 14 new railway lines in that province. These lines will open up large areas of country hitherto untouched by railroad development. One of the most important is a line from Athabasca Landing to the Peace river crossing. The general description of these lines is as follows:

From a point on the Edmonton and Slave Lake Railway at or near Athabasca Landing thence in a generally northeasterly direction to a point on the Athabasca river at or near Fort McMurray.

From a point on the line described above, thence in a generally easterly direction to a point at or near Lac La Riche.

From a point on the constructed lines of the C. N. R. at or near Edmonton thence in a northeasterly and easterly direction on the north side of the North Saskatchewan river to the easterly boundary of the province of Alberta.

From a point on the constructed line of the C. N. R. at or near Bruderheim thence in a generally easterly and southeasterly direction to a point at or near Vermillion, thence in a southerly direction to a point on the southern boundary of the province of Alberta.

From a point on the constructed lines of the Edmonton, Yukon and Pacific Railway Company between Stony Plain and Wabanum lake, thence in a generally southeasterly direction to a point at or near township 49, range 8 west of the fifth meridian.

From a point on the authorized line of the C. N. R., at or near Brule lake thence in a generally northwesterly direction for 35 miles more or less.

From a point on the authorized line of the C. N. Alberta Railway at or near Brule lake, thence in a general northerly direction to a point on the authorized line of the C. N. Western Railway Company.

From a point on the authorized line of the C. N. Western Railway Company at or near the crossing of the Little Smoky river, thence in a northerly and northeasterly direction to a point at or near Lesser Slave Lake.

From a point at the authorized line of the C. N. R. Western Railway Company's Brazeau branch at or near the

Medicine river, thence in a generally southerly direction to a point at or near the town of Pincher Creek.

From a point on or near Camrose, thence in a generally southeasterly direction to a point on the eastern border of Alberta.

From a point on the authorized line of the Edmonton and Slave Lake Railway Company at or near Athabasca Landing, thence in a northerly direction to a point at or near Peace River Landing.

12—From a point on the constructed line between Big Valley and Stettler southeasterly to a junction with the Saskatchewan-Calgary line.

13—From a point at or near Calgary thence in a generally northerly direction for a distance of seventy miles.

13—From a point at or near the town of Strathcona, thence in a generally southwesterly direction for a distance of fifty miles.

Manitoba Association of Architects

There was a large attendance at the Manitoba Association of Architects' first monthly meeting of the season held last week. Mr. J. D. Atchison, the president, was in the chair.

One of the most important questions discussed was with reference to the new provisions of the Manitoba Health act, passed at the last session of the legislature. Some of the new provisions of the act which affected the building by-laws of the city of Winnipeg were found to be impracticable, and a committee from the association was appointed to interview the government. The committee reported that the ministers had agreed that some amendments to the act would be accepted, and the same committee was asked to prepare a synopsis of the suggested alterations to the act which the government will introduce at the next session.

The proposed formation of an Art Institute in Winnipeg was also discussed, a report being received from a committee of the association appointed some time ago to confer with similar committees from the Western Art association and the Arts and Crafts Society. The committee reported that a sub-committee had been appointed to work out details for the formation of an institute worthy of the city. The present intention is that the new institute would provide for art classes, the holding of regular exhibitions, etc. For the present the institute would be housed in rented premises, but a movement is already on foot looking to the securing of a permanent building, and it is hoped that both the city and the provincial government may be induced to contribute toward the first cost of such a building.

A special committee was appointed to inquire as to permanent quarters for the association.

Advices from Winnipeg, Man., state that the overhead bridge which the Canadian Northern Railway Company will build over its Fort Rouge yards, in accordance with its agreement with the city, will cross the yards at Hugo street, according to plans just completed by City Engineer Ruttan, and which, it is understood, the railway company has agreed to. The plans reached the Board of Control and were referred to the works and property committee. They show the north approach of the bridge, starting at Pembina highway. When the plans pass the committee application will be made to the Railway Commission for an order. It is expected that the contracts will be let this winter and that work will start early next year.

With the civic works piling up so quickly in Victoria a pressing need is felt for more laborers. At present about 600 men are employed on sewer construction work, and a proposal is made to increase the number to 1,000. This will establish a record for the city.

Personal Mention

Mr. Joseph Perrault, architect, of Montreal, has left for England and France on a business visit.

J. H. Siegfried, formerly of Helena, Montana, has been appointed superintendent of the Winnipeg hydro-electric plant at Point du Bois.

The Society of Beaux-Arts Architects announces the opening of an Atelier in Vancouver, under the patronage of Raphael A. Nicholais, 324 Pacific building.

Mr. D. R. Brown, of Brown & Vallance, architects, Montreal, is on a visit to the West, in connection with the work of his firm in the prairie provinces. He will be away for about six weeks.

Mr. M. Blyzard, lecturer in mechanical engineering at McGill University, has resigned his position at Montreal to accept a post as mechanical engineer in the Government coal testing department.

Mr. H. J. Glaubitz, superintendent of the Waterworks Department at London, Ont., proposes to employ the ultra violet system of water purification. The method is stated to have been used with considerable success in France and Germany.

Professor Ludlow, of the department of architects, McGill University, is giving a course of ten lectures at the Royal Victoria College. Prof. Ludlow is a Licentiate of the Royal Institute of British Architects and an Associate of the Society of Beaux Arts Architects. He has given similar courses of lectures at Columbia University, New York.

Construction News and Notes

The Siemens Bros.' Dynamo Works have opened an office at 707 McArthur Block, Winnipeg.

The Hydraulic Lime and Quarries Company has been formed at Edmonton and will operate lime kilns west of that city. Wm. Vogel is president.

Permits have been issued for the new examining warehouse to be erected for the Dominion Government at Vancouver. The estimated cost is \$380,000.

The value of Winnipeg's permits for the first three-quarters of the year is \$15,828,650, compared with \$13,233,850 for the corresponding period of last year.

The last contract awarded by the old Government was let to M. J. Hogan, of Port Burwell, for the new break-water at Port Stanley, Ont. The estimated cost was \$210,000.

The Canadian Northern Railway will not begin work in their depot at Calgary this year, according to a statement made recently by H. H. McLeod, general manager of the company.

Good progress is being made on the filtration plant of the Saskatoon waterworks. The floor has now been put in, and the work on the walls will be started at once. Engineer Meley, of New York, is preparing comprehensive plans for the equipment.

A six-storey reinforced concrete store and office building will be erected at Columbia and Pender streets, Vancouver. The building will be 25 by 120 feet. The ground floor will be devoted to stores and the upper storeys to offices. Architects Perry & Nicolais will supervise the erection by day labor.

Work will begin shortly on the six-storey reinforced concrete building on Douglas street, Vancouver, which is to be constructed for Bradshaw, Martin & Marymont. Adkinson & Dill, of Vancouver, are the contractors. The ground floor will be occupied by stores and the upper storeys by offices. The building will cost about \$130,000, and will be faced with white glazed terra cotta; oak interior finish, art and wire glass, steam heated.

Engineers Waddell & Harrington, of Kansas City, have submitted to City Engineer Fellowes, Vancouver, plans for four bridges for Hastings, Pender, Keefer and Harris streets, over the G. N. tracks in the eastern part of the city. The plans show alternate bridges, which range in cost from \$223,600 to \$435,100. The lengths of the bridges as estimated would be as follows: Hastings street, 1,200 feet; Pender street, 777 feet; Keefer street, 782 feet, and Harris street, 790 feet.

The following is the list of lectures arranged by the Province of Quebec Association of Architects to be given at 5 Beaver Hall Square, Montreal, during the winter season:—Tuesday, November 21, "Modern Methods in Foundation Work," by Mr. Alexander Allaire, M.E.; December 19th, "Ventilation of Public Buildings," Dr. T. A. Starkey, Prof. of Hygiene, McGill University; January 16, 1912, "Improvements to Traffic Routes in Montreal," Mr. F. G. Todd; February 20, "Mouldings," Prof. P. E. Nobbs, A.R.I.B.A.; March 19, "French Apartment Houses," Prof. Jules Poivert, of the Polytechnic School; April 16, "Colonial Architecture," Prof. T. W. Ludlow, of McGill University.

At the annual meeting of G. T. R. shareholders held in Montreal recently, announcement was made by Mr. Chas. M. Hays, president, that it was the company's intention to establish a chain of first class modern hotels across the country. Of this chain the proposed Fort Garry hotel at Winnipeg is the first link.

There is stated to be no lack of competition for the construction of the proposed tube system at Toronto. Among the outside firms who are known to have figured are Patrick McGovern, Nawn & Son, and Coleman Bros., all of Boston, Mass. Mr. McGovern is the lowest tendered for \$11,000,000 worth of work on the New York subways.

The Fitzhugh Lime and Stone Company, Limited, is being formed for the purpose of operating a valuable deposit of limestone about two hundred miles west of Edmonton, near the famous Roche Miette. The officers of the company are. President, Dr. Hislop; vice-president, J. Hall; secretary, C. Hyndman; directors, H. Hyndman, P. J. Craddock, J. P., and G. Conway Brown; solicitors, Hyndman and Hyndman.

In his forthcoming annual report, Mr. Alcide Chausse, building inspector of the Montreal City Council, will recommend considerable additions to his staff of inspectors. What is required is a staff of men sufficiently large to go over the building permits in every detail, and take cognizance of the strength of materials required; as well as a larger force of inspectors to superintend the erection of buildings according to specifications.

The value of buildings for which permits have been issued in Victoria, B.C., during the nine months ended September 30, is now over the two-and-a-half million mark. According to figures issued by Building Inspector Northcott, the aggregate value of new buildings this year is \$2,604,215, compared with \$1,837,625 for the corresponding period a year ago, an increase of \$766,590, or forty-two per cent. Compared with 1909 the increase is no less than \$1,160,920, or eighty per cent.

Obituary

We regret to report the death of Mr. S. R. Poulin (Chief Engineer, District F, National Transcontinental Railway), which occurred suddenly at Winnipeg last week as a result of heart failure.

J. H. King, of King Bros., builders and contractors, Toronto, died last week in the General Hospital at Toronto. Deceased had been a resident of the Queen City for the last 40 years and was well known to the trade.

Mr. Samuel Hooper, of Winnipeg, Provincial Architect of Manitoba, died suddenly in London, Eng., on October 19. He had been troubled with bronchitis and asthma for some years and had gone to the Old Country in the hope of obtaining relief from specialists. The news of his death came as a great shock to the architectural profession and contracting community of the West. The late Mr. Hooper went to Manitoba thirty years ago, and took up his residence in Winnipeg, where he established the Hooper Marble Works. While engaged in that business he designed and executed the monument erected in St. John's cemetery,



The late Samuel Hooper, Provincial Architect of Manitoba

Winnipeg, to the memory of Hon. John Norquay, and also the monument in the Winnipeg city hall square commemorating the deeds of those who fell in the Riel rebellion in 1885. Subsequently Mr. Hooper took up the profession of architecture, which he had learned in England as a young man in the office of his uncle, who was at that time surveyor of the Duchy of Cornwall, one of the estates of the Prince of Wales. He was born in Devonshire, Eng., in 1851, and came to Canada at the age of 18. He was a member of the council of the Royal Architectural Institute of Canada.

R. V. Winch & Co., Vancouver, acting for an English syndicate, have purchased the water rights of the Paterson-Eckert Lumber Company., and 110 acres of land at Chilliwack, B. C. A \$500,000 cement plant is to be erected. The company has been formed to manufacture cement from the shale and limestone deposits of which that section of the foothills abounds. From tests taken of the material it has been found that cement of the first class can be

manufactured. The entire mountain side is full of a material which geologists have pronounced to be lava and other volcanic deposits. The plant and development machinery will involve the expenditure of a million or more dollars. A concern large enough to employ 500 men from the outset is proposed, and this force will be increased as the demand for cement warrants. To facilitate the transportation of the product it is said that the B. C. E. Railway Company have agreed to extend their line from Chilliwack to the plant, and have it running within a year.

American Road Builders' Association

The American Road Builders' Association have issued an informative little booklet devoted to their plan and purpose, constitution and by-laws.

The Association was first organized in the year 1902 as the American Road Makers' Association, the objects of which were the betterment of the highways throughout the United States. At first its membership was small, consisting mainly of the highway officials of such states as had instituted state aid and established highway departments. As the state aid principle became more widely applied, the scope of the organization was enlarged and a stronger effort made to extend its membership. Later, the name was changed to the American Road Builders' Association, and in the year 1910 it was duly chartered, without capital, under the laws of the state of New York. The Association represents the first organized effort to unite in a national body those identified with road building in the United States and Canada.

The aims and objects of the Association may be stated as follows:

First, to unite in a national organization all those in the United States and the provinces of Canada who are actively engaged in laying out or supervising the work of construction and maintenance of roads and streets, and all others especially interested in highway development.

Second, to carry on a campaign of education among its members, and thereby raise the standard of road building and street paving.

Third, to advocate the principle of state aid in highway improvement and to help in its extension.

Fourth, at its conventions to devote its sessions especially to the presentation of papers and discussions on three topics connected with highway improvement, viz.: organization, construction and maintenance.

The secretary of the Association is Mr. E. L. Powers, 150 Nassau street, New York City.

Publications Received

The Contractors' and Builders' Handbook, by Wm. Arthur (David Williams Co., New York, \$2). A practical treatise divided into three sections, the first dealing with the contractor as a business man, the second as a constructor, and the third as a citizen and tax payer. Under these headings are grouped business affairs, technical subjects and matters of general interest to the building fraternity. There are tables of the proper thickness of walls, the strength of columns, floor loads and such things. There is a chapter on the contractor's public duty to decrease the fire loss and increase the safety in buildings. There is a discussion of the best place for a building contractor to locate and there are accounts of some of the most noted buildings of ancient and modern times. It is apparent, therefore, that the scope of the book ranges through such a wide field that any attempt to enumerate the contents is out of place here. The work is decidedly interesting and helpful.

Canadian Car and Foundry Co.'s Operations

The Canadian Car and Foundry Company of which Mr. N. Curry is president, have some important building operations in hand with the object of increasing their capacity. At Turcot, near Montreal, their facilities for constructing passenger cars will be doubled, which will enable the company to turn out 125 cars per annum. They have just completed a steel car plant for building steel underframes and composite cars. The shops at "Dominion," just outside Montreal, are also being extended, to the extent of 50 per cent; at this place "all steel" cars are constructed.

The Canadian Steel Foundries, Ltd., an allied concern, are erecting a plant at Longue Pointe, at a cost of about a million dollars, which will be ready at the beginning of the year. The Dominion Bridge Company are furnishing the steel work; C. E. Deakin is doing the balance of work on the main building; and the Bishop Construction Company and C. E. Deakin have some work on minor buildings.

The buildings, &c., cover 35 acres, at Longue Pointe, and the company will have a capacity of 25,000 tons of steel castings per annum; this includes manganese steel, switch work, and other material used in street and steel railway construction.

Progress at Battleford is represented by contracts amounting to \$1,260,000, all of which are under actual construction and to be completed by April 1 and July 1, 1912.

Stationary Equipment for Lighting Construction Work of all Kinds at Night

The Pyle-National Electric Headlight Company, of Chicago, has had on the market for the past year a most successful stationary lighting equipment for contractors, which constitutes a practical outfit for lighting construction work of all character at night. The equipment is particularly adapted for steam shovels, drag line excavators, dredges, wrecking cranes, heavy foundation work, tunneling, grading, etc.

The equipment complete consists of a small steam turbine engine with a direct connected dynamo, an arc lamp with a special reflector in a portable weather-proof case. Electric current for the lamp is supplied by the dynamo delivering about 35 amperes at about 35 volts. The very low voltage makes it impossible to get a shock from the equipment, no matter how it is handled. This is an especially valuable feature for out-door work where many common laborers are employed. The working parts of the dynamo and engine are so simple that any hoisting engineer or man of similar experience can understand it at once.

The lamp with a special reflector is about 250,000 candle power. When the reflector is set to diffuse the light the area in front of it within a radius of 150 feet is illuminated so that work can be handled with practically the same efficiency as in day-light.

The outfit is shipped so that it can be set up by anyone familiar with construction plant. All that has to be done is to set the turbine-dynamo unit in a place convenient to a boiler and make a three-quarter-inch steam pipe connection from the boiler to the turbine engine. No permanent foundation is necessary.

The only attention required after the machine is running is to see that it is kept oiled and to trim the lamp when carbons are consumed. One carbon will burn between eight and nine hours.

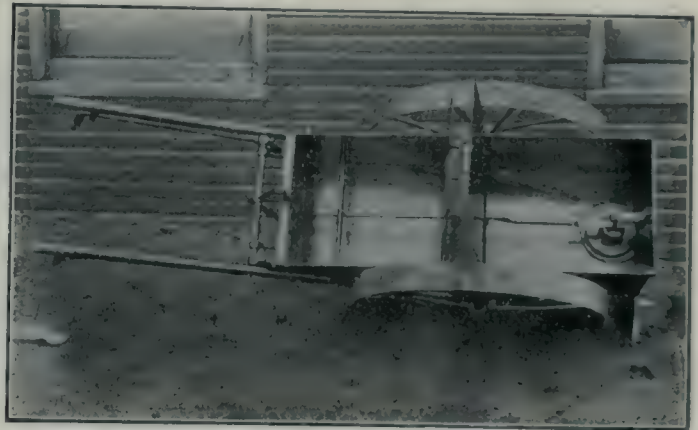
The Pyle-National Electric Headlight Company issues a booklet entitled "How to Increase the Efficiency of your Night Shift," which explains this equipment and shows

some views of different jobs taken at night with no other light than that furnished by one of their special stationary lighting equipments. They will be very glad to mail one of these booklets, free of charge, to anyone interested in lighting night construction work of any character.

The "Eldus" Hot Asphalt and Oil Distributor

This machine is designed to apply the bituminous binder in road building in a way which will produce the best possible results at a minimum cost. It is undoubtedly true that up to the present time the best results in general have been secured when the bituminous binder was poured by hand, the main objections being that it was impossible to secure an even distribution of material and the excessive cost of labor.

The picture shown will give a good idea of the operation of the "Eldus." The tank holds 40 gallons. After it has been filled, the operator moves to the point where he intends to begin the distribution of the bitumen, opens the valve and walks the required distance to secure the spreading of the quantities specified. The distribution secured is absolutely uniform, and in every respect the results ob-



The "Eldus" Distributor

tained are better than hand pouring. The wheels measure 30 in. x 3 in., making it extremely easy to draw the machine over any surface.

As to the cost of pouring with the "Eldus" as compared with hand work, the following tables are submitted:

"Eldus"	
3 men, 1 day each, at \$1.75	\$5.25
1 pair canvas gloves	.10
¼ gallon kerosene	.025
¼ day foreman, at \$3.00	.75
	\$6.125

700 ft. of 16-ft. road per day, or 1,244 sq. yds., and at rate of 1¼ gal. to sq. yd., making a total of 2,177 gals., or at cost of .0028 per gal.

Hand	
3 men, 1 day each, at \$1.75	\$5.25
6 men, ½ day each, at \$1.75	5.25
1 foreman, ½ day, at \$3.00	1.50
3 pairs canvas gloves at .10	.30
½ gal. kerosene oil, at .10	.05
	\$12.35

400 ft. of 16-ft. road per day, or 711 sq. yds., and at rate of 1¼ gal. to sq. yd., making a total of 1,242 gals., or at cost of .01 per gal. to pour.

Canadian municipalities and engineers will be well advised to secure prices and full information which may be

obtained on application to Henry J. McCoy Company, 65-67 Dey street, New York, N. Y.

A Pioneer Roofing Firm

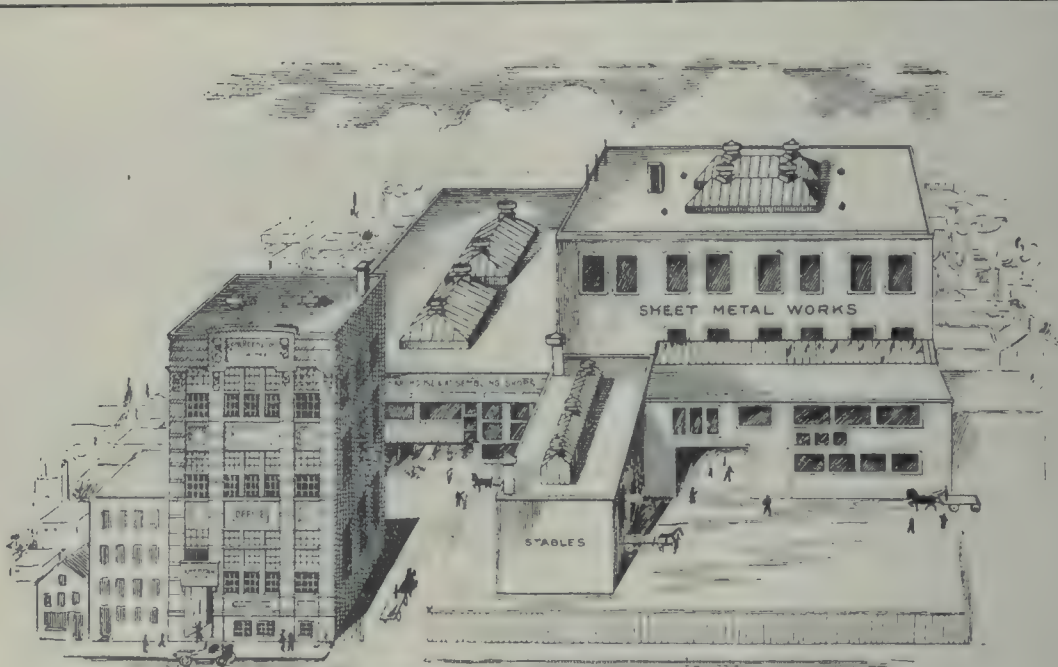
One of the oldest roofing concerns, possibly the oldest and largest in Montreal, is George W. Reed & Company, Limited, 37 St. Antoine street. This firm was established in 1852 by the late George W. Reed and was carried on successfully by him until 1897, when it was taken over by the late Mr. Charles T. Williams, who had been for some years closely associated with Mr. Reed.

Mr. Williams conducted the business until 1906, when Mr. F. H. Barwick was admitted to partnership. In 1907 the business was incorporated under the firm name now in use. Mr. Barwick, who had been with the firm for thirty years, at this juncture became the vice-president, and on the death of Mr. Williams he became president and managing director of the company. Mr. Reed was one of the pioneers in the

They have done considerable work for the C. P. R. at Winnipeg, in Montreal and other centres; also for the Dominion Textile Company and other large corporations such as D. G. Loomis & Sons, John Fenderson & Company, Sayabec, the Argenteuil Lumber Company, the Montreal Last Company, and about a dozen Montreal shoe factories, and various other establishments in different parts of the country.

While this firm have always been specialists in the roofing line, the quality of their work in the sheet metal and ventilation departments has caused these lines to expand to an extraordinary extent. The company now have on their pay roll 250 men. A large proportion of these are trained journeymen, for it will be readily understood that only skilled labor can be employed satisfactorily on roofing, asphaltting, and metal working.

The company have been fortunate in being able after considerable planning and negotiations, to concentrate their



Office and Sheet Metal Works of Geo. W. Reed & Company, Limited, Montreal

slate roofing business, that being at the start the only work engaged in by him. Gradually, however, the business has developed in several directions until it now includes all kinds of sheet metal roofing, gravel and composition roofing, asphalt and cement paving, mill flooring, the manufacture of fireproof doors and windows, the installation of ventilation and exhaust systems for planing mills, wood-working shops, shoe factories, pulp and paper mills, cotton and woollen mills, jewelry factories, brass and iron foundries and other factory and office buildings. This company does a general sheet metal business in all departments of that industry.

While claiming to have in their factory the most modern equipment in Canada they are just now adding new machines which they claim are superior to any now in use in this country. They are now filling a contract for an exhaust system in the factory of the Hartt Boot & Shoe Company at Fredericton, and are also installing the sheet metal work in the ventilating system of the Ogilvy Building on St. Catherine street, Montreal. They have numerous contracts of this character in various centres throughout the country.

factory, ware-rooms, yards and offices in St. Antoine street. The original office occupied by Mr. Reed was in Craig street, a short distance east of their present premises. The expansion of the various lines compelled the company some four or five years ago to provide themselves with a large factory on Latour street. Their present premises extend through from St. Antoine to Latour and they moved into their fine red brick offices on the first of last January. First quality in goods and satisfactory workmanship have always been insisted on by the heads of the firm, with the result that to-day a large number of the most important buildings in Montreal stand as silent testimony to the excellence of their work.

A \$260,000 hotel building is to be erected for How Wing at the corner of Hastings street and Gore avenue, Vancouver. It will be of six storeys, containing nine stores on the ground floor, with office and rotunda. The upper floors will contain 214 rooms. It will be a modern fireproof structure, and the plans have been prepared by Mr. Patrick J. Donohue, architect, of Vancouver.

Contracts Department

News of Special Interest to Contractors, Engineers, Manufacturers and Dealers in Building Supplies.

Information for insertion in these columns is invited from Architects, Contractors, Engineers, etc.

Waterworks, Sewerage and Roadways

Calgary, Alta.

Controller Davidson recommends the opening of O'Connor street, the widening of Wellington and Riverdale avenue. Work to be done as local improvement.

Coquitlam, B. C.

The council are contemplating the construction of about 20 miles of sidewalks this fall.

Dundas, Ont.

A by-law will be submitted shortly for an expenditure of \$8,000 for sidewalks.

Edmonton, Alta.

The council approved of recommendation of commissioners that tenders be called at once for the proposed paving. Cost \$380,000. City engineer, A. J. Latournell.

Granum, Alta.

Tenders are called for purchase of \$2,500 debentures for the purpose of grading and draining until October 31. C. E. Cameron, secretary-treasurer.

Hamilton, Ont.

Cement walks and curbing will be laid on Wentworth street, \$1,680, 25.4 cts. per ft. Dunsmuir avenue, \$394.80, 13.2 cts. per ft. East Bend avenue to Highland avenue, \$903.45, 24.6 cts. per ft. Primrose avenue, \$2,892.56, 21.6 cts. per ft.

Hardisty, Alta.

Tenders are called until October 31 for purchase of \$3,000 debentures for street grading and plank sidewalk. A. Mursell, secretary-treasurer.

London, Ont.

Ald. Morgan has given notice of motion that at next meeting of council he will move that the city engineer be instructed to prepare estimates for a storm sewer system.

The council has decided to replace the old flagstone sidewalks on the business streets with cement walks, at a cost of about \$25,000. Tenders will be called shortly for construction. City engineer, G. W. Wright.

Tenders are called until Oct. 19th for pavement on Cabell street. City engineer, Geo. W. Wright; chairman No. 2 committee, Neil Cooper; construction of macadam pavement. Address "Chairman and Members No. 2 Committee," 10 per cent. of tender to accompany each bid.

New Westminster, B. C.

City engineer J. W. B. Blackman estimated the probable cost of installing and operating a rock crushing plant (crushing capacity of 200 cu. yds. per day) at \$2,000 per year. It was suggested that small portable crusher be purchased to operate in conjunction with steam roller.

Niagara Falls, Ont.

By-law to raise \$60,000 to convert Muddy Run Creek to a 5-ft. 10-in. sewer, which was defeated last summer, will probably be submitted again in January.

North Vancouver, B. C.

The ratepayers will vote on two by-laws shortly to raise \$200,000 for improvement of Keith road and for other street purposes.

The \$63,000 by-law for extension to waterworks, street maintenance and addition to fire department fund carried.

Tenders are called until Oct. 23rd for supply of material and construction of sewers on Esplanade and Crescent street and Second street. Cheque for five per cent. of tender and bond for 25 per cent. is required. City engineer, G. S. Hanes.

Point Grey, B. C.

Tenders will be called shortly for gate valves for water system, from 4 in. to 12 in. in size. Municipal clerk, H. G. Floyd; engineers, Cleveland & Cameron. Winch building, Vancouver.

River Glade, N. B.

Gould Shapeley, Muir, Brantford, Ont. will install water system for fire protection at the Jordan Sanatorium. The system includes a 20,000 gallon tank erected on a 60-ft. steel tower and supplied with water from river by a hot air engine.

Ridgetown, Ont.

Tenders will be called shortly for a fire pump, gasoline engine and a producer gas engine in connection with the new waterworks system. Engineer, C. E. Farncombe, London.

St. Mary's, Ont.

Tenders are called for supply of material and construction of Dyer Drain Extension, Bott Drain Extension, and Roulston Drain Extension. Plans, etc., at offices of M. N. Wright, Thorndale, and F. W. Farncomb, London. Received by township clerk until Oct. 28th, or by M. N. Wright, Thorndale, until noon, Nov. 1st.

Saskatoon, Sask.

By-law will be submitted to vote \$100,000 for purchase of land opening up streets etc. Date, November 3rd. City clerk, Andrew Leslie.

Sudbury, Ont.

Tenders are called for sewerage. Mayor, L. O'Conner; town clerk, Geo. Elliott; engineers, Chipman & Power, Mail Bldg., Toronto. Construction on following: sewers, sewage, pumping station, sewer pipe. Plans, etc., at office of resident engineer and at office of engineers. Received by town clerk until November 16th. Tenders for "Main sewers" and "Disposal Work" called within a few months.

Selkirk, Man.

The Corporation of Selkirk will present a petition to council for asphalt on principal streets, a distance of about two miles. Ald. Simpson, vice-president, Winnipeg. Industrial Bureau is interested.

Toronto, Ont.

Following local improvements are recommended: grading, \$4,794; curbing, \$1,830; medium asphalt pavement, \$16,753; concrete, \$13,315; concrete sidewalks, \$17,116.

The City Engineer has recommended extension of Harrington ave.; widening of Christie street; widening and grading of Chelset ave., westerly; widening and grading of Central ave., from Indian rd. easterly to Barrett ave.; cement concrete sidewalks, \$21,095; asphalt pavements, Huntley street, \$1,134; Salem ave., \$6,728; also concrete curbing; St. Anne's road, \$3,207; also concrete curbing. Laing street, \$7,031; brick block pavement, St. Lawrence, \$8,795.

Vancouver, B. C.

Tenders will be called shortly for bitulithic paving on Parker street, concrete from Gore to Jackson; creosoted wood block on lane, etc. City clerk, W. McQueen.

Wingham, Ont.

Additional wells will be sunk to extend water supply. The Petrolea Well Digging Company is at work sinking one well now.

CONTRACTS AWARDED

Bridgeburg, Ont.

Work was begun on the Lewis street sewer, by Contractor Connolly. Cost, about \$9,000; 15-in. tile will be used.

Port Colborne, Ont.

The contract for construction of one and three-quarter miles of cement concrete sidewalks has been awarded to Henry Nelson, Port Colborne, at 8.7c per foot. Work amounts to about \$4,000, and will be done under supervision of G. Dunham, chairman of board of works.

Scott, Sask.

Contracts for the construction of the power house equipment, waterworks material, laying of mains, have been awarded as follows: Power house, Gowe & Yeo; electrical apparatus and pumping machinery, Canadian Westinghouse Co; pneumatic storage tanks, Polson Iron Works; hydrants, valves, etc., T. McAvity & Sons; water mains, Drummond McCall Co; poles, Lindsey Bros.; line material, Northern Electric Co.; wire, Eugene Phillips Co.; erecting pole line, Fletcher & McGarvey; reservoir, Gowe & Yeo; laying mains, day labor; crude oil machine, Diesel Engine Co.

Victoria, B. C.

The contract for 70,000 yards of paving has been signed by the Worswick Paving Company, and work will be commenced at once.

Railways, Bridges and Wharves

Brandon, Man.

The C. P. R. directors report favorably on the continuing of double track from Brandon to Medicine Hat, 524 miles.

Belleville, Ont.

The Canadian Pacific Railway have asked for tenders for extensions of their line from Perth to Belleville, and have placed an order for 25,000 tons of rails.

Calgary, Alta.

Grand Trunk Pacific Railway by-law carried and A. H. Fitz, 1st vice-president announced on the 11th that their depot will be completed. Enquiries to be directed to head office as no plans are being prepared in this city.

Coquitlam, B. C.

Excavation tenders will be called preparatory to erecting shop, round house, etc., early in the spring, for Canadian Pacific Railway, Montreal. General Supt., F. Busteed; Divisional Supt., J. Rindall.

Fort Erie, Ont.

High level bridge across Niagara river, suspension type, steel, concrete abutments. The estimated cost \$800,000 to be borne jointly by the Canadian and American governments. Date set for dedication, 1915. Address:—Memorial Peace Bridge Committee, Bugalo, N. Y.; also secretary Fort Erie Board of Trade who will forward all enquiries to the joint committees where they will receive prompt attention.

Islington, Ont.

A by-law has been passed by the Etobicoke Township Council to raise \$8,000 for sub-way purposes.

Kamloops, B. C.

The present bridge across South Thompson is condemned by Mr. Griffiths, engineer, and work on a bridge will commence at early date—probably not of steel construction. Public Works engineer, F. C. Gamble, Victoria. B. C.

Lindsay, Ont.

The council approved of G. T. R.'s plans for reconstruction of bridge over Logie street and the clerk notified Railway Commission of same.

London, Ont.

The city will at once take up the matter with the London Street Railway Company re extensions of lines. It is altogether probable that several miles of new line will be built and additional equipment purchased.

London Street Railway; manager, C. B. King. At a meeting to be held shortly the question of purchasing equipment for power house, extension of lines and purchase of cars will be taken up.

Montreal, Que.

Survey parties have started work on the proposed Quebec Eastern Railway. It is reported that Mr. Rudolphe Forget and Mr. J. N. Greenshields are interested.

The Canadian Car & Foundry Company, Eastern Townships Bank, are doubling the capacity of their passenger car shops at Turcot and Dominion, which will enable them to turn out 125 cars a year. They are also extending their steel shops at Dominion near Montreal to give an increase in capacity of 50 per cent.

North Toronto, Ont.

Report has been presented for a new street railway. Single track, switches and turnouts, ballast construction, cedar ties, standard T rail; to operate five years, when permanent steel construction and sewer fills will be put in. Route, Melrose ave. south on Mt. Pleasant rd. to St. Clair ave. E. A. James, engineer, Eglinton, Ont.

Niagara Falls, Ont.

Water Commissioners have engaged Wm. Kennedy, hydraulic engineer, Y.M. C.A. building, Montreal, to estimate cost and advise re deepening intake channel. Town engineer, J. C. Gardner.

Nanaimo, B. C.

Tenders for clearing the right-of-way of the E. & N. Railway between McBride Junction (about 20 miles from Nanaimo) and Comox (Union Bay) have already been called for and close Oct. 16th. Tenders for the grading between McBride Junction and Comox, a distance of 37 miles, will be called for within the next three months. Construction of the remainder of the line to Campbell river will not be undertaken until a later date, probably early next spring. H. E. Beasley, superintendent, Victoria; R. A. Bainbridge, divisional engineer, Victoria.

Ottawa, Ont.

Tenders are called until Nov. 8th for construction and erection of 150 h.p. horiz., return tubular boilers at the following: Wapodogaan, N. B., Edmunds, ton, N. B., and Cochrane, Ont. Plans, etc., at office of W. J. Press, mechanical engineers, Ottawa. Comms. Transcontinental Railway; secretary, P. E. Ryan.

Romney, Ont.

The township is contemplating an expenditure of \$4,050 on a new bridge and laying new drains. Engineer, Alex. Baird, Leamington.

Rossland, B. C.

An important change is reported on the Rossland-Trail section of the Canadian Pacific Railway. The company is taking steps to electrify the route between the mines of Rossland camp and the large smelter of the Consolidated Mining & Smelting Company, at Trail.

St. Boniface, Man.

A meeting is to be arranged with representatives from Winnipeg City Council, and Provincial and Federal Governments regarding the erection of a bridge between the two cities of St. Boniface and Winnipeg over the Red River. Aldermen interested, Lachance and Marion.

St. Valerier de Milton, Que.

Tenders are called until Nov. 1st for construction of bridge over Black river, 203½ ft. in length, superstructural steel and concrete abutments. Plans, etc. obtained from department of Public Wks., Que. Secretary-treasurer, C. Boutellier.

Toronto, Ont.

Permission has been granted to city by the Railway Commission to construct a subway on Coxwell avenue to carry four tracks, the cost to be borne by the city. City engineer, C. H. Rust.

Railway material required for C. N. R. 200 round head rivets, ¾ in. x 5½ in., for retaining rings on steel tyred wheels; 100 steel countersunk head boiler patch bolts, 1 in. diam. by 1 in. long (12 threads; 100 steel countersunk head boiler patch bolts, 1 in. diam. by 1½ long, 12 threads; 100 steel countersunk

head boilers patch bolts, 1½ in. diam. by 1½ in. long, 12 threads; 100 steel countersunk head boiler patch bolts, 1¼ in. diam. by 1¾ in. long, 12 threads; 100 iron collar screws, diam. of screw 1 in., 1½ in. long, diam. of collar standard, 12 threads to inch; 100 iron collar screws, 1½ in., 1½ in. long, diam. of collar, standard, 12 threads to inch; 100 iron collar screws, diam. of screw 1½ in., diam. of collar, standard, 12 threads to inch, 1½ in. long. Note—all finished sizes, V-standard thread, iron collar screws to be threaded within 1½ in. of collar. J. W. Corbet, purchasing agent.

Vancouver, B. C.

Tenders were received until 4.30 p.m., October 16th, for the supply of 286 five-light standards for streets, and several thousand feet of galvduct conduit; Wm. Queen, city clerk. Particulars with J. A. McCrossan, city electrician.

Victoria, B. C.

Tenders will be called by Canadian Northern Railway for construction of 40 additional miles—60 m. now being built northward from here. Part of section to be awarded will follow the Cowichan river, thus opening up numerous timber limits. Line already located to Alberni.

Wilkie, Sask.

The surveying and staking out of 12 town sites on the new Canadian Pacific Railway lines being built from this town have commenced. The towns to be located this fall on the Wilkie-Moose Jaw line are Redford, Leipsic, Pascal, Handel and Calfee. On the Wilkie-Lacombe line are Prevenue, Lamping Lake, and Broadacre, and those on the Cutknife branch are Thackeray, Cloan, Rockhaven and Cutknife. Marchants, bankers and tradesmen are already on the grounds, and many buildings will be erected in these places as soon as the stakes have been driven.

Woodbridge, Ont.

Tenders will be received by Ed. W. Brown, village clerk, until October 27, for the purchase of Humber bridge debentures worth \$335,806.

CONTRACTS AWARDED

Sydney, N. S.

British Canadian Shipbuilding & Drydock Co. are reported to have secured the right to construct graving and dry dock here. Adolph Bernasconi, resident engineer. Estimated cost, \$4,500,000.

Port Hood, N.S.

Department of Public Works, Ottawa, has awarded contract to A. D. McIsaac, Port Hood, for raising and extending the breakwater. Estimated cost \$100,000.

Vancouver, B. C.

The contract for the Kitsilano bridge has been awarded to Armstrong, Morrison & Company, Bower Building. It includes the building of a double track bridge, with the exception of the draw span, present one being used. Austrian hardwood will be used.

George H. Webster, Fairfield building, Vancouver, has been awarded the contract for grading for double tracking for B. C. E. Ry., from 24th avenue to Eburne—no contracts.

Wheatley, Ont.

Breakwater to cost \$28,000, for Department of Public Works, Ottawa. Contractor, Wm. Birmingham, who will reside in Chatham until the contract is finished.

Public Buildings, Churches, Schools, etc.

Calgary, Alta.

The Hillhurst English Church are having plans prepared by Architect Leo. Dowler for the erection of additions and alterations to their church to cost about \$20,000.

Guelph, Ont.

The Homewood Sanitorium will be erected at an estimated cost of \$400,000. Fire protection system, new hydrants, tile walls, and thoroughly up-to-date equipment will be required.

Hamilton, Ont.

Fire, police and jail committee contemplate submitting by-law to people for expenditure of probably \$50,000 on new central fire station. City clerk, S. H. Kent; chairman of committee, Ald. Clark, 7 Main street west.

Kingston, Ont.

A by-law will be submitted to the rate-payers in January to guarantee bonds to a company of Boston capitalists for \$100,000 for a new hotel.

Lethbridge, Alta.

The Board of Education will call for plans and specifications for a new 8-room school on Ninth avenue.

Montreal, Que.

Tenders are called for erection of a fire station on Mill street. Architect, Finley & Spence, 46 Beaver Hall Hill, Montreal, where plans may be seen. Received by Board of Commissioners until noon Oct. 25th.

North Vancouver, B. C.

The by-law providing for purchase of property for school purposes carried.

North Battleford, Sask.

\$16,000 was voted for site last session for erection of a new post office.

Sketches are being prepared for erection of a brick hospital to cost \$30,000, for Order of Sisters, Roman Catholic Church. Architect, C. J. Stephenson.

Niagara Falls, Ont.

The Independent Order of Foresters are contemplating the erection of a lodge building to be erected at corner of Ontario avenue and Queen street next summer. No plans prepared. Sec.-treas., Wm. House, Morrison street, Niagara Falls.

Italian citizens are planning to secure site for the erection of a church—Peter Lorenzo, contractor, Niagara Falls. Chairman of committee in charge.

Oak Bay, B. C.

The by-law to raise \$20,000 for school purposes carried.

Port Colborne, Ont.

The school board has purchased from Mr. G. Pietz, 4½ acres on the east side of the Welland canal, on which they will build a school in the spring.

Pincher Creek, Alta.

The Pincher Creek Rink Co., capital \$10,000, have secured option on a building site.

Regina, Sask.

\$35,000 by-law for Exhibition buildings carried.

Saskatoon, Sask.

Telephone building for Department of Public Works, Regina; architects, Storey & Van Egmond, Regina. The building is to be 3 storey, 35 x 70, faced with

mottled Roman bricks, and will have a stone entrance. The third floor is to be dust-proof and to be ventilated by fan system. Floors are to be patent rubber substance.

South Vancouver, B. C.

Steps are to be taken at once towards securing a site for the erection of an isolation hospital.

Toronto, Ont.

The Board of Railway Commissioners approved of the plan prepared by Board of Trade for the new Union Station which provides for ten tracks for local trains to be reached by gates and 6 for through trains to be reached by subways.

Plans are being prepared for addition to cathedral for Church of England, (St. Alban's), Bishop Sweeney; architects, Symonds & Rae, 15 Toronto street, Toronto. Increasing dimensions to length, 250 ft., width 136 ft., height (floor to top of vaulting), 62 ft. 6 in.

Victoria, B. C.

Plans are pending for erection of a theatre building, Government and Bay streets, to cost \$100,000. Local capitalists are interested.

Two schools will be erected in Comox district. Department of Public Works, Victoria. Public Works Engineer, J. E. Griffiths. Tenders received for 1-room school at Nob Hill until Oct. 27th; for 1-room school at headquarters of district until Oct. 31st. Plans, etc., at office of department.

Vancouver, B. C.

R. F. Tegen, 807 Metropolitan building, has been chosen as architect for the new \$400,000 St. Paul's hospital here. Plans are being prepared.

Tenders were opened for the new isolation hospital in Hastings. One set is for construction entirely of wood, and the other provides that the administration department shall be of brick. Vancouver Construction Co., \$44,771 and \$52,871; Chas. F. Perry, \$59,435 and \$62,244; Shaw Brothers, \$60,536 and \$62,036; Campbell & Wilkie, \$45,581 and \$50,011. Referred to City Engineer Fellows.

A site has been purchased at the corner of 5th avenue and Pine street for a police sub-station.

Welland, Ont.

Wm. Dawdy is contemplating a frame addition 45 x 20, to the opera house. Work to be done by day labor. Streets and additional lighting.

Winnipeg, Man.

Architect E. D. Tuttle, 701 McArthur Block, is preparing plans for a school to be erected next spring in St. James.

Tenders are called for erection of a school, East Winnipeg. Board of Trustees, Springfield Road, East Winnipeg. Architect, J. A. Hudon, Builders Exchange, Winnipeg. 4 rooms, brick veneer. Received by H. Fuller, sec.-treas., S.D. 1568, box 83, Transcona P. O., Man. until 6 p.m. Oct. 24th.

Weyburn, Sask.

The Sisters of Our Lady of the Cross are contemplating the erection of a large hospital here.

Yorkton, Sask.

The Sisters of Sacred Sacrament of Antoine, France, have selected Yorkton as the most suitable site in the province

at which to locate \$150,000 hospital, and plans are now being prepared.

CONTRACTS AWARDED

Burnaby, B. C.

Prison farm building to cost \$500,000. Public Works Department, Victoria. Engineer, J. E. Griffith, Victoria. General contractor, Smith & Sherbourne, 615 Hastings, W. Vancouver. Construction of administration and prison buildings. 4 storeys in height, 346 x 200, main building, steel and concrete, with orick facings, wings of concrete, with 250 steel cells. The general contractors will handle all the minor contracts, with the exception of heating, wiring, plumbing and grill steel and possibly the structural steel.

Cardinal, Ont.

Extension to Presbyterian church to cost \$2,500. Architect, A. Stuart Allaster, Brockville; contractor, Rankin & Co., Cardinal; brick, cement, composition and slate roofing. Heating system already installed. Contract awarded Oct. 12th.

Goderich, Ont.

Excavation has started for a Masonic Lodge to cost \$25,000. Contractor, Goderich Planing Mills Co., Goderich; 3 storeys, red brick, stone foundation, electric lighting, steam heating. Complete interior fittings, lighting and heating apparatus to be bought.

Haileybury, Ont.

Convent to cost \$45,000, for Roman Catholic Church (Bishop E. A. Latulippe, Haileybury). Architect, Eugene Payette, 103 St. Francois Xavier, Montreal. Contractor, V. Ladouceur, 107 Augusta street, Ottawa; 4 storeys, 106 x 54, stone, concrete foundation, hot water heating, electric lighting, galvanized iron roof. Work not started.

Hamilton, Ont.

Church to cost \$25,000, Main St., near Ferguson avenue, for First Congregational Church. Secretary of Church, W. J. Atchison, 98 Main street, Hamilton; architect, Stewart McPhie, Bank of Hamilton Bldg., Hamilton; general contractor, Geo. E. Mills, 614 King street E., Hamilton; carpenter, L. J. Beattie, 19 Lock street S., Hamilton; painting and glazing, Goodale & Laidlaw, 20 Hunter E., Hamilton; plumbing, Geo. Stevenson, 15 Walnut S., Hamilton; roofing, Geo. E. Mills; contractor for iron work, Ham. Bridge Co., Stewart street, Hamilton; electrical work, Chadwick Bros., 193 King E., Hamilton; heating, McLary Co., York and Bay, Hamilton. Contract let Oct. 12; seating contract not yet let.

Kamloops, B. C.

Addition to Provincial Home to cost \$150,000, for Department of Public Works, Victoria, B. C. Architect, Frank Owens; general contractor, Johnson & Co., Kamloops. \$45,000 contract covers only east wing, the 1st unit of larger building contemplated.

Lennoxville, Que.

The contract for the 2-storey school has been awarded to A. O. Belodeau. Sherbrooke, 85 x 54, brick and stone. Architect, J. W. Gregory, Sherbrooke.

Montreal, Que.

Foundation contract has been let for church on Hutchison and St. Viateur streets, for MacVicar Memorial Presbyterian congregation; Rev. J. G. Potter, B. A., pastor. Architects, MacVicar &

Heriot, 104 Union avenue, Montreal. Contractor for foundation, Reid, McGregor & Reid, 668 St. Catherine W., Montreal. Balance of construction deferred until spring.

St. Leonard de Port Maurice, Que.

Contract for school to cost \$7,000 has been awarded to Lalonge & Gascon, 2817 St. Hubert street, Montreal, stone, brick, wood, concrete foundation, metal roof, hot water heating, electric lighting.

St. Pierre aux Liens, Que.

Work is in progress for a residential school to cost \$37,000 (Bluebonnets) for Catholic School Commissioners. Architect, Dalbe Viau, 76 Gabriel street, Montreal; general contractor, J. H. Leboeuf & Co., Ville St. Pierre, Quebec; 3 storeys, concrete foundation, brick and stone, electric lighting, furnace heating, 8 rooms in school. Excavation started to-day.

Vancouver, B. C.

Isolation hospital to cost \$50,000. Medical Health Office, Dr. F. T. Underhill; architect, S. M. Eveleigh, c/o Dalton & Eveleigh, 615 Hastings W., Vancouver; general contractor, Campbell & Wilkie, 615 Pender street W., Vancouver. Excavation tenders called at once—other contracts not to be awarded for about two weeks. Heating tenders called separately by architects.

Residences

Bridgeburg, Ont.

Frame residence, \$2,500, hardwood finish, shingle roofing, gas lighting. Owner, Reuben Tisdale.

Calgary, Alta.

C. G. Cunningham is contemplating the erection of two residences at Elbow Park, estimated cost, \$6,000 each.

Leo. Dowler, architect, is preparing plans for 12 residences in Parkdale, brick veneer, 2 storeys each; cost, \$20,000.

A. Auriol, Gadagon Block, will build a residence to cost \$8,000 in Glencoe. Architect, W. Lang, 8th avenue E., Calgary; 1 storey, 51 x 48, frame, concrete foundation, steam heating, electric lighting, shingle roof, hardwood interior finish, fireplaces. Permits granted.

A residence to cost \$6,000 will be built by W. Brennan, 1410 2nd street, W., Calgary; architects, F. W. Faux, Marlborough Mansions, Calgary; 2 storey, brick, concrete foundation, electric lgt., hot water heating, shingle roof, hardwood interior finish, fire place, boilers, etc. Excavation under way.

Permit granted for a 2-storey dwelling, 30 x 34, brick, concrete foundation, hot air heating, electric lighting, shingle roof, hardwood interior finish, \$4,200; owner, Stubbs & Wallace, 1324 12th avenue west.

Essex, Ont.

Residence to cost \$6,000, 2 storey, brick, stone foundation, steam heating, electric lighting. Owner, Lawrence Shipley.

Hamilton, Ont.

Plans are being prepared for erection of an apartment house to cost \$10,000, Springer avenue, for J. Chapham, 14 Main E., Hamilton. Architect, Stewart McPhie, Bank of Mamlton Chambers, Hamilton; 3 storeys and basement, 30 x 70, brick and stone (some steel) stone

foundation, felt and gravel roof, electric and gas lighting, hardwood finish, telephones, electric bells, cement work, cut stone, tile, mantels, structural iron, ornamental iron, sheet metal work, weather strips, electric work, pipe covering, steel beams and fire escapes. Tenders called in ten days, close in one week.

Residence, \$3,200, 2½ storey, 40 x 50, brick and stone, stone foundation, hot air heating, electric and gas lighting, shingle roofing. Owner, D. J. Henry, 193 West avenue north.

Maisonneuve, Que.

Foundation is started on six flats, \$9,000, 3 storey, 44 x 38, cement foundation, stone, gas and electric lighting, gravel roof, stove heating; for C. Lalonge, 281 Orleans; architects, C. A. Reeves, 58 St. James street.

Foundation is started on five flats, Fourth avenue, \$4,800, 3 storey, 27 x 42, stone, stove heating, gas and electric lighting, gravel roof; for J. Conlombe, 530 Bourbonniere street.

F. Dausereau, 184 Adam street, will build three flats, \$5,000, 3 storey, 24 x 36, stone, stone foundation, stove heating, electric lighting, gravel roofing.

Montreal, Que.

The Centenary Methodist Church are planning to erect a parsonage.

Work has started on a residence, \$4,000; stone, brick and wood, stove heating, electric and gas lighting, gravel roof; for John Hoollahan, 478 St. Eracie street.

N. Jasmin, Cote St. Luc, will build a residence to cost \$8,000, on Highland avenue. Architect, D. Vian, 76 St. Gabriel street; 2 storey, 35 x 48, brick and wood, hot water heating, gas and electric lighting, asbestos shingles.

Apartment house to cost \$200,000, on Bishop street, for O. L. Henault, 4545 Sherbrooke street W., Montreal. Architect, C. A. Mitchell, 58 Beaver Hall Hill, Montreal; 10 storeys, steel frame, terra cotta facings, concrete foundation, steam heating, gas and electric lighting, roof garden, interior finish marble, mosaic and hardwood, refrigerating plant, mail chutes, gas stoves for each apartment, telephone system, electric bells, plate glass throughout. Foundations to be started early in November. Tenders invited shortly for balance of work. House to be occupied next September.

James Bryce, 39 MacGregor street, will build a residence to cost \$20,000 on Cedar avenue; architect, P. J. Turner, 121 Board of Trade, Montreal; 3 storey, 26 x 34, Milton brick and Indiana lime stone, rock masonry foundation, hot water heating, electric lighting, green slate roof, electric pump required for domestic water service; some wrought iron work, refrigerators. Tenders of Jackson & Co., 635 Hibernia street, lowest. Work deferred to next spring, when awarded will go to lowest tenderer, if prices allow tender to stand at present price.

Tenders are called for erection of a residence on Maplewood avenue, for J. H. McGowan, 28 Sherbrooke street W., Montreal; architect, P. J. Turner, 121 Board of Trade Bldg., Montreal; 2 storeys, 25 x 50, concrete foundation, brick encased, furnace heating, electric lighting, gravel roof.

Nine flats, \$5,000, 3-sty., 48x45, brick, cement foundation, stove heating, elec-

tric lighting, gravel roofing. Owner, Joseph Fabieu, 153 Lasalle road. Plastic brick is required.

T. Denvers, 321 Amherst street, will build three flats, \$4,500, 3 storeys, 25 x 40, stone, cement foundation, stove heating, gas and electric lighting, gravel roofing.

Five flats, \$5,000, Cuvilier street, 3-storey, 30 x 43, pressed brick, cement foundation, gas and electric lighting, gravel roof; owner, H. Pageau, 408 St. Germain.

R. Charbonneau, 52 St. James, will build two flats, \$3,000, 2 storey, 25 x 51, brick encased, cement foundation, stove heating, electric lighting, gravel roofing.

Residence, \$4,000, 2 storey, 44 x 49, brick encased, concrete foundation, gas lighting, tar and gravel roofing. Owner, J. Friedman, 178 Mitcheson street.

Five flats, \$3,500, 3 storey, 25 x 55, pressed brick, stove heating, gas, and electric lighting, gravel roofing. Will be built by A. Lamontagne, 2313 St. Lawrence street.

Six flats, \$5,000, 3 storey, pressed brick, cement foundation, stove heating, gas and electric lighting, gravel roof; owner, N. Leger, 226 Adam street.

Four flats, to cost \$6,000, will be built on Plateau street, 2 storey, 50 x 60, pressed brick, cement foundation, gas and electric lighting, gravel roof, hot water heating; owner, Gagne & Casson, 169 Cartier Park; architect, 52 St. James street.

Tenders called for erection of a cottage to cost \$12,000 on St. Antoine and Highland, for N. Jasmin, Notre Dame de Grace; architect, Dable Viau, 76 St. Gabriel street, Montreal; 2½ storeys, 35 x 48, brick encased, stone foundation, hot water heating, electric lighting, asbestos shingle roof, hardwood interior finish. Received by architect until Oct. 24th.

Nelson, B. C.

George Maurer, Victoria street, is to build a new residence, \$3,800. A. G. Lambert & Co., Limited, Baker street, are building a warehouse to cost \$3 500.

Outremont, Que.

Six flats, \$8,000, 3 storey, 25 x 65, brick and wood, stone foundation, gas and electric lighting, gravel roofing. Owner, N. Limoges, 93 Laurier avenue east.

J. D. Camierand, 2256 Hutchison St., Outremont, will build 3 cottages to cost \$12,000; 2 storeys, 25 x 40, stone foundation, hot water heating, gravel roof, electric light. Excavations started.

Two residences, \$5,000 each, brick veneer, concrete foundation, electric lighting, hot water heating, gravel roof; will be built by John Brunette, 413 Durocher street.

Nine flats, Bloomfield, 3 storey, 75 x 60, cost, \$10,000, brick and wood, electric lighting, gravel roof; owner, Arsent Legault, 2907 St. Urban street.

Three flats and store, cost \$3,000, 3 storey, 25 x 36, brick encased, concrete foundation, stove heating, electric lighting, gravel roofing; owner, J. W. Gauthier, 1137 Van Horne avenue.

Work is in progress for erection of 9 flats, cost \$15,000, Bloomfield, for A. Legault, 290 St. Urbain st., 3-sty., 20x65, stone fndn., furnace heating, electric and

gas light, gravel roof, furnace heating. Foundation started.

Ridgetown, Ont.

W. J. Prosser contemplates building a bungalow; electric lighting, furnace and interior finishings to be purchased.

Toronto, Ont.

Apartment house to cost \$18,000 will be erected on Tyndall avenue, for J. J. Walsh, 37 Adelaide E., Toronto; brick, concrete, skylights, metallic lathing, felt and gravel roofing. Architect, S. A. Wagget, 61 Bleecker street, Toronto.

Work is in progress for the erection of twenty residences on Cody ave., for L. A. De la Plante, Manning Arcade, Toronto; solid brick, detached, electric wiring.

Vancouver, B. C.

Tenders will be called about Nov. 1 for the erection of a residence to cost \$7,000. Architect, G. A. Horel, 25th and Main streets; 2 storey, frame, hot water heating, leaded art glass, hard wall plaster.

Jones & Doherty, 355 Water street, will build two frame apartment houses on Heatley street, \$20,000. Hot water heating and all modern accessories equipment.

Plans have been completed by P. Hammer, 986 Howie street, for a 2-storey frame residence for Shaughnessy Heights, \$8,000.

Sketches have been prepared for a residence, Shaughnessy Heights, for G. B. Kaufmann, 38 Davis Chambers, Vancouver; 2 storeys, rough cast plaster. A large amount of small panel leaded glass will be used and the system of electric lighting will be indirect.

Hampton & Co., 532 Granville street, will build about thirty bungalows on eleven acres purchased recently. Contract let for clearing land.

Westmount, Que.

Work is in progress for eight residences to cost \$48,000, on Victoria ave. for W. H. Creed, 686 Roslyn avenue; 3 storey, 26 x 50 each, solid brick, concrete foundation, hot water heating, electric lighting, gravel roofing, hardwood floors, enamel baths. Excavating.

CONTRACTS AWARDED

Bridgeburg, Ont.

The contract has been awarded to Chester Taylor for erection of frame house on Bowen road., for Fred Seisser, Buffalo, \$3,000, hardwood finish, gas heating and lighting, shingle roofing.

Contractor Oscar Teal is building two frame houses on Dufferin street for W. B. Miller, of Buffalo, \$3,000, shingle roofing, sewer and water connections, gas heating, gas lighting, hardwood finish.

Calgary, Alta.

Residence, to cost \$4,500, frame concrete foundation, hot air heating, electric lighting, shingle roof; owner, J. R. Jaques, First avenue west; contractor, J. H. Patton, 320 Sixth avenue west.

Residence to cost \$5,000, 2 storey, 32 x 30, frame construction, concrete foundation, hot air heating, electric lighting shingle roofing, hardwood finish. Contractor, W. W. Duncan, 1925 5th street west.

Residence to cost \$5,000, frame, concrete foundation, hot air heating, electric lighting, shingle roof, hardwood interior finish, furnace, fireplaces; owner,

L. J. Williams, 516 13th avenue east; contractor, G. C. Tolkins, 1122 17th ave. west.

Residence to cost \$8,000, Hillhurst, for W. L. Lathwell, Hillhurst, Calgary; contractor, John Harrison, box 1243 Calgary; 2 storeys, 50 x 50, brick, concrete foundation, steam or hot water heating, electric lighting, shingle roofing, hardwood interior finish. Excavation starting.

Work is in progress for erection of six residences to cost \$3,200 each, for G. W. Morfitt, 8th avenue E., Calgary; contractors, Lea & Goulding, 231 15th avenue W., Calgary; 2 storeys, 20 x 36 (each) frame, electric lighting, shingle roof, fir interior finish; fire places and furnaces required in each house.

Montreal, Que.

Residence, cost \$55,000, on Ontario ave., for Herbert Molson, Molson's Brewery; architect, Robert Findlay, 10 Phillips Place, Montreal; general contractor, J. H. Hutchison, 64 St. Ambroise street; carpentry, Geo. Roberts, 79 Lagachetiere st., Montreal; plumbing and heating, Henry Moreau, 1 Beaver Hall Hill, Montreal; roofing, Geo. W. Reed & Co., Ltd., 37 St. Antoine st., Montreal; painting and glazing not awarded yet.

Six flats to cost \$6,000, St. Dominique; 2 storey, 50 x 50, concrete foundation, red pressed brick, gravel roof, gas and electric lighting. Owner, D. Pariseau, 69 Laurier avenue; architect, P. Favreau, 405 Duroche street, contractor, P. Naddon, 16 St. Denis.

Residence to cost \$14,500, on Fullum street, for Brothers of the Sacred Heart, Fullum street; architect, Alphonse Venne, 15 St. Lawrence street, Montreal; general contractor, E. Dussault, 85 La-salle st., Rosemount; 3-sty., 35 x 63, solid brick, hot water heating, electric and gas lighting, gravel roof. Foundation started.

Store and two houses to cost \$5,600 for A. Charland, 412 Montcalm street, Montreal; general contractor, M. Boudon & Fils, 527 Panet street, Montreal; 3 storey, 60 x 24, pressed brick, cement and stone foundation, stove heating, gas and electric lighting, gravel roof, ground floor hardwood. Work not started.

Work is in progress for a residence to cost \$55,000 on Ontario avenue for Herbert Molson, Molson's Brewery; architect, Robert Findlay, 10 Phillips Place, Montreal; general contractor, J. H. Hutchison, 64 St. Ambroise street; gas and electric lighting, hot water heating. Roof on.

Excavation is finished for six residences to cost \$15,000, Mt. Royal, for L. A. & F. Carriere, 31 Laurier avenue E., Montreal. Architect, Y. Trudel, 238 St. Andre, Montreal; general contractor, Carriers & Frere, 31 Laurier avenue E. 3 storey, 52 x 60, brick and stone, cement foundation, gravel roof, hot water heating.

A. Blore, 2072 Waverly, will build two flats, to cost \$4,500; 2 storey, 25 x 67, brick and wood, concrete foundation, hot air heating, electric lighting, tar and gravel roofing. Contractor, D. Cusson, Cartier Park.

P. E. Jarmin, 20 Minto avenue, will erect two flats to cost \$4,500, 2 storey, 25 x 67, brick encased, cement foundation, hot air heating, electric lighting, tar and gravel roofing. Contractor, D. Cusson, Cartier Park.

Niagara Falls, Ont.

Residence to cost \$3,500, 2½ storey, 26 x 40, frame construction. Owner, Reuben Rudd, Niagara Falls south; general contractor, J. A. Kelsey, Gray street.

Outremont, Que.

Two residences to cost \$10,000 each; 2 storey, 50 x 112, brick encased, concrete foundation, electric lighting, gravel roof; owner, L. Lafrance, 261 Wolfe; general contractor, 910 Dorchester.

Stettler, Alta.

Residence to cost \$3,000, 2 storey, 30 x 36, frame, concrete foundation, hot air heating, electric lighting, shingle roofing, hardwood floors. Owner, Geo. C. Bentley; contractor, G. B. Rathbun.

Vancouver, B. C.

Two storey frame apartment house, at Hemlock street; general contractors, Campbell & Wilkie, 615 Pender street west; painting, galvanized iron work and hot air heating not included in general contract.

Business Buildings and Industrial Plants

Berlin, Ont.

The Foster Armstrong Piano Company are planning to double their factory in the near future.

The city council has endorsed a proposition of the Ontario Adjustable Hub & Wheel Company and if stock can be secured plant will be erected.

Brockville, Ont.

Tenders are called for erection of a moulding shop to cost \$3,000, on William street, for Cossitt Company, Brockville; 1 storey, 40 x 50, brick construction, concrete foundation, exhaust-steam heating, electric lighting, composition roofing. The firm manufacturers cream separators.

Coalmont, B. C.

The Bank of Commerce has bought a double corner on Main street and is going to build. J. T. Ryan has decided to build a general store.

Calgary, Alta.

W. R. Brock & Co. 8th avenue west, are having plans prepared by Architects Hodson, Bates & Butler, Calgary, for the erection of an addition of one storey to their warehouse to cost \$25,000.

T. J. S. Skimer, I.S.E., Calgary, will erect a large block 8 to 10 storeys, on 8th avenue. Size of building 130 x 140; cost, \$500,000.

The Western Tent & Mattress Co. have another factory under consideration, to be erected on 4th avenue E. at a cost of \$8,000.

Permit has been granted for erection of a factory to cost \$6,000 on 3rd avenue W. for F. Langston, 3rd ave. W.; architect, C. K. De Kam, Calgary; 1 storey, 24 x 125, frame, with metal siding, concrete foundation, steam heating, electric lighting, felt and gravel roof. Firm manufacturers aerated waters.

The Ontario Laundry Co. have been granted a permit to erect stables at a cost of \$6,000 on 4th avenue. Architect, D. S. McIlroy, 1187 8th avenue W., Calgary; concrete throughout, steam heating, electric light, gravel roof. The same company will build laundry in the spring on 4th avenue.

Tenders and For Sale Department

Tenders for Street Railway Supplies

Sealed tenders marked "Tender for Street Railway Supplies," addressed to the City Commissioners, Calgary, Alta., will be received up to 12 o'clock noon, November 15, 1911, for the supply and delivery of the following street railway material, via lake and rail or all rail:

Track

26,000 standard 6 x 7 fir tamarac ties.
300 tons 6-in. high T. 60 ft. No. 60 rails,
800 tons A.S.C.B. standard 60 ft. No. 60
rails; or their equivalent in A.S.C.E. 60, 30
or 33 ft. rails with necessary angles, bolts, etc.
quoted separate.
15,000 lbs. 5½ x 9-16 in. track spikes.
3 double 3-part Y branch off with crossings.
1 double track, left-hand branch off.
6 standard A.S.C.E. ordinary T rail spring
tongue switches.
6 standard A.S.C.E. ordinary T rail solid
mates.
6 standard A.S.C.E. ordinary T rail frogs
fitted.
3,200 10-in. bonds, ¾-in. plug, flexible, 4/o.
2,500 13-in. bonds, ¾-in. plug, flexible, 4/o.

Line Material

250 wood poles, 6-in top, 12-in. butt, not
over 4 in. def. 30 ft. standard spec.
250 wood poles, 8 in. top, 12-in. butt, not
over 4 in. def. 35 ft. standard spec.
Tenders will also be considered on 30-ft.
poles 7-in. tops 10-in. butts, and 35-ft. poles
8-in. tops, 10-in. butts. All to be peeled.
80 steel poles 28 ft. long, maximum load 1000
lbs.
20 steel poles 30 ft. long, maximum load 1000
lbs.
18,000 ft. 500 M.C.M. 600-volt conduit cable
(Underground).
30,000 lbs. 2-0 trolley wire, round.
7,000 lbs. 5-16 single galvanized soft steel
span wire.
1,200 ¾ eye bolts galvanized.
400 9-in., 400 10-in., 400 12-in.
1,200 wood strain insulators 1-in. galvanized.
500 standard strain insulators 2-in.
100 standard strain insulators 2½-in.
800 straight line hangers one piece, galvan-
ized, round top ¾ stud.
1,200 straight line clips 12-in for. 2-0 trolley
(clinch).
300 double curve cap and cone pullovers, gal-
vanized, comp.
300 single curve and cone pullovers, galvan-
ized, comp.
25 R. H. trolley frogs, malleable.
25 L. H. trolley frogs, malleable.
12 right angle cross overs.
20 adjustable crossovers.
10 rigid crossings.
25 feeder hangers, O. B. 2417 or similar.
12 section insulators, 2-0 round wire.
6 Y-trolley frogs.
36 metropolitan strain plates, galvanized.
36 metropolitan strain ears.
10 200 amp. section switches, with boxes.

Each tender must specify clearly the capacity
and type of article quoted on with full speci-
fications.

For further information or particulars, before
submitting tenders, address City Commissioners.

W. D. SPENCE,
City Clerk.

42-44

Positions Wanted

Advertisements under this heading one cent a
word per insertion. Box No. ten cents extra

Competent Engineer (Civil) solicits work on
designing wharves, breakwaters and general har-
bor construction and surveying; also any kind
of draughting. Box 341, Contract Record, To-
ronto, Ont. 41-43

To Contractors

Tenders will be received until the 1st of Nov-
ember for the necessary trades, including Cut
Stone, Brick, Fireproofing Concrete, Painting
and Glazing, Iron Window Frames, etc., in
connection with a large Cut Stone Building to
be erected as an extension to the Power House,
Niagara Falls, Ont., for the Toronto-Niagara
Power Company. Plans and specifications can
be seen and any other information obtained from
the architect.

E. J. LENNOX,
164 Bay Street, Toronto.

43-43

CITY OF SASKATOON, SASK.

Superstructure 19th St. Subway

Tenders Wanted

Sealed tenders, addressed to the City Com-
missioners, Saskatoon, Sask., and endorsed "Ten-
der for Superstructure, 19th Street Subway," will
be received up to 12 o'clock noon on Friday,
November 17, 1911, for the furnishing and erec-
tion of the superstructure over the 19th street
subway in the City of Saskatoon, Saskatchewan.

Plans and specifications may be seen at the
office of W. L. MacKenzie, Bridge Engineer,
Canadian Northern Railway, Winnipeg; and at
the office of George T. Clark, City Engineer,
Saskatoon.

The lowest or any tender not necessarily
accepted.

JAS. CLINKSKILL,
W. B. NEIL, City Commissioners.
E. M. SNELL,
Saskatoon, Sask., Oct. 18, 1191. 43-44

CITY OF LETHBRIDGE ALBERTA, CANADA

Extensions to Power Station

Sealed tenders marked "Tender for Power
Station," will be received by G. W. Robinson,
secretary-treasurer of the city of Lethbridge, up
to and including Friday, November 24th, 1911,
for the supply, delivery, and erection, of the
following equipment for the Power Station Ex-
tension:—

Section B.—Boilers and accessories.
Section C.—Mechanical draft and economizer.
Section D.—Steam turbo-generator set and
condensing equipment.
Section E.—Steam engine driven exciter.
Section G.—Sub-station equipment.

Plans and specifications can be obtained from
Arthur Reid, superintendent engineer, City of
Lethbridge.

An accepted cheque for ten per cent. of the
amount of the tender must accompany each bid.

The lowest or any tender not necessarily
accepted.

G. W. ROBINSON, Sec.-Treas.,
Lethbridge, Alta.

39-44

Sewer Excavator

For sale for immediate use, a Vulcan "Little
Giant" Steam Shovel with extra long dipper
handle for excavating to 16 feet below sur-
face, mounted on traction wheels, dipper 1½ yd.
capacity. Machine just overhauled; new chain,
and extra large new boiler; weighs 32 tons;
low price. Address

WILLIS SHAW MACHINERY Co.,
39 South LaSalle Street,
Chicago, Ill.

42-t.f.

TOWN OF SUDBURY PROVINCE OF ONTARIO

Sewerage Works

Sealed tenders will be received by the Town
Clerk until 8 p.m. on Thursday, November 16th,
1911, for the construction of the following works:

Contract A.—Labor on Sewers.
Contract P.—Sewage Pumping Station.
Contract S.—Sewer Pipes.

Tenders for Main Sewers and for Disposal
Works will be called for within a few months.

Plans and specifications may be seen at the
office of the Resident Engineer, Sudbury, or at
the office of the Engineers, Toronto.

No tender necessarily accepted.

L. O'CONNOR, Esq., Mayor.

GEO. ELLIOTT, Esq., Town Clerk.

GEO. TUDDENHAM, Esq., Chairman.

CHIPMAN & POWER, Engineers.
Nov. 16, 1911. 43-43

CITY OF TORONTO CANADA

Tenders for Subway Construction

Sealed tenders will be received by register-
ed post only, addressed to the chairman of the
Board of Control, City Hall, Toronto, up to
12 o'clock noon on Wednesday, Nov. 1st, 1911,
for the construction of three miles of rein-
forced concrete subway and subway stations.

No tender will be received for less than one-
half mile sections.

Envelopes containing tenders must be plain-
ly marked on the outside "Tenders for Pro-
posed Subway Construction."

Plans and specifications may be obtained on
application to the Department of Railways and
Canals, City Engineer's Office, Toronto, also
on file for inspection at the following points:

1. N. B. Colcock, Ontario Government Agent,
163 Strand, London, W.C.
2. Canadian Engineer, B/33 Board of Trade
Building, Montreal.
3. Engineering News, 220 Broadway, New
York.
4. Engineering Record, 239 West 39th St.,
New York.
5. Engineering Contracting, 537 S. Dear-
born street, Chicago, Ill.
6. Canadian Engineer, Room 404, Builders
Exchange Building, Winnipeg.
7. Commercial Department of His Majesty's
Board of Trade, 73 Basinghall Street, London,
E.C., Eng.

Each tender must be accompanied by a mark-
ed cheque for two thousand (\$2,000) dollars for
each one-half mile section tendered on.

The lowest of any tender not necessarily ac-
cepted.

G. R. GEARY, Mayor.
Chairman of Board of Control.

40-43

CITY OF EDMONTON
ENGINEERING DEPARTMENT

1912 PAVING

Sealed tenders, addressed to the undersigned, and endorsed "Tender for 1912 Paving," will be received at the office of the City Commissioners, Edmonton, Alberta, until twelve o'clock noon (12.00 M.) on Friday, December 1st, 1911, for approximately 100,000 square yards of street grading and paving with curb.

Preliminary plans, and specifications, and all information may be obtained at the office of the City Engineer; plans and specifications are on file also at the office of the Canadian Engineer, 62 Church street, Toronto, and the Contract Record, 220 King street west, Toronto. A deposit fee of Five (\$5.00) Dollars is required. This fee will be refunded when plans are returned.

Tenders are invited for Wood Block, Asphalt Block, Sheet Asphalt, Bitulithic, or other kinds of pavement.

Proprietors of patented pavements are required to furnish their special specifications.

Tenderers are required to submit bids as follows:

- Tender No. 1 Unit prices, for whole work.
- Tender No. 2 Unit prices, for 75,000 sq. yds.
- Tender No. 3 Unit prices, for 50,000 sq. yds.
- Tender No. 4 Unit prices, for 25,000 sq. yds.

An accepted cheque for five per cent. (5 p.c.) of the amount of tender must accompany each bid.

The lowest or any tender not necessarily accepted.

CITY COMMISSIONERS

Office of the City Commissioners,
Edmonton, Alta., Oct. 19, 1911. 43-43

TOWN OF NEEPAWA
PROVINCE OF MANITOBAWaterworks and Sewerage
Notice to Contractors

Sealed tenders will be received by the undersigned Secretary-Treasurer of the Town of Neepawa until 8 p.m. on Friday, December 15th, 1911, for the following works:

- Contract A.—All labor and certain materials necessary for laying water pipes and sewers.
- Contract B.—All labor and materials necessary for the construction of Pump House and Filter Room and for brickwork in Boiler Room.
- Contract C.—This contract will be sub-divided as follows:

1. Furnishing materials and labor for and erecting steel Water Tower.
2. Furnishing materials and labor for and constructing concrete foundation for Water Tower.
3. Furnishing material and labor for and constructing frame housing for Water Tower.

Contract D.—Furnishing Cast Iron Water Pipes and Special Castings.

Contract E.—Furnishing Gate Valves, Fire Hydrants, etc.

Contract F.—Furnishing and erecting Mechanical Filters.

Contract G.—Furnishing and erecting Pumping Machinery.

Contract H.—Furnishing materials and labor for Dam, Intake and Reservoir.

Contract M.—Furnishing Wooden Stave Pipes for Conduit.

Contract S.—Furnishing Tile Sewer Pipes and Junctions.

Contract W.—Furnishing materials and labor for laying Wooden Stave Conduit.

Contract X.—Furnishing materials and labor for constructing Sewage Disposal Works.

Plan, specifications, etc., may be seen at the Town Hall, Neepawa, or at the Engineer's offices, Winnipeg and Toronto, on or after Wednesday, November 15th, 1911.

No tender necessarily accepted.

W. H. GOSSEL, Mayor.

R. H. FUSEE, Chairman.

J. W. BRADLEY, Sec. Treasurer.

CHIPMAN & POWER, Engineers.
43-43

To Contractors

Sealed tenders will be received up to noon of Wednesday, November 1st, 1911, for all trades required in the erection of a Loft Building in Toronto.

The lowest or any bid not necessarily accepted.

F. S. BAKER, Architect,
43-43 Traders Bank Bldg., Toronto.

Dutton, Ont.

Jos. Dent, Thamesville, Ont., is planning to erect a new saw mill here. New machinery will be installed.

Galt, Ont.

Plester & Parker are building an addition, 2 storey, 40 x 50, brick veneer. Work has been started on foundation; work on building expected to start in about ten days. More machinery will be installed.

Hamilton, Ont.

Plans are prepared for a storage warehouse to cost \$40,000 on Robert and Elgin streets, for Thomas Hamsav Market Place, Hamilton; architect, E. D. Paterson, 167½ King E., Hamilton; 6 storeys, 50 x 150, brick and steel, stone foundation, steam heating, electric lighting, tar and gravel roofing, electrical work; refrigerators probably required. Tenders closed Oct. 16th.

Humberston, Ont.

The Empire Limestone Company, local agents, Hyman & Thomas, are contemplating extensions to their plant; manufacturers drills and track material.

Leamington, Ont.

Dr. Hellier will build a business building 2 storeys, 50 x 80, cement block construction, gravel roof, gasoline tank, cost \$15,000; ground floor will be used as garage by Earle Bee who will buy a complete stock of auto accessories and supplies.

London, Ont.

Greene, Swift & Co. are planning extensions to their factory; 3 storey, 45,000 ft. floor space, cement and steel, steam heating, electric lighting, elevators, cost \$25,000. The firm manufactures clothing.

Merritton, Ont.

A factory will be erected for Interlake Tissue Paper Mills, Ltd. President, Mr. Carruthers; town clerk, R. Clark. The by-law granting them exemption from taxes carried unanimously. Estimated cost, \$25,000.

Montreal, Que.

Foundations are in for one store, two houses to cost \$6,000, for Z. Martel, 1306 A Bordeaux street; 3 storey, 25 x 50, stone, hot water heating, gas and electric lighting.

Tenders are called for bank and clerk's rooms on Park avenue, for The Molson's Bank, St. James street, Montreal; architect, Philip J. Turner, F.R.I., B.A., 121 Board of Trade Bldg., Montreal; 2 storey, 30 x 55, buff pressed brick, hot water heating, electric lighting, gravel roof, hardwood interior finish.

Store and dwelling to cost \$8,000 will be built at 32 Parke avenue, for Jno. Allan, 300 Atwater avenue, Montreal; architect, K. G. Rea, 54a Beaver Hall Hill, Montreal; brick and stone, gas and electric lighting, gravel roof, furnace heating, one electric elevator, new front, ground floor fire proofed.

Nanaimo, B. C.

Tenders will be called for the erection of an hotel to cost \$100,000, on Church street, for Jos. Fox, Windsor Hotel; architects, Parr & Fee, 570 Granville street, Vancouver; 7 storeys and ground floor, concrete foundation, hot water heating, electric lighting, asphalt roof, fire escapes, vaults, etc. Specifications not yet available.

Niagara Falls, Ont.

Mrs. Wm. Graque, Huron street, is calling for competitive plans for the erection of a large business block on Queen street.

Tenders are called until Nov. 1 for power extension for Toronto Niagara Power Co., Niagara Falls. Architect, E. J. Lennox, 164 Bay street, Toronto. Necessary trades including cut stone, brick, fireproofing concrete, painting and glazing, iron window frames.

M. E. Blaiser Machine Co., Utica, N. Y., will locate a branch factory here. Industrial commissioner, W. E. Tuttle. Firm manufactures laundry machinery, pressing and cleaning apparatus.

Sherbrooke, Que.

A British syndicate has purchased 100 acres as a building site for a Canadian branch. Firm manufactures "Blastine." Buildings and machinery to cost \$40,000.

St. Stephen, N. B.

William Smith has had plans prepared by Architect F. Neil Brodie, St. John, for addition to Queen's hotel; 4 storey, 64 x 40, offices and 30 rooms, most of which are to be fitted with private baths. Excavation to commence this week.

St. John, N. B.

The Franklin Baker Cocoa Company are negotiating with the council for lease of lots on Broad street. Before granting lease further inquiries will be made as to company's building plans.

Toronto, Ont.

Plans are being prepared for erection of an hotel at 163 Yonge street, for P. J. Mulqueen (prop. Tremont House); architect, J. Wilson Gray, Confederation Life Bldg., Toronto; 5-sty., brick, with terra cotta front, felt and gravel roof, steam heating, electric light, telephone system.

Plans are being prepared for the erection of a warehouse for E. B. Eddy Co., 5 Front street east, Toronto; architect, Chadwick & Beckett, 20 Toronto street.

Vancouver, B. C.

Contractors Booker, Campbell & Whipple, Williams building, will receive tenders for galvanized iron and tar and gravel roofing on one-storey frame warehouse, on the painting, sheet metal work and slate roofing of the Chalmers Presbyterian Church at 12th avenue and Hemlock street.

The Agutter-Griswald Co., one of the largest manufacturers of steel boxes, switch and panel boards and other electrical apparatus, will lease a 5-storey and basement building here, and open up a factory for their products. Separate company formed. Information regarding location later.

The American Safety Powder Company announces that it will locate a powder plant here. The powder has a high efficiency in blasting.

A new steel company will probably be formed, capitalized at \$200,000, which will invest \$125,000 in a plant and equip-

ment, especially a rolling mill plant on the Fraser river. The products will include steel rails and bridge material. G. M. Gibbs is interested.

George E. Bourateau, Montreal, is contemplating the establishment of a shipyard and engine manufacturing plant here.

The Molson's Bank has purchased 25 feet on Hastings street for \$100,000, and will erect a branch bank building there at some future time.

Victoria, B. C.

Jesse M. Warren, Sayward Bldg., is preparing plans for a 3-storey concrete, 30 x 112 store; Blanchard and Douglas streets, to cost \$12,000.

The Canadian Puget Sound Lumber Company has a permit to erect a new dry kiln of concrete, to cost \$5,000.

Plans are prepared for steam laundry to cost \$25,000, North Park street, for Victoria Steam Laundry; proprietor, Mr. Bickerdike; architects, Hutcheson & Ford, Sayward Bldg., Victoria; 2 storeys, concrete, 62 x 128. Building will include rest room, dining room, and individual lockers for employees.

The building at the corner of Yates and Douglas streets will be remodelled for the Dominion Bank branch. H. S. Griffiths, 1006 Government street, architect.

Wardsville, Ont.

Tenders are called until Oct. 25th for erection of a building for D. M. Campbell; architect, Mr. Findley, St. Thomas, Ont. Brick. Plans, etc., at his office.

CONTRACTS AWARDED

Berlin, Ont.

By-law to raise \$20,000 to purchase additional equipment for electric lights carried.

Brockville, Ont.

Extension to factory to cost \$2,500 on Mill street, for D. H. Burrell & Co., Brockville. Masonry contract, Haggarty & Co., Brockville; 2 storeys, 35 x 42, brick, exhaust-steam heating, electric lighting. Factory machinery will be required.

Addition to factory for Cossitt Company. Masonry contract, Pattison & Fox, Brockville; carpentry, Brown & Co. Brockville; 2 storeys, 40 x 50, brick, exhaust-steam heating, electric lighting, composition roofing, one freight elevator. Factory machinery required. Contracts awarded Oct. 12th.

Calgary, Alta.

Hotel and stores to cost \$1,500,000 for Canadian Pacific Railway, Winnipeg. Contractor for sub-structure, P. Lyall & Sons, Montreal, Winnipeg; 13 storeys, 228 x 146, fireproof, steel construction, concrete foundation, steam heating, electric lighting, gravel roofing. Foundation to be ready by Dec. 1st. Tearing down of buildings on site began Oct. 15th. E. L. Ellingwood, new superintendent, expected in Calgary to superintend construction. Contract for superstructure not awarded yet.

Campbellton, N. B.

Business block for B. A. Mowat Company. Architect, F. Neil Brodie, St. John, N. B. Contractors, J. & D. A. Harquail, Campbellton; 3 storeys, 80 x 35, pressed brick, concrete foundation, steam heating, electric elevators.

Hamilton, Ont.

Knitting factory to cost \$22,000 on John street N., for Canadian Knitting

Co. President protom, R. R. Simpson, Royal Hotel, Hamilton. Architects, Stewart & Witton, 2 Hughson street, S., Hamilton; general contractor, W. H. Yates, 24 Leeming; roofing, J. E. Riddell, 12 Ferguson avenue; plumbing, Fitzpatrick, 252 King W., all of Hamilton; 2 storey and basement, 125 x 52, brick and steel, stone foundation, hot water heating, electric and gas lighting; knitting machines, electric motors, switchboard, sprinkler system, electric work, boiler for heating in separate building; office furniture wanted when building is completed. Contract just let.

The contracts for warehouse for R. Watkins, 252 Park street, have been awarded as follows: General contractor, R. Tape, 191 Robinson street; painting, Stanip & Son, 145 King William street; roofing, J. E. Riddell, 12 Ferguson street north.

Montreal, Que.

Work is in progress for alterations, store and house, \$5,500, 146 Mansfield street, for Chas. Edlington, 413 St. Catherine street west; architect, D. J. Crighton, Jacobs Bldg., Montreal; general contractor, Jos. Laurier, 388 Ontario st., 3-sty. addition, 22 x 40, Roman stone, wood cornice, electric and gas lighting, tar and gravel roof, hardwood floor, plate glass, hot water heating. Contract for heating and plumbing not let. Foundations nearly in. Owner deals in picture frames.

Extension to shop, cost \$7,000, at 165 St. Urbain street, for Jas. M. Aird, 165 Urban street. Contractors, A. Strang & Co., 4550 St. Catherine street west; 1-sty., 62 x 30, brick, steam heating, tar and gravel roof. Basement and wall of one storey up. Firm carries on a bakery business.

Work is in progress for a steel plant on Longue Pointe for Canadian Steel Foundaries, Ltd. President, N. Curry, Montreal; Man. director, W. F. Angus; sec.-treas., C. H. Godfrey; contractors, Bishop Construction Co. and Messrs. C. E. Deakin, Montreal. The Canadian Steel Foundaries' plant will be open for business by the beginning of the new year, at a cost of \$1,000,000. The capacity will be over 2,000 tons of steel castings per month. The company owns 35 acres of land.

Coal oil storage warehouse for Canadian Oil Companies Ltd., 123 St. Etienne street. Contractor, Byers & Anglin, 65 Victoria avenue, Montreal. New warehouse to replace the one burnt. Messrs. McKinnon, Holmes & Co., Sherbrooke, Que., will supply 6 oil tanks (10,000 imp. gal. capacity each, \$12,000).

Contract will be awarded shortly for clothing factory to cost \$200,000, St. Lawrence Blvd. and Duluth avenue, for H. Vineberg & Co., 163 St. James street, Montreal. Architect, C. Dufort, La Patrie Bldg., Montreal; 8 storeys and basement, 175 x 105, cement and steel, stone front. Building to be ready for occupation by May 1st. Machines to be run by electric power.

Foundation has been started on erection of a stable to cost \$6,000 on Laurier avenue, for J. E. Stuart, 143 Esplanade, Montreal. Architect, L. R. Montbrian, 2307 St. Andre, Montreal; contractor, H. Demers, 47 Labelle street, Montreal; 1 storey, 47 x 50, solid brick, concrete foundation, electric lighting, gravel roofing. 14 stalls.

Extension to factory to cost \$8,000 at 736 Mullins street, for A. R. Whittall, 736 Mullins street, Montreal. Architect, Comber & Comber, 4113 Dorchester street, Montreal; general contractor, S. Whitaker, 285 Highland avenue, Montreal; 3 storeys, 60 x 72, concrete foundation, brick and plank, tar and gravel roof, (hopper) electric lighting, automatic doors, one freight elevator. Work not started yet.

Power Plants, Electricity and Telephones

Calgary, Alta.

The proposition of the Canada Light, Heat & Power Co. to pipe gas to the towns on main line of C. P. R. between Bow Island and Calgary has been considered favorably. The agreement will be presented to the following for ratification: MacLeod, Claresholm, Granum, Shavely, Nanton and Okotoks; 150 miles of steel pipe will be required. Eugene Coste, president of company; W. H. Laws, solicitor, Calgary. Work to probably start in April.

Drummondville, Que.

Tenders were called until October 23rd for power machinery, a.c. generator, 150 kw.; water wheel, 250 h.p. Specifications at office of W. A. Moisan, secretary-treasurer.

Embryo, Ont.

The village is contemplating the installation of a hydro-electric station, and putting in complete lighting equipment.

Granby, Que.

Executors have continued option on water power about 11 miles distant from Granby. It is proposed to develop same and transmit power to Granby next summer. Owner, Estate of E. H. C. Miner; secretary, R. R. MacAulay, Eastern Tpc. Bank Bldg.

Hamilton, Ont.

Engineer Sifton, City Hall, is preparing plans for two transformer stations, for municipal electrical system. One, on corner Trolley and Gilkinson, will cost between \$8,000 complete; other, Hughson street north, \$10,000; city clerk, S. H. Kent.

Tenders will be called shortly for hydro-electric distribution system. Main transforming station, 40 ft. by 60 ft., with heating, lighting and plumbing, about \$16,000; station equipment, including transformers, switches, switchboards, indicating and recording instruments, about \$40,000; wooden pole line distributing service, complete with hardware, etc. (about 600 poles); reinforced concrete poles and equipment for same, about 7,000 poles; underground conduit system construction, about \$98,000, and approximately 400,000 duct feet; service cables, main distributing cables, estimated at \$60,000; complete requirements of line transformers, meters, lamps, line wire and other devices and apparatus entering into the construction of their distribution system will also be called for. Engineer, E. I. Sifton.

Business Notes

Toronto, Ont.

Contract for Private Patients Building of the new Toronto General Hospital has been awarded to R. Robertson & Sons, Confederation Life Building. Darling & Pearson, architects, 2 Leader Lane.

Contract Record

ESTABLISHED 1886

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Municipal Progress, Advance Information

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THOMAS S. YOUNG, General Manager.

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SUBSCRIPTION RATES

Canada and Great Britain, \$2.00. U. S. and Foreign, \$2.50

Vol. 25

November 1, 1911

No. 44

Municipal Administration at Victoria, B. C.

If the city council of Victoria, B. C., had deliberately set out to make themselves ridiculous in the eyes of the engineering profession, they could not have met with more success than they have done during the past year or so. In August, 1910, they decided that they needed a stronger executive head for the Works Department, as a result of which negotiations were opened with one of the most prominent engineers of the Dominion. Later they reversed their decision and decided to give their present engineer six months on probation. During this period the official would appear to have made good, but later again this year's council decided to "strengthen" the department and practically offered the position of construction engineer to a well known Winnipeg man. At that time, in fairness to the position he held, the latter was unable to accept the offer of the city of Victoria. He was then given to understand that the post would be held for him to take up at a later date. By the time his services were available, however, the city council had again reversed their position,—a turn of the tide which left the Winnipeg man in a very awkward position with the authorities of his own city.

The present state of affairs, however, is perhaps the most ridiculous. The mayor wants to suspend the present engineer and the aldermen are bent upon raising his salary \$1,200 a year,—in fact they brought on a resolution to that effect, but the mayor vetoed it. The mayor has brought a written indictment against the city engineer, who, we understand, will prepare his defence in the shape of a regular report.

Bunglers of the type that make up the Victoria city council are an effective setback to the municipal engineering profession. Ignorant of technical matters, slow of understanding, and suspicious, they constitute about the most difficult problem that mortal man could possibly set out to solve. Their ignorance is not confined to technical details: it includes the

most elementary matters of municipal administration. They clothe a man with authority and then divest him of it at the most critical moment of his office; and they hire him as an independent engineer, but he is independent only in the sense that he stands alone to bear the brunt of the mistakes that have been brought about by his ignorant overlords.

Any so-called authority that makes such a spectacle of itself as the Victoria city council has done should be publicly decorated—every man of them—with the order of the ass. Blunders of this kind bring one to the conclusion that the system of civic government employed in Germany and other countries, where those having the administration of such affairs are properly trained, adequately remunerated and, above all, held responsible, has much to commend it. Our advice to the city of Victoria—and we believe that it is the best for the present incumbent of the city engineer's office—is to get the best engineer possible (if he will go), give him a good salary with absolute charge of his department, and then—lie low for a year or two.

The Responsibility of the Engineer

The mix-up at Victoria leads us to consider the matter of the engineer's responsibility. Who spends the ratepayers' money? And who is responsible for the economy of that expenditure? These and similar questions are pertinent at this time. Aldermen are elected, but they are not experts. What, then, is their duty? Nominally they are responsible for the well-being of the community over which they preside, for the work which they control, and much depends upon their tact, their knowledge and their supervision in all that concerns the health and the wealth of the constituency. Still, they must rely upon their experts for guidance. Thus in the end the responsibility rests upon the shoulders of the expert. Of course, our argument may be incorrect. If it is, so much the worse for our experience. But if we are even approximately correct, we ask in all seriousness if the expert advisers of the councils are treated as if the responsibility resting upon them were recognized. No doubt a council has to decide upon a policy, but generally the policy is forced upon them by circumstances. There is little forethought, though brilliant examples of it might be cited. Usually a water, or a sewage, or a lighting scheme is postponed till necessity knows no law, when the policy is adopted.

The position of the council being admitted, it is the engineer who has to advise and prepare a scheme, and here the greater or lesser ability comes into play. The money has to be spent in carrying out the scheme, and the economy depends upon the perfection or otherwise of the design. Just at the present time the true meaning of economy in many municipal councils is ignored or not understood. The engineers stand aghast when commanded to prepare a scheme for a low initial outlay. They know the result will be disaster and soon an annual sum for maintenance that with a little more initial outlay could be avoided. Is not this fashion partly the result of our system of government? A man wants to be elected to the Council. His first cry is economy and his desire to show what he could save where his opponents would spend. Is this working altogether for good, or does it not naturally re-act upon the policy of councils in that it causes them to try and carry out schemes at a lower cost than is really economical?

As has been often said, economy is not in not

spending money, but in spending it wisely. We trust that those gentlemen who propose to enter councils or be re-elected will consider a little more closely the position of their expert advisers, and in the first place having obtained the services of a good man, will support him, remunerate him properly, and see that his position is rendered secure from that precariousness which is at the present day a blot upon our municipal administration.

A Noteworthy Precedent

The manner in which contracts of quite a respectable magnitude have been quietly disposed of in many of our large cities to firms who, rightly or wrongly, have had the good fortune to "stand in" with the various civic departments has been the cause of no little dissatisfaction to those on the outside. We have advocated upon more than one occasion some definite limit for private awards and we are glad to note that in the city of Regina there is now in force a by-law which provides that any civic work costing more than two hundred dollars must be done by tender. Beyond the question of the merits of day labor and the contract system, the by-law has much to recommend it. Above all it deprives civic officials of the privilege of choosing for themselves by which method the work shall be done, and thus there is no chance of any under-current of opposition to any particular firm in the contracting business—an element with which every contractor who figures on civic work has had more or less experience.

Incidentally, the by-law is one which goes a long way toward giving the ordinary tax-payer value for his money. The system of tender is always a more transparent one—the figures are available, and the cost of the work is more accessible to the man on the outside.

Speaking generally, there is no doubt that the city of Regina will benefit on both small and large jobs. The work of a contractor must always be of a type that will stand alone: whose excellence must be its defence in case any question should arise. The contractor prospers according to his ability and the class of work he turns out. He, therefore, makes it his chief aim in life to see that the work is well done and that any job which comes under his control has all the qualities which will give the required service.

On the other hand the civic employee may hold his job, not because of the ability which he possesses, but simply because he had influence. In which case the civic authorities are paying for expert services which they do not receive. Far better it would be to have a supervisor or a foreman of this type stay away from the job and allow him to draw his salary.

The general adoption of such a by-law would lead to greater activity in contracting circles. There would be more work for the small contractor and more opportunity for men of ability but limited capital.

In the year 1893 Saskatchewan had but 748 miles of railway. The subsequent development of this province, however, due to the remarkable fertility of its agricultural lands, has been extremely rapid and completed statistics for 1910 show that at the end of that year the province possessed 3350 miles of railway. This is probably the greatest percentage in increase of railway mileage of any province in the Dominion.

Something to be Thankful For

We always knew that the less prominent professional men in England were underpaid, but it is news to us to learn that they can get even an "assistant" highway surveyor over there for a salary of \$300 a year. This is the case, however, if we are to believe our London contemporary, the *Contractors' Record*. According to this journal the Settle Rural District Council recently received an application from their assistant highway surveyor for an increase of salary—from \$300 to \$400 a year, the request being made upon the ground that he had to pay considerable out-of-pocket expenses and had barely sufficient left to live upon. In response the council granted the munificent increase of £10, barely \$50! Our English contemporary comments that the authorities in question "evidently go warily in the payment of salaries to their officers." We should say they do! We would hate to work for the Settle District Council.

Bulldog Tenacity

Talking about "bulldog" tenacity and "sticktuitiveness," did you ever notice that a bulldog will hang on to a root or an old insignificant rag as long and as hard as to a piece of juicy porterhouse steak? And yet, we boast that persistency always wins.

Keeping "everlastingly at it," doing the wrong thing, never brings anything but failure.

If the bulldog would stop long enough to see what he had in his iron jaw, he might wonder if it was worth while to "hang on."

Better call a consultation, look the ground over carefully and, if all is well, grab hold and stick to it through thick and thin. In other words, "Be sure you are right and then go ahead."

Inclined belt conveyors have been used by the Leonard Construction Company for raising concrete materials to elevated points on reinforced concrete buildings for which they were the contractors.

The recently completed Armour-Swift Burlington bridge crossing the Missouri River at Kansas City, is 5,998 feet long. The entire floor is of concrete, which was mixed in a single Ransome mixer located on the shore directly under the bridge, the material being hoisted in a tower. This is probably the longest concrete floor in the world.

According to a dispatch from Seattle, Mr. R. H. Thompson, the city engineer there, is resigning. "During recent years," the dispatch continues, "he has become very wealthy. . . . When Seattle civic politicians bothered him too much he retired to his farm, a short distance out of town." Here again is a precedent worthy of emulation in Canada.

The total trade of the Dominion for the first half of the current fiscal year amounted to \$400,270,855, an increase of \$40,000,000 over the first six months of last year. Imports for the six months totalled \$258,406,094, an increase of \$35,000,000. Exports of domestic products totalled \$129,606,982, and of foreign products \$12,257,779,—increases, respectively, of \$2,000,000 and \$3,000,000. September trade totalled \$69,868,429, an increase of \$5,250,000 over September of last year.



Simpson Street Bridge, Fort William, Ont.

50-ft. Span Reinforced Concrete Elliptical Arch over the Neebing River, on the Boundary Line between Fort William and Port Arthur

By H. S. Hancock, Jr., Consulting Engineer, Vancouver
(formerly City Engineer of Fort William).

This bridge is built on Simpson street, Fort William, Ont., the main highway to the neighboring city of Port Arthur, at the point where it crosses the Neebing river, close to the boundary line between the two cities.

Since 1892 a single track pile trestle bridge had carried the street railway traffic between the two cities across the river, the vehicular traffic being accommodated on a separate pile trestle bridge, twenty feet in width and about fifteen feet down stream from the street railway bridge. In spite of many repairs, these bridges, under the stress of modern traffic, continued to get into serious condition until practically a climax was reached towards the end of the year 1909 when it became a matter of urgent necessity that both bridges should be reconstructed.

In 1908 the city of Fort William had purchased the street railway within its limits formerly owned and operated by the city of Port Arthur. Under terms of purchase the city of Fort William was obliged to double track all existing lines in order that an adequate inter-urban service might be maintained.

The Neebing river is a stream ranging from 80 to 90 feet in width, with a depth in centre stream of about 9 ft. Much of this volume of water backs up from Lake Superior, for excepting the spring thaw

and heavy rain storms the discharge does not exceed twelve c.s.f. under normal conditions. The drainage area is approximately 40 sq. miles.

In studying the problem of reconstruction it was considered both desirable and economical that a permanent bridge should be erected. The interest and sinking fund to be annually provided on 30-year bonds for a permanent combined structure would not exceed the interest and sinking fund to be provided on ten-year bonds for a double track street railway and highway bridges plus the cost of maintenance to the deck, floor and other parts subject to damage within a less period than the life of the bonds.

In considering the type of permanent bridge, an arch was primarily favored because of the location. In addition to its being immediately adjacent to the new 40-acre site of the Algoma Agricultural Association's Fair Grounds and on the principal, and practically only, highway between the two cities, the Neebing river is destined to become the scene of a large part of the aquatic pleasures of the city—due to the large amount of business that has developed in recent years on the large, navigable, harbor river Kaministiquia, driving the lighter craft to more secluded and safer waters. The arch span not only gives ample waterway and head room for small craft but lends it-



Arch Ring completed.—Looking towards Port Arthur



Erecting Mixer Platform and Material Incline

self to a treatment of the river which it is hoped will be developed in the near future. At present four or five outlet sewers discharge into the Neebing River in a distance of about a mile and a half above the Simpson Street bridge. In a very short time this pollution will become objectionable to all pleasure craft using its waters, as well as to the residences along its banks. To overcome this objection and at the same time make this river an ornamental stretch of water, it is proposed to build an intercepting sewer down

The wing walls are splayed on a curve to the full width of the street. The ends of these walls were placed immediately opposite one another, to secure the appearance of an even approach. The bridge being on the skew, this gave uneven lengths for the wingwalls. To prevent this arrangement from spoiling the elevation as viewed from the river, the two long wing walls were backed on the river side by a second wall of the same curve as the shorter wing wall and returned to the end of the long wall parallel



Elevation of Simpson Street Bridge

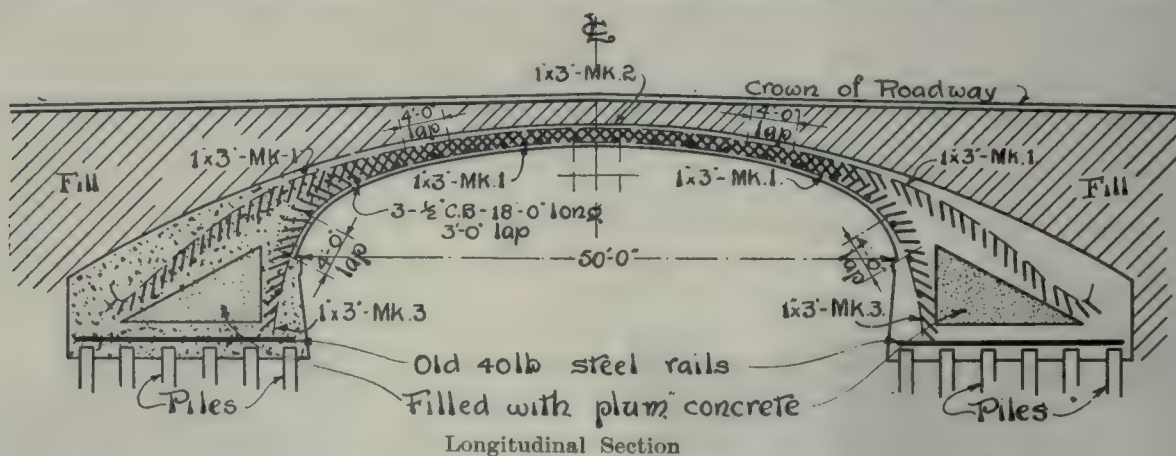
both banks of the river. These sewers will be parallel, with their covers about three feet above water level. The tops of the covers will be finished as a sidewalk and the side of the sewer as a concrete dock, with concrete steps at intervals. Ample water for flushing can be secured, either from the upper waters of the river or from the copious domestic water supply. This arrangement would give a pleasure canal, say, 90 feet wide, with concrete arches of similar design to the Simpson Street bridge at the various necessary street crossings, and also furnish a much needed promenade on both sides of the river.

The Simpson Street bridge is built in the form of an elliptical arch of 50 ft. clear span, with a rise of 9 ft. 6 in., and the centre line of the crown of the arch is on a skew of 68 degrees 30 minutes with the centre line of the bridge. The total width at right angles to the centre line of the bridge, outside to outside of

to the centre line of the bridge. The space so enclosed was used in one case as a covered urinal, and in the second it was filled and planted with ornamental shrubs.

As the street is only sixty-six feet in width it was necessary before commencing operations to remove the two old bridges occupying the site. The highway traffic was diverted to other bridges higher up the river and the street railway traffic was accommodated on a 100-foot temporary pile trestle bridge driven clear of the cofferdam, about 30 feet up-stream from the old location.

Instead of constructing a separate cofferdam for each abutment the whole site was enclosed by two straight dams driven from bank to bank. Each consisted of a double row of tongued and grooved 3-inch sheeting, driven not less than five feet into the clay, four feet apart and held in place by 8 in. x 12 in.



parapet walls, is 46 ft. 6 in., and measured on the skew approximately 50 ft. Provision is made for a double track street railway with a five-foot devil strip and two sidewalks five feet nine inches in width. The arch is designed to care for 30-ton street cars, loaded with 100 passengers, travelling at 30 miles an hour, and highway traffic, equivalent to the load exerted by a 15-ton steam roller, is provided for.

walings, braced and tied to the piling of the old street railway and highway bridges. The four-foot cores were filled with clay secured on the site of the work from bank excavation for wing walls, abutments, &c. The total length of this type of cofferdam was less than for two separate dams. It avoided the making of four corners, reduced the number of pumps and cost of pumping; facilitated the erection of the centering

and simplified the removal of the piling of the old bridges and the sunken logs that had accumulated.

The comparatively small stream was taken care of in a sluice-way eight feet wide and two feet deep, which handled all the water presented. Occasionally, after heavy rain, the water accumulated above the sluice, backing up about two miles to a height of two feet. The dams however were built high enough to take care of this rise as well as the fluctuation normally due to windstorms on Lake Superior.

The cofferdam was kept unwatered by a centrifugal pump (cap., 500 gals. per min.), direct connected to a 7½ h.p. 3-phase 550-volt A.C. motor.

To secure a foundation of good clay the excavation was carried 18 in. below plan measurement. No rock had been discovered by sixty-foot borings, so piles were driven to sustain a safe load of forty tons

on the formula $P = \frac{2Wh}{d+1}$ in which P is the safe load in tons, W the weight of the hammer, h the drop of the hammer in feet and d the penetration in inches under the last blow. The piles used varied from forty to fifty feet in length with a minimum thickness of

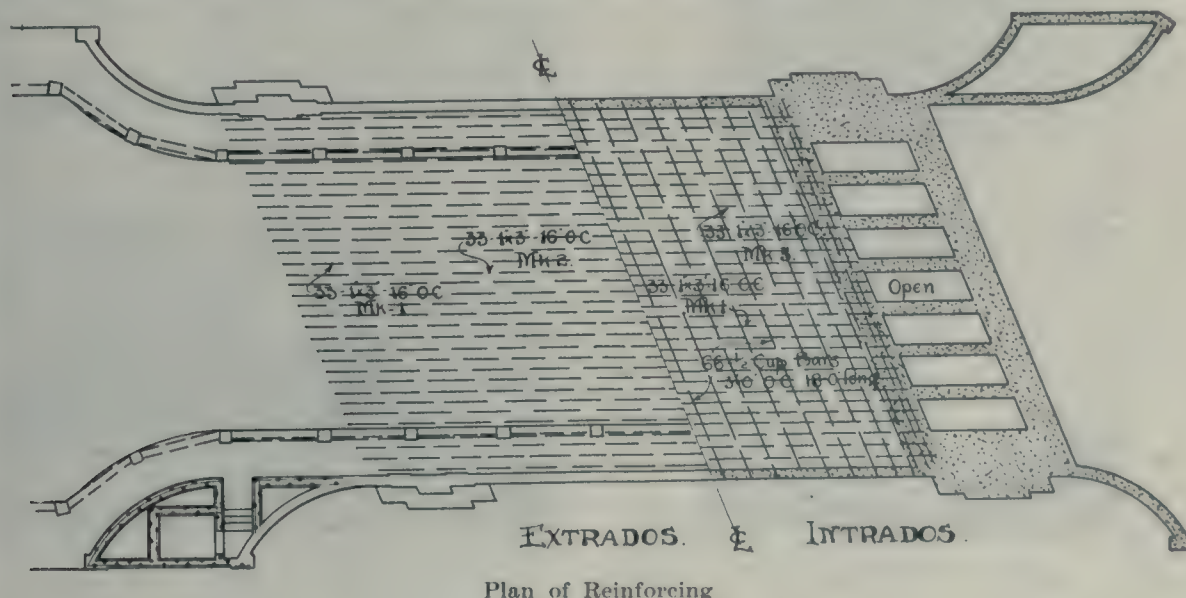
and a sharp turn had been embodied in the original construction. The reconstructed sewer was ramped back of the abutment and carried through the abutment, so that the entire cross-section of the outlet was below low water mark. Specially heavy, well lapped reinforcing and rich concrete were used on that part of the sewer passing through the abutment.

A six-inch cast iron water main blow-off was also carried through the abutment and discharged two feet below low water level.

The cement used was furnished by the Canada Cement Company and tested for conformation to the standard requirements of the Canadian Society of Civil Engineers.

The sand used was a clean sharp lake sand hauled 50 miles in scows from Isle Royale in Lake Superior, and an attempt was made to secure a sand consisting of 30 per cent. of particles 1-64 inch or less in diameter and 70 per cent. of particles about four times that size.

For the large portion of the aggregate a hard, clean trap rock was used, crushed for all concrete above the springing line to a maximum size of two inches. Below the springing line, sizes up to four inches were



Plan of Reinforcing

twelve inches of heart at the butt and seven inches at the point. They were driven with a cup-shaped iron follower to prevent brooming.

The total load exerted by the completed structure ran to the rather high average of approximately 30 tons a pile, but as the sandy clay foundation appeared almost good enough to take the total load of approximately a ton and a half to the square foot, and as the soil value was utilized as far as possible—old 40-lb. steel rails being placed both ways over each row of piles, no ultimate trouble is anticipated. In the twelve months since the completion of the arch no appreciable settlement has taken place.

Piles were cut off eighteen inches above the bottom of the excavation, and a six-inch layer of well rammed cinders was placed over the entire area before depositing the concrete.

A reinforced concrete sewer, 4 ft. 6 in. x 3 ft. 10½ in., had been built to discharge above the old street railway bridge and this would have awkwardly discharged through a wing wall of the new bridge. To avoid this the sewer was reconstructed from a point about 30 feet from the river where a manhole

permitted. To assure a high grade of rock the quarry arranged to have the rock for this work put through at a special run. Prior to the run, all bins, platforms, crushers, cars, &c., were thoroughly cleared of every particle of defective rock and a special inspector was appointed by the writer to examine all rock before entering the crusher to be sure that only sound hard trap was used. All rock was thoroughly washed with a hose not more than fifteen minutes prior to its delivery to the mixer.

The steel used was supplied by the Trussed Concrete Steel Company and consists longitudinally of 1 in. x 3 in. Kahn trussed bars carried far into the abutments and turned up 12 in., at 16-inch centres, for both the extrados and intrados of the arch. At the intrados it is crossed by half-inch cup bars at three-foot centres. For walls, stairs, sidewalk, sidewalk beams, &c., half-inch cup bars were used at centres shown on plan. Generally speaking, the walls were reinforced both horizontally and vertically at 18-inch centres. Columns supporting the sidewalks had four ½-inch vertical cup bars with ¾-in. x ¾-in. bands at 2-ft. 0-in. centres, the vertical rods being spliced

to three-foot rods previously placed and projecting 18 inches from the arch ring, abutment or footing:

The truss bars are of mild steel of an ultimate strength of from 60,000 to 70,000 lbs. and the cup bars of high carbon steel of an ultimate strength of 80,000 lbs. All truss bar splices were made with well wired 4-foot laps and cup bar splices with a lap of eighteen inches, all ends being turned down six inches. All rods crossing other rods were wired with 16-gauge wire at the point of crossing in at least three places, but in no case were such points more than four feet apart.

The centering for the arch was supported on the old piling of the two former bridges, capped with 12 in. x 12 in. timbers where necessary, and consisted of 6 in. x 6 in. posts at six-foot centres with bottom chords of double 4 in. x 8 in. timbers with some 3 in. x 10 in. bracing. Two-inch dressed lagging was supported on 3 in. x 12 in. joists at 3-ft. centres resting



Detail of Buttress

on 6 in. x 12 in. caps carried through the arch on each row of posts.

The forming for all exposed surfaces was lined with galvanized sheet iron tacked tightly and smoothly against the forming. For the intrados of the arch, however, the metal lining was dispensed with and special care was devoted to the lagging to insure a smooth and perfectly tight surface.

Practically all the concrete was a 1-2-4 mixture, with the exception of the lower portions of the abutments which approximated 1-2½-5. The mixing plant consisted of a No. 1 Smith mixer driven by electric motor, erected on a platform. Material was delivered to the mixer in 18 c.f. capacity Koppel side dump steel cars loaded with approximately 15 cu. ft. by means of an inclined 50 c.m. gauge track operated by a small hoisting engine. Each car came to the mixer with sand, cement and crushed rock in correct proportions, one car load making a batch. Three lines of track with switches and cross-overs facilitated handling the material at the point of assembly. The mixed concrete was delivered into a car of similar capacity and run on trestles to the various portions of the work and there discharged through chutes. All forms were thoroughly wetted before the concrete

was deposited. The entire arch above the springing line was run in one continuous operation, the work being carried on night and day. Two mixers were not available so that the ring could be started from both abutments, therefore complete strips eight feet in width were run entirely across the arch and care taken to secure a good bond between the strips. With the object of securing a smooth surface on all exposed faces, one or two men were kept working ahead of the concrete depositing, engaged in spreading and trowelling on to the face of the form a 1:2 mortar, care being taken that not more than twenty minutes elapsed between the mixing of the mortar and the deposit of the concrete. Light ramming and spading then brought the mass into one uniform layer.

The whole extrados of the arch, the haunches, the back of the abutments and inside of parapet and wing walls up to sidewalk level were coated with a mixture of coal tar and pitch, applied at boiling temperature. All exposed faces of the concrete received two coats of "Drywall" waterproofing.

At the back of each abutment, six-inch open joint field tile were laid, discharging into the sewer at the south abutment and through the parapet walls at water level for the north abutment.

Material for backfilling was not available in the immediate neighborhood so fully 90 per cent. had to



Up-stream Grille

be hauled by the street railway a distance of nearly three miles, consisting largely of shale and broken rock, and general quarry debris. To facilitate delivery a switch was cut in and the track run on a temporary trestle. The cars dumped directly into place, except that no dumping was permitted onto any concrete work until three feet of material had been first hand-placed. Water and hand-ramming were both used and as soon as possible a steam roller assisted in the consolidation. The top eighteen inches were laid with crushed trap rock of which the upper eight inches were laid in "Tarvia X" to form a macadam surface. The river bank adjacent to the bridge was trimmed, lined and, where necessary, rip-rapped.

On each of the four buttresses was placed a "Jandus" 4-light standard. This consists of a hollow pressed steel cylinder (tapering) of eight inches minimum internal diameter, carrying four arms suspending 100-watt tungsten lights, enclosed in Alba globes. Within the cylinder is a steel pole, tapering from 7 in. to 5 in. outside diameter, which projects beyond the casing and carries the trolley span wire. There is sufficient clearance to prevent any vibration of the street railway pole affecting the tungstens attached to the outer casing. The wires were carried to the

poles in two-inch metal conduits run under the sidewalks and built into the buttresses.

In the centre of each parapet wall was placed a wrought iron grille, each with two bronze shields bearing the name of the city and date of construction.

Approaches 300 ft. and 250 ft. respectively, supported by dry rubble retaining walls, were built to the bridge on a 3 per cent. grade, reducing on the bridge itself to 2 per cent., with a vertical curve at the centre.

Tenders were first called for the construction of the bridge and varied from \$22,000 to \$29,500, but finally it was built entirely by day labor under the direction of the writer. The work contemplated in the contract on which figures were received included only that portion of the approaches within 80 ft. each way from the centre of the arch, none of the street railway material or track-laying, no sidewalks on the approaches and a depth of foundation one foot less than actually constructed.

The total cost of the work was approximately \$25,000, of which the portion of the work covered by the contract amounted to approximately \$22,500, including engineering and superintendence.

Mr. D. A. Gordon was the foreman in active charge of the work. Mr. John Wilson, assistant city engineer (now City Engineer), devoted much time and energy to the work, contributing largely to its success, and Mr. W. H. MacAulay, chief draughtsman, evolved the architectural features of the design.

Concrete in Sea Water

The deterioration of concrete in sea water has received much comment in Boston lately, due to statements by the State Board of Harbor and Land Commissioners. The subject is a very old one, and a marked difference of opinion regarding it exists between German engineers on the one hand, and English and American engineers on the other. There seems to be a rather prevalent opinion in Germany that it is necessary to employ special classes of cement for concrete harbor works. This opinion is based very largely on what may be called experimental investigations, although they have been conducted on a large scale. On the other hand, British engineers have used enormous quantities of concrete made with straight Portland cement, and the results of such work in service have not indicated the necessity of employing special material. The use of cement mortar for protecting the inside of the hulls of steel ships, where they are exposed to bilge water, is widely practiced; and it is generally understood that this protection is the best that can be applied, although the foulness of bilge water is traditional.

In the United States, certain investigations have been made by immersing concrete test specimens in salt water for various periods, and these have shown some results unfavorable to the concrete made and exposed in that fashion. On the other hand, concrete sea walls are in service in New York after many years' exposure, which are in an admirable condition. It will be noticed that the Boston Harbor works referred to have been mainly injured where alternately exposed to water and to air. In other words, the combined atmospheric and aqueous conditions are precisely those which have caused deterioration of concrete in structures exposed intermittently to fresh water during the winter. Frost rather than sea water has ap-

parently been the destructive agent, and the remedy for this is dense concrete with good surface finish.—Engineering Record.

Blasting Gumbo at Toronto

The city of Toronto is building an industrial siding along the east bank of the River Don and in connection with the work some difficulty was experienced in taking out the excavation which consisted of gumbo clay. The annual report of Mr. C. H. Rust, city engineer, contains a brief account of the reasons for building the tracks and tells of the methods employed for removing the gumbo. Since 1905, it is stated, applications have been made from time to time for the construction of railroad tracks on the reserved area on the east side of the River Don. In view of the fact that the city did not desire to give the railroad rights at this point to any one company it was decided to have municipally built and owned tracks operating rights to which were to be granted to all railroads on a rental basis. The length of track-age is 1.96 miles.

In the construction of the tracks it was necessary to remove about 30,000 cu. yds. of gumbo clay located in the Isolation Hospital hill, immediately north of the Gerrard street bridge. A point worthy of mention, the report states, is that practically all of the material had to be blasted. Eight sticks of dynamite, 50 per cent. nitroglycerine, had no effect on this material other than to blow a hole about 3 ft. in diameter, and black blasting powder alone was practically useless. After three days of experimenting, it was found that three sticks of dynamite and two quarts of blasting powder in each hole, 5 to 10 holes at a time, drilled alternately 5 ft. apart, and alternately 6 ft. and 2 ft. back from the face, had the desired effect; it loosened from 21 to 40 yd. at a time, depending on the number of holes drilled. The average haul was 1,600 ft. on dump cars drawn by teams. The average cost was 29.5 cents per cubic yard.

Concrete Tanks for Storing Ammonia

Two concrete ammonia storage tanks, built at the plant of the Ann Arbor Gas Company, at Ann Arbor, Mich., have a common wall. The larger tank, 40 ft. by 10 ft. 1½ in. by 13 ft. 2 in. deep, has a capacity of 27,853 gals., while the smaller, used for concentrated liquor, is 30 ft. by 8 ft. 1½ in., of the same depth, and has a capacity of 17,091 gals. As the tanks were built underground where quicksand and water were encountered, it was necessary to sink a pit outside the excavation and to lay drains under the entire tank bottom, pumping from the pit during the period of construction. Two inches of concrete containing stone of ¾ in. diameter or less was first laid and then covered with a coarser concrete; after this bottom was in, the sides and top were run without a break in the work. Both tanks are reinforced with trussed bars, laid in both directions, and bent rods carried from the bottom into the sides and common wall. The walls were finally roughened on the inside, and, after a thorough cleaning, were whitewashed with neat cement and plastered with a light coat of two parts sand and one part cement. Although these tanks were built in 1909 they have remained absolutely tight. The total cost was \$1,687.74, or 3.7 cents per gallon of storage.

Fairbanks-Morse Warehouse, Saskatoon

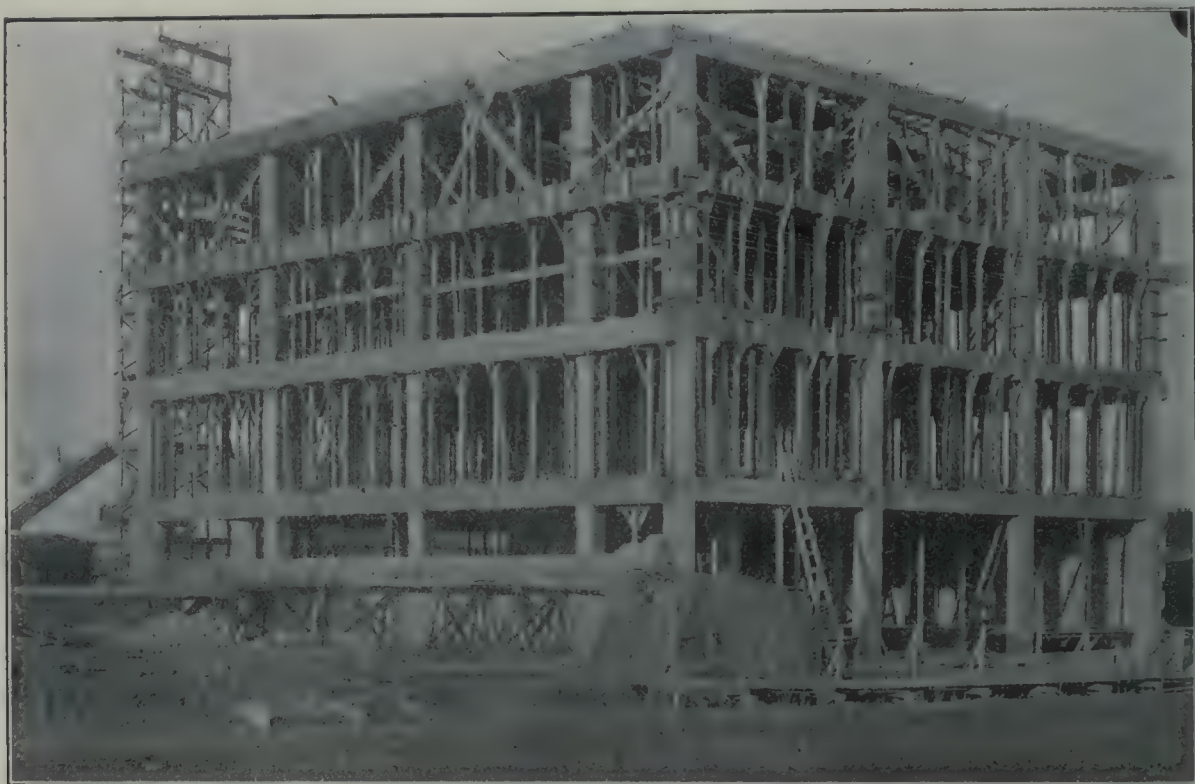
An example of the best type of modern warehouse construction is the building now under construction for the Canadian Fairbanks-Morse Co., Ltd., at Saskatoon. This structure includes all the features that go to make up the most desirable type of warehouse. It is located in 23rd street and will be used by its owners to house their selling and distributing business for Saskatchewan in scales, gasoline engines and other well-known lines of machinery manufactured and sold by this company. The building is built of reinforced concrete, according to the C. A. P. Turner system of mushroom construction. Every measure has been used to make it as fireproof as possible.

The lay-out of the building consists of four storeys and a basement. The first floor will be used entirely as a show room; the general offices will be lo-

feet around the walls and columns. The walls and columns above that point and the ceilings are covered with one coat of magneto water paint. The floors are oiled.

In order to bring the front wall parallel to the street, it is built at an angle of 73.32 to the sidewalk. The building is 55 ft. high from the sidewalk. It is 84 feet long and 60 feet wide. The carrying capacity is 200 lbs. live load per square foot.

The foundations are of reinforced concrete. The greatest dimensions of the footings of the main columns is ten feet square. There are four rows of columns from top to bottom, consisting of five columns each, or twenty columns in all. The area carried by each set of columns is 18 feet by 18 feet 6 inches. The basement columns are 26 inches square, on the ground floor the columns are 24 inches square,



Canadian Fairbanks-Morse Company's Building at Saskatoon, Sask., now under construction.

cated on the second floor, and the third and fourth floors will be used for warehousing purposes.

The formula of the concrete used in the construction of the building is one part Portland cement to six parts sand and gravel. The front is built of dark red paving brick trimmed with Bedford stone. The aim of the builders to provide ample light is shown in the front of the building, which consists chiefly of windows. The spaces between these windows are provided with cast-iron panels. The windows of the first storey are fitted with prismatic lights for the purpose of throwing the light back into the warehouse. The sashes throughout are of the type known as the Henry Hope. The glass used is rolled plate, wired.

The stairs are built of concrete, have Mason safety treads, and are fitted throughout with pipe railing. The floor sleepers, are laid on concrete slabs and are cinder filled. The flooring is of maple. The roof is of tar and gravel. The rear wall is coped with tiles.

The building is finished inside with a dado four

on the second floor 22 inches, on the third floor 20 inches, on the fourth floor 18 inches. The columns are chamfered on the corners throughout.

The floor slab is eight and one-half inches. The side walls are carried on the wall columns of the floor below. The side walls are 12 inches thick from top to bottom. The main entrance is fitted with prismatic lights to provide light for the basement. The main entrance vestibule has a tile floor.

The building is provided with a large vault, with up-to-date lavatory accommodation and with an elevator fitted with steel rolling doors. It is heated by steam and lighted by electric light, wired in concealed conduits.

The architects of the building are Brown & Valance, of Montreal and Winnipeg. T. P. O'Leary represents the architects on the job. The general contractors are the J. McDiarmid Company, Ltd., of Winnipeg.

The heating plant is being installed by James Bal-

lantyne. The elevator was installed by the Canadian Brosseur Company, and the roofing was supplied by A. B. Ormsby & Company.

The building is now rapidly nearing completion and will be ready for occupancy at an early date.

Aids to Bricklayers

Brick manufacturers, as a rule, lend generous aid to trade schools in order to encourage young men to learn useful trades, and especially to learn the trade of bricklaying, so that indirectly it may help extend the use of brick and make it practical for those desiring brick work done to get someone qualified to do it, says the Clay-Worker.

There is perhaps hope in the minds of some that the training of more men will, to a certain extent, ease the cost of bricklaying and in this way encourage a still larger use of brick. To this same end brick manufacturers might well give attention to the encouragement and development of ideas of a mechanical nature that will assist in bricklaying and contribute something to reducing the cost of putting brick in the wall.

It is not only the brick masons that costs money. Not only is he about the highest paid skilled laborer working on structural work, but there is a lot of incidental cost surrounding him. As a rule the hod carriers cost more money than carpenters, though hod carrying is not skilled work. So do those who mix mortar and prepare it for the building, cost money, and then there is the expense of scaffolding, which sometimes amounts to nearly as much as the expense of doing the actual work of bricklaying.

The question is, what can be done to reduce the burden of cost for some of these? Just what can be done remains to be seen, but it looks like there is a chance here to develop machinery and mechanical appliances just as the trade has developed them in the work of digging clay and making up and burning brick. It should be practical to develop machines for contractors for mortar mixing and already there is some progress being made with inexpensive hoisting machines to carry the brick and mortar up on buildings, and there should be more of these. The brick machinery people might well turn some attention to developing special machines to assist in this work. Machines that the contractor and builder can afford to build, and they will not only relieve the burden of cost, but will also be something of a safeguard against any scarcity of labor and difficulty in getting enough help to push building work forward.

There is room to not only develop mortar-making machinery and hosting machinery, but also develop some special mechanism or appliance that will facilitate scaffolding and reduce both the time and expense required in rigging temporary scaffolds for masons to work on. It is not an easy thing, neither can it be done all at once. If it were so it would have been done long ago. However, the problem as a whole is no more difficult than many other problems the clay-worker has already solved, and if enough attention is concentrated on it some good progress can be made in the course of time that will reduce the cost of laying brick in the wall and thus encourage a more extensive use of clay products.

According to a local paper the town council of Barrie, Ont., are in favor of engaging a "competent man" as town engineer at a salary of \$1,000 a year!

Metal Doors for Fire Protection

Some so-called fireproof buildings have not stood up when put to the test because there is too much wood in and about them.

The entire construction of a building, walls, floor beams and trusses, from foundation to ceiling, may be of structural steel, protected with stone, brick, terra cotta and fireproofing, yet, despite these primary conditions of indestructibility, the building may be destroyed through collapse following superheating by a fire feeding on wooden desks, wooden floors and baseboards, wooden doors and casings, wooden window frames and wooden filing cases filled with documents and paper, along with other inflammable material of various kinds that gets into a building.

The wise thing to do in the construction of fireproof buildings is to take the last step toward making them wholly and completely fireproof by protecting each room so that if a fire should break out therein, it could not extend to other rooms. There is but one way to do this, viz.: By having the doors and the frames of metal. When this precaution has been taken, the fire will burn itself out within the room.

Use of Oil on Roads

Oiling roads is frequently done with far too much oil, according to statements by Mr. H. Tipper, of the Texas Company. It is his opinion that such quantities as 1-3 to $\frac{1}{2}$ gal. to a square yard, put down at one time, are unnecessary. In fact, they may be decidedly objectionable because of the slippery surface that will result or the sloppy condition of the surface, causing much inconvenience to pedestrians who track the oily mud into their houses. For conditions in New England and the adjoining states, not more than 1-6 gal. per square yard should be used, according to his recommendations, and as little as 1-10 gal. may be applied satisfactorily, provided the application is repeated when it is necessary. It is assumed that the surface has been cleaned before the oil is applied. This work should not be done, Mr. Tipper states, if the surface has been worn so as to have depressions exceeding 1 in. in depth. If these exist, he believes that resurfacing is likely to prove necessary.

Coarse screening of sewage at Providence, R. I., resulted in the production of 500 tons of debris from 4,801,000,000 gal. of sewage during 1910. The clear openings between screen bars are about $\frac{3}{4}$ in. The screenings amounted to about 68.7 tons when they were reduced to solids.

Cutting concrete on the U. S. government wharf at Key West was successfully performed by chipping out the concrete around the rods at the required level and severing the rods with a hack-saw. The waste end was then easily knocked off by a few blows on the sides with a sledge. The general contractor on this work is the Hennebique Construction Company, of New York City.

Tunnel muck, taken from the Newton pressure tunnel of the Metropolitan Water Board, Boston, used as concrete aggregate, showed greater strength than neat cement.

Account-Keeping in Contracting Work

Serious Leakages Often Due to Careless Book-keeping—Value of Efficiency Records—Satisfactory Types of Sheets and Cards for Entries

By Chas. E. White, Jr., A. I. A.

Sounds dry, doesn't it? Gives visions of a perspiring bookkeeper at the tall, old-fashioned black-walnut or golden-oak standing desk we see so often in a contractor's office, covered with papers and dust, with a few cheap pasteboard letter files standing upright on the shelf above. However, nothing is more important in the contracting business than accounts, and accounting is not uninteresting to the progressive business man.

Because builders are busy men trying to do thirty hours' labor in twenty-four and striving hard to do their work honestly and well, little time is left for bookkeeping. Though many contractors employ expert bookkeepers, most do not. By far the greater number of builders living in small towns and cities either keep accounts themselves or employ a youth, possibly a son or daughter, in that capacity. Casting no reflections, it is only fair to observe that said youth is usually self-trained or else trained by the contractor, who is not as a rule an expert accountant himself. Consequently, systems of accounts employed in many offices are so lax as to be almost useless, when it comes to information concerning all the little details so necessary to know about if a man wants to keep track of business and determine whether he is making satisfactory headway or gradually dropping behind.

Step into the office of the average builder—by average I mean an office such as you will find in cities and towns under 20,000 population—and you will find a sort of thumb-hand system of accounts in operation. Cost of labor is kept, perhaps, by a foreman on the job, entering each man's time in a little book—books such as you may purchase by the dozen at five cents (lost) he might even ascertain just what job John Smith was working on if the foreman has made out the time book carefully. But the builder who really wishes to keep posted on the efficiency side of his business would have a very hard time finding out much about John Smith himself—his character, rate of wages, his efficiency, the exact amount of time he spent on any portion of the work, or other details about John Smith of which knowledge might help his employer to conduct business with much more assurance of success.

Why is it necessary to know all the little details of a business? The answer isn't far away. No builder, clever though he may be, can tell whether he is going ahead or getting behind unless he knows the exact status of every detailed part of his business. He must know the market price of material and where he can buy the best material at the least cost. He must understand where to get the best mechanics, men who will turn out most work of the best quality—men who will do the work so well that it will not have to be done over again. The builder, to be successful, must know precisely what every branch of the work is costing in labor and material, so that he may have a chance to cut off inefficient workmen who do not give him good value for his

money, or he can check up the extravagant waste of material and see to it that leakages in this way are quickly stopped.

Money is made primarily in doing work which costs such a sum and receiving for that work a certain price greater than its cost. The difference between what it costs and what the contractor receives for it is his profit. This profit is a varying factor, being a large or small amount, according to the skill of the contractor. One man by his efficient building methods will make a clear profit of 10 per cent., while another, whose business may be apparently organized as well, makes only 5 per cent. Right accounting usually makes for increased profits.

Bookkeeping is not dull, nor is it difficult to keep books comprehensively when the right system is installed. A good system does not require many more books than a poor one but the books are probably arranged differently. Each classification is more direct and complete in the well-designed system of accounts than it is in the hit-or-miss, systemless system. Modern bookkeeping is merely a collection of note books containing memoranda of the various transactions occurring in everyday business, so that the proprietor can at some future time, if he wishes, look back over his memoranda and tell at a glance just what was done. The correct system of books will show just how much money was spent and how much was received, and that without wading through a mass of accounts. It will indicate every item of material and labor, giving the amount of profit or loss. A good system of accounts will keep the builder informed as to whether he is doing a prosperous business or is running behind. It will keep tabs on his men, indicating when any of them grow less efficient, and keep the builder posted on the best market in which to buy material. It will check up all bills rendered for material, so that the contractor may know just what was bought, at what price, and he can tell on what job it was used.

All these details are necessary to know if a contractor expects to make money. The keeping of such accounts doesn't involve so much work as one might suppose. Modern efficiency accounting systems are so well itemized that the details are easy to keep track of, only a few entries being necessary. One contractor I know keeps his own books and has no difficulty in posting entries himself each week. His business is comparatively large, but he has his accounts so well arranged in detail that only a few entries are necessary to cover every phase of it. He uses a large day book, or "blotter," in which every transaction occurring during the day is entered. For instance, if a workman goes to the shop to get material he enters on the day book a memorandum of what material was taken and for what purpose. Every incident happening during the day is accounted in this way, so that all the contractor has to do at the end of the day is to glance over his day book to find out just what occurred. An hour or two at the end of the week is sufficient

Fig. 1—Ideal Page for Blotter, Cash Book or Journal

for him to post all the items from day book into ledger, cash and other books.

A good type of day book, or "blotter," is indicated in Fig. 1, showing pages ruled something like a cash book or journal, to facilitate entries involving dollars and cents. A book like this should be kept on the contractor's desk at all times, that every incident of the day may be entered as it occurs. Cash paid in or cash paid out, material used, orders can all be entered on the day book first, serving as a daily memorandum of office happenings. Afterwards, at the leisure of the contractor or his bookkeeper, different items are posted into the proper books. Thus the day book is a sort of journal containing every transaction of the business day.

Cash books for strictly cash transactions are usually ruled in the same way as Fig. 1. Cash items are posted from blotter into cash book, so that the cash balance may be obtained at a glance, at any time. When it comes to the ledger containing all charge accounts there are two kinds, those ruled on the inside or outside edges, like ordinary ledgers, and those ruled on the center of the page. The latter are by far the most convenient as center ruling (in the center of the page instead of in the roll of the book or at the outside edge) makes entries easier. At the same time debit and credit columns, being side by side, it is easier to compare totals than when the columns are widely separated, as they are on the ordinary edge-ruled page.

These are the three books every business requires—day book, cash book and ledger—but they are not the only books needed if a contractor wishes to keep

Fig. 2—Specimen Page of Order Book

permanent memoranda of his business in all its details. One of the most serious leakages in the building business is caused by inadequate records kept of material ordered. Too many builders simply write letters ordering goods or order by telephone. In each case the original memorandum is frequently lost, so that in the end the builder is in doubt as to what was ordered, when it was ordered or where. To obviate this difficulty many contractors have installed an order book in which is entered each order for material (Fig. 2). Orders can be in duplicate or triplicate, as desired, by inserting a little piece of carbon paper underneath the original entry page when the order is written. This original blank is torn out and sent to the concern from whom the goods are ordered, the carbon duplicate remaining in the book for future reference. Then when goods come in the contractor has a chance to check up the bill, and at any time he wants to know the details of the order he simply refers to his order book, which contains all the details of the transaction.

Jobbing is one of the hardest branches of the building business to keep track of, and it is the most profitable work the contractor can do if he makes the right percentage of profit. In accounting, a book should be devoted to jobbing and sheets ruled like Fig. 3 will be found useful for entering details. From the day book (in which the original order is noted) the jobbing sheet is made out before the work is started, entering the name of the customer, his address and date of order. Each man sent out on the job and every item of material used is charged to this job by entering on the jobbing sheet, and after the work is completed the bottom of the sheet is filled in with de-

Fig. 3—Sheet for Detailed Account of Jobbing

Fig. 4—Billhead of Latest Type for Double Entry

in the rock and the work is continued by drilling and blasting successive rows of holes parallel to the face and some 6 or 8 ft. back of it. When pieces of rock too large to handle are blasted out, they are afterwards broken by mudcapping or block holing as in quarry work.

In such work it is not customary to drill holes much deeper than 20 feet, so when it is necessary to make cuts deeper than 20 ft., the rock is taken out in two or more layers or "benches." Cuts along the sides of hills or mountains are blasted in the same way, but in these the outside holes are much shallower and require smaller charges of dynamite than the inside ones.

The quantity and strength of dynamite for best results in road grading is governed by the character of the work and kind of rock to be blasted. Generally from $\frac{1}{2}$ to $\frac{3}{4}$ lb. of dynamite is required to blast each cubic yard of rock in cuts through higher ground. In cuts along hill sides, or sidehill cuts, less dynamite is required for each cubic yard of rock, because in this work an additional "free face" is presented, the rock being bound in on the back, bottom and one side only, instead of back, bottom and two sides, as in the former case.—Good Roads.

Standards of Ventilation

Dr. Evans, of Chicago, in a paper read before the American Society of Heating and Ventilating Engineers in speaking of standards of ventilating, said:

The temperature should not rise above 65 degrees Fahr. When the air currents are moderate the temperature should range from 68 degrees to 70 degrees Fahr. When the temperature passes 70 degrees Fahr. the air currents should be travelling not less than 10 miles an hour when they strike the body and the head zone.

Methods of gauging: Thermometers properly placed with regard to heating, lighting, occupation, radiation, convection and conduction.

Carbonic Dioxide—In establishing a standard for carbon dioxide it is well to bear in mind certain fundamental facts:

(a) The carbon dioxide produced in the human body is a harmful agent, but it is not violently so, or immediately so; neither is it the most harmful agent or quality of expired air.

(b) It is a good index of pollution when animal life is practically the only agency of production operating in the area which is being judged.

(c) While the CO_2 produced in processes of manufacture is slightly harmful, air containing a given content of CO_2 is much less harmful than air containing the same proportion of CO_2 to animal expirations.

(d) CO_2 is a readily diffusible gas and therefore in a given room the proportion of CO_2 is the same at all points, regardless of temperature conditions and location of agencies of production. Diffusion requires a little time, therefore, in a room with uprising air there is a slight excess at the ceiling, there is a slight excess at air outlets regardless of whether they are located at the floor or the ceiling. As it is impossible to keep all the air around lights, etc., from rising, there is always a very slight ceiling excess even in downward ventilation installations.

Therefore—The amount of CO_2 in a room should not pass ten parts per 10,000, if it is all being produced by animals. If it is being produced by other agencies it can pass this figure. For example, in the

brewing industry the CO_2 will probably be unassociated with any other harmful substance, therefore it could safely be allowed to pass 30.

In brick burning it would probably be associated with considerable SO_2 , therefore 15 would not be compatible with comfort.

Methods: The Rogers modification of the Peterson-Palmquist apparatus is the best thing we have.

There is great need for some simple approximate test.

Feel—There is no way of standardizing the feel of air. The personal equation here is quite as large as it is in the case of odors. The feel of a draught which would be highly agreeable and stimulating to one man would cause the next grave dissatisfaction. And yet there must be a something in the feel which cannot be analyzed. It is a sense which should be of great value if we could develop a set of "feelers" who would be the judge and jury. What makes it impossible is the individualism of the feelings. There is a very definite something in the better feel of a sunned and aired bed or the atmosphere which irritates enough to stimulate but not enough to be unpleasant. It is a great pity that such individualism as that displayed by the draught crank makes the feel an unavailable factor in ventilation.

In the present state of public intelligence on ventilation, the engineer who invites and stimulates criticism on the basis of the feel is making insurmountable trouble for himself. There is no instrument or apparatus to measure the feel of ventilation.

Volume of Air—There is need for a standard of volume of air per inhabitant, as a part of a composite standard. As the only standard, it has probably been the basis of more so-called ventilation than any other item. Ventilation based on volume alone has not made good, could not be expected to make good. In considering volume, variation in the standard is required. As the British Parliamentary Commission have well said, "It is not so much the volume of air which you put in as where and how you put it in." Four cubic feet of air will contain enough oxygen to supply a man's needs for one hour. However, it is impossible to extract all of the oxygen from the air. This would then represent the ultimate theoretical possibility. Seventeen cubic feet of air will furnish enough extractable oxygen for a man for one hour. Let us call this the theoretical possibility. It would supply all that was needed by a calm, cool, idle man if the foul or exhalation air high in CO_2 and in moisture was kept entirely away from the inspired air.

Sulphate of alumina is purchased by specification at the Bangor, Me., filter plant and the price paid depends upon the composition of the coagulant, as shown by analyses. Mr. James M. Caird, in his last annual report dealing with the operation of the works, states that the following are the specified requirements: Alumina (Al_2O_3), not less than 17.5 per cent; acid (SO_4) not more than 37.5 per cent.; iron (Fe_2O_3) not more than 0.4 per cent.; water, not more than 47.0 per cent.; insoluble matter, not more than 0.25 per cent. If the analytical results show the alumina to be below 17.5 per cent. and over 17.0 per cent. a deduction of 8 cents per 100 lb. is made; if the alumina is below 17.0 and above 16.5 per cent. the deduction is 15 cents per 100 lb. For each .25 per cent. or fraction thereof of iron above 0.4 per cent. a reduction of 5 cents per 100 lb. is made.

Wood Pavement Specifications at Vancouver, B. C.

The causes of some failures of creosoted wood block pavement in Chicago which, according to the writer, represented a "rather general state of affairs chargeable to improper methods and faulty workmanship in laying" were reviewed in a recent issue of the Engineering News by Mr. C. K. Mohler, consulting engineer, Chicago, who pointed out that unless better methods were employed this kind of paving would gain a degree of unpopularity not deserved. Reproductions were made from a number of photographs. One of these showed the wear due to the action of horses' shoes at the open joints left where tie rods occurred in the street railway track; another showed settlement and rutting outside the rails and settling of granite block paving between the rails; the third showed excessive settlement and rutting, with practical destruction of the blocks.

In defence of this paving Mr. W. H. Harvie, president and manager of the Dominion Creosoting Company, Limited, Vancouver, submits the following interesting letter.

Sir: Referring to the paper of Mr. C. H. Mohler, on "Failures of Wood Block Paving in Chicago," I would state that there are in this city (Vancouver) to-day a number of miles of creosoted block pavement which has not developed any of the faults set forth by Mr. Mohler.

The accompanying specification for wood paving, in successful use here for the past ten years, was inaugurated by Colonel T. H. Tracy, formerly City Engineer here.

Templet strips $\frac{3}{8}$ in. in depth and double handled wide wooden scrapers are used to get a perfect cushion surface. The tie rod in 8-in. T-rails is 5 ins. below the top of the rails and there is no trouble in that respect. The full standard complement of ties are now used on a 6-in. concrete base; then the ties and rails are embedded in concrete to $3\frac{1}{2}$ ins. on the rail, leaving $4\frac{1}{2}$ ins. for paving, chamfered brick are inside for flange space and chamfered wood blocks fit flush against the rails outside. This is called slab construction and seems quite efficient.

One advantage lies in the fact that it is quiet. Formerly the ties were spaced 5 ft. apart and the rail was embedded in concrete but this proved very noisy. The pounding vibration of the rails disrupted some of the tracks, but not badly, however. This was overcome, as stated above, by laying the full standard complement of ties so as to absorb the vibration of the rails. There is not a single instance of disruption at manholes in ten years.

Yours truly, etc.

Specifications for Paving with Dominion Creosoted Wood Blocks at Vancouver, B. C.

GRADE.—The roadway shall be excavated and graded to a depth of the finished pavement, say 11 ins. deep. Any soft places shall be dug out and refilled with sound earth and stone or other suitable material as the City Engineer may direct. The finished grade shall be smooth and even with the surface of the proposed pavement.

CONCRETE.—Upon the finished grade shall be placed a layer of concrete 6 ins. thick, evenly laid and well tamped to a smooth surface, the contour and crown to be determined by the City Engineer. Careful provision shall be made in this surface for inclines to catch-basins. The concrete shall consist of 1 part cement, 3 parts clean, sharp sand, and 5 parts washed and screened gravel or broken stone thoroughly incorporated.

CUSHION.—When the concrete base has sufficiently set, a dry mortar of 1 part cement to 3 parts clean sand shall be evenly spread over the surface of the concrete base to the depth of $1\frac{1}{2}$ in., all inequalities filled to a smooth

surface, and, as the placing of the paving blocks proceeds, the dry layer of mortar shall be sprinkled ahead of the block laying with sufficient water.

PAVING BLOCKS.—The paving blocks shall be of Douglas fir accurately cut to dimensions, the plank having been run through a planer to ensure even thicknesses. The blocks shall be free of pitch and shakes and of sound live timber. The blocks to be treated with approved creosote under pressure until they have absorbed the full quantity of oil as specified by the engineer.

The paving blocks to be — ins. deep, 4 ins. wide and from 4 to 9 ins. in length.

EXPANSION JOINTS.—A space of about 1 in. wide is to be left between the paving blocks and the curb to be filled with clay or pitch.

FINISHING.—When the paving blocks have been laid on the mortar base in sufficient area and closely driven together longitudinally of the street, and laterally, less tightly, they shall be rolled with a heavy hand roller to a footing in the wet mortar, and any uneven blocks shall be lifted and replaced uniform with the surface.

SURFACING.—The surface of the paving blocks shall be swept clean and the whole surface floated and re-floated until all interstices are uniformly filled with a hot flux of coal tar paving pitch, leaving a finish of it upon the surface to retain gravel. The surface shall then be covered with a layer of fine gravel or granite screenings.

The Claims of Brick

That enterprising firm, the Milton Pressed Brick Co., Ltd., of Milton, Ont., and Toronto, Ont., have just published an interesting little book, entitled "Milton Bricks: An Aid to Better Building."

"The use of brick," according to this publication, "dates back to the earliest history of man."

Ancients Used Brick

"The Great Wall of China was built of brick—with what foresight we cannot know—but we do know that time has demonstrated the wisdom of the ancients in choosing that almost indestructible material.

"To the Romans, however, is due the credit of perfecting the manufacture of bricks. By them; too, it was introduced into England. The old Roman Wall which they built around London was made of brick, and stood for centuries as a lesson in solid construction to the British people.

Bricks a National Institution

"This lesson is one that has endured through the history of the Anglo-Saxon race. Bricks were, have been, and are, the staple building material of the nation. The use of this material in building Bentley's colossal Westminster Cathedral shows clearly that the claims of modern construction materials cannot dislodge from the mind of the Briton the faith in bricks which centuries of successful building experience have inspired.

The Charm of Age

"The world over, the human heart longs for permanence. When you plant a tree you like to think that its shade will be enjoyed by generations to come. When you gaze at the pile of brick and stone that represents an architecture of bygone years, you admire it—not for what it is, but because it has stood there for 800 years.

"Brick has proven itself the most permanent building material in the world."

The booklet contains valuable information which every architect and builder will do well to take to heart. There is much of interest in what is written concerning the special uses and adaptability of Milton Pressed Brick and the process of its manufacture.

A Talk On Reinforced Concrete Design

Given by Professor Brown, of McGill University, before the Montreal Builders' Exchange—Importance of Reliable Workmanship and Supervision

Special to the Contract Record

Mr. John Quinlan presided at the second lunch and noon-day talk of the Builders' Exchange held on October 18th, at Montreal. There was again a very good attendance of representative men. The talk was by Prof. Ernest Brown, M.Sc.M., Eng., Prof. of Applied Mechanics, McGill University, and the subject was "Reinforced Concrete."

After some preliminary remarks Prof. Brown referred to the leading part that reinforced concrete has played in the development of Montreal. "This form of construction," he continued, "has many followers, ranging from the rabid enthusiast who would have you believe that it is the thing for almost every kind of building, to the more modest, and perhaps more effective advocate, who realizes at one and the same time its advantages and its limitations. There was a day when it had its opponents, but its record of actual achievement in the past few years has established its claim to being one of the principal forms of construction at the present day. The opponents have become friendly critics, or even converts, and there are now very few who are so blind as to ignore the facts of the situation."

"There are, however, some who seem to think that a designer in reinforced concrete is drawing on his imagination to a much greater extent than a designer of steel work. Some steel work designers, at all events until recently, would almost give you the impression that their work was calculated to such a nicety as compared with that possible in reinforced concrete work that the latter by comparison had very little claims to exactitude. I am not here advocating one form of construction as against another, nor any particular type of either form, but I do say that if we set down the exact conditions of the problem confronting a designer in these rival forms of construction there is not much to choose in the matter of exactitude. The problem is always this, no matter whether it is a design for a huge bridge or for an office building or store: (1) to make some estimate, more or less exact, of the forces which will probably be brought to bear on the structure considered, floor loads, wind loads, etc; (2) by some theory, more or less exact, to determine the forces which the above estimated loads will produce in the component parts of the structure; (3) from our knowledge, more or less exact, of the physical characteristics of the materials employed in the various parts of the structure to so proportion those parts that they may withstand successfully for an indefinite period the forces which are estimated to come upon them."

Importance of Good Workmanship and Reliable Supervision

"After that it is necessary to have the work carried out in strict conformity to the designs by efficient labor under the best supervision. In the matter of the first two processes above, designers of steel work and of reinforced concrete work are on the same footing. As regards the third point our knowledge of the properties of concrete and of the effects of changes in its composition is now of considerable extent, and I do not think that a conservative designer need have any anxiety in regard to the behavior of his structure if reasonable sound specifications are lived up to. Steel designers in recent years have come to consider much more carefully than heretofore the probable effects of eccentricity in some of their details, and in this reinforced concrete designers can learn from them, and in the particular case of columns consisting of angle and other sections latticed and tied together we are only in the early stage of finding out how they really act. I could show you experimentally the actual conditions of stress in such a member as a tie bar made up of two angles back to back, connected by a plate at their ends and separated at intervals at distance pieces—one of the commonest forms of construction imaginable. Experiments of a very interesting character are being made by one of our staff at McGill on this very matter, and all I need say to emphasize the point is that any steel designer who thinks that even such a simple built-up member acts as one piece has another 'think' coming to him. We are all engaged in estimating something. Formulae expressing the complex action which is going on in either a

steel structure or in one of reinforced concrete may be forthcoming, but of this I have grave doubts, and even if they are, we shall, for practical purposes, make such modification of them as will eliminate from them any complexities which are due to effects which are either of small magnitude or which can be allowed for in a simpler manner."

"While I, for one, would not be prepared to admit that the steel designer can figure the actualities to a much finer degree of accuracy than the reinforced concrete designer, I do think that the latter depends to a tremendous extent on the honesty and sincerity with which his plans are carried out. Structural mild steel is manufactured in our steel mills under reasonably uniform conditions, and, speaking broadly, of course, an engineer buys it in the open market with considerable confidence in the uniformity of its qualities. He knows that he can figure safely on sixteen thousand pound square inch in tension and that if he is cutting his sections as finely as possible he may reduce them by say ten per cent. and increase his unit stress accordingly. The properties of his material are not altered. He is not taking an unknown risk. But in concrete construction the material by which the compressive forces in the structure are carried is made and laid on the spot, and is liable to variations in mixing, the weather conditions, and soundness of forms, etc., quite apart from any variations in quality due to change of composition. If we reduce cement by, say, ten per cent., use an inferior sand, or change the nature of the aggregate, without definite knowledge of the effects of this change—if we do all or any of these things we are altering to an uncertain extent the physical properties of our concrete. We are taking an unknown risk and one which, to my mind, is entirely different in character from that involved in a cut of a definite percentage on steel sections. We know from experience that certain expectations in the properties of mild steel will almost certainly be lived up to, and it is in the power of those engaged in reinforced concrete work to produce a concrete equally uniform and reliable. A successful designer has always in mind certain possible differences between assumed and actual conditions, and it is in a proper realization of such differences and in the capacity of the designer to appreciate the extent of their influence that reliance must be placed. Poor concrete is much the same weight per cubic foot as good concrete, and if the concrete is poor and only capable of safely carrying a small compressive stress more is required to sustain a given compression, and hence more steel is required to carry the extra dead load necessitated. As a factor influencing the cost of a safe design, this is important, but we can get uniformly high grade concrete if proper care is exercised. At the same time the calculations of a designer can be rendered of little avail if the actual work is not carried out in a thoroughly conscientious manner."

Simplicity the Keynote of Design

"To my mind the keynote of design and construction work should be simplicity. A brief survey of the evolution of design principles will show that when this has been departed from we have always had to retrace our steps and come back to simple ideas. A correct understanding of the theory of the strength of beams is one of the first essentials in the preparation of a design of the steel frame work of a building, and when reinforced concrete entered the field as a competitor it is not surprising that the earliest tests were made to determine the properties of reinforced beams."

Prof. Brown then commented upon the large number of apparently exact formulae sent out in the early days of reinforced concrete, and expressed the view that the physical properties of concrete were not of such a precise and regular nature to make it necessary to have them expressed in apparently exact formulae running into several decimal places. He continued: "Laboratory experiments are all right, and designers have to use information so obtained along with that mass of information gathered in practical work. The man in practice must not discard information obtained from a test in which the precise conditions of practice are not present, nor must the man in the laboratory seek to push his results to foolish limits. In reinforced concrete

design we must try to get all possible experimental information on the interior action in our structures, but let us remember that there are many effects, notably those of continuity, the influence of which can only be estimated in a general way, sufficiently closely perhaps, but not exactly. On such grounds I would discard any elaboration of theory or design which produces only slight changes in the important features of a design from the proportions given by simpler methods. We may theorize as much as we like, make allowances for this little variation and for that, but in the end we are face to face with a problem which admits of no such exact treatment. I defy any experimenter seeking to verify the deductions from an elaborate analysis to manufacture, with certainty, a test beam in which the rods are placed exactly as on paper, and in which the physical properties of the concrete in every part of the beam follow the laws laid down in his theoretical analysis. This is, of course, far from saying that the results of beam tests are at variance with calculations based on a rational interpretation of the known physical properties of concrete. On the contrary, beam tests agree remarkably well with a simple rational theory, and this leads me to notice briefly the physical properties of concrete involved in the basic formulae of our designs, and to see to what extent any particular property is uniform or not, and to what extent each property is of importance. If we take a bar of steel and subject it to a tensile stress of, say, 30,000 lbs. per square inch, a length of ten inches would be found to elongate about one hundredth of an inch. Not only is this true, but if we halve the stress intensity we halve the elongation—the one is directly proportional to the other up to the limit of elasticity of the steel. That is to say, the modulus of elasticity is constant.

"In concrete we do not as a rule find this simple proportionality hold good. The modulus of elasticity is not constant, and consequently this characteristic is the one which leads to all the elaborate formulae for design which are so unnecessary and, indeed, unjustifiable. In view of the uncertainty of the values of the modulus for concrete and of the law of its variations. If we take a number of moulds and make several compression specimens of a given batch of concrete and test them under compression we shall find that uniform conditions of mixing will give a concrete showing reasonably uniform strength. For a 1:2.4 rock concrete we would expect from 2,000 to 2,500 pounds per square inch ultimate strength at thirty days; but if we make careful measurements of the amount by which the concrete specimens shorten under compression, we should not find the uniformity of behavior which steel exhibits. We might find, for example, that on loading any one specimen from zero to, say, 500 pounds per square inch, a length of ten inches would shorten by about 1/500 in. If we measured the shortening in several places taken round the specimen over the same ten inches we should probably find variations, and the average might be as stated. These variations might be almost entirely absent, but are generally appreciable. If we increased the load on the specimen to, say, 1,000 lbs. per square inch, the shortening due to this additional five hundred pounds per square inch would probably be greater than that found for the initial 500 lbs. per square inch; a further increase of 500 lbs. per square inch to 1,500 lbs. per square inch would again show an increased yield; and in all cases measurements taken round the specimen would usually show variations from the average. If such a specimen failed at say 2,500 lbs. per square inch, it might well be that the increase of stress from 2,000 to 2,500 lbs. per square inch would give a shortening of 1/250 inch over ten inches, while the initial increase from zero to 500 lbs. per square inch only gave 1/500 inch shortening. This means that the modulus of elasticity is variable and not constant as for steel. It decreases as the stress increases. In a beam the greatest tension or compression exists at the extreme layers on convex and concave sides, and for a beam of homogeneous material such as steel the stress intensity diminishes uniformly from the further layers towards a plane separating tension area from compression area and known as the neutral plane. But for concrete, the modulus of elasticity is not constant, and hence we find that taking a beam having a depth of say 6 inch in compression, a layer two inches above the neutral plane is stressed, perhaps, to 200 lbs. per square inch, while the extreme layer, 6 inches away, is stressed not to three times the stress at 2 inches away, as would be the case for steel, but perhaps only to 550 lbs. per square inch. The exact proportion between stress at the two layers is immaterial, and would be changing all the time if the beam were loaded gradually to breaking point. Thus we have deviations from the well-known simple beam laws for homogeneous materials, but before

accepting a theory allowing for such deviations there are two questions to be asked. 1. Are the laws of variation in the physical properties of concrete which necessitate these changes of a fixed and definite character? 2. Are the changes in essential dimensions of a design which a consideration of these physical properties involves, of an appreciable magnitude, such as would not be offset by the inaccuracies of the spacing of material which are inevitable in practice (or even in a laboratory)?

"The answer to both these questions is 'No.' and experiment demonstrates the validity of this answer in regard to the rate of yielding of concrete under load. If we make carefully a number of similar compression specimens from the same mix and measure the amount of shortening of each under load we should not find them to behave uniformly. For an increase of load from zero to 500 lbs. per square inch in each case one might shorten 1/500 inch on a length of ten inches, another 1/400 inch, and another 1/600 inch, and so on. Further, each would probably show an increased rate of yielding as the load was increased, and measurements made round the specimen in different places would show considerable variations in the yield for any given increase of load. The point is that although variable the modulus follows no certain laws, neither as regards its value nor as regards its variations; in fact the one property which runs uniformly with uniform mixtures is the strength, and fortunately for the ensured stability of designs the fickle variations of modulus of elasticity are of little or no account, and the uniform strength property is the all important one.

The Fundamental Theory

"Any theory of reinforced beams starts from the assumption that the several layers of the beam are lengthened or shortened by an amount proportional to their distance from the neutral plane. Careful experiments show that while this is not rigidly true in all cases it is conformed to with reasonable accuracy in most cases. Accepting it as true we shall get different results for the bending moment which the beam can carry according as we assume: A. Variable modulus following some assigned law. B. Modulus uniform during loading. C. Different values for the uniform modulus. I cannot go into details, but may state the results found by analysis. Assume a rectangular beam ten inches deep with, say, one per cent. reinforcement. Then taking average concrete we should find that under working loads the distance from the steel line to the point in the section where the resulting compression acts is about 8.6 inches, if, we assume, a variable modulus, with definite law of variation; 8.8 inches, if we assume a uniform modulus of 3×10^6 lbs. per square inch; 8.6 inches, if we assume a uniform modulus of 2×10^6 lbs. per square inch. These figures show the relative strengths of the beam according to the different methods of computation assumed. The figures neglect concrete tension, and their differences indicate the extent to which different methods of calculation affect the broad features of design. We can see at once that the variable modulus theory gives for this case a result which differs by only about two per cent. from that for uniform modulus of 3×10^6 . That of the modulus is 2×10^6 —a very large change—the difference between the result for 3×10^6 is only two per cent.

"Now it is an undoubted fact that in actual construction, even of the most careful kind, some of the rods may be displaced by an amount quite as great as the differences shown by this theory, and therefore the above differences are on paper only. As a working theory the straight line constant modulus theory has every claim to adoption, and in the standard specification of the American Society of Test Materials it is adopted. All concrete is taken to have the same modulus; viz.: 3×10^6 , a great change from the days when cinder concrete, rock concrete, gravel concrete, etc., were all supposed to have a different modulus, each following a different law of variation as the load increased. It has been amply demonstrated that all these were unnecessary refinements, and the standard specifications recently drawn up have been swept away. Similar simple specifications were drawn up earlier by the Institute of British Architects, and I would urge the adoption of some such standard here. I do not believe you have any such standards at present.

Toronto's Foolish By-law Again

"When in Toronto a couple of years ago, attending the Cement Association Congress, I learned that their building by-laws prohibited a designer from figuring any continuity in reinforced concrete floor systems, and I believe that foolish and unjustifiable prohibition still stands. It seems to me to leave a clear field for the steel construction people. Here I do not think you are hampered by any

by-laws on such matters—it is more of a go-as-you-please. You are more familiar than I can be with the results of this, but unless the miraculous happens, the usual result of such conditions is to find one design called for according to one set of specifications, another design to another set of specifications, and so on. Now, even if all these varied specifications were beyond reasonable criticism—which is questionable—would it not be better to have a working standard? Our railroad bridges and highway bridges are built under standard specifications, and it seems to me desirable that there should be some standard in this matter also. Perhaps your association can take the matter up. I am sure it would be advantageous to have something of the kind, whether an architect prepares plans in his own office or has them prepared independently by an outside firm. It would tend towards standardization and be beneficial all round."

Prof. Brown concluded by inviting members of the exchange to spend an evening at McGill University in seeing tests of concrete beams in the laboratory.

Trade News from the Federal Capital

Correspondence of the Contract Record

Ottawa, October 28.—It is stated that there will be several changes in regard to the government building operations in this city as a result of the change of government. The date for calling for tenders for the new departmental block was postponed by the late government on account of strong opposition made to the site chosen, between Mackenzie avenue and Sussex street. The site was low and very narrow and it was then urged that the property on the east side of Sussex street be expropriated and the block erected there. However, as soon as the new government gets settled, it will be suggested that the block be erected west of Parliament Hill instead of east. This block would be between Wellington street and the Ottawa river. If the government complies with this request, it will mean that the big structure will not be built for some time yet, as this land would all have to be expropriated and the present buildings torn down. It looks very likely, however, that this will be done, as the arguments in favor of the western site are strong.

The question of Ottawa's railway entrances will have to be settled at once and it is announced that the C. P. R. and the city will wait on the government immediately in this connection. The C. P. R. asked to be allowed to close up the Rideau canal from the Deep Cut about half a mile south of Central station and allow its lines to come into the station by the bed of the canal. From Central station, it would tunnel through under the city, coming out near the western station. The city is recommending that instead, the railway come into the city along the west side of the canal, making the waterway somewhat narrower but not closing it up altogether, and have the tunnel, but at a somewhat higher level than the C. P. R. proposes.

The entire question must be settled at once. Ottawa is growing so fast that large sections are demanding bridges across the canal to give them access into the centre of the city. These bridges could be for the most part low level bridges, if there were no navigation on the canal, but with navigation they must be high, and consequently much more expensive. The preliminary work in connection with one of these high level bridges has already been completed. It is to be at the point where Bank street crosses the canal. It will cost about \$130,000, and is only one of several similar ones that will have to be erected if the canal is to be kept open. It really forms a belt around half the city, and the half in which there is the most growth. Whether the traffic from the Rideau river to the Ottawa river is sufficient to keep the waterway open is the main point. If it were closed the traffic from Kingston to Ottawa would not be interfered with, except that the wharves would be farther from the centre of the city.

The new Minister of Railways and Canals visited the site of the proposed high level bridge for which the government has provided \$70,000 and the city has voted the remainder. The work may be held up until the railway entrance scheme is settled.

The new central station was to have been handed over by the contractors to the Grand Trunk this month. It is expected that this will take place very soon. The work on the C. P. R. roundhouse is also being hurried.

In the private building, conditions are very favorable. Most of the builders are putting in foundations for houses before the fall frosts, the buildings to be completed later on. The weather has been excellent so far and the builders are well satisfied.

Of the larger buildings, the new Blackburn building is, perhaps, the most important. The first section of this big structure will be completed about the first of November and the second will be begun at once. There will be three sections when completed. Mr. W. E. Noffke is the architect. The remodelling of the Rideau Club is practically completed. Mr. James Mather is the architect.

Labor is more plentiful than it was earlier in the fall, particularly among the trades, but there are practically none out of jobs. It has been a great summer for the trades people and the good October has added to their prosperity. Prices of building materials remain unchanged.

Canada Cement Company's Extensions

The Canada Cement Company have large extensions of their plants under consideration, with the object of filling the growing domestic demand for their commodity and for extending their foreign business. It is proposed to expend large sums on these additions during the next few months. At Port Colborne work is now being carried on with the object of enlarging the mill to twice its present capacity. When finished this branch will give employment to about 500 men.

Winnipeg Plant to Cost \$150,000

A huge plant is under construction on the outskirts of Winnipeg. It will cost \$150,000, and will be in operation next May. The capacity at the start will be 3,000 barrels per day.

The buildings at present in course of construction comprise a stock house capable of storing 150,000 barrels of finished cement. It is 120 by 100 feet in size, on heavy foundations, and is being built of reinforced concrete. Inside there is one large central bin and eighteen smaller ones. The purpose of the latter is that a contractor may reserve one for his supply of material and in this way can be sure that he is always getting a certain fixed quality of fully matured cement. Each of the bins of this storage house opens into a duct beneath and belt conveyors carry the finished material to the bagging house.

The bag and packing house is a concrete building 150 by 40 feet, and is located along one of the many spur tracks which intersect the property. It will be fitted with the latest appliances for rapid handling of material and will have large storage space for bags.

The clinker mill and clinker storage building is a huge structure measuring 190 by 70 feet. As the clinker comes in on the cars it is dumped directly into a large hopper where a patent conveyor takes it to the storage house, to be piled up in a huge heap ready for grinding. Gates in the floor open on a huge tunnel in which is a belt conveyor to the grinding bin, from which the material is fed into the machines automatically.

Other buildings are the machine shop and power sub-station, where the high voltage current will be stepped down for use in the plant.

Construction Work at the Coast

Vancouver, Oct. 27, 1911.

A new theatre is promised for Vancouver to cost approximately \$700,000. It will be located at the south-west corner of Hornby and Georgia streets, and it is expected that building operations will commence at an early date. The theatre will be ten storeys high, have a commanding appearance and be a credit not only to Vancouver but to the Pacific Coast. By the erection of this theatre which, it is stated, will be one of the best structures of its kind on the American continent, Vancouver will take its place with New York and Chicago. To have such a theatre in Vancouver has long been the ambition of Mr. E. R. Ricketts, the present lessee of the Vancouver Opera House. The lease on the Opera House expires in September, 1912, and consequently it is imperative that other quarters be secured. The theatre proper will take up six storeys and the other four floors will be let out in offices. The building will occupy 150 feet on Hornby street by 120 feet on Georgia street. There will be seating capacity for 1,600 persons.

False Creek Bridge

Recommendations for a \$550,000 money by-law to cover the expense of a bridge across False Creek, connecting Georgia and Harris streets, has been decided by the bridge committee of the Vancouver City Council. The structure is to be 66 ft. wide, 10 ft. wider than the present False Creek bridges, with a roadway of 42 ft., and sidewalks of 7 ft. each. Accommodation will also be provided for double streetcar tracking. The estimated cost of the bridge itself is \$485,000. It was stated that it would be necessary to acquire C. P. R. land to the extent of \$30,000 or \$35,000, and City Engineer Fellowes suggested that the by-law be framed for at least \$550,000, to cover all possible contingencies. The viaduct will be 2,800 to 2,900 feet in length, only 200 to 300 feet of which will span False Creek itself. The greater portion will stretch across the C. P. R. yards and tracks at the Georgia street end. It is not intended that there shall be any drawspan, for the bridge will be high enough to permit the passage of all such craft as make their way that far up False Creek.

Contract Disputes

City Engineer Fellowes submitted to the city council a report on the relative responsibilities of Messrs. Waddell & Harrington, who are the city's consulting bridge engineers, and Messrs. Palmer Bros. and Henning, who are the contractors for the Cambie St. bridge, in the matter of construction delays. The sum of about \$1,200 was involved in penalties, and Mr. Fellowes, according to agreement, was sole arbiter. He decided that inasmuch as the city's engineers had been unable to prepare the approaches in proper time for the structural work of the contractors, the latter could not be held responsible.

There was a communication from the Canadian Bridge Company, sub-contractors on the work, asking that their bond for \$100,000 be released, in view of the fact that the bridge is practically completed, and the city holds about \$40,000 of their funds besides. The application was refused.

The general contract for the Burnaby prison farm building has been awarded to Smith & Sherbourne, 615 Hastings street, W., Vancouver, by the Provincial Government, and as soon as plans can be arranged, construction will be started. The contract calls for the construction of the administration and prison buildings, to be a main building and four wings, four storeys in height, covering a ground space of 346 by 200 feet, and to cost about \$500,000. The administration building will be of steel and con-

crete, with brick facings, and the wings will be of concrete, with 250 steel cells.

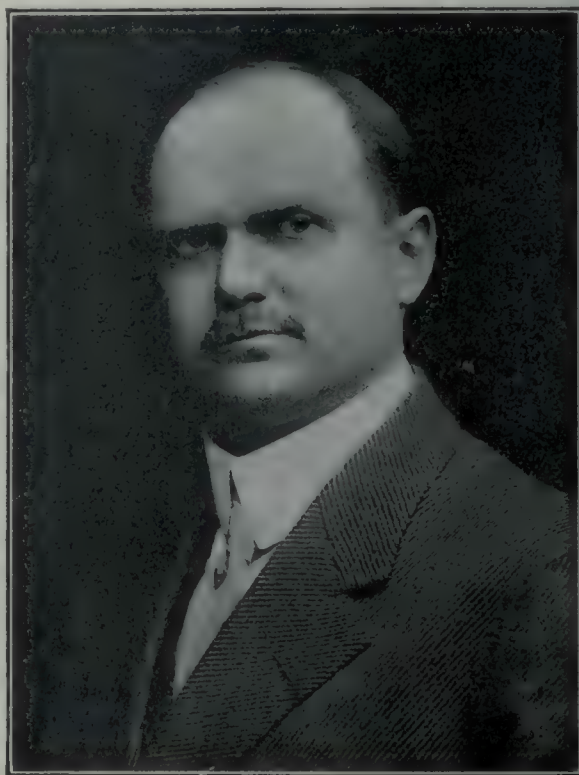
The provincial department of public works has awarded the general contract for the home for the aged at Kamloops, at \$45,000. This contract covers only the east wing, which is the first unit of a building to cost about \$150,000. Frank Owens, of Kamloops, is the architect.

J. McDiarmid & Co., of Winnipeg, have begun excavation for the 8-storey examining warehouse for the government at Howe and Cordova streets, Vancouver. The building will be 120 x 120 ft., and two storeys will be below grade, and opening out on a level with the C. P. R. drive.

Construction has commenced on the 6-storey reinforced concrete building for Leo Gee Wing at Pender and Columbia streets, Vancouver.

Mr. A. D. Dame's Appointment

Mr. A. D. Dame, sales manager of Steel Products, a branch of Steel & Radiation, Limited, Toronto, is severing his important connection with this firm to become gen-



Mr. A. D. Dame, of Toronto, who has been appointed Canadian Sales Agent for the Master Builders' Company.

eral Canadian sales agent for the Master Builders' Company, of New York, Philadelphia, Cleveland and San Francisco. The latter concern, as a result of nine years' patient experimental and testing work, have produced what is known as the "Master Builders' Method,"—a system of repairing or resurfacing defective or worn concrete floors and of laying new floors which are claimed to be absolutely wear-proof, dust-proof and water-proof.

The Master Builders' Method is simply the incorporation into the concrete of a material which fills all the pores and which expands when acted upon by moisture. This material is called Master Builders' Concrete Filler. The claims made for this filler are that it never deteriorates;

that it always remains permanent, and that it will stand an endless amount of heavy wear. By its use a perfect bond can be obtained between old and new concrete, an achievement which heretofore has been found most difficult. So confident are the manufacturers they they sell their material under an absolute guarantee of efficiency.

The Master Builders' Method has been used extensively in eastern Canada. From a list of some fifty leading industrial concerns who have proved its outstanding excellence we may mention the Canadian Westinghouse Co., Dominion Power & Transmission Co., International Harvester Co., J. R. Booth, City Dairy Co., Wm. Davies Co., Ltd., Don Valley Paper Co., Dunlop Tire & Rubber Co., T. Eaton Co., Ltd., O'Keefe Brewing Co., Ltd., Robert Simpson Co., Ltd., E. B. Eddy Co., Canadian Pacific Railway, Grand Trunk Railway and the Montreal Waterworks Department.

The Master Builders' Company recently sent their General Sales Manager, Mr. S. R. Newman, to look over the Canadian field, and Mr. Dame's appointment speedily followed.

Previous to his connection with Steel & Radiation, Ltd., Mr. Dame filled similar positions with the Expanded Metal & Fireproofing Co., Ltd., the Galt Art Metal Co., Ltd., and the Metal Shingle and Siding Co., Ltd. He has been closely connected with the architectural and engineering professions and the building trade of Canada for the past twelve years and we know of no other who could handle more capably the interests of the Master Builders' Method.

Mr. Dame will make his headquarters at Toronto and will appoint sales agents and distributors in all the leading cities.

Personal News and Notes

Sir John Jackson, M.P. one of the largest Admiralty contractors in the world, spent a few days in Victoria recently.

Mr. Sanford Evans, mayor of Winnipeg, laid the corner stone of the new Winnipeg General Hospital on the afternoon of October 16th.

Mr. W. S. Lea, Montreal, arrived in Vancouver last week to take charge of the waterworks department under the supervision of City Engineer Fellowes.

According to the Clayworker, the Red River Valley Brick Corporation, of Grand Forks, N. D., sold about 3,000,000 brick during the past season to the Canadian market.

Mr. A. V. Williams, secretary of the Builders' Exchange of St. Paul, Minn., was a recent visitor at the Calgary, Alta., Builders' Exchange. Mr. Williams is making a trip through the prairie provinces.

Frank Hook, who has had charge of the Clay Product Company's plant at Medicine Hat, has purchased a large clay pit in that vicinity, and it is understood that he is contemplating the establishment of a factory there.

It is stated that the Brick & Tile Company, of Cloverdale, B.C., has found its clay deposit eminently satisfactory and the demand for its brick and tile has been such that the company is planning an extension of its works.

Mr. R. G. Austin has just resigned from the position of engineer of construction of the city of Westmount, and proposes to go into business on his own account as a contractor. His office will be in the Orpheum building, St. Catherine street west, Montreal.

The Port Credit Brick Company, of Toronto, is installing additional brickmaking machinery and electrical apparatus which will enable them to manufacture brick on

a much larger scale. Their plant at Port Credit, Ont., is considered one of the most up-to-date on the North American Continent.

Mr. R. E. Leonard, C.E., the new chairman of the Transcontinental Railway Commission, is to be entertained at dinner by the Montreal Branch of the Royal Military College Ex-Cadet Club. Members of the Kingston, Quebec, Halifax, Toronto, and other branches of the Ex-Cadet Club throughout the Dominion are to be invited.

Frank B. Allen, of Toronto, has purchased the plant of the Washington Terra Cotta Brick Company, at Terra Cotta, D.C., which has been in the hands of a receiver for some time. The price paid was \$30,000. While the plans of the new company have not been definitely announced, it is expected that the plant will be remodeled and operations started at an early date.

Mr. J. G. Sullivan, formerly assistant chief engineer of the C.P.R., has been appointed chief engineer of the western lines of the same company. The company have abolished the position of assistant chief engineer. Mr. Sullivan was born in Monroe county, New York, in 1863, and was educated at Cornell University. In 1900 he became



Mr. J. G. Sullivan, who has been appointed Chief Engineer of the western lines of the C. P. R.

identified with the Canadian field by obtaining the post of division engineer of construction for the C.P.R. He is a vice-president of the Canadian Society of Civil Engineers and a member of the American Society of Civil Engineers. (For detailed biography see Contract Record, Jan. 18, 1911).

The Montreal Board of Control have under consideration of the construction of a boulevard from the aqueduct at Point St. Charles to Lachine, and the question will largely be determined by the price of the land necessary for the project, and by the co-operation of the proprietors along the route. The idea is to construct 40-ft. roadways on either side of the aqueduct, with driveway and two car tracks.

Good progress is being made with the clearing of a right of way on the uncompleted gap of the Grand Trunk Pacific Railway from Tete Jaune Cache westward to Aldermere, in the Bulkley Valley, work on which was started a few weeks ago by the contractors, Foley, Welch & Stewart, of St. Paul, Minn. Operations thus far are restricted to the route along the south fork of the Fraser between the Cache and Fort George. It is believed that J. W. Stewart, Vancouver, B.C., managing director of Foley, Welch & Stewart, will

shortly let sub-contracts covering the uncompleted gap of 415 miles.

The Garson quarries near Winnipeg, including about 240 acres of land, the plant and a quantity of quarried stone, have been sold at auction for the sum of \$150,500, the purchaser being Peter Lyall, Sr. The bidding was fairly well contested, but the land was knocked down to Mr. Lyall at the above mentioned figure, the consideration being for the entire property.

A bonus of about \$1,500,000 is to be asked of the Canadian government for the Temiskaming & Northern Ontario Railway, which is controlled by the Province of Ontario. The officials of this road are placing a number of improvements, chief of these being the lowering of the grade for some thirty miles beyond North Bay and the construction of an extension to Elk Lake. S. B. Clement, North Bay, Ont., is chief engineer.

The Dominion Wood Pipe Company, Limited, New Westminster, B. C., have reprinted from the Contract Record in booklet form an interesting article, entitled, "Characteristics of Wood Stave Pipe," by T. C. Hatton. The booklet contains additional arguments in favor of the use of this material. Among the many claims that are made for wood stave pipe are that it is economical and durable, and that it is practically frost-proof and free from rust and corrosion. In addition it is said to have a greater carrying capacity than pipe made of any other material.

Owing to the activity in the Montreal building trade, there is a great scarcity of common brick, and some operations are being delayed in consequence. There is hardly any brick of this description to be had locally, and although some have been sent from Toronto, it has not nearly met the requirements. In the city of Westmount, Mr. Currie, the engineer, is further handicapped by the small supply of skilled labor. He has practically no bricks on hand, but cannot allow his men to go, as if he does, he will not be able to secure help when he obtains the necessary material to enable him to resume active operations.

Active preparations are being made for the American Good Roads Congress, which is to be held at Rochester, N. Y., November 14-17, in conjunction with the eighth annual convention of the American Road Builders' Association. Among those who have made application for exhibition space are a number of firms well known to the Canadian field in general and to readers of the Contract Record in particular, namely, the American Asphaltum & Rubber Company, Dunn Wire-Cut Lug Brick Company, J. I. Case Threshing Machine Company, Austin-Western Company, Buffalo Pitts Company, and the Haywood Wagon Company.

Some of the Montreal contractors have been complaining that they do not get fair play from certain architects engaged by the city to build fire stations and other structures. The matter was brought before the council by Alderman L. A. Lapointe, who stated that contractors had been refused the customary blue prints and were advised where they must buy their materials. Controller Wanklyn replied that it would be better to charge a small deposit for blue prints, which could be returned when a genuine tender was sent in. If this were not done boys could walk into an office and demand copies of the plans. The council decided to leave the matter with the controllers.

Mr. E. D. Pitt, of Niagara Falls, Ont., has prepared designs, and the Bishop Construction Company, of Montreal and Toronto, have the contract, for the erection of the \$100,000 factory to be established by the Yale and Towne Manufacturing Company, at St. Catharines, Ont. The builders' hardware department of the Yale and Towne Company commenced when in 1886 it made the bronze door plates

and knobs from Root's special designs for the Rookery Building, in Chicago, and from that commencement has grown to be the largest builders' hardware manufacturing concern in the United States. The establishment of the works in Canada will give to Canadian architects an opportunity to procure hardware that has the best of art and the most reliable material in its composition.

Mr. Reuben Wells Leonard, C.E., of St. Catharines, who has been appointed chairman of the National Transcontinental Commission is a native of Brantford, Ont., and a graduate of the Royal Military College of Kingston, Ont. He has followed his profession in many parts of Canada and has carried out a considerable number of contracts for the railways. Latterly he has devoted a good deal of attention to mining enterprises. In this connection he is well known as president and general manager of the Coniagas Mines, Limited, Cobalt. He is a vice-president of both the Canadian Society of Civil Engineers and the Canadian Mining Institute, and he is also a governor of the Kingston School of Mines and the University of Toronto. A more detailed sketch of his career was published in our issue of January 18, 1911.

Mr. F. O. Lewis, of Lewis Bros., Montreal, representing Vickers, Son & Maxim, England, has received tenders for the construction of the buildings in connection with the proposed dry dock at Maisonneuve, Montreal. The tenders have been opened and forwarded by Mr. Lewis to his principals for their consideration. The ground is being tested by pile driving and other means to determine the bearing capacity of the soil. It is possible that excavation and some foundation work will be done this fall if heavy frost does not set in too early; meanwhile the steel work is being manufactured and other materials prepared for an early start in the spring. The government has guaranteed 3½ per cent. on an expenditure of three million dollars, but the company has an available capital of five millions for this enterprise. The announcement as to the award of the contracts may be expected within a month.

The contract for the elevators required in the New Greeley Square Hotel, on Broadway, 33rd and 34th streets, the largest hotel in the world, has been awarded to the Stokes-Larsson Company. It is itself the largest contract ever given out for hotel elevators, amounting to over a quarter of a million dollars. These elevators will be of the direct plunger type, and will embody the Larsson patented improvements, including a new control valve, a new automatic device which does away with the trouble caused by the expansion and contraction of the cable safeties used with other automatic devices, and a new resilient plunger bottom. These direct plunger elevators will be similar to the eleven passenger elevators and freight elevators, some of which have lifts 176 feet, built for the new C. P. R. Windsor Station, Montreal, by the John McDougall Caledonian Iron Works Company, Limited, who control for Canada the improvements patented by Mr. Larsson.

Announcement is made that the Canadian Northern Montreal Tunnel and Terminal Company, Limited, will make application at the coming session of the Federal Parliament for authority to construct and operate a railway tunnel from Montreal westerly under Mount Royal, with the necessary approaches and works. A reliable estimate places the cost of this work at about \$25,000,000. The tunnel itself will be approximately three miles long. No details have yet been announced as to the location of the city terminals, or regarding the precise location of the tunnel, but the application to Parliament is very comprehensive, asking authority to construct and operate lines of railway connecting the tunnel and works with the tracks of the Canadian Northern Ontario and Quebec Railways and with the lines of the Harbor Commissioners.

Contracts Department

News of Special Interest to Contractors, Engineers, Manufacturers and Dealers in Building Supplies.

Information for insertion in these columns is invited from Architects, Contractors, Engineers, etc.

Waterworks, Sewerage and Roadways

Bridgeburg, Ont.

Clerk Land will receive tenders for sewer, \$9,000. C. Anger, superintendent of work.

Edmonton, Ont.

Tenders are called for 1912 paving. City engineer, A. J. Latornell; about 100,000 sq. yds. of street grading and paving with curb (wood block, asphalt block, sheet asphalt, bitulithic, etc.) Proprietors of patented pavements requested to furnish their specifications. Plans, etc., at office of city engineer. Received by city commissioners until noon, Dec. 1st. Tenderers are requested to submit bids as follows: (1) unit prices for whole work; (2) for 75,000 sq. yds.; (3) for 50,000 sq. yds.; (4) for 25,000 sq. yds.

Fitzhugh, Alta.

Federal Government Engineer, Ritchie is to make a report on the water supply. Report of railway engineers indicate the supply as satisfactory. Commissioner of Government Parks, Howard Douglas, Edmonton. Fitzhugh is the Mountain divisional point on Grand Trunk Pacific Railway.

Guelph, Ont.

Vitrified brick is recommended by Bd. of Works for paving subways. In order to have work started at once, special meeting of council will be called.

Hamilton, Ont.

Clerk, S. H. Kent. City council will be asked to purchase two electric pumps for sewage disposal plant at Wentworth street North. Cost not decided yet.

Hamilton, Ont.

Tenders were called until Oct. 25 for construction of sewers on five streets. Received by G. H. Lees, mayor, chairman Board of Control. City Engineer, A. F. Macallum.

By-law will be submitted for waterworks extension. S. H. Kent, clerk. Engineers, W. Chipman, Mail Building, Toronto and A. F. Macallum, city engineer. Estimates: Intake and crib, \$60,000; high level station, \$67,000; beach station, \$70,000; force main, 296,000; sub-mains, \$42,000; conduit, \$30,000; total, \$565,000, less amount authorized by by-law, \$35,000=\$530,000. Estimated cost of additional improvements and extensions: additional sub-mains, \$73,000; reservoir, \$120,000; 2,000 meters, set, \$27,000. Total \$220,000. By-law to raise money submitted in January. Electric pump required may be bought next month.

Montreal, Que.

Tenders are called for construction of sewers in Valmont, St. Bordeaux Ward, between Viel and Salaberg streets. Plans etc., with superintendent.

About 2,400 ft. of drains are about to

be constructed in Montreal; also in Rosemount and St. Lawrence Ward. Further information from Stuart Howard, superintendent of sewers, City Hall, Montreal.

Tenders are called for sewers. L. N. Senecal, secretary Board of Commissioners. St. Denis Ward main sewer steel outlet into Back River; Monkland avenue between Old Orchard and Harvard avenues. Plans, etc., with superintendent of sewers. Received by Board of Commissioners until noon November 3rd.

North Toronto, Ont.

The town is planning to construct 6-in. watermain, and also 4-ft. sidewalk on certain streets. Clerk, W. N. Norman.

North Vancouver, B. C.

By-laws passed for local improvement of Marine Drive, west of Capilano, \$100,000, walks and road improvements, including a bridge over Lynn Creek, \$100,000.

Neepawa, Man.

Tenders are called for waterworks and sewerage. Secretary-treasurer, J. W. Bradley; chairman, R. H. Fusee; engineers, Chipman & Powers, Toronto and Winnipeg. Plans, etc., at the town hall, Neepawa, or at the engineer's offices, Winnipeg and Toronto, on or after Wednesday, Nov. 15th, 1911. Received by secretary-treasurer until 8 p.m. Dec. 15. See advertisement in "Tenders & For Sale Dept." of this issue.

Regina, Sask.

City Engineer L. A. Thornton has recommended the construction of 6-in. water mains on 27 streets; 12-in. water main on Sixth avenue, to a point 250 ft. east; sewer mains on 17 streets. The work has been referred to council.

Toronto, Ont.

Tenders are called until Nov. 7th for pavements and concrete walks, on over 17 streets. Chairman Board of Control, G. R. Geary.

Recommendations have been made for medium asphalt pavement, combined curbing and gutters, \$20,825; macadam roadway, concrete curb, brick gutter, \$10,645; concrete sidewalks, \$1,849. City clerk, W. A. Littlejohn.

Tenders are called until Nov. 7th for sewers, Broadview avenue, storm overflow 135 ft. 24 in. and 803 ft. 18 in. vit. pipe; with manholes, screening chambers; overflow chamber; also in Ridley Gardens, Christie st., Chandos ave., Connaught ave. Chairman Board of Control, G. R. Geary.

Pavements, asphalt, recommended for Sumach street, Barber Asphalt, \$11,999; Starr ave., Barber Asphalt, \$3,600; Tecumseh (King to Queen), Godson Contracting Co., \$6,688; Tecumseh street, Barber Asphalt, \$5,047; Geary avenue, Barber, \$14,728; Godson Contr. Co., \$14,912; Const. Paving Co., \$14,600; City En-

gineer, \$14,255; Heath street, Godson \$4,598; Metcalfe, Godson, \$2,566, concrete, Westmoreland, City Engineer, \$7,809; Milan, City Engineer, \$787; Poullette street east, City Engineer, \$758.

Toronto, Ont.

Vancouver, B. C.

The city is planning the erection of asphalt plant for street repair work; also at some later date, a wood block plant. City engineer, F. Felowes.

Recommendations have been approved for construction of sewer between Powell and Cordova streets, 12th avenue E. to Eton street. Work will be done this year.

Tenders will be called for the construction of sewer on Willon street from 12th to 16th avenues, and a temporary sewer on 12th avenue from Willon to Laurel.

Walkerville, Ont.

Extension of debenture issue under by-laws 381 and 413 (\$30,534) to construct relief sewers; Township of Etobicoke; approval of by-law to raise \$8,000 to pay share of subway ordered by Dom. Railway Com. in connection with G.T.R. grade alterations; Midland, Ont., approval of elec. light and waterworks extensions, \$6,500.

CONTRACTS AWARDED

Montreal, Que.

J. Toussaint & Co., contractors, Montreal, sewers on Notre Dame and St. Peter streets, \$27,000. The city is to lay the Dorchester street sewer by day labor.

Sewers, cost, \$8,967. Superintendent of sewers, Major Howard, City Hall. Contractor, Glielbert & Paye, Huntley avenue, Montreal; 1335 ft. of brick sewers, 2 x 3 ft.

St. Lambert, Que.

Laying of concrete sewer pipe on Front st. granted by council October 20th. Cost, \$11,000. Contractor, B. Laurent, St. Lambert.

Railways, Bridges and Wharves

Calgary, Alta.

The C. N. R. contractors working on the Pincher Creek-Macleod section will rush construction. It is also stated that work will commence on the line from Mcleod to Calgary shortly.

Edmonds, B. C.

By-law will be submitted to authorize agreement with the British Columbia Electric Railway Company, Ltd., for an electric railway system in the district of Burnaby.

Edmonton, Alta.

A charter has been acquired for a railway extending to Fort George, B. C., through the Peace River district, connecting with Grand Trunk Pacific at Fort George. J. D. McArthur, contractor of Winnipeg is interested.

Hamilton, Ont.

City has now agreed to let Grand Trunk build bridge under tracks. Plans will be prepared in Montreal and work will be done by company or sub-contractor who will be selected by railway from Montreal. Cost, \$65,000. City engineer, A. F. Macallum.

Kamloops, B. C.

Public Works Engineer, F. C. Gamble, Victoria, B. C. Drawings have been deposited with the Minister of Public Works Department, Ottawa, for the erection of a highway bridge.

Bridges to cost \$1,100,000, for the Canadian Northern Railway. Engineers, Waddell & Harrington, Pacific Building, Vancouver, are retained by C. N. R. to design and superintend erection of ten steel bridges between Cisco and Kamloops.

Macleod, Alta.

Cowan Construction Company, Edmonton, have commenced grading on C. N. R. out of Macleod. Sub-contracts to be let.

Nelson, B. C.

It is expected that the huge plant of the Hall Mines Smelter, including smelter, railway terminal, assay office, etc., will be re-built.

Ottawa, Ont.

Plans for high level bridge were on exhibition and have been forwarded to the Department of Railways and Canals for approval. N. J. Ker, city engineer.

The C. N. R. Tunnel and Terminal will apply for authority to construct and operate a railway tunnel under Mount Royal at Montreal, Que., to cost \$250,000.

Pointe Claire, Que.

Work is in progress for barn and sea wall to cost \$50,000, for C. W. McLean, Pointe Claire. Architect, Finlay & Spence, 46 Beaver Hall Hill, Montreal. Sea wall, 700 ft. long; width 8 ft. at base, 2 ft. at top; stone with concrete facing and earth filling at back. Rough stone work done.

Sherbrooke, Que.

The Quebec Eastern Railway's projected line is to run between Sherbrooke and Levis. Preliminary surveys have been made.

Saskatoon, Sask...

Tenders are called for subway-superstructure. Commissioners, Jas. Clinkskill, W. B. Neil and E. M. Snell. City engineer, G. T. Clark. Furnishings and erection of superstructure. Plans, etc., at office of W. L. MacKenzie, bridge engineer, C. N. R., Winnipeg and at office of city engineer. Received by commissioners until noon, Nov. 17th.

South Vancouver, B. C.

The B.C.E.R. propose to extend from Main street line at 63rd avenue to meet New Westminster—Eburne line to serve Coast Lumber & Fuel Co. If the company will construct a double track and give passenger service, council will approve and work will commence at once.

Toronto, Ont.

Negotiations are said to be about completed for the purchase of the property owner by Sisters of St. Joseph at Sunnyside as a site for the new station for the Grand Trunk Railway.

Vancouver, B. C.

A plan prepared by City Engineer Fellows will be presented to the ratepayers

re overhead bridge across G. N. R. on Hastings, Pender, Keefer and Harris streets.

By-law to be submitted to grant a lease for 21 years to Electric Tramways Construction Co., Ltd., (capital \$250,000) who will build a double track line across Stanley Park.

At a meeting of representatives from Pt. Grey, Eburne, New Westminster, South and North Vancouver it was decided to commission H. H. Stevens, M. P., to apply to federal government for preparations of plans for improvement of harbor.

A by-law will be submitted for a bridge to cost \$550,000, Harris to Georgia streets. Engineers Waddell & Harrington, 739 Hastings, W. Vancouver. Proposed structure would cost \$485,000, if 66 ft. wide and \$415,000 if 56 ft. wide. If reinforced concrete is used cost would be increased 20 per cent. Provision is made for car tracks as well as for two roadways, each 19 ft. wide and 2 sidewalks each 7 ft. wide. Ratepayers will vote on question in January next.

Contemplated improvements, harbor tunnel, etc., to cost \$6,000,000. Company interested, Vancouver Harbor & Dock Extension Co. Options have been taken on large amount of land in Lulu Island and at Eburne and along Fraser river. Proposed work—harbor tunnel, across Pt. Grey into Kitsilano, where pass terminal will be built, freight terminal on Lulu Island, townsite, with graded streets, water and sewer systems, street railway. It is reported that the railroads are behind the scheme.

Victoria, B. C.

Solicitor W. H. Langley, Victoria, has been preparing application for the incorporation of the North Arm Bridge & Railway Co. to construct, maintain, etc., a bridge across North Arm of Burrard Inlet, etc. Bridge to have roadways for foot passengers, street railways, etc.

County of Wellington, Ont.

Plans are in progress for bridges and breakwater. Engineer, Bowman & Connor, 36 Toronto street. Saunders bridge 33 ft. span, 18 ft. deck, reinforced concrete; bridge between W. Luther and W. Garafraxa Tps. 17 ft. span, reinforced concrete, 16 ft. 6 in. width; Burke's bridge, 47 ft. 6 in. x 16 ft. deck; Nightingale bridge and breakwater, reinforced concrete 23 ft. roadway, 10 ft. bridge.

CONTRACTS AWARDED**Inverness, N. S.**

Roy McLean has commenced work on the erection of the breakwater here to cost \$200,000. It is expected to be completed in 1913.

Melville, Sask.

The contract for erection of car repair shops for the Grand Trunk Pacific has been let to T. J. Brocklebank. Work will also commence soon on erection of a 1,000 ton coal dock which will require 350,000 feet of lumber and 90 tons of iron.

Victoria, B. C.

Branch railway (C.P.R.) for the Esquimalt & Nanaimo Railway. Superintendent, H. E. Beasley, Victoria. Contractor, Westholme Lumber Co., 701 Broughton, Victoria; 40 mile of the extension from McBride's Junction beyond Union Bay.

Vancouver, B. C.

The Great Northern Railway will commence early in January to double track its line from Everett, Wash., to Vancouver, a distance of 116 miles.

Public Buildings, Churches, Schools, etc.**Copper Cliff, Ont.**

Plans are being prepared for erection of a school to cost \$30,000, for Public School Board. Architect, H. W. Angus, North Bay.

Edmonton, Alta.

Board of Education. Building commissioner Turner is preparing plans for a 4-room addition to Alex. Taylor & McKay avenue. Schools to be erected next year, 2 storeys and basement. Installation of a complete up-to-date heating and ventilating plant will be put in then in the McKay avenue school.

Hamilton, Ave.

At the annual meeting the committee of management reported the urgent need of a new modern fireproof structure for aged women's home.

Kentville, N. S.

Mayor, Mr. Wickwire. The citizens have decided in favor of a new academy costing \$35,000. The new building will be commenced in the spring.

Kingston, Ont.

The Kingston Health Association have purchased the home of Lieut. Col. Van Straubenzie and will remodel the building into a hospital. President, Dr. J. C. Connell, Dean of Medical Faculty.

Mont Laurier, LaBelle Co., Que.

Tenders are called for erection of a court house, to cost \$22,000. Department of Public Works, Quebec. Secretary, A. Gagnon; architect, E. Charest, Parl Bldg. Quebec; construction, stone, brick, slate roof, hot water heating. Received by secretary until noon, Nov. 6th.

Montreal, Que.

The property on the corner of Gosford and Champ de Mars streets has been purchased as a site for the City Hall annex.

Contemplated hospital, for Directors, Montreal Foundling Baby Hospital, 43 Argyle avenue. Superintendent, Miss L. C. Philips. As soon as present premises can be sold a larger institution will be built.

More tenders are called for church to cost \$30,000, corner Simard and St. Joseph Blvd., for Methodist Church of Canada; (Rev. Dr. Yonge, Montreal). Architect, Penden & MacLaren, 20 Alexis, Montreal; brick, concrete foundation, electric lighting, furnace heating. Architects calling for tenders on balance of work until November 1st. Brick and masonry let to Paterson & Scobie, Montreal.

Work is in progress for new church and Presbytery to cost \$182,000, on Gilford and La Salle, for Roman Catholic Church. Parish Priest, Rev. A. O. J. Piette, La Salle and Gilford. Architect, Boileau Freres, Gilford and La Salle. Plumbing and heating contractor, N. Belanger, 1349 Notre Dame W., Montreal. Electric lighting, hot water heating, galvanized iron roofing; seating capacity 2,000. Rich church furnishings required. Opening set for Christmas, 1912.

New Westminster, B. C.

It has been decided to build a race course on the Port Mann side of Fraser river, to cost, with stands, etc., about \$200,000. The Westminster Thoroughbred Association, New Westminster, has obtained charter. Work will commence in time to have track ready for next spring.

Niagara Falls, Ont.

The Niagara Falls Club, Ltd., will build a curling rink to cost \$3,000. Secretary, John Vanstone, Niagara Falls. Arrangements being made for a building in rear of Club House.

Owen Sound, Ont.

Tenders were called till Oct. 24th for erection of 4-room school on East Hill. Archas., Forster & Clark, Owen Sound, John Rutherford, secretary, Board of Education.

Peterboro, Ont.

Site has been selected for a new town hall at Water and Brick streets. Chairman of committee in charge, Wm. Langford. Matter referred to City Trust Commissioners.

Red Deer, Alta.

School to cost \$3,000, 2 storey, 30 x 36, frame, concrete basement, furnace heating, electric lighting, shingle roof. Owner, Public School Board; secretary-treas., A. Munro.

Strathcona, Alta.

The Board of Health have advised purchase of incinerator and steps are being taken towards location.

Saskatoon, Sask.

Plans for new barns submitted to council for approval by commissioners were laid over. Probable cost, \$50,000.

South Vancouver, B. C.

The Independent Order of Foresters are contemplating the erection of an I. O. O. F. hall, 13th and Main. President's address, 441 Seymour street, Vancouver; 2 storeys, estimated cost, \$16,000.

Sudbury, Ont.

Town will build a 1-storey solid brick 32 x 50 addition to the power house; cement foundation, mill construction. Two 150 h.p. boilers auxiliary steam plant to present electric pumping plant.

St. John, N. B.

Work will commence shortly on erection of a theatre for Messrs. Keith, lessees of Nickel Theatre in King Sq. Local manager, W. H. Golding; modern fireproof, seating capacity, 2,000. Present buildings on site will be demolished at once.

St. Thomas, Ont.

The Board of Education have under consideration the extension to Collegiate. Architect, Jno. T. Findlay, St. Thomas; 3-sty., 83 x 36, brick, stone foundation, steam heating, slate roof, direct ventilating system, telephone, electric wiring, 2 lavatories, 1 low pressure boiler. Contracts will probably not be let till spring.

Tillsonburg, Ont.

Tenders are called for erection of 12-room school. Plans, etc., at office of Hollier & Walsh, and at office of architect. Received by Geo. H. Hollier until Nov. 20th. Public School Board, Tillsonburg. Chairman Property Committee, Geo. H. Hollier; architect, B. McNichol, Woodstock, Ont.

Toronto, Ont.

Regatta course, $\frac{3}{4}$ mile in length is proposed by city from lagoon to Western channel. Of the total cost, \$22,855, \$14,600 will be spent in dredging.

The Baptist Church of Canada has under consideration the erection of a five to eight storey building as a central administrative building.

Tenders will be called shortly for erection of church on Roncesvalles avenue for St. Jude's Parish. Architect, J. F. Brown, Board of Trade Building, Toronto. Wire lath, steam heating, slate roofing, hardwood trimmings.

Extensions to building for Alexandra School for Girls. A new assembly hall, new cottage and new school room has been advised by committee of which Mrs. R. Kilgour, 6 Beaumont Road, and Miss M. Wilkes are members.

Tenders will be called shortly for the erection of a Sunday School to cost \$20,000, on Davenport Road, for Davenport Methodist Church. Architect, David E. Smith, 77 Victoria street, Toronto. 2 storeys and basement, felt and gravel roofing.

Plans have been prepared for the erection of a Church to cost \$16,500 on Dufferin street, for Dufferin street Presbyterian Church. Architect, W. R. Gregg, 23 Jordan street, Toronto. Tar, gravel and slate roofing, leaded glass, electric wiring, hardwood trimmings.

Transcona, Man.

Equipment is required for new school S. D. No. 1569 Transcona; secretary, H. Fuller, Box 83; W. McFarlane, chairman of Trustees. Architect, J. A. Hudson, Builders Exchange, Winnipeg; brick veneer, stone foundation, shingle roof. Tenders for construction closed Oct. 24. Blackboards, desks, etc., to be supplied. Apply to secretary.

Vancouver, B. C.

Board of Education are contemplating extension of school system. Secretary, C. W. Murray; city superintendent, W. P. Argue. Total expenditure involved, \$212,000. If the government makes a grant of \$100,000 the city will submit by-law for \$112,000.

Working plans are being prepared for Y. M. C. A. building for Y. M. C. A. Association of Canada. Architect, H. S. Griffiths, Dominion Trust Building, Vancouver. Plans are expected to be ready for figuring in about seven weeks.

Sketches have been prepared for a new opera house, 10 storey, on the corner of Georgia and Hornby streets to include offices and stores. Cost, \$700,000. Lease held by E. R. Ricketts, on Vancouver Opera House, 747 Granville, expires on present building in September, 1912, and he is said to be willing to take 15 year lease on the projected one.

Victoria, B. C.

The School Board has decided to erect schools in Oaklands, James Bay, and on Burnside Road. Plans not made public. Secretary will furnish information. Geo. Jay, 1436 Elford street, trustee.

Winnipeg Man.

Tenders are called for machinery and heavy tools required in connection with the Technical High Schools. Received by Secretary until 5 p.m. Nov. 9th. Public School Board. Secretary-treasurer, R.

H. Smith. J. B. Mitchell, Commissioner of Supplies.

Weyburn, Sask.

The Moose Jaw Machine Co. has charge of the iron and steel work in the new public building here.

CONTRACTS AWARDED**Aldershot, Ont.**

School to cost \$9,000, for County of Wentworth; architect, Munro & Mean, Chancery Chambers, Hamilton. General contractor, Coleman & Nicholson, Burlington; 1 storey and basement, 35 x 40, brick and stone, stone foundation, steam heating. Contract awarded October 21.

Chilliwack, B. C.

Public building to cost \$35,000. Dept. of Public Works, Ottawa. Secretary, R. C. Desrochers, Ottawa. Gen. contractor, Edward Hunt, Victoria Building, will include post office, Customs and revenue offices, 2 storeys, reinforced concrete, 65 x 60.

Levis, Que.

The Ideal Construction Company have the foundations in for the new drill shed being erected by Dominion government.

Ottawa, Ont.

The following have been awarded recently by Public Works Department: Lunenburg, N. S., interior fittings for post office; contractors, Boehmer Bros., of West La Have, N.S. Meaford, Ont., extension to Eastern breakwater, removal of "L" on western breakwater, and dredging; contractor, Gideon Kastner, Wiarton, Ont. Melfort, Sask., public building; contractors, the J. McDiarmid Co., Winnipeg. Meat Cove, N.S., wharf, contractor, D. W. B. Reid, Halifax, N.S. Moose Jaw, Sask., public building; contractors, the J. McDiarmid Co., Winnipeg, Man. North Bay, Ont., breakwater, contractor, Edward Conray, Peterboro, Ont. Owen Sound, Ont., retaining wall; contractors, R. McDowall, Alex. Green, F. W. Harrison, Owen Sound. Prince Rupert, (quarantine station). Digby Island, B.C., wharf and two approaches; contractors, Naylor Bros., Vancouver, B.C. Red Bay, Ont., wharf; contractor, Gideon Kastner, Wiarton, Ont. River L'Assomption, near L'Assomption, P.Q., ice pier; contractor, G. A. Grunninger, Three Rivers, Que. St. Joseph, N.S., breakwater; contractor, D. W. B. Reid, Halifax, N.S. Surf Inlet, Princess Royal Island, B.C., pile wharf; contractor, Mark Hyatt, Prince Rupert, B.C. Thessalon, Ont., breakwater; contractor, D. Porter, Wiarton, Ont. West Advocate, N.S., breakwater; contractors, John E. and Halle Bigelow, Canning, N. S. Feltzen South, N. S., breakwater; contractor, Obed A. Ham, Mahone Bay, N.S. French River, N.S., breakwater; contractors, Robert & Bart, Musgrave, North Sydney, N.S. Kelly's Cove, N.S., breakwater extension; contractors, Jacob K. Thurston and Ross W. Durkee, Sanford, N.S. Kingston, Ont., Royal Military College, renewal of wharves; contractors, Gowan & Whitney, Brockville, Ont.

Vancouver, B. C.

College building to cost \$15,000, 10th and 12th avenues, for McGill University College. General contractor, A. Radellet, 873 18th avenue W. 2 storeys, brick. The general contractor will take figures on some of the minor contracts.

Residences

Calgary, Alta.

W. A. Denby, 349 14th avenue west, is contemplating the erection of a 2-storey brick veneer apartment house 36 x 54. Cost \$7,000.

A permit has been granted for erection of two residences to cost \$8,000, for E. D. Lea, 571 23rd west, Calgary; 2 storeys, 24 x 36, frame, concrete foundation, electric lighting, hot air heating, hardwood finish.

Alliance Investment Company, 711 First street west, will build a residence to cost \$4,000, 1 storey, 40 x 30, frame, concrete foundation, hot air heating, electric lighting, shingle roofing, hardwood.

A permit has been granted for a residence to cost \$4,500, for Stubbs & Wallace, 1324 12th avenue west; 2 storeys, 22 x 36, brick, concrete foundation, hot air heating, electric lighting, shingle roofing, hardwood finish.

J. Howard, 1124 17th avenue west, will build two residences to cost \$9,000; 2 storey, 30 x 42, each, brick, concrete foundation, hot air heating, electric lighting, shingle roof, hardwood interior finish.

Permit has been granted for a residence to cost \$6,000, for G. G. Woods, 828 4th avenue west; 2 storeys, 30 x 40, frame, hot air heating, electric lighting, shingle roof, hardwood interior finish, furnace, electric light.

Permit granted for a two-storey residence, 22 x 38, \$4,500, brick, concrete foundation, hot air heating, hardwood finish, shingle roof, fire places; owner, E. C. Smith, 1132 15th avenue W.; arch., Rose Bros., Lineham Block.

A permit has been granted for a residence to cost \$10,000 for Alliance Investment Co., 711 First street west; 2 storeys, 46 x 50, brick, cement foundation, hot water heating, electric lighting, shingle roof, hardwood interior finish.

Hamilton, Ont.

Residence to cost \$3,000, 2½ storey, 28 x 30, stone and brick, stone foundation, hot air heating, electric and gas lighting, shingle roofing, hardwood finish; owner, O. S. Clarke, 312 John street south; architect, Hyseth & Hildredth, 188 Gibson avenue; masonry, C. Kidd, 398 Barton street east; plumbing, J. N. Luxon, 607 Barton street east.

Maisonnette, Que.

Excavation started on three flats, \$5,000, Fifth avenue, 3 storey, stone construction, 24 x 36, gravel roof, electric lighting; owner Xavier Dausereau, 184 Adam.

Work started on five flats, \$5,000, Fifth avenue, 3 storey, pressed brick, 26 x 45, cement foundation, gravel roof, electric light; owner, N. Demers, 61 Brown street.

Woodwork started on three flats, \$5,000, Third avenue, 3 storey, 24 x 44, stone, gravel roof, electric lighting; owner, J. Sicotte, 178 Third avenue.

Five flats, \$5,000, 3 storey, pressed brick, 25 x 38, gravel roof, electric lighting; owner, Pierre Pouliotte, 862 Pius IX. avenue.

Montreal, Que.

Six flats, \$5,000, 3-storey, stone foundation, gravel roof, wood and brick, elec. lighting.

Three flats, \$4,000, 3 storey, 29 x 45,

stove and electric lighting, gravel roof. Owner, J. Audet, 2411 St. Andre.

Eleven flats, \$12,000, brick, gas and electric lighting, gravel roof. Owner, H. Plante Co., 1807 Labelle street.

Three flats, \$3,000, pressed brick, cement foundation, gas and electric lighting. Owner, J. Schiers, 447 Joliette.

Four flats, \$4,000, 2 storey, 27 x 50, wood and brick, cement foundation, stove heating, gas lighting, gravel roof. Owner, R. Leduc, 452 Delisle street.

Three flats, \$3,000, 3 storey, 27 x 38, and extension, stove heating, gas and electric lighting, cement foundation. Owner, O. Brault, 3662 Alice street.

Six flats, \$3,400, 85 Darling street, 3 storey, 30 x 45, pressed brick and stone, gas and electric lighting, gravel roofing; owner, O. Masson, 234 Delormier.

Four flats, \$3,500, 2 storey, 40 x 25, brick, concrete foundation, electric lighting, gravel roof. Owner, H. Gousset, 2607 Labelle street.

Four flats, \$4,500, 3 storey, 25 x 40, brick, stone foundation, stove heating, gas and electric lighting, gravel roof. Owner, F. Pelletier, 1299 Parthenais street.

Three flats, \$5,000, 2 storey, 22 x 70, pressed brick and wood, cement foundation, electric and gas lighting, gravel roofing. Owner, A. C. Leger, 29 Esplanade avenue.

Three flats, \$4,000, 3-storey, 25 x 68, pressed brick, stone foundation, hot water heating, gas and electric lighting, gravel roof; for J. R. Dagenais, 374 Marquette.

Work is in progress for five flats to cost \$4,500, Prefontaine, for O. Germain, 173 Iberville street, Montreal; 3 storey, 24 x 43, pressed brick, stove heating, gravel roof, gas lighting.

Six flats, 2 storey, 50 x 36, 2567 Labelle street, pressed brick and concrete gravel roofing; owner, Alex. H. Hamelin, 2920 St. Hubert street. Work has not started yet. Cost, \$4,000.

Six flats, \$5,000, 3 storey, 44 x 35, wood and brick, stone and cement foundation, stove heating, gas and electric lighting, gravel roofing. Owner, Odelon Archambault, 625 Fullin street.

Excavation is going on for two flats, \$5,000, Durocher street, for H. Lafleur, 2203 Waverly street, Montreal; 2 storeys, 25 x 30, rock foundation, brick encased, furnace heating, electric light, gravel roof.

Work is in progress for fifteen flats, cost \$8,500, Dumont, for Raoul Marsolais, 770 Dorion street, Montreal; 3 storeys, 75 x 41, brick and wood, stone foundation, stove heating, gas lighting, gravel roof. Excavation started.

David MacKay, 5 McCulloch avenue, Montreal, will build ten flats to cost \$9,000. Architect, J. E. Adamson, 127 Stanley street, Montreal; 2 storeys, 60 x 44, brick encased, concrete foundation, stove heating, gas lighting, felt and tar roofing.

Foundations under way for residence, \$3,900, Herald avenue, Montreal West, 2 storey, 28 x 28, brick and concrete, asbestos shingles, hot water heating, electric lighting; owner, J. Lombardi, 739 Dourin street; architects, Prefontaine & Drouin, 56 St. Francois Xavier street.

Excavation is completed for a residence to cost \$8,000, Highland avenue, for D. F. Deslauriers, 1031 St. Antoine

street, Montreal; architect, Rene Charbonneau, St. James, Montreal; 2 storeys, 25 x 32, wood and brick, stone foundation, hot water heating, gas and electric, light, gravel roofing.

Twelve flats, \$14,000, 3 storey, 43 x 55, brick and wood, cement foundation, gas and electric lighting, gravel roofing. Owner, F. X. Roy, 1041 Marie avenue.

Work pending on three flats, \$3,500, 3-storey, 16 x 38, brick, concrete foundation, gas and electric lighting, hot water heating, gravel roof; for J. A. Brunet, 660 Casgrain street.

Excavation started for four flats, \$3,500, 3 storey, 26 x 40, wood and brick, cement foundation, gas lighting, gravel roof; owner, J. T. Lebrun, 781 Fullum; contractor, U. Sauvageau, 228 Aylwin.

Three flats, \$4,500, 3 storey, 25 x 40, wood and brick, stone foundation, gas and electric lighting, gravel roofing. Owner, Joseph Maisonneuve, 2488 Waverly street.

Residence, \$4,500, Victoria avenue, Montreal West, 2 storey, 27 x 30, brick and concrete, asbestos shingles, electric lighting; owner, C. S. Jones, 151 Westminster avenue; architect, C. A. Sievert.

Residence, \$4,000, Herald avenue, Montreal West, 2 storey, 28 x 28, brick veneer and concrete, electric lighting, asbestos shingles; owner, J. Lombardi, 739 Dorion street; architects, Prefontaine & Drouin, 55 St. Francois Xavier street.

Foundations are started for an apartment house to cost \$12,000, on Mance street, for Jos. Hogue, 965 Berri street; 3 storeys, 50 x 50, stone with copper cornice, hot water heating, gas and electric lighting. Owner will supervise work.

Foundations are in for a residence, to cost \$6,500, for G. H. Horsfall, Gazette avenue, Montreal West; architect, N. L. Benoit, 17th avenue, Lachine; 2 storeys, 28 x 30, brick encased, stone foundation, hot water heating, electric light, asbestos shingle roofing, hardwood finish.

Roofing not awarded for residence, \$17,000; owner, C. S. Garland, 100 Notre Dame W.; architect, Hogle & Davis, 80 St. Francois Xavier; masonry, J. H. Hutchinson, 64 St. Ambroise street; carpentry, George Roberts, 79 LaGauchetiere; plumbing and heating, W. J. McGuire & Co., Ltd., 332 Craig W.; steel, Dominion Bridge Co., Ltd., Lachine; plastering, R. G. Hamilton, 515 Victoria avenue; tar and gravel roofing; floors deadened by heavy paper.

Outremont, Que.

Excavation has been completed for cottage to cost \$10,000, for Mrs. Jos. Cyr, Outremont; 2 storey, 30 x 40, solid brick, stone foundation, hot water heating, electric lighting, gravel roofing.

Excavation is commenced for two cottages to cost \$10,000 on Durocher street, for Pierre Gindazio, Outremont; 2 storeys, 24 x 38, solid brick, stone foundation, hot water heating, electric lighting, gravel roofing.

Port Arthur, Ont.

The Alberta Land Co. have purchased 105 acres of land to be subdivided into lots on which it is proposed to erect about 50 cottages in the spring. H. D'Arcy Hutton, manager, Arundel street The Strand, London, Eng.

Strathcona, Alta.

The Jas. Watson Co. are planning to have erected next year twelve new residences or more.

Toronto, Ont.

Apartment house, \$18,000, Plewes & Carter, 319 Jarvis street, 3 storey and basement, brick, plumbing and heating, felt and gravel roofing.

Plans are being prepared for erection of four residences to cost \$2,500 each, for F. Leander, photographer. Architect, R. J. Edwards & Saunders, Toronto street, Toronto.

Excavation is completed for two residences to cost \$5,000 on Pauline avenue, for Watt & Hannah, 38 Pembroke street; architect, W. R. Gregg, 23 Jordan street, Toronto; 2 storeys, and alt., detached, stone and brick.

Major H. C. Bickford, 28 Dunvegan Road, Toronto, will build a residence to cost \$12,000, Forest Hill Road and Heath. Architect, J. H. Galloway, 23 Toronto street, Toronto; brick and stone. Excavation has already started.

Vancouver, B. C.

Plans are being prepared for erection of an apartment house to cost \$40,000, Park Drive. Architect, Jos. H. Bowman, Crown Building, Vancouver; 3 storeys, brick, 66 x 120, concrete basement, brick and mill construction, hot water, 3 storeys, 19 3-room and 4-room apartments. The architect will not be ready for figuring on contracts for about two weeks.

Tenders are called for an apartment house to cost \$115,000, on Haro and Denman streets, for H. M. Cuttingham, Seattle. Architects, Quandt & Creutzer, Vancouver office, 312 Pacific Building; 6 storeys and basement, 66 x 132, brick and stone, steam heating, marble, tile, terra cotta, tar and gravel roofing, ornamental iron. A large refrigerating plant will be installed in the basement. Heating with a vacuum steam heat plant, giving mostly indirect radiation.

Westmount, Que.

Foundations are in for two dwellings to cost \$16,800, for J. H. Hand, 609 St. James street, Montreal; 2 storeys, 52 x 50, solid brick, hot water heating, slate and gravel roofing, hardwood interior finish. Arch., Wright & Son, 204 St. James street, Montreal.

CONTRACTS AWARDED**Barrie, Ont.**

2½ storey residence, 28 x 40, brick veneer, electric lighting, hot air heating, oak and maple flooring, shingle roof, \$3,500. Owner, Dr. Brothers, V.S., Worsley street; contractor, The Ball Planing Mill Co., Ltd., Barrie.

Montreal, Que.

Residence to cost \$19,000 on Ryan avenue, for Catholic School Commissioners of Montreal; architect, R. A. Brasseur, 9 St. James street, Montreal; general contractor, Antoine Marchand, 108 Hamilton street, Montreal; 2 storey, 70 x 36, plastic brick encased, stone foundation, hot water heating, electric lighting, gravel roofing. Work not started.

Foundations are started for erection of apartments to cost \$75,000 on Berthelet street, for J. S. Evans, Bank of Ottawa Building, Montreal; architect, Findley & Spence, Beaver Hall Hill, Montreal; general contractor, Bishop Construction Co., Ltd., Eastern Townships Bank Building, Montreal; 4 storey, 99 x 69, brick and stone, concrete on piles, gas and electric lighting; roof—"Barrett Specifications,"

galvanized iron cornices, reinforced concrete, fireproof, 3 entrances, fire escapes.

Residence to cost \$35,000 on Westmount, for Ben Tooke, Linton Apartments; architects, McVicar & Heriot, 104 Union avenue; masonry contractor, G. W. T. Nicholson, Eastern Townships Bank; excavation, G. W. T. Nicholson, Eastern Townships Bank; plastering, R. G. Hamilton, 515 Victoria avenue; carpenter, Simpson & Peel, 10 Benoit street; painting and glazing, Castle & Son, 568 St. Catherine W.; plumbing and heating, W. J. Graham, 85 Cathcart street; roofing, Richardson Simard & Co., 129 Elgin street. Foundation in; stone work started.

Toronto, Ont.

Excavation has started for a warehouse to cost \$9,500 for Page & Co., 89 Charles street, Toronto; 1 storey, concrete, steel. Firm makes wire fencing, etc.

Plans are submitted for alterations to store to cost \$6,000, on Yonge street for A. Levy, 260 Yonge street. Extension in rear, 60 ft., large front windows will be put in on 2nd floor. Owner carries on a boot and shoe business.

Work is in progress for an ice house to cost \$6,000, Keele and St. Clair, for Swift Canadian Co., Keel and St. Clair; 1 storey, concrete foundation, with wood superstructure, mechanical ice conveyor.

Trail, B. C.

The Board of Trade are trying to secure a rural telephone system to connect this city, Sayward, Fruitvale, and Pend d' Oreille.

Vancouver, B. C.

Two-storey frame apartment house to cost \$7,500; architect, H. M. Barker, 423 Pender street west; contractor, M. H. Nelems, Construction Co., Inns of Court Bldg.

Plans completed for two 3-storey apartment houses to cost \$40,000, at 3046 Granville street and 1483 15th avenue w., for A. Ferguson, 1406 10th avenue w., who will superintend the erection of the two buildings. Mr. Ferguson will handle all minor contracts. Architects, Townsend & Townsend.

Office building, for Brackman-Ker Milling Co., Ltd., is ready for letting contracts for roofing (tar and gravel), plumbing and hot water heating, electric lighting. Egddell & Dixon, contractors, 115 Carter-Cotton Building, Vancouver.

Plans are completed for erection of an exchange building to cost \$45,000 on Turner street, for B. C. Telephone Co. Superintendent of construction, C. F. Bollsheveller; 4 storey, 43 x 60, steel and concrete, brick facing.

Contemplated extensions to plant for Union Steamship Co., Carrall street; manager, E. H. Beazley. Tenders were called until October 21 for wharf, 200 x 96, including pile driving. This is the first of the improvements planned which are, new office, sheds, warehouse, and shed room. Dalton & Eveleigh, 615 Hastings street west, have drawn plans, but nothing will be done until wharf is well under way.

Victoria, B. C.

The property corner of Fort and Douglas streets occupied by D. E. Campbell, druggist, it is understood, has been sold

to a Vancouver dry goods firm for a building site.

Since the acquiring of water front adjacent to Rock Bay by the city, for buildings, a by-law is in course of preparation to provide for the erection of stables, storehouses and other buildings on the site.

The council has decided to begin alterations to market building on Cormorant street necessary to prepare building as city jail. By-law passed recently for \$30,000 to be applied to same. Purchasing agent, W. N. Northcott.

F. M. Rattenbury, architect, reported to council that the G. T. P. have under consideration the erection of a large hotel, on the condition that they are granted tax exemption. It is likely that 10 years exemption will be made.

Weymouth, N. S.

Contract will probably be let in the spring for a concrete pulp mill building to cost \$50,000. Engineers, Ross & Taggart, 114 Liberty street, New York, N. Y.

Westmont, Que.

Two residences to cost \$18,000; architects, Wright & Son, 204 St. James street Montreal; general contractor, John H. Hand, 609 Belmont street; 2 storeys, 63 x 52, solid brick, hot water heating, electric light, slate roofing, hardwood interior finish.

Winnipeg, Man.

Work is in progress for the erection of a business building on Notre Dame avenue for Farmers Advocate Publishing Co., London.

Business Buildings and Industrial Plants**Aurora, Ont.**

The Positive Clutch & Pulley Co., 11-13 Jarvis street, Toronto, are contemplating the erection of a factory to cost \$18,000. General manager, Chas. S. Hook; architect, A. R. Denison, 20 King street west, Toronto; brick and concrete, tar and gravel roofing.

Aylmer, Ont.

Tenders are called until Nov. 14th for purchase of manufacturing plant. Concrete building, brick storage building and factory, frame moulding shed, engine room, and other buildings together with machinery and moulders' patterns. Clerk, D. C. Davis.

Banff, Alta.

The Canadian Pacific Railway, Montreal, are planning additions to hotel. It is reported that about \$250,000 will be spent on additions, etc., between now and next June.

Calgary, Alta.

The land & General Investment Co. will put on the market very shortly a town site of 700 acres (Maharg) which will include manufacturing as well as residential sites. C. A. Owens, manager.

Permit has been granted for a business block to cost \$30,000 for R. C. Thomas, 2nd street west; 4 storeys, 75 x 73, mill construction, brick walls, concrete foundation, steam heating, electric light, tar and gravel roofing, hardwood finish, boiler, elevator. Fire escapes will be required.

(Continued on page 61)

Tenders and For Sale Department

To Engineers

Every man who puts in a tender on your jobs has got to see your plans and specifications first. If you are in Montreal and he is in Vancouver the inspection of your plans is a problem. Let us solve that for you. Place on file copies of your plans and specifications in any or all of the "Contract Record" offices.

More contractors and manufacturers read the "Contract Record" than any other Canadian publication. It is the logical place to look for tenders called, and where all important works are advertised.

Send along your plans for your next job and put a line in your ad. to that effect.

Contract Record

Montreal—B34 Board of Trade.
Toronto—220 King Street West.
Winnipeg—Commercial Travellers' Bldg.
Vancouver—441 Seymour Street.

CITY OF MOOSE JAW SASKATCHEWAN

TENDERS

Sealed tenders addressed to the undersigned will be received up to the hour of 8.30 p.m. on Monday, December 4th, 1911, in the Council Chamber, Moose Jaw, Saskatchewan, for supplying the Fire Department of the City with one Pumping Engine, with a capacity of 800-850 gallons per minute. Tenders are invited for motor driven pumping engines, motor propelled steam pumping engines, or horse drawn steam pumping engines.

Tenders must specify the time in which delivery can be guaranteed, and complete specifications must be furnished for the apparatus proposed to be supplied. Tenders for steam pumping engine must comply with the provisions of the "Steam Boilers Act" of Saskatchewan, particulars of which may be obtained from the office of the Chief Steam Boiler Inspector, Department of Public Works, Regina.

All tenders to quote price f.o.b. Moose Jaw. The right to reject any or all bids expressly reserved.

44-48 W. F. HEAL,
City Clerk.

CITY OF MOOSE JAW SASKATCHEWAN

TENDERS

For Fire Alarm Boxes

Sealed tenders addressed to the undersigned will be received up to 8.30 p.m. on Monday, November 13th, 1911, in the Council Chamber, Moose Jaw, for the supply of twenty (20) non-interfering type alarm boxes complete. Tenders must contain complete specifications for the boxes, proposed to be supplied and tenderers must be prepared to furnish a sample fire alarm box if requested to do so. Tenders must also specify the time in which delivery can be guaranteed and must state price f.o.b. Moose Jaw. The lowest or any tender not necessarily accepted.

44-45 W. F. HEAL,
City Clerk.

Tenders for Street Railway Supplies

Sealed tenders marked "Tender for Street Railway Supplies," addressed to the City Commissioners, Calgary, Alta., will be received up to 12 o'clock noon, November 15, 1911, for the supply and delivery of the following street railway material, via lake and rail or all rail:

Track

26,000 standard 6 x 7 fir tamarac ties.
300 tons 6-in. high T. 60 ft. No. 60 rails,
800 tons A.S.C.B. standard 60 ft. No. 60 rails; or their equivalent in A.S.C.E. 60, 80 or 33 ft. rails with necessary angles, bolts, etc. quoted separate.

15,000 lbs. 5½ x 9-16 in. track spikes.
3 double 3-part Y branch off with crossings.
1 double track, left-hand branch off.
6 standard A.S.C.E. ordinary T rail spring tongue switches.

6 standard A.S.C.E. ordinary T rail solid mates.

6 standard A.S.C.E. ordinary T rail frogs fitted.

3,200 10-in. bonds, ¾-in. plug, flexible, 4/o.
2,500 13-in. bonds, ¾-in. plug, flexible, 4/o.

Line Material

250 wood poles, 6-in top, 12-in. butt, not over 4 in. def. 30 ft. standard spec.

250 wood poles, 8 in. top, 12-in. butt, not over 4 in. def. 35 ft. standard spec.

Tenders will also be considered on 30-ft. poles 7-in. tops 10-in. butts, and 35-ft. poles 8-in. tops, 10-in. butts. All to be peeled.

80 steel poles 28 ft. long, maximum load 1000 lbs.

20 steel poles 30 ft. long, maximum load 1000 lbs.

18,000 ft. 500 M.C.M. 600-volt conduit cable (Underground).

30,000 lbs. 2-0 trolley wire, round.

7,000 lbs. 5-16 single galvanized soft steel span wire.

1,200 ¾ eye bolts galvanized.

400 0-in., 400 10-in., 400 12-in.

1,200 wood strain insulators 1-in. galvanized.

500 standard strain insulators 2-in.

100 standard strain insulators 2½-in.

800 straight line hangers one piece, galvanized, round top ¾ stud

1,200 straight line clips 12-in for. 2-0 trolley (cinch).

300 double curve cap and cone pullovers, galvanized, comp.

300 single curve and cone pullovers, galvanized, comp.

25 R. H. trolley frogs, malleable.

25 L. H. trolley frogs, malleable.

12 right angle cross overs.

20 adjustable crossovers.

10 rigid crossings.

25 feeder hangers, O. B. 2417 or similar.

12 section insulators, 2-0 round wire.

6 Y-trolley frogs.

36 metropolitan strain plates, galvanized.

36 metropolitan strain ears.

10 200 amp. section switches, with boxes.

Each tender must specify clearly the capacity and type of article quoted on with full specifications.

For further information or particulars, before submitting tenders, address City Commissioners.

42-44 W. D. SPENCE,
City Clerk.

Positions Wanted

Advertisements under this heading one cent a word per insertion. Box No. ten cents extra

WANTED—Position as manager of a combination electric and steam heating plant or either one separate. Have had 10 years experience in all branches of the business. Am 30 years old. Employed at present, but wish to go to Canada. Box 349 Contract Record, Toronto, Ont. 44-45

To Manufacturers of Machinery

A firm wishing to take up the manufacture and marketing of the most complete and up-to-date concrete machinery in the United States or Canada. A proposition will be considered for just the manufacturer. Please address Box 348, Contract Record, Toronto, Ont. 44-49

CITY OF SASKATOON, SASK.

Superstructure 19th St. Subway

Tenders Wanted

Sealed tenders, addressed to the City Commissioners, Saskatoon, Sask., and endorsed "Tender for Superstructure, 19th Street Subway," will be received up to 12 o'clock noon on Friday, November 17, 1911, for the furnishing and erection of the superstructure over the 19th street subway in the City of Saskatoon, Saskatchewan.

Plans and specifications may be seen at the office of W. L. MacKenzie, Bridge Engineer, Canadian Northern Railway, Winnipeg; and at the office of George T. Clark, City Engineer, Saskatoon.

The lowest or any tender not necessarily accepted.

JAS. CLINKSKILL,
W. B. NEIL, City Commissioners.
E. M. SNELL,
Saskatoon, Sask., Oct. 18, 1911. 43 41

CITY OF LETHBRIDGE ALBERTA, CANADA

Extensions to Power Station

Sealed tenders marked "Tender for Power Station," will be received by G. W. Robinson, secretary-treasurer of the city of Lethbridge, up to and including Friday, November 24th, 1911, for the supply, delivery, and erection, of the following equipment for the Power Station Extension:—

Section B.—Boilers and accessories.

Section C.—Mechanical draft and economizer.

Section D.—Steam turbo-generator set and condensing equipment.

Section E.—Steam engine driven exciter.

Section G.—Sub-station equipment.

Plans and specifications can be obtained from Arthur Reid, superintendent engineer, City of Lethbridge.

An accepted cheque for ten per cent. of the amount of the tender must accompany each bid.

The lowest or any tender not necessarily accepted.

G. W. ROBINSON, Sec.-Treas.,
Lethbridge, Alta. 39-44

Sewer Excavator

For sale for immediate use, a Vulcan "Little Giant" Steam Shovel with extra long dipper handle for excavating to 16 feet below surface, mounted on traction wheels, dipper 1½ yd. capacity. Machine just overhauled; new chain, and extra large new boiler; weighs 32 tons; low price. Address

WILLIS SHAW MACHINERY Co.,
39 South LaSalle Street,
Chicago, Ill.
42-t.f.

TOWN OF NEEPAWA PROVINCE OF MANITOBA

Waterworks and Sewerage Notice to Contractors

Sealed tenders will be received by the undersigned Secretary-Treasurer of the Town of Neepawa until 8 p.m. on Friday, December 16th, 1911, for the following works:—

- Contract A.—Labor for laying Water Pipes and Sewers.
- Contract B.—Pump House and Filter Room.
- Contract C.—Water Tower.
- Contract D.—Cast Iron Water Pipes.
- Contract E.—Gate Valves, Fire Hydrants, etc.
- Contract F.—Mechanical Filters.
- Contract G.—Pumping Machinery.
- Contract H.—Dam, Intake, and Reservoir.
- Contract M.—Wooden Stave Pipes.
- Contract S.—Sewer Pipes.
- Contract W.—Laying Conduit.
- Contract X.—Sewage Disposal Works.

Plan, specifications, etc., may be seen at the Town Hall, Neepawa, or at the Engineer's offices, Winnipeg and Toronto, on or after Wednesday, November 16th, 1911.

No tender necessarily accepted.

W. H. GOSSEL, Mayor.

R. H. FUSEE, Chairman.

J. W. BRADLEY, Sec.-Treasurer.

CHIPMAN & POWER, Engineers.
44-44

CITY OF EDMONTON ENGINEERING DEPARTMENT

1912 PAVING

Sealed tenders, addressed to the undersigned, and endorsed "Tender for 1912 Paving," will be received at the office of the City Commissioners, Edmonton, Alberta, until twelve o'clock noon (12.00 M.) on Friday, December 1st, 1911, for approximately 100,000 square yards of street grading and paving with curb.

Preliminary plans, and specifications, and all information may be obtained at the office of the City Engineer; plans and specifications are on file also at the office of the Canadian Engineer, 62 Church street, Toronto, and the Contract Record, 220 King street west, Toronto. A deposit fee of Five (\$5.00) Dollars is required. This fee will be refunded when plans are returned.

Tenders are invited for Wood Block, Asphalt Block, Sheet Asphalt, Bitulithic, or other kinds of pavement.

Proprietors of patented pavements are required to furnish their special specifications.

Tenders are required to submit bids as follows:—

- Tender No. 1—Unit prices, for whole work.
- Tender No. 2—Unit prices, for 75,000 sq. yds.
- Tender No. 3—Unit prices, for 50,000 sq. yds.
- Tender No. 4—Unit prices, for 25,000 sq. yds.

An accepted cheque for five per cent. (5 p.c.) of the amount of tender must accompany each bid.

The lowest or any tender not necessarily accepted.

CITY COMMISSIONERS

Office of the City Commissioners,
Edmonton, Alta., Oct. 19, 1911. 43-47

Debentures For Sale

The Corporation of the Town of Bracebridge offers the following five per cent., 20-year debentures for sale:

Local Improvements	\$3,447.15
Local Improvements	4,142.93
Power Extension	8,300.00

The above are all payable in twenty equal annual instalments of principal and interest and have interest coupons attached.

Sealed tenders for the block or each debenture, will be received by the undersigned up to 6 p.m. on Tuesday, November 14th, 1911.

ALEXANDER C. SALMON,
Town Clerk, Bracebridge, Ont.
44-45

Electric Pumps

Tenders will be received by the undersigned for a small electric pumping unit for the Southampton waterworks. For further information apply to Bowman & Connor, consulting engineers, Berlin, Ont. 43-43

Proposals Wanted

Sealed proposals will be asked for during the next two months by the Hamilton Hydro-electric Department for bids on the following classes of materials required in the construction of a distribution plant for Hydro-electric power, throughout the City of Hamilton:—

- A.—Substation buildings, heating, lighting, plumbing, etc., for same.
- B.—Station equipment, including transformers, switches, switchboards, lightning arresters, instruments, oil tanks and other appurtenances.
- C.—Wood poles, cross arms, pins, sideblocks, braces, insulators, machine bolts, lag screws, brackets, anchors, pole steps, guy wires, etc.
- D.—Reinforced concrete poles, condulets, conduit, steel reinforcing, cross arms and castings.
- E.—Underground conduit system construction, including cable racks, manhole and hand hole castings, structural steel, fuse pillars and castings.
- F.—Conduit ducts (Tile, fibre or other system for underground distribution).
- G.—Weatherproof and rubber covered copper and aluminum solid and stranded wire, lead encased cables and installation of same, distribution boxes, pot heads and connectors.
- H.—Line transformers, meters, cutouts and devices, lamps, wiring supplies or other appliance, device, apparatus or material entering into the construction and equipment as above mentioned.
- I.—Printing, stationery, office systems, and books of account and record.

Companies, firms or individuals desiring to tender on any of the foregoing equipment must file application for specifications with the undersigned engineer, stating specifically the portions and sections they desire to tender on and for sections A. B. and E. must deposit with the engineer a marked cheque payable to the City of Hamilton Hydro-electric Department for the sum of \$10, which will be returned in the event of receipt by the Corporation of bona fide tender on the work specified accompanied by the complete plans and specifications with tender.

The lowest or any tender not necessarily accepted.

GEO. H. LEES, Mayor,

E. I. SIFTON, Consulting Engineer.

44-45

City Hall, Hamilton.

TOWN OF SUDBURY PROVINCE OF ONTARIO

Sewerage Works

Sealed tenders will be received by the Town Clerk until 8 p.m. on Thursday, November 16th, 1911, for the construction of the following works:

Contract A.—Labor on Sewers.

Contract P.—Sewage Pumping Station

Contract S.—Sewer Pipes.

Tenders for Main Sewers and for Disposal Works will be called for within a few months.

Plans and specifications may be seen at the office of the Resident Engineer, Sudbury, or at the office of the Engineers, Toronto.

No tender necessarily accepted.

L. O'CONNOR, Esq., Mayor

GEO. ELLIOTT, Esq., Town Clerk.

GEO. TUDDENHAM, Esq., Chairman

CHIPMAN & POWER, Engineers.
Nov. 16, 1911. 43-43

Business Buildings and Industrial Plants

(Continued from page 59)

Calgary, Alta.

The Carlyle Dairy Co. are planning to build a 3storey tile extension to their dairy. Cost \$5,000.

Foundations are in for business block for Colonel Walker on 7th avenue. It is proposed by owner to use lower portion as a theatre to accommodate 500; fireproof, steel construction. Work has been suspended till spring.

A permit has been granted for erection of car barns to cost \$7,000. City engineer, J. T. Child; 2 storeys, 45 x 194. brick, concrete foundation, steam heating, electric lighting, tar and gravel roofing. Equipment for car repairs will be installed.

A permit has been granted for workshop to cost \$4,000 for J. Marr & Son, 1012 12th avenue west, Cal— architect, Holman & Gotch, Herald Block, Calgary; brick, concrete foundation, steam heating, electric lighting, tar and gravel roofing.

Cloverdale, B. C.

The Brick & Tile Co. are planning to extend their plant.

Cobalt, Ont.

It is reported that the New York & Pennsylvania Pulp & Paper Co., of Johnsbury, Pa., intend erecting a pulp wood and paper mill here.

Fort William, Ont.

Copp Stove Co. are planning addition to their factory; architect, Hood & Scott, Fort William.

Fredericton, N. B.

J. Ernest Howes, formerly proprietor of the Park Hotel, St. John, who recently sold out to Michael J. Barry, has been inspecting the Queen Hotel, with a view to purchasing. After looking over the property he has declined for the present to make his intentions known. F. L. Blinn, of Haverhill, Mass., has been mentioned as a probable purchaser.

Galt, Ont.

A site of 120 acres has been reserved for manufacturers wishing to locate here. It is announced that F. T. & C. Appleby will erect a cement block manufactory. Canadian Motors, Ltd., are also locating here.

London, Ont.

Permit granted to McCormick Mfg. Co., Dundas and Wellington, for sprinkler tank and system to cost \$16,000. Builders, American Tank & Tower Company.

Meaford, Ont.

By-law will be submitted to authorize the granting of a bonus by way of a loan of \$15,000 to the Meaford Manufacturing Co., Ltd., together with certain exemptions, the said company to erect an additional factory and complete sawmill. Geo. G. Albery, town clerk. Firm manufactures furniture. Date set, Nov. 3rd.

Medicine Hat, Alta.

Frank Hook, who has had charge of the Medicine Hat Clay Product Co. has purchased a large clay pit and it is understood that he is contemplating the establishment of a factory here.

Montreal, Que.

Excavation has commenced on two stores and two dwellings to cost \$7,000 St. Antoine, for Archie Dumont, 145 City Councillors St., Montreal; 3 storeys, 50 x 30, brick, stone foundation, gas and electric light, gravel roof.

Niagara Falls, Ont.

The Gaso-Electric Motors, Ltd., New York City, will establish a branch factory. Mayor O. E. Dore, chairman of committee in charge of negotiations, announces the location of a branch here.

Ottawa, Ont.

Tenders have been called for erection of a bottling factory for Ottawa Wine Vault Co., Ottawa: Architect, W. E. Noffke, Central Chambers, Ottawa; 2 storeys, concrete construction, concrete foundation, steam heating, electric lighting.

Port Arthur, Ont.

Negotiations are about completed for a location of a branch factory of the Mueller Brass Goods, head office Illinois; F. G. Neill, Industrial Commissioner.

Port Colborne, Ont.

Work is in progress for extension to plant of Canada Cement Co., Ltd.; secretary, H. L. Doble, Banque Nationale Building, Montreal; local supt., F. M. Preston; brick, steel, reinforced concrete. Every department is to be doubled and machinery equipment increased.

St. John, N. B.

T. S. Simms & Co., manufacturers of brushes and brooms, find present quarters too small for increasing business and are looking for a site for a new factory. President, L. W. Simms.

Saskatoon, Sask.

Plans are being prepared for the erection of an hotel to cost \$45,000; architect, R. M. Thompson, Saskatoon; 3 storeys, 38 rooms, brick, cut stone trimmings.

Southampton, Ont.

The Pett Biscuit factory has been purchased from the town by Mr. Robert Smith, who will convert it into a wood turning plant for the manufacture of doors, sash and other articles of wooden ware. He expects to have necessary machinery installed and the plant in operation by the New Year.

Sydney, N. S.

J. H. Plummer, vice-president of the Dominion Iron & Steel Co., Sydney, N.S., has announced that the company will shortly commence to operate twenty new collieries.

Toronto, Ont.

Options of building sites in Calgary and Edmonton have been approved at head office of the Canada Life Assurance Co., King street, Toronto.

Tenders are invited for factory to cost \$18,000 for Conduit Co., Ltd., Don Roadway, Toronto; architect, Bond W. Smith 19 Wellington W., Toronto; reinforced concrete, brick, felt and gravel roofing, steel roof trusses.

Tenders are called for erection of a store and dwelling to cost \$4,000 on Dufferin and Bird avenue, for Jas. Manchester, 1678 Dufferin street; architect, Leonard Foulds, 21 Leader Lane, Toronto; 2½ storeys, 24 x 140, oak and georgia pine interior finish, electric wiring, hot air heating.

Valleyfield, Que.

E. H. Hebert, is contemplating the erection of a brewery; architect, C. F. Hettinger, 1140 Columbia avenue, Boston, Mass.

CONTRACTS AWARDED**Bridgeburg, Ont.**

Equipment is required for factory to cost \$35,000 on Jennet street, for The Lautz Marble Co., 861 Main street, Buffalo, N.Y.; general contractor, Oscar Teal, Bridgeburg. The building must be completed by contractor by March 1, 1912. Machinery will then be installed. Stone saws, lathes, planers, polishers, electric motors, air compressor, electric lighting, steam heating, water connections for a million gallons per month, 18-in. sewer connection, ventilating system, shafting, derricks, crane track to connect to railroad, etc. Specifications with O. Teal. Tenders received by A. Lautz until Dec. 1st.

Calgary, Alta.

Addition will be made to business block to cost \$30,000 for Wendell McLean; architect, Lang & Major; general contractor, J. H. McNeil, Box 14, Calgary. Two additional storeys 50 x 130, fireproof steel construction, electric lighting, gravel roofing, 1 passenger elevator and 1 freight.

Machine shop for the city; contractor, Craddock & Sweeney, \$29,292.95; 2 storeys, 41 x 143, brick and mill construction, concrete foundation, steam heating, electric lighting, tar and gravel roofing. Excavation is completed.

Fort William, Ont.

Barnett & McQueen, contractors for power house for Imperial Oil Company and for a frame office, cost \$7,000.

Ingersoll, Ont.

Factory addition for Jno. Morrow Machine Screw Co., Ingersoll; architect, Stewart McPhie, Bank of Hamilton Chambers, Hamilton; general contractor, Magill & Mills, Ingersoll; mill construction, stone foundation, steam heating, electric light, gravel roof. Screw manufacturing machinery required for new addition, also for one just completed.

Montreal, Que.

Andrew Wilson & Co., 43 Yonge st., Toronto, will make alterations to factory to cost \$8,000 at 37-41 Recollet. Contractor, R. E. Edwards & Son, 200 Versailles street, Montreal; 6 storeys, 30 x 70, fire escapes. Work just started; building to be ready for occupation by Dec. 1st. Firm manufactures cigars.

Power Plants, Electricity and Telephones**Baden, Ont.**

The by-law to spend \$5,000 on distribution of power from Niagara was carried.

Bracebridge, Ont.

Tenders are called until Nov. 14th for sale of \$8,300 power extension debentures. A. C. Salmon, town clerk.

Fort William, Ont.

The Canada Iron Corporation (Montreal) are contemplating a gas producing plant. Gas produced used for heating purposes only, to dry the moulds utilized in pipe making.

Hamilton, Ont.

Tenders called for distribution plant for Hydro-Electric Dept. Mayor, Geo. H. Lees; consulting engineer, E. I. Sifton; heating, plumbing and lighting buildings; station equipment transformers, switches and switch boards, lightning arresters, oil tanks, etc.; wood poles, cross arms, insulators, guy wire, etc.; reinforced concrete poles, conduits, steel reinforcing; underground conduit system construction including cable racks, manhole and hand hole castings, fuse, pillars, etc.; conduit ducts; weatherproof and rubber covered copper, standard wire; line transformers, meters, lamps; printing, stationery, etc. Tenders held open for two months.

Midland, Ont.

The Canada Iron Corporation, Ltd., Midland, are enquiring for names of electrical construction firms who would undertake installation of a short power line. For further information apply A. C. Adams, Midland.

Nanaimo, B.C.

The B. C. Hydraulic Co., Victoria, have offered to instal a railway provided council guarantees interest on bonds of \$150,000. A by-law is being prepared. Ald. Wilson is interested. City engineer, A. G. Waters.

Napanee, Ont.

Ontario Power Co. contemplate the expenditure next year of \$200,000 on development of power at Napanee river, Camden east, etc., which will necessitate rock cutting in river channel, several drains, 3 generating stations, etc. elec. power supplied here in a few weeks.

Shuswap Falls, B.C.

The power obtained from the falls will be utilized by the Coteau Power Co. (Canadian Northern Ry. officials interested) in the electrification of a tram line through Okanagan Valley, supplying power and light along line. Route now being decided upon.

Toronto, Ont.

Transformer building, cost \$2,500, on Natalie st., for Toronto Electric Light Co.; contractor, Thos. Wright, 12 Adelaide east, Toronto, 1-sty., galv. iron and concrete.

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Contract Record

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British Trade Records

In his recent address before the Canadian Manufacturers' Association, Mr. R. Grigg, His Majesty's Trade Commissioner in Canada, quoted figures calculated to prove the fallacy of the statement that British trade is slowly expiring. "One of the ablest of your ex-provincial premiers," said Mr. Grigg, "once told me that 'to be wise, a man must live upon biscuits and blue books.' I cannot think that Canadians live to any great extent upon that diet, but if they did the figures which I venture to lay before you would interest them.

"In the year 1902 the products of British industry exported to all countries amounted in round figures to \$1,379,000,000; a steady progress has been maintained through the intervening years, until in 1910 the export of British industry reached the largest figures ever known—viz., \$2,094,000,000, and the increase of the five years from 1905 to 1910 amounted to no less than thirty per cent.

"These figures rival Canadian progress and make it very difficult to say that the Britisher has gone to sleep and has had his day. On the contrary, you believe, and I believe, that Great Britain with her sturdy sons around her will long continue to grow and prosper. And each and every member of that family will rejoice to see their own ever-widening successes welcomed, reflected and encouraged by the heart of the motherland."

The city of Montreal is incensed because one Herr Gratz, of Berlin, has discovered that its business district is ugly, and, generally speaking, devoid of architectural treatment. The press turns round and calls the same Herr Gratz all kinds of hard names. Now this is a poor way to encourage truthful criticism. Certainly the city—as nature made it—is one of the beauty spots of the North American Continent, but that was the work of God and has no connection with the congested thoroughfares and narrow confines of

modern Montreal. Yes, there are a number of saving graces—the Cathedral, the stations and the Bank of Montreal—but we (and Herr Gratz) are speaking of Montreal as a city.

Interest on Contractors' Deposits

The controllers of Montreal recently received from Mr. Hofeller, of the Hofeller Concrete Company, Ltd., a protest against the city's custom of drawing interest on deposits made by contractors when they were awarded contracts. Mr. Hofeller pointed out that it was unjust that firms should not only be deprived of the use of their money, but that they should not be given a cent of interest on the deposits.

This is a serious handicap to contractors having a great deal of work in hand, and it is a matter worthy of an insistent call from the trade.

Higher Prices for Glass

Owing to the success of the European plate glass syndicate of Europe, the sheet glass manufacturers, in the spring of the present year, entered an association known as the "Mutuality." The Mutuality control not only the prices at which European sheet glass is sold in the various parts of the world, but also the quantity which each manufacturer may produce. In consequence of this, the output was materially reduced and was still further reduced owing to the intense heat in Europe during the past summer. This, in conjunction with the great demand for sheet glass, has resulted in prices being gradually advanced until to-day they are higher than have ruled for many years. Furthermore, the Canadian Government in mid-summer last enforced the payment of duties on the Belgium home consumption prices, which prices are materially higher than the export prices. This resulted in an increase in duties ranging on double thick glass from 48 to 74 per cent. It will readily be seen, therefore, that if the Canadian importers are to make equivalent advances the price of glass must materially advance. That such an advance has not taken place is because the jobbers have been selling on their old purchase contracts. These are now exhausted, and the stocks in hand in Canada are lower than they have been for years. During the past few weeks there has been an increase in price amounting to about ten per cent., but further increases must follow, and the winter bookings for spring import promise to be at higher prices than have ever ruled in Canada before.

Why Published Costs of City Day Labor Work Are Unreliable

The misleading statistics and arguments adduced in favor of day labor, as opposed to contract work, are assailed editorially in a recent issue of our Chicago contemporary, Engineering & Contracting, which comments as follows:

Every American city of size performs a part of its task of constructing and maintaining its public works by means of department forces. Few cities have any exact knowledge of what this force account or day labor work costs. It is true that costs are named and that these costs are often quoted and accepted, but they are rarely true costs. The fundamental reason is that bookkeeping and cost keeping are essentially different; they have different purposes and their results are expressed in entirely different

terms. A city's bookkeeping may be above reproach, although it seldom is, and yet its officials may have very little knowledge of what work done by the several departments really costs. This fact is forcibly presented in the report just published by Mr. Bernard J. Mullaney, late Commissioner of Public Works of Chicago. Mr. Mullaney says:

Cost accounting has been mentioned several times in this report. The subject is worthy of a special report covering the entire city service. From within, as from outside of, the City Hall, much is heard of what this, that or the other kind of city work costs the taxpayers. But nobody knows. The necessary accounting is not done. In this department, and probably throughout the City Hall, the quantity of accounting is ample, and there is abundance of system—one sometimes thinks too much system and too little method.

The actual cost of every function performed by the city should be known. It is considered impracticable to manage a large private business intelligently unless the cost of all operations in that business can be readily ascertained. A step in the direction of getting at the cost of municipal service would be accomplished if each department and bureau were required to pay for every service rendered by another department or bureau. This should tend towards both economy and efficiency.

Why should the salary of a policeman, assigned to the office of the Commissioner of Public Works, be charged to policing the city when he is only doing work which should be done by a messenger? Why should a \$1,500 draftsman in the Map Bureau be charged against operating expense of the Department of Public Works when 132 days of his time last year were spent making charts for the Efficiency Bureau of the Civil Service Commission, 32 days of his time in making maps for the Health Department, and 82 days of his time in making drawings and blue prints for the Police Department? Why should \$5,000 worth of steam used by the water works shops last year be charged against operation of the 22nd street pumping station? Why should the heat of a ward yard be charged to operating cost of a sewer pumping station? Why should the Department of Public Works collect samples and test coal gratis for all other departments, thus letting them get coal at less than cost? The illustrations could be multiplied to tiresome length. Correction of this condition would impose no heavy burden upon the accountant force of the city and would have the merit of being in the direction of accuracy.

In some cities doubtless the situation is better than in Chicago, and in other cities it is perhaps worse. The engineers of the Boston Finance Commission found matters quite as bad in the Massachusetts capitol. They state repeatedly in their reports that cost comparisons were impossible because the city's method of accounting was such that exact costs could not be determined. Yet costs were freely published in the department reports and quite as freely accepted by the people and by the city officials themselves as something reliable and accurate. Outside engineers and city officials used these figures to show the greater economy of day labor work when compared with contract prices. The Boston heads of departments did the same thing. To mention a single instance: The Water Department had maintained for years shops where valves, hydrants, and smaller articles had been manufactured. It had regularly published the costs of these articles and these published costs were lower than responsible private manufacturers would bid for the same articles. The comparison was used as an argument for main-

taining the city shops. The people accepted it as a sound argument and the department heads believed it to be true as well as sound. The engineers of the Finance Commission did some independent accounting and found that the true costs were from 35 to 40 per cent. greater than those given by the published figures and were higher than the bidding prices named by responsible manufacturers for the same articles. The department had an accounting system, its books we have no doubt balanced to a penny, but it did not know to within a third of what the valves and hydrants turned out of its shops were costing.

What Commissioner Mullaney says is true of Chicago and what the Boston Finance Commission engineers found to be true of Boston has been learned to be true of every city public works department which has ever been thoroughly investigated. Commissioner Mullaney draws one lesson from the conditions: The necessity of an efficient and reliable cost-keeping system to the business-like administration of a city's public works. Since we have selected above the Boston waterworks shops as an example of cost accounting, it will be interesting here to note what Mr. Mullaney has to say in his report of the Chicago waterworks shops:

The waterworks shop, by far the largest, is on the most satisfactory basis, but there is room for improvement. It is operated as a business unit, making water hydrants and valves and doing a general mechanical repair business at cost for the pumping stations especially, but also for other bureaus and sometimes for other departments. Besides a shop force, it carries a field force of mechanics, plumbers, machinists, steamfitters, painters and the like for pumping station and other work outside of the shop. It has a working capital for running expenses which is reimbursed and kept unimpaired by collecting from all other divisions, bureaus and departments the cost of work done for them. This reimbursement of the capital account is accomplished by application of a cost accounting system which arrives at the actual cost to the shop of each job, including overhead expenses. This cost accounting system is being extended as fast as possible to all other repair shops.

The cost accounting serves as a check against loafing and waste. Each bureau and department is interested in conserving its appropriation for its own uses and when it has the means, in itemized cost accounting bills, it will check up on repair bureau bills to avoid being overcharged.

All repair work of this general class for the entire department, including bridge repair and repair of street bureau wagons, etc., should be concentrated under one bureau head and accurate cost accounting should be applied.

For a time at least, and until accurate standards are established, there should be latitude in this bureau for having some repair work done by contract. Most of this class of work can be done to advantage by the city itself with city employees, but there is always one bad tendency to be fought. "Pull" of a kind cannot be eliminated until human nature is remodeled and appropriations are made and salaries are raised automatically. The demand for certain kinds of repair work is greater at some seasons than at others. When the dull season comes, there is always a tendency to stretch out jobs, to duplicate work and so to make excuses for carrying the "peak-load" force all the year around. The result is to make the payroll heavier than it should be.

Stated briefly this quotation says: A cost-keeping system is essential to efficient performance of work by department forces; work done by department

forces leans towards extravagance in cost and this tendency should be counteracted by freely bringing in contract work as a competitor when the occasion arises. This tacit acceptance of contract work costs as the standard with which to compare the efficiency of department force work is the fact to which we wish to call attention. There is in the long run no other sound method of measuring the economy and efficiency of day labor work. But to employ this method accurately and effectively the true costs of

day labor work must be kept and known. The method of measurement fails wholly when department costs are kept as described above for the Boston waterworks shops or, as stated by Commissioner Mullaney, is the practice in Chicago's department of public works except in one or two bureaus. Unfortunately this latter is the sort of cost keeping that is found in most cities, and it misleads people into the support of department force work in opposition to contract work.

Unfair Provisions of Specifications

Unreasonable Clauses and Ambiguous Terms which too Frequently Become Part of a Contract — Responsibility of the Engineer

A set of specifications for sewer work was submitted recently to the Secretary of the American Society of Engineering Contractors. A critical discussion of certain clauses of the proposed specifications was prepared in the belief that the same would prove of interest to those who have to write specifications, and, likewise, to those who would like to have unfair clauses eliminated.

In the following extract the paragraphs marked A are taken from the specifications, and those marked B set forth the criticisms made.

1A. The engineer as the representative of the board shall have the option of making any changes in line, grade, position, plan, or dimensions or the material of the work herein contemplated, either before or after construction is begun. And all explanations or directions for carrying out and completing satisfactorily the different kinds of work contemplated and provided for under this contract, will be given by said engineer. He shall decide if all work or materials comply with these specifications. He shall give all lines and grades and make all measurements necessary for the construction work and for computing the payments that are to be made for same.

1B. It is decidedly objectionable to give the Engineer the right to make such changes. The specification is part of the contract and as such can be changed without the consent of the other party. Disregard of this provision has led to endless law suits. If changes may be necessary or are anticipated, careful provision must be made covering such possible changes and the rate of compensation.

2A. Nothing in this contract shall be construed as preventing either party from appealing from a decision of the engineer to a board of arbitration, whose findings shall be binding on all parties concerned; to be composed of three disinterested persons, one appointed by the board of commissioners and one by the contractor and the third selected by the other two. One-half of the expenses of this board to be paid by the contractor and one-half by the board of commissioners.

2B. It will be found that this arrangement is not workable as it stands, for the man who is in the wrong commonly selects an arbitrator who always agrees with his contention, and never agrees to a third arbitrator, unless it is known in advance that the third man will do likewise. The law says that, unless the arbitrator is named, either by name or reference to his office, so that he is designated beyond all question, the arbitral provision is void.

4A. In case of any ambiguity or inconsistencies between

plans and specifications the explanation or interpretation of the engineer is to be final.

4B. This clause provides that the Engineer is to decide as to the meaning of the specifications. There is a rule in law appertaining to the construction of contracts, which has been called the rule of "reasonable construction." When plans and specifications for an engineering contract are considered, one must construe them like anything else. In such cases, it is the meaning of the words used, and not the intention of the man who drafts the specifications, that is to be taken into account. And just here is where the Engineer commonly gets into trouble. He knows that he intended the specifications to mean a certain thing, and, therefore, as Engineer, he says they mean that thing. Therein lies his error, for he is deciding not what they do mean but what he intended them to mean, and that is not the interpretation of the specifications at all. It is the rule, therefore, the necessary rule, that the meaning of the words must govern the construction, for the man who contracts on specifications has just as much right to say what he intended the meaning should be as the man who drew up the contract.

5A. Should the work under this contract not be finished within the time herein specified, the contractor agrees to pay the sum of \$10.00 per day to the board, as liquidated damages, for each and every day which shall elapse after the expiration of the time herein agreed upon for the completion of the work. It being understood and agreed by the parties to this contract that the damages which the board, acting for the city, may sustain by reason of the delay in completing the work within the time herein agreed upon, are uncertain in character and not capable of being ascertained by the usual and customary methods of estimating damages, it is, therefore, agreed that the aforesaid sum of \$10.00 per day shall be paid to the city, through the board of commissioners, for delay in completing the work within the time herein specified, this in addition to the cost of engineering, inspection and other expense mentioned below. If from any cause, excepting only delay caused by the board in ordering shipments of materials or in procuring right of way, the contractor shall fail to complete the work within the specified time for doing the same, and the time of this contract be extended, then the contractor shall pay the expense of the inspectors and extra services of the engineer and all other expense caused the board by reason of such failure to complete within the specified time.

5B. What is meant by liquidated damages? Here again the law construes the thing to mean what

it is in fact, and not what one may choose to name it. If it is not liquidated damages in fact, the court will not allow a recovery upon the theory that it is, simply because it is called so. It is really a penalty and will be considered as such, but a penalty can not be enforced unless there is a corresponding bonus for completing the work ahead of the contract time. Also, in the matter of delay, this clause does not provide fair safeguards. If the delay in completion is caused by the Engineer as agent of the Owner, or by the Owner himself—it makes no difference which—then, though the contract says that no extra time shall be allowed unless it is agreed to in writing during the progress of the work, it still must be allowed, though not asked for during the performance, because the Owner will not be permitted to penalize the Contractor for matters which are plainly the fault of the Owner or Engineer.

6A. When any work or material is found to be imperfect, whether passed upon or not by any inspector, said work or material shall be taken up and replaced by new work at any time prior to the final acceptance. If the contractors shall be notified by the engineer of any requirements or precautions neglected or omitted or of any work improperly constructed he shall at once remedy the same, and if he fail to do so, the engineer, under the direction of the board, shall perform such work at the contractor's expense and deduct the same from any money due or to become due the contractor.

6B. It is doubtful whether such a clause could be enforced. What is meant by "imperfect work?" When is the work perfect? If the work is passed upon by the inspector, it is assumed that it is made in accordance with the specifications; otherwise, the inspector is incompetent. The contractor is made responsible for the work, but, under such specifications, no responsibility rests on the inspector.

8A. It is further agreed that, other things being equal, local labor shall have preference over that from outside the town, and the contractor will not place any restrictions on their boarding places, excepting disorderly places are not to be patronized.

8B. This clause should be omitted. Make the contractor responsible for the results and do not hamper him with restrictions which, after all, only serve to engender disputes and lead to law suits. Every contractor will prefer to employ local labor if it proves equal to any other.

9A. This contract shall not be assigned or any part of it subcontracted without the written consent of the board of Commissioners endorsed thereon and in no case shall such consent relieve the party of the second part from the obligations herein entered into by the said party of the second part, or change the terms of this contract.

9B. There is not much reason for this. Seldom, if ever, does the engineer refuse his consent to a subcontract. Why should not a contractor have the right to sub-let a portion of his work without permission of the owner, just the same as he is allowed to buy materials from whomsoever he chooses, so long as he produces the results called for in the specifications?

10A. If any alterations in plan directed by the board or the engineer increase or diminish the amount of work to be done they shall not constitute a claim for damages nor for loss of anticipated profits, neither shall such changes invalidate the contractor's bond. Any increase or decrease shall be paid for or deducted according to the quantity actu-

ally done, and at the prices established for such work under this contract.

10B. This is a clause which opens the way to justice to the contractor, and may result in law suits. If any decrease is going to be made in the amount of work to be done under the contract, especially if its value amounts to a substantial sum, it will work injury on the contractor who has figured a smaller percentage of profit based on the full amount of the contract. It would seem advisable to at least specify that deductions not exceeding a certain figure may be made.

11A. The contractor shall at all times prosecute the work with a force sufficient, in the opinion of the board and the engineer, to complete the work within the time set, and if at any time he shall refuse or neglect to prosecute the work with a sufficient force, after having been notified to do so, or if in any event the said contractor shall fail to proceed with the work in accordance with the terms of this contract then the board of commissioners shall have full power to employ workmen, use any or all of the contractor's tools or other equipment, and purchase materials in the open market to complete the unfinished work, and to deduct the expense thereof from any money that may become due and owing to said contractor on account of the prosecution of the work under this agreement, according to the provisions thereof, or to relet this work to other contractors. In case of abandonment by the contractor the board is hereby authorized and empowered to pay the laborers, who may have been employed by said contractor on this work, out of any funds remaining or becoming due the contractor under this contract, and this may be done without giving any notice whatever to said contractor of their intentions to make such payments, but each person receiving money under this clause must sign an affidavit that the same is due and wholly unpaid. The board shall have the right and power to declare this contract forfeited, or any part thereof, for the violation of any of the terms, conditions or limitations herein contained at any time during the continuance thereof.

11B. This is another one-sided clause which entirely neglects to consider the contractor's judgment. The proper way to provide for completion of the work is to specify that the same is to be done or completed at a certain rate of progress. The force employed should be absolutely the contractor's affair. Men's judgment will differ very much as regards to whether his force is or is not sufficient. Anything that opens the way to disputes and law suits should be eliminated. Of course, this may not be an easy matter, but much that is objectionable in specifications at the present time, can be avoided. Leave out of specifications all clauses that cannot be enforced.

12A. If any additional work of the general nature of that work herein contracted for, but for doing which no provision has been made by the engineer in preparing the bidding blank, shall need to be done, the contractor shall do the same under the direction of the engineer and shall receive therefore as compensation the actual cost of all labor and material plus 10 per cent. for superintendence and use of tools, but he shall not be entitled to receive payment for any work as extra work, unless ordered by the engineer in writing and approved by the board and on material actually furnished by himself. All claims for extra work of any character or nature must be filed with the board within fifteen days after completing said extra work.

12B. The clause which provides that the contractor "shall not be entitled to receive payment for extra work, unless ordered by the engineer in writ-

ing, etc.," is a provision that is capable of being waived by an oral agreement, just as much as any other provision, provided the waiver is clearly proved; and it should be so. If it were not so, then a clause which is inserted for the protection of the owner, instead of simply protecting him, would be wrested from its proper purpose to the injury of the contractor, and the law says that can not be done. Therefore, if for any reason whatever, this provision is waived orally, the contractor may recover for his work with the same effect as if it had been ordered in writing.

A Deep Mine Shaft Through Sand and Gravel

A contract for the sinking of a shaft 35 ft. in diameter through water bearing sand, clay and gravel to a depth of 200 ft. has been awarded by the St. Albert Collieries Limited, Montreal, to The Foundation Company, Limited, Bank of Ottawa Building, Montreal.

The contractors will follow the methods they have used in constructing some twenty-five shafts under similar conditions. A circular concrete caisson will be constructed at the ground level and sunk to rock, the cutting edge being carried a sufficient depth into the shale to permit of its being sealed to withstand the full hydrostatic pressure of 125 ft. head of water, thus forming a water tight shaft from the surface to rock, which can easily be extended down to the coal without further trouble from water.

The shaft is to be constructed at the town of St. Albert, Alberta, to develop the extensive coal areas which the company owns at this point. The coal lies at a depth of about 303 ft. below the surface of the ground and is overlaid by about 102 ft. of shale, with occasional seams of coal and sandstone. Above this is 201 ft. of clay, and water bearing sand and gravel.

Some time ago an attempt was made to sink an ordinary timbered shaft at this point but after reaching a depth of 82 ft. the work was abandoned, it being impossible to follow that method further, on account of the influx of sand and water.

Remarkable Reinforced Concrete Floors

Four of the large halls in the new ethnological museum in Hamburg were constructed with reinforced concrete paneled floors, molded throughout, and for that reason offer a very interesting case. As a rule paneled floors are rather expensive due to the costly falsework and forms. Usually where such floors and ceilings are used the load bearing floor is made of some simple, inexpensive reinforced concrete type and the paneled floor is simply attached to this and has no part in supporting the floor loads. In this case, however, the entire floor was cast on previously molded panel sections. These sections were made of reinforced concrete with the lower face having the desired panel form. These panel sections, seen in Fig. 1, are 2.05 x 2.5 m (6.7 x 8.2 ft.) in area and 3 cm (1.2 in.) thick at the center, and are reinforced by a meshwork of 6 mm (0.2 in.) steel rods, the meshes being 100 mm (4 in.) wide.

The reinforced concrete panels are made in wooden forms which are lined on the inside with tin plate and four of these forms were sufficient to make 225 panels. They were made near the building where they were to be used so as to save the

cost of cartage. After the concrete had set the panels were placed on wooden falsework in their definite final position. Then the reinforcement rods were inserted and the spaces between the different panels were filled with concrete.

The panel molds in this way were used as falsework or forms for the reinforced concrete floor beam slabs and were found in that capacity, to have extraordinary strength and rigidity. To increase the cohesion and bond between the set concrete in the panel and the fresh concrete the sides of the former were made to slant a little to the outside so that the upper sections rest against the edges of the lower panel and find a firm support there until the concrete

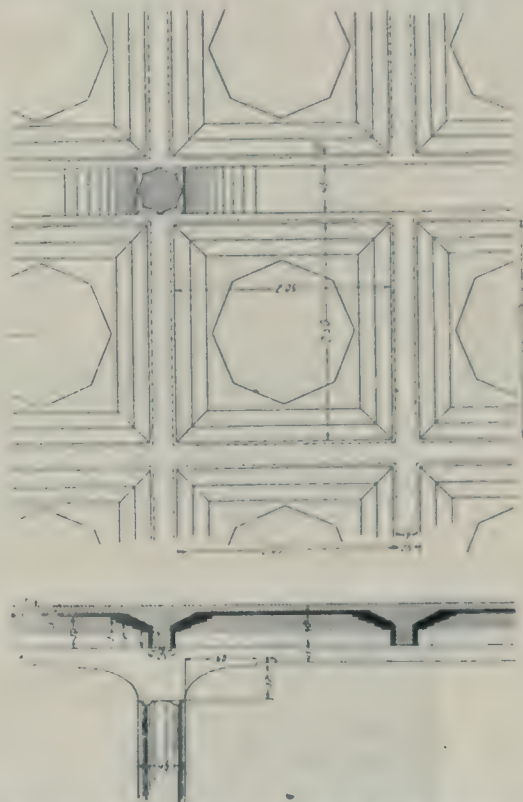


Fig. 1—Plant and Section of Floor Construction Using Previously-Molded Concrete Core Panels.

has had time to set and adhere firmly to the older concrete. This type of floor construction has given great satisfaction and has proved very economical in cost.

Tar Spraying of Roads

The following details concerning the methods in Bristol for tar covering of macadamized roads will be of more or less interest to those who are seeking a remedy for the dust nuisance in many parts of Canada:

The Corporation of Bristol have during the past summer tarred upwards of 100 miles of macadamized roads; the greater portion of the work is carried out by contract, the tar being distributed hot by means of machines fitted with spraying nozzles working under pressure produced by a force pump geared to the wheels of the vehicle.

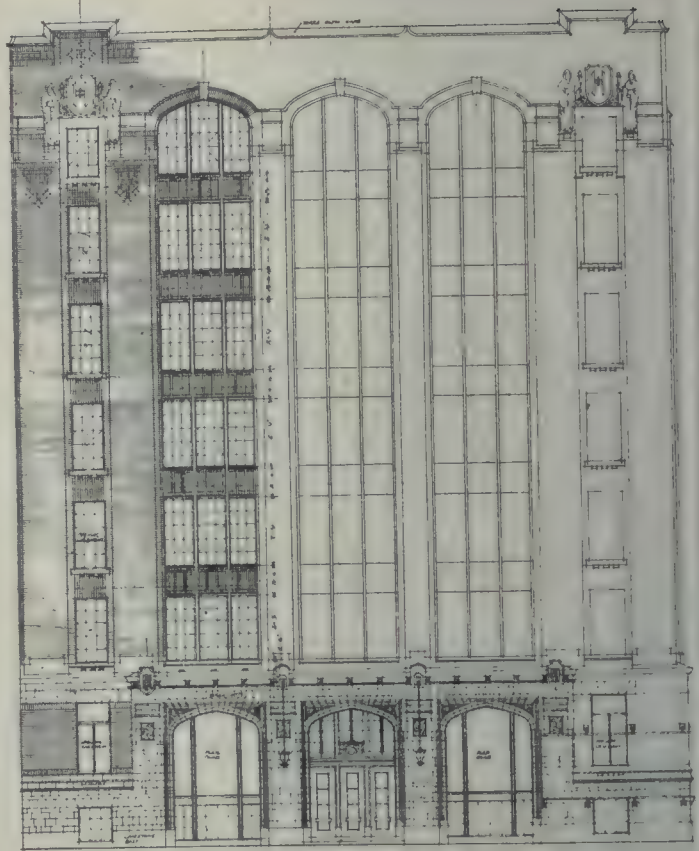
One or two coats are supplied according to the character of the road, and the cost works out at about 1d. (2 cents) and 1½d. (3 cents) per yard super for one and two coats respectively, including cleansing and gritting.

The Herald Building, Montreal

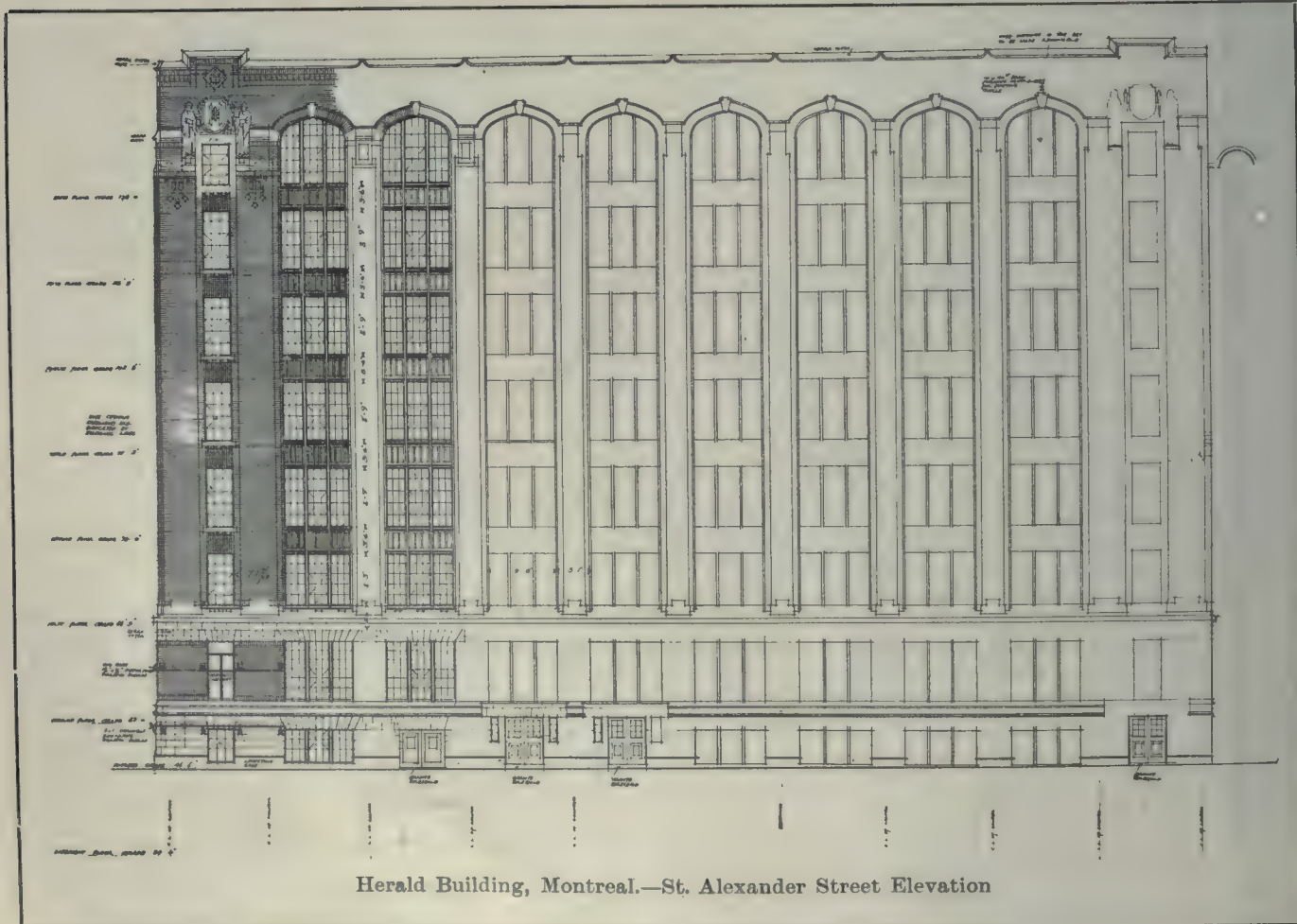
New Home of one of the Leading Newspapers of the Commercial Metropolis—Suggestive Plans

The new Herald building at Montreal is being erected in the down town district, on the north-west corner of Craig and Alexander streets. Covering an area of 12,000 square feet, it has a frontage of 800 feet on Craig street and 150 feet on Alexander street. There are seven storeys and a high basement, which are absolutely fire proof. The building is of reinforced concrete, on the Kahn system, and is carried on a raft of this material 2 ft. 6 in., which feature was decided on in view of the nature of the soil. The structure is also designed to carry a load of 250 lbs. to the square foot. The exterior is of brick and terra cotta.

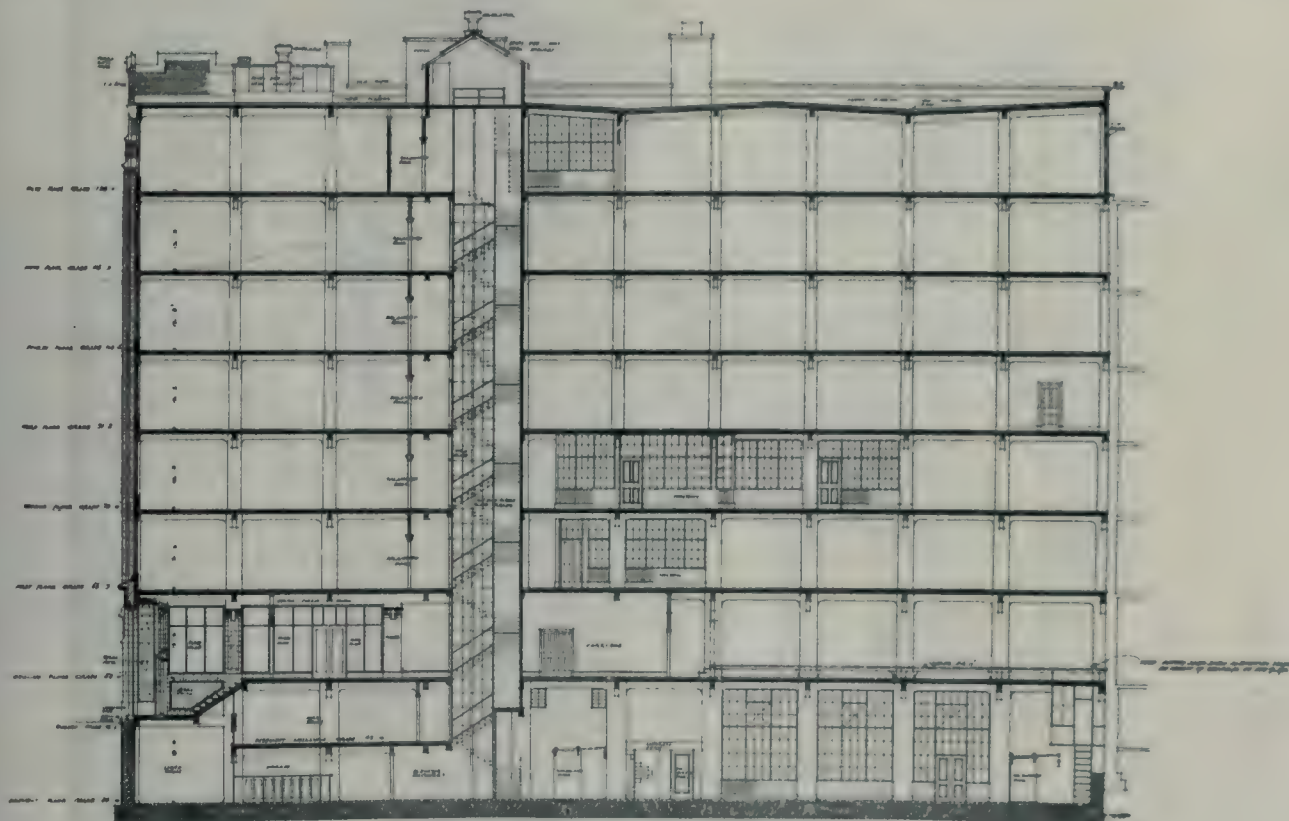
The "Herald" will occupy the greater part of the new structure but there will be sufficient room to rent a number of flats. The stereotyping plant and large presses will be in the basement, the Mezzanine will be devoted to the mailing department, while the ground floor will contain the business offices. The second and third floors are to be set aside for various departments of the paper, and on the top floor the editorial rooms and linotypes will be located. Messrs. Brown & Vallance, architects, of Montreal, designed the building, and the general contractors are the Bishop Construction Company, of Montreal and Toronto.



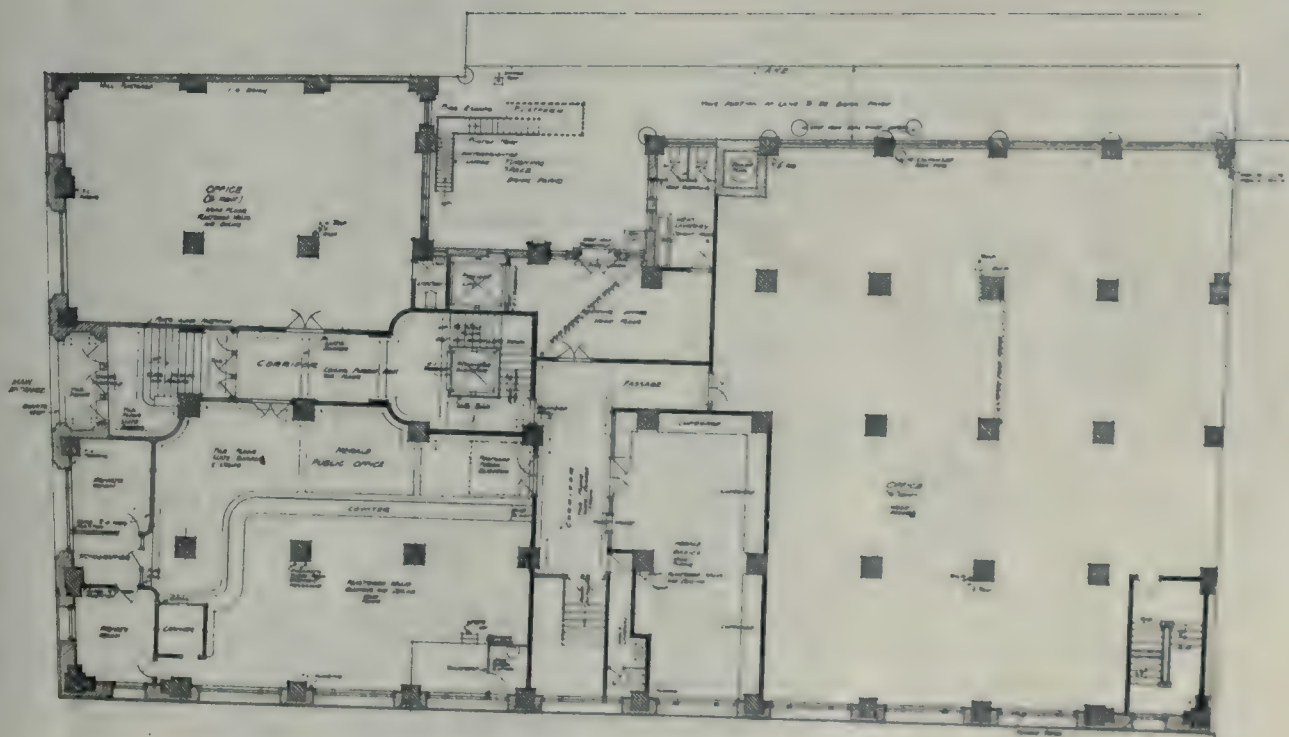
Herald Building, Montreal,—Craig Street Elevation



Herald Building, Montreal.—St. Alexander Street Elevation



Herald Building, Montreal.—Longitudinal Section

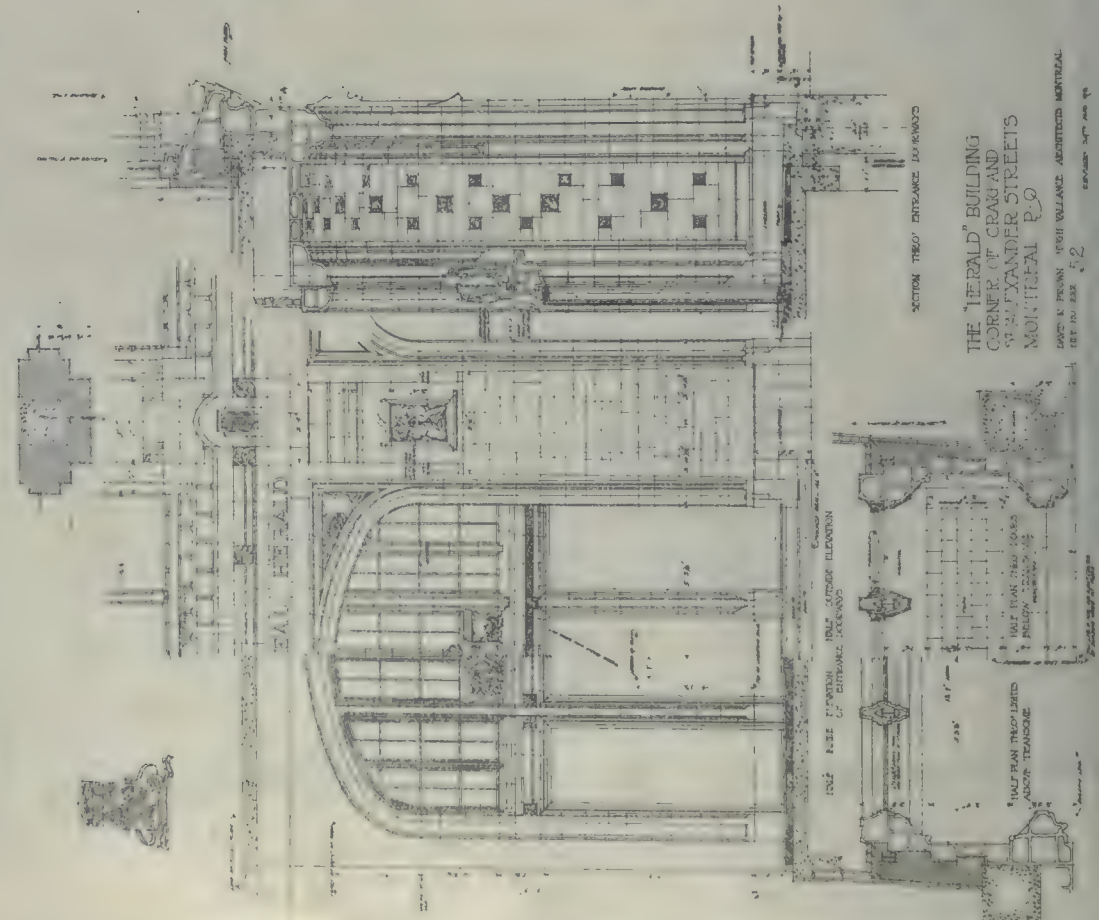


Herald Building, Montreal. Ground Floor Plan

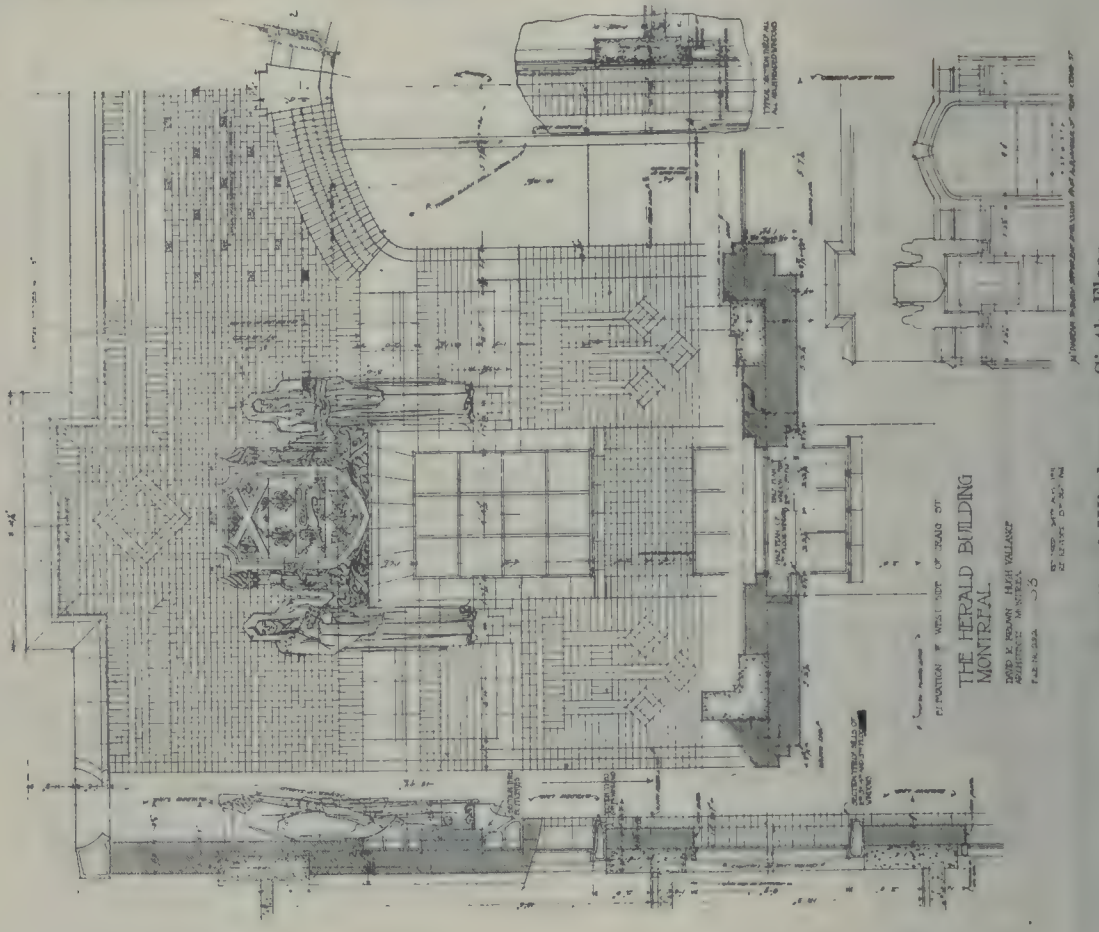
Architects: Brown & Vallance, Montreal

HERALD BUILDING, MONTREAL

Architects: Brown & Vallance



Details of Entrance Doorway



Details of Windows on Sixth Floor

The Superintendence of Building Work

Another Department in Which Leakages Often Occur—Selection and Care of Materials—Progress of Construction—Avoidance of Overlapping

In the course of an interesting article on the superintendence of building construction and a discussion of various phases of the work, a recent issue of the Record & Guide contains the following concerning the care of material at the job, weights of materials and progress of construction:

By exercising even moderate care of material as it arrives on the job, a good superintendent can prevent many small losses, which in time aggregate large sums. All material should be carefully checked as it arrives. Count and measure all lumber and pile it with boards slanting so that water will drain off. Lay as few boards or timbers directly on the ground as possible. See that the top layers are turned over occasionally to prevent warping. Many builders insure all lumber and timber work against fire. This is a precaution that does not cost much, but saves much to the builder in the event of fire, either accidental, spontaneous or malicious. These general instructions serve merely to suggest ways of stopping leaks that weigh heavily into profits.

Checking off Materials

It is an often serious question with operators who have had little experience in building construction, to check off accurately the material as it arrives on the job. In the case of sand or materials delivered in bulk, the material clerk or superintendent is handed a slip of paper giving the quantity or weight of material delivered, which he signs and of which he retains a duplicate. Many builders do not know how to measure lumber, for example, and under those circumstances they generally sign the slip and take it for granted that the supply man has sent them all that they paid for.

To calculate the number of feet board measure in a sawed stick of timber, multiply the width in inches by the thickness in inches, divide the product by 12 and multiply the quotient by the length of the stick or piece in feet. It will, therefore, be a simple matter to estimate a load of lumber or timber of regular sizes. Mixed loads can be measured separately as they are being stacked in their respective piles.

Green white oak is heavier than water and weighs more than 5 lb. per ft. (board measure), there being 12 ft. board measure per cu. ft. Green Southern yellow pine weighs $5\frac{1}{2}$ lb. per cu. ft., board measure, and kiln dried yellow pine weighs 3 lb. per cu. ft., board measure. To find the weight of any piece of timber, float a block of the wood in water, and measure the total depth of the block and the submerged depth and the weight can be calculated in simple proportion, thus:

$$4:6::x:5.2$$

showing that X, or the unknown quantity, represents nearly 31.2 lb. per ft., board measure. This is only one of many rules for ascertaining this information.

Weights of Materials

Basic building materials usually are sold by number, cu. yd., cu. ft., bags, bbls., and in the case of roofing slate, in squares, each square of roofing slate being the unit of measurement per 100 sq. ft. of

roofing area. In estimating, it is frequently desirable to know what the weights of such material as brick, cement, crushed stone, etc., are. If cartage is charged by tonnage, it is also well to have some idea of the weights delivered on the job. Even in materials sold by carton, it would be necessary to know their tonnage under such circumstances and so the following table may be helpful:

5¼ bbls. Portland cement (380 lbs. gross), 1 ton (2,000 lbs.)			
21 bags Portland cement (95 lbs. paper or cotton)	.....	"	"
500 common brick	.....	"	"
10 barrels of lime (200 lbs.)	.....	"	"
20 cu. ft. of sand or gravel	.....	"	"
22 cu. ft. of sand, broken limestone or granite	.....	"	"
20 cu. ft. broken trap rock	.....	"	"
12 cu. ft. solid block granite	.....	"	"
32 cu. ft. water (62½ lbs. per cu. ft.)	...	"	"
2 squares of 1¼-in. roofing slate	.....	"	"
About 3 squares of Bangor No. 1 slate	...	"	"

Progress of Construction

One of the essentials in good supervision is to so arrange the delivery of materials that no subcontractor will be obliged to wait for another to finish his work before he can begin. In the large general contracting companies high salaried men are employed to look after this important detail. The saving on delays from this source alone is tremendous, and if it be true of the large jobs, how much more so will it be in the smaller one.

In excavating, for example, have the contractors dig from the outside in, rather than vice versa, so that the foundation setters may start work before the excavation is completed. The same principle should be followed throughout the whole job and this can be very easily arranged, if the builder has kept track of each day's progress by means of his time cards.

This is only possible when careful provision is followed by supply men in making their deliveries of materials. And in this connection it is equally important that too much material be not delivered on the job before it is actually needed.

All through the operation, one contractor should follow closely upon the heels of the other, but at no time should they overlap, for the sake of harmony, if for no other reason.

Time Essential to Success

As the average speculative construction work goes ahead to-day, time is the greatest essential to success. Under such circumstances there is great need for accurate knowledge of the building material market, how to buy materials and what kind to select.

The builder must have some knowledge of what trim he can put in a building that will sell for \$2,500, and also what the purchaser of an \$8,000 home would expect in the way of interior decoration and equipment. Once he has selected these materials for samples, he must make sure that he is getting what he contracted to pay for. For instance, suppose he

wanted a light gray brick for facade and selected a sample at a front brick salesroom, only to find when the material was delivered that there was a range of several shades in the shipment. Would he have any redress once these brick were laid up?

Hotel Mount Royal, Montreal

Marble will enter largely into the construction of the ten-storey hotel which will be commenced next spring on a site on the corner of St. Catherine and Peel streets. This material will be used not only for the exterior, but also for many interior purposes. The building, judging from the plans, promises to be one of the finest and best equipped in Montreal.

The frame will be of steel, with fireproof floors, walls and partitions. The main entrance will be on Peel street, from which the rotunda will be reached by eight steps. On either side will be the dining room and the lounge and cafe, situated several feet above the street level. This gives an opportunity



Proposed Hotel Mount Royal, Montreal

for the construction on the street level of a number of shops, the rent of which is naturally looked on as a valuable source of revenue. The men's cafe on the main floor and the main dining room above it will be situated on the south side, each having immediate connection with the rotunda. The dining room will have balconies overlooking it and a marble staircase communicating with it. On the other side of the rotunda, on the mezzanine floor, the ladies' lounge and tea room will overlook this large central hall in a similar way. Quick and easy communication has been provided for by means of one direct staircase communicating with the kitchen. The approaches to all parts of the building will lead from the rotunda.

On the first floor are to be placed a series of private dining rooms for social functions and convention purposes.

Naturally the equipment of a hotel of this description will be of the highest class. There is to be a

complete direct and indirect heating system and ventilating plant, an electric plant, an intercommunicating telephone system, and a system of water filtration. There will be an efficient elevator service.

Ross & Macfarlane, of Montreal, are the architects. P. Lyall & Sons, of Montreal, have the general contract for the construction. The marble will be from the quarries of the Missisquoi Marble Company, Philipsburg, Que.

All the industries of Nova Scotia complain because of the inability to procure labor to carry on their work. Men are badly needed to assist in the building of the new wharves and docks, and now that contracts are let for building the Halifax & Eastern Railway, the demand will increase. The prospects for steady work during the entire winter are excellent. From present indications, no man need go hungry in Nova Scotia the coming winter for the want of employment.

In the Catskill Aqueduct project, concrete cradles were used at certain points to hold the pipe in position before the placing of concrete. The cradles were provided at intervals of $7\frac{1}{2}$ ft., or one for each length of pipe. They were given approximately the shape of the outside of the pipe, so that it would rest more or less solidly in it, although the curve was flattened a little to permit slight lateral adjustments. A groove about $\frac{1}{2}$ in. deep runs from one side to the other of this cradle block, and three grooves at right angles to this are also provided; the object being to fill the space between the pipe and the cradle with cement grout, which these grooves will facilitate. These blocks will, of course, be imbedded in and become a part of the concrete which will later be placed under and around the pipe.

German contractors use a type of cement gun in placing the plastering on large areas of wall space like those of factories and apartment houses. The cement gun works in combination with a mortar mixing machine which mixes the mortar or plaster, as the case may be, in the proper proportions, and drives it, by means of compressed air, into a line of hose from which it is forced against the sides of the wall in a steady stream. The entire portable plant is on a truck, and consists of a mortar mixing machine, a mortar pump, the compressed air plant, and the driving motor. The pump takes the mortar mixed by the mixer and forces it into the line of hose. At the other end of this hose is the nozzle, through which the compressed air from the compressed air pump forces out the mortar at a pressure of $1\frac{1}{2}$ At. A workman, standing about 5 ft. away from the wall, directs the nozzle and can cover about 1,000 sq. ft. in one hour. The pump pumps about 70-105 cu. ft. mortar per hour, which is sufficient to place a $\frac{1}{2}$ -in. thick coat of plaster on 1,200-1,700 sq. ft. wall surface.

The city of Moose Jaw, Sask., is to be congratulated upon the organization of the Saskatchewan Bridge & Iron Company, Limited. This company, which is capitalized at \$250,000, has purchased a property covering fifty-four city lots. Their plant will be the largest of its kind in the three western provinces. The new company will manufacture principally bridge and structural iron work and will employ about four hundred men.

Standard Plans for Reinforced Concrete Work

The report of the Reinforced Concrete Practice Committee, embodying suggestions on "The Standardization of Drawings of Reinforced Concrete Work," was presented recently to the Concrete Institute. As reinforced concrete is most extensively used in building, drawings should conform most closely to general architectural practice. The standards found advisable for the preparation of drawings for reinforced concrete in architectural work will serve quite well for engineering work.

Scale—It is recommended that the following are the best scales:

For general drawings, without detailing the reinforcement: $\frac{1}{8}$ -in. scale (1-16-in. scale to be substituted for $\frac{1}{8}$ -in. scale for large jobs).

For detail drawings, for framing plans and reinforcements $\frac{1}{8}$ -in. scale for elevation of beams, etc., and general detail drawings: $\frac{1}{2}$ -in. scale ($\frac{1}{4}$ -in. scale to be substituted for $\frac{1}{2}$ -in. scale for large members); for sections of beams, etc.; $1\frac{1}{2}$ -in. scale; for large details of intricate work: 3-in. scale.

Thus we have, generally speaking, three scales— $\frac{1}{8}$ -in., $\frac{1}{2}$ -in., and $1\frac{1}{2}$ -in. These three scales, it is suggested, are sufficiently elastic for ordinary work, and for very large jobs smaller scales can be substituted as suggested above.

All dimensions should be figured on the plans and nothing left to be scaled.

Standard Size Sheets—It is suggested that the size of sheets upon which drawings are made be standardized. For general purposes two sizes are advocated, namely, 40 in. by 27 in. and 20 in. by 27 in. Larger sheets would be of the same depth, 27 in., but of greater length. These are measurements within the margin line, which later should be ruled upon the tracing cloth, and photographic prints should be trimmed to this ruled margin line. These sizes have been chosen for the reason that tracing cloth usually measures 29 in. to 30 in. wide, while photo-printing paper when trimmed is about 28 in. wide. The suggested standard sheets are therefore, proportionate to the tracing cloth and to photo-printing paper.

Indicating the Reinforcement—It is suggested that it will be found convenient generally on $\frac{1}{2}$ -in. scale drawings to show main bars by means of thick solid lines, secondary bars by means of lines of medium thickness, and the outlines of the concrete and other work of thin lines. Working with this small scale, it may often be found an advantage to omit the reinforcements in adjoining members, as, for instance, the bars in floor slabs when drawing elevations of T-beams, as otherwise the main reinforcements may be obscured.

In $\frac{1}{2}$ -in. and 3-in. scale drawings it will often be found advisable to show bars, when not of very small size, by means of double lines. The lines should, however, be strongly drawn.

Indicating Sections—Many draughtsmen prefer to indicate the concrete by marks intended to show stones, as it is claimed that etching takes longer to do and requires great care to ensure the lines being spaced regularly apart, without which the appearance is not good. There seems justice in this contention, and such marking for showing concrete is advised.

Reinforcement shown in section should always be blacked in. It is better to do this even on the largest drawings, because the drawings are made much clearer thereby, and too much emphasis cannot be given

to the reinforcements, as the drawings are especially intended to indicate them.

Shading of bars should not be employed on anything less than half full-size drawings.

Stops to Ends of Lines—In showing reinforcement on plans and elevations to $\frac{1}{2}$ -in. scale it is necessary to employ some form of stop to the ends of each line to show where the ends of a bar terminate. As the ends of bars are manipulated in various ways, it is advisable to employ some form of shorthand to indicate the various kinds of ends, and the committee show methods of representing ordinary cut, fishtail, turned-over, and hooked ends, cranking, and wired junctions.

It is suggested that some standard list of abbreviations would not only save much time in draughtsmanship, but would be clearer in every way to every one consulting the drawings, and such a list is put forward. Suggestions as to lettering and coloring are also detailed in the report, which will no doubt be published by the Institute.

Ozonized Air in Underground Railways

Ozonized air will be used in one of the London underground railroads shortly, according to an announcement recently made by Mr. H. F. Parshall. It is proposed to filter the air at each station and then pass a portion of it over ozonizers. This air will then be mixed with the air in the station and part of it forced into the tunnel. The adoption of this system of making conditions in the stations less offensive is really not surprising. The rapid introduction of ozonizing apparatus in buildings where the air has hitherto been foul is one of the noticeable features of the extension of electrical improvements into everyday life. In a number of old buildings in New York, for instance, particularly those used by financial houses, the lack of ventilation has been a serious drawback to effective work by the office staff. The subject has been studied by ventilating engineers from time to time, but usually in such places the difficulty of installing ventilating ducts has been so great that little or nothing has been done. Ozonizing machines seem to solve the problem. Just what is the action upon the air of these appliances has yet to be definitely settled, but the fact remains that where they have been introduced they have been a great help in making working conditions more pleasant. Their use in subways, where the air is generally quite offensive, particularly during rush hours, is a much larger problem, however, for the large volumes of air to be treated in this way and the changing of the air by both artificial and natural methods of ventilation introduce conditions which do not exist in the offices and auditoriums where ozonization has heretofore been introduced. Accordingly, the results of the experiments on the Central London Tube should furnish decidedly useful information.—Engineering Record.

A blow-out occurred in driving a compressed-air tunnel under Chelsea Creek, Boston, Mass., to carry one of the pipe lines for the distribution system of the Metropolitan Water Board. The tunnel line crossed a spot where a number of timber piles had been driven and withdrawn. The holes left when the piles were removed filled in with soft material, and when the subaqueous work crossed one of these holes the air blew out through the soft mud and water rose in the tunnel to the height of a man's chest.

Safety Factor of Wire Rope in Hoisting

Tensile and Transverse Stresses—Effect of Undue Bending—The Safety of Material Loaded Beyond Elastic Limit

By William Hewitt, M. E.

In the application of wire rope to the transmission of power, and for purposes of hoisting or haulage where it has to run about sheaves, it is subjected to two stresses, tensile stress due to the load, and transverse stress due to bending. In an article on "The Internal Stresses in a Wire Rope," by Walter C. Kretz, it is stated that the bending stress does not affect the ability of the rope to carry external loads; in other words, that the factor of safety of a given rope lifting a given weight is identically the same whether that rope be bent over a sheave or not, and that this has been proved by tests time and again. The explanation given is that a tension on one side of the neutral axis due to flexure means a compression on the other side, and that the sum of these stresses is nil. On the other hand, it is further stated that while bending does not affect the strength, it does affect the life of the rope by reason of the continual stressing of the outermost fibres of the wires which causes the material to deteriorate rapidly.

What is the factor of safety of a wire rope? Are we to infer that because certain tests may have shown no impairment in the tensile strength of wire ropes subjected to bending that its factor of safety is independent of the conditions governing its life? Can we say that a wire rope in use on a mine shaft, for instance, is just as safe running over a sheave half the diameter of the one that it actually does run over? When a wire is bent free of contact, the neutral plane of flexure is undoubtedly coincident with its axis, but is this true with a wire bearing against other wires as it does in a wire rope, or against the rim of a sheave?

We know that a wire rope subjected to undue bending after a time shows the effect of this in the fracturing of the wires. That this result is due to the overstraining of the wires in bending is confirmed not only by the observations of wire ropes in actual use, but by experiments made to determine the effect of bending about sheaves of various diameters on the life of wire ropes running under tension. The fractures may occur without flattening of the wires from abrasion, and are generally flush and breaks at the crown faces of the strands; that is, the points are not tapered with cupped ends like those of wires broken under direct tensile strain. Occasionally, but rarely, such fractures will occur, especially with wire ropes of the plow-steel grade, where the wires of one strand cross those of an adjoining strand. It has not been observed that breaks of this nature have been accompanied by any marked indentation of the wires, and it is probable that they are caused by some molecular disturbance produced by the friction of one wire against the other. It is difficult to account for this phenomenon in any other way. It is rarely that a core wire breaks unaccompanied by breaks in the outer wires, notwithstanding the fact that a theoretical demonstration of the stresses sustained by the individual wires shows that the proportion of load borne by the central core wires is somewhat greater

than that by any of the surrounding wires. Such breaks have been observed, however, and can be readily detected by the drawing-in of the surrounding wires. It is rarely also that fractures occur in the outer wires of the strands in the interior of the rope or where these wires bear against the hemp cord.

Sufficient consideration is not generally accorded to the effect of bending upon wire ropes, and it is too often the case that sheaves are used of too small diameter for satisfactory results. The strength of the sheave itself is frequently the chief consideration, its diameter apparently being of little or no moment. The rope soon goes to pieces, and it is either condemned as "rotten" or the natural inference is that it is too small, and a rope of larger diameter is tried, which goes to pieces even more quickly. Had a smaller rope been substituted instead, better results might have been obtained, as has been demonstrated on several occasions where such substitutions have been made. This is explained by the fact that the difference in the maximum safe stresses in such cases was considerably more than compensated for by the greater difference in the bending stresses.

Safety of Material Loaded Beyond Elastic Limit

When a body is placed under stress action deformations occur in the fibres or molecular structure of the material which are proportional to the amount of the external load up to a certain point known as the limit of elasticity. Within this limit no change takes place in the molecular structure, and upon relieving the body of stress the molecules assume their original arrangement. Now, if the load is increased beyond that corresponding with the limit of elasticity, the deformations in the molecular arrangement increase at a faster rate, and upon release of a load do not at once assume their original arrangement, and are said to take a set which may be a permanent or temporary one, according to the nature of the material. If the load is still further increased, a point is reached where the molecules begin to separate, or, in other words, lose their power of coherence. This is known as the yield point. With some materials rupture may take place immediately upon reaching this point. With iron and steel, however, the ultimate stress is somewhat greater. Beyond the yield point there can be no restoration of the original molecular arrangement, and it makes little or no difference whether part or all of the fibres or molecules are subjected to such a stress; as far as the general effect is concerned, the material has been permanently weakened and should be considered unsafe for use. How far the factor of safety of a wire rope running about sheaves may be independent of the bending will depend upon the conditions under which the bending takes place.

The question is, can any material be regarded as safe that is loaded beyond its elastic limit, but within the yield point? The answer to this should take into account not only the molecular condition of the

material, but also its fluidity. That a certain movement of the molecules one about the other takes place with deformations, in the molecular arrangement is an accepted theory, and although the laws governing the molecular flow of solids may not as yet be thoroughly understood, we have reason to believe that certain disturbances affecting this flow have a detrious effect on the material, and that the mobility of the flow may be affected not only by temperature, but in other ways from the manner in which the deformations under stress are produced.

In fact, the distinction between a solid, liquid, and gas, as far as the molecular flow is concerned, is only one of degree. Water, as we know, under the effect of temperature, assumes all three conditions. In a gas the molecules are so sensitive to external forces that they are mobile in the highest degree, and we can feel the movement although we may not see it. In liquids the movement can be seen in the wave motion, which may be active or sluggish, according to its viscosity.

A material that has been strained or loaded beyond its elastic limit, although a permanent set may have taken place, is not necessarily injured if the load is so applied that the molecules have time to assemble themselves into positions corresponding with the new shape, so that their coherence remains intact, and tests made under such circumstances would develop no impairment in the strength of the material. But if the loads are so applied that the molecules have not time to accommodate themselves to the changes of form, the material may be injured and become unfit for use. It is well known that iron and steel bars subjected to rapidly recurrent stresses, even though these may not be applied suddenly, will eventually break with loads considerably less than the ultimate static stress.

The theory of molecular flow above enunciated would account for this phenomenon, and may also account for the fact that mild steel or even iron has been found to give better service in the case of recurrent loading or intermittent stresses, than a higher grade of steel, the tensile strength of which is considerably greater.

The maximum safe stress of a wire rope may be considered as two-thirds of the elastic limit of the wires, which for iron or steel is about two-thirds of the ultimate stress, or, in other words, the maximum safe stress may be considered as four-ninths of the ultimate stress; a good rule under ordinary conditions is to take it at two-fifths. In any case the effect of bending should be taken into consideration in estimating the total stress. Whether this should be added to the load stress, wholly, on part, or not at all, will depend on the circumstances of the case. With iron, owing to its ability to recover from strain more quickly than steel, the maximum safe stress may be taken at a higher ratio, and it will not be amiss in most cases to consider this as three-fourths of the elastic limit of the wires, as Mr. Kretz states, or one-half of the ultimate stress.

We conclude from the foregoing that while the safety factor of a wire rope in most cases may be considered as an empirical ratio between the load and ultimate stresses, it really has no definite limitations and may vary according to the conditions under which the stresses are applied. The maximum safe stress for a wire rope on a mine shaft, for instance, where an accident might result in serious consequences, can hardly be as great as on a haulage line

or derrick where the damage is not likely to be serious.

Furthermore, while bending under certain conditions may not affect the ability of a wire rope to sustain external loads, it is surely incorrect to infer from this that the safety factor of a wire rope is entirely independent of the conditions that govern its life.

Bituminous Concrete Pavements

We are in receipt of an interesting paper read by Mr. H. G. Lykken, city engineer and building inspector of Grand Forks, N. Dak., at the recent annual convention of the American Society of Municipal Improvements. The object of Mr. Lykken's paper, as defined by its author, was not so much to advance anything new on the subject as to correlate the many theories and varied practices in existence. Mr. Lykken commenced by defining bituminous concrete pavement as a pavement composed of a compressed composition of crushed rock, sand and mineral dust aggregate with a binder of either coal tar pitch or asphalt cement, mechanically mixed before being spread on the roadway. In passing, the author gave it as his opinion that all composition pavements should have a Portland cement concrete or vitrified brick gutter of generous width. On slow grades, especially, it was a difficult matter to get a true gradient with a material that had to be compressed in place. If the gutters were built with Portland cement concrete or brick laid true to line and grade, as they easily can be, a much better job could be had of the composition surface. The chief advantage, however, lay in the added life of the pavement.

Mr. Lykken maintained that there was a natural transition from cement-mortar to concrete by the addition of broken stone, and that in much the same way sand-asphalt paving surfaces had been naturally transformed into bituminous concrete by the addition of stone. He remarked that no one thought of patenting the graded mixture of the concrete, and left his hearers to infer that there was no more reason for taking out a patent on the grading of the aggregate in bituminous concrete. He stated that "the evolution of the coarser mixture from the finer was analogous and inevitable in either case." Having set forth his views on this part of his subject, the author discussed various practical phases of bituminous concrete, including the choice of the bituminous material which, in his opinion, should be carefully selected asphalt. In short, a bituminous pavement, from Mr. Lykken's viewpoint, would be composed of an asphalt-mortar with crushed stone added, the size of the stone to be approximately one-third of the depth of the pavement layer.

In a lengthy written discussion of Mr. Lykken's paper Mr. Warren contended that there should be a clear-cut distinction between mortar and concrete. He maintained no such analogy exists between hydraulic cement-concrete and bituminous cement-concrete as had been claimed by Mr. Lykken, and he also maintained, as one would naturally expect from the representative of a proprietary process, that the addition of stone to bituminous mortar, instead of being merely an obvious step in the evolution of pavements, was a highly useful and meritorious patentable invention. He also urged that the grading of the stone in bituminous concrete has an altogether different function from similar grading in Portland cement concrete.

The Construction of Good Earth Roads

Economy in Location—Elimination of Unnecessary Rise and Fall—Efficient Drainage one of the First Considerations

By Robert G. Thomas, C.E.

In regard to good roads, as to most good things, there are obviously degrees of excellence. While the best may be beyond our means of attainment, surely it is the part of wisdom to improve conditions where practicable, to get better roads, where the cost of the best is prohibitive.

The claim is not made that under all conditions the earth road is as good as any other type of road. It is held that with proper construction and maintenance the earth road is a good road, and it may serve a community well until the increase of traffic makes a more unyielding surface imperatively necessary.

It is to be remembered that when the time comes to build a macadam or other pavement, it will have to be built upon an earth bed, so much of the work of making an earth road may be utilized in the future, when it becomes necessary and practicable to have a paved surface on the road.

The condition of the common roads is so bad at times that it is desirable that every interested citizen should know something about the location, construction, drainage and maintenance of earth roads; and under the term earth roads, are included those with an admixture of sand and clay.

Every thing connected with the construction, use and maintenance of roads was, in times past, before the introduction of railways, the subject of exact observations, and experiments, many and varied in character. On this account old engineering works that treat of road making are excellent reading to-day. This is true not only of the construction but of the need of better legislation. It is held that many of the evils due to bad common roads that we suffer from at the present time are inherited from the antiquated legislation of the past.

Now that we have the results of a great number of years of experience in older countries, it seems that there is little to invent but much to learn in this branch of construction. Yet there have been improvements in road making, and especially in road making machinery and tools, notably the stone crusher and the steam roller.

It must be acknowledged that conditions in this country are in many respects different from those that obtain in the older and more thickly settled countries of the old world. Nevertheless the fundamental principles of good road construction are the same everywhere, and once they are understood can hardly be forgotten.

The Aim in Location

The most economical location of a road is that for which the sum of the cost of transportation, the cost of maintenance, and the interest on the cost of construction, is a minimum.

The cost of transportation is affected by the rate of grade, the rise and fall, and the length. The rate of grade is important, because it limits the load that can be hauled or determines the number of loads and fixes a limit to the speed of travel. The rise and fall affects the expenditure of power required to haul a load over the road. The length of the road has an effect upon the amount of work of hauling, the time required for a trip, and the cost of maintenance.

The cost of construction depends upon the accuracy with

which the line of the road is fitted to the surface of the ground, as determining the amount of earthwork and cost of bridges and culverts; and upon the character of the ground over which the road is to be built, as that affects the cost of the work and the expense of drainage.

In location, the grade of the road is the most important factor. In the effort to make the road along the most direct line between two places, the grade is often made much steeper than is necessary. The fact is overlooked that the distance halfway around a hill or valley may be little, if any, longer than the distance over the hill or through the valley.

The aim in location should be to make the road the easiest and most economical, and the shortening of the route should be subordinated to these considerations. The difference in length between a straight road and one that is slightly curved is less than many suppose. It has been shown that if a road between two points 10 miles apart were made to curve so that the eye could see no more than a quarter of a mile of it at once, its length would exceed that of a perfectly straight road between the same points by only 150 yards. The value of straightness for a country road is frequently very much overrated. Considerable deviations from the straight line may often be made with but slight increase in length. While straight roads are the best for traffic, other things being equal, in hilly country straightness should be sacrificed to lower the grade, and for pleasure the curved road gives a greater variety of scenery. Many roads have been made on such steep grades that the cost of cutting and filling to bring them to a proper grade would be greater than to relocate the roads and make them anew.

The Rise and Fall

Distinct from and independent of the rate of grade is the amount of rise and fall, or the vertical height through which a load must be lifted in passing in each direction over the road. The minimum amount of rise and fall is found where the rise is all in one direction and the fall in the other, each being equal to the difference of elevation of the terminal points. Any increase in the rise and fall beyond this amount is represented by the rise encountered in passing from the higher to the lower terminus. It affects the traffic equally in each direction and requires a certain expenditure of power to lift the load through the given rise in each direction.

The rise and fall may be evaluated in terms of distance. Thus on an ordinary earth road on which the resistance to traction where level is 100 lbs. per ton, the distance a ton may be moved on the level surface in developing 2,000 foot-pounds of work is $2,000 \div 100 = 20$ feet. As the work of lifting one ton through a rise of 1 foot is 2,000 foot-pounds, 1 foot of rise or fall may be considered as equivalent to 20 feet of level distance. So far as the expenditure of power is concerned, the elimination of unnecessary rise and fall is thus equivalent to shortening distance. Of course when the termini of the road are at different elevations there is a certain amount of rise and fall that must necessarily be encountered.

The proper grade for any particular road must be determined by the conditions and requirements existing on

that road. The ideal is the level road with no rise or fall, but as the level road can seldom be obtained in rolling country, it is well to consider the greatest allowable grades for country roads.

It has been found that for a short time a horse can double his usual exertion, and that he can draw only about one-half as much on a 4 per cent. grade as he can on the level. If full loads were to be hauled, this would make a 4 per cent. grade the maximum. One authority states, from his own observation and from tests made by the United States Department of Agriculture, that a team can exert four times as much tractive energy going up a short hill as its average pull upon the level. As the load that can be hauled continuously up a ten per cent. grade has been found to be one-fourth of that drawn upon the level, this shows that the full load might be carried over a ten per cent. grade for a short distance—say 200 feet. Most road builders prefer 3 per cent. grades to those of 4 per cent. where they can be secured without additional expense. A 3 per cent. grade is one down which a horse with vehicle can comfortably trot.

On all public highways which are travelled by heavily loaded vehicles, the aim should be to keep the grade down to 3 or 4 per cent. and not to exceed 5 per cent. In mountainous regions steeper grades are often unavoidable, and even in ordinary hilly country it is good engineering not to reduce grades where much earthwork is necessary, as it is generally a few short deep cuts that add so greatly to the cost of the road.

In most parts of the state the roads are in the main already located and the problem of location consists, for the most part, of the relocation of portions of old roads, so as to reduce the grades and render the roads more convenient and pleasant for travel. When the road must be constructed of the material over which it passes, it is often possible to select a route where the soil is better adapted to the purpose than that found where first located. Upon one side of a valley the surface may be clay, upon the opposite side gravel, and in the bottom of the valley the soil is usually alluvial. Higher up the ground is generally far more fit for road purposes.

Pointers on Design, and Errors to Avoid

In starting the construction of any road the width and shape of the cross section have necessarily to be determined. The practice is too common of designing a uniform cross section for a road, regardless of the character of the soil and the drainage area that the ditches must serve. A uniform cross section for all parts of the road should not be adopted. The depth of the ditches should be made to vary with the character of the soil—very shallow in sand and on steep grades, and deep in flat soggy land, but ordinarily not much more than a foot below the general ground level. The width depends upon the requirements of the case. Sometimes 12 feet is sufficient, but 18, 24 and 40 feet are the usual widths for country roads.

The surface should be formed with a crown at the middle sufficient to shed the water that falls upon it and prevent it from standing upon the road. The slope necessary to shed the water readily is about 1 in 20, a fall of 5 per cent. each side, from the middle. The most desirable section is usually that composed of two planes of equal inclination rounded off in the middle.

Such a surface can be constructed and repaired with a road machine, and a roller can be used upon it to advantage. Deep, narrow bottomed ditches at the sides are to be avoided. Wide, shallow ditches are best, generally, and they are favorable to the use of the drag and wheel scrapers, the wheel scraper being regarded by one authority as the greatest labor-saving device for moving earth

ever invented. Sometimes the only ditches necessary to carry off the surface water are those made with the road machine. The side ditches should have a fall of at least half a foot in every 100 feet; in fact the road itself would be better to have that slope longitudinally than to be level, so as to secure drainage of any incipient ruts that may form in the surface.

As noted before, the problem is generally the improvement of existing roads, and enough progress in this direction has been made in recent years to show how much improvement can be effected. The improvement in the surface of the earth road has been most marked. The method of improvement of the surface depends upon the nature of the material of which it may be composed. When the material is loose sand, the surface will be more firm if the sand be damp, and more unstable in dry weather. In such cases a small admixture of clay in the surface layer may give cohesion to the surface when dry, or a layer of clay six or eight inches deep may form a hard and comparatively durable surface, as it is easily drained when upon a sand road bed. Clay used alone is the least desirable of all road materials, but roads composed of clay may be treated with sand or small gravel, from which quite a hard and compact mass is formed, which is nearly impervious to water and but little acted on by it. Material of this character found in the natural state, known as "hard pan" or "cement gravel," makes a very solid and durable road when properly applied.

In soil composed of a mixture of sand, gravel and clay, all that is necessary to make a good road is to crown the surface, keep the ruts and holes filled and the ditches open and free.

Proper Drainage an Important Factor

Drainage is especially important upon earth roads, as the material of the surface is more susceptible to the action of water and more easily destroyed by it than are the materials in the better class of roads. It has been said that the whole problem of the improvement and maintenance of ordinary country roads is one of drainage. Drainage, more drainage, better drainage, should be the cry.

Surface drainage is mainly affected by making the surface of the road slope from the middle to the side ditches. When the road is on a steep grade the inclination of the slope to the sides should be greater than when on a level, so as to prevent the water from following the wheel tracks.

The side ditches can be prevented from being washed into deep gullies by paving the bottom and sides with brick or field stones. When water has to be carried under the road, sewer pipe or culverts of concrete, stone, or brick will be in the long run more economical than those of wood. In very wet ground sometimes underdrainage must be resorted to in order to get a dry roadbed.

The maintenance in good condition of a country road requires constant care and watchfulness. Any small breaks in the surface should be immediately repaired, and ruts filled and smoothed before they become serious. Earth roads are especially difficult and expensive to maintain under the common system of repairing once or twice a year or at long intervals. The only way to keep an earth road in good condition is by the employment of men whose business it shall be to watch the road continually and make such small repairs as may be necessary from time to time. Ruts and holes should not be filled with stones unless a considerable section is to be so treated. They should be tamped full of some good material like that of which the road is constructed. When work is needed over a considerable area, earth roads can be rapidly repaired by the use of road machines and road rollers. In case the roadway is sufficiently high, the work should begin in the middle of the road and the loose dirt should be gradually pushed to

the ditches and finally shoved off the roadway or placed where it will not be washed back into the ditches by rain. The advantage of this method is that there is secured at once a smooth, firm surface; a surface which will stand wear much longer than one composed of loose worn out material thrown up from the ditches. When, however, the crown is worn down and the roadway low, it is desirable to work from the sides, scraping the material lightly toward the middle until the proper crown is obtained, and then compacting the surface by the roller.

It is claimed that two good men with two teams can build or repair more road in one day with a roller and road machine than many times that number can with picks, shovels, scoops, and plows, and do it more uniformly and more thoroughly.

As soon as possible after long continued rains, the roads should be gone over with the scraper and put in proper form, and then rolled down hard. While earth roads should generally be repaired in the spring and fall of the year, if they receive daily attention, they will require no

extensive repairs. The old adage, "a stitch in time saves nine," finds application here.

A system of common road maintenance, introduced in Vermont, has been so successful in operation that "much better roads are secured at less expense, and the tax rate for highways has been reduced each year." This system is like that applied to railway maintenance—the roads are divided into certain lengths and each length allotted to a section man, caretaker or farmer. It is suggested that our important country roads could be divided into sections varying in length from one to five miles, and a good road man who lives on the section put in charge. It should be his duty to devote a few hours each week to the filling of small ruts or holes and to the protecting of the road from running water. He would have plenty of work to do in keeping the road clean, free from loose stones and rubbish, in cutting weeds and clearing drains and side ditches. The efficiency and economy of this plan of road maintenance have made the roads of France and other European countries deservedly famous.

Care of Vitrified Brick Street Pavements

Provision for Expansion and Contraction—Selection and Preparation of Filler—Uniformity in Strength and Perfect Drainage

By W. P. Blair, Secretary National Paving Brick Manufacturers' Association.

The extent of injury done to brick street pavements from contraction and expansion has been greatly magnified on the one hand, and the difficulties in preventing any injury at all has been enlarged upon to an exasperating degree. This has not been done by the friends of brick pavement; neither has it been done by engineers who are real students of street construction. It has been done by commercial interests, seeking to introduce and sell fillers for brick pavements absolutely worthless for the purpose. An advertising campaign full of misrepresentation and deceit has mislead the public and in fact many engineers into the use of fillers utterly without warrant. It becomes necessary, therefore, to look at the matter from an economic and, so far as is possible, from a purely scientific standpoint.

We freely grant that there are behaviours in structural materials, particularly cement, brick and iron, that are not fully and completely understood, in spite of the research work that has been done by various investigators. But that is no argument at all against the use, within the range of what we know and even beyond that which we know, even if we should encounter hazardous and strange phenomena. In fact, if we are to await a perfect knowledge and information concerning all utilitarian matters but little progress would be made and we would be without the enjoyment of many useful and pleasurable things in life. I therefore wish to say that a properly constructed brick street pavement using a filler composed of one part sand and one part cement meets most perfectly the ideal pavement, regardless of what happens it, even if unprotected, from expansion and contraction due either to low temperature or high temperature.

Observations in Cleveland

The city of Cleveland has afforded a field of study during the past season much beyond that of any locality in the country. The season has been very changeable in temperature. Sometimes a variation of more than 40 degrees has occurred within a period of one week, but in the ex-

perience of many years preceding, the temperature has not been subject to such great variations. While it is entirely fair to say that seventy-five per cent. of the streets of Cleveland are properly cement filled provision for expansion and contraction has not been considered of very great importance, and to a very large extent neglected. Even with the streets built under contracts calling for expansion cushions, very few streets are found where the provision exists. In spite, however, of the almost entire lack of provision for expansion and contraction, out of more than 2700 street intersections but 27 ruptures occurred. Twelve of these were examined personally by the writer, and in every case no provision for expansion relief whatever was found. Of the remaining I was assured by Mr. Abbott, the engineer in charge of repairs in that city, the same lack was in evidence. Throughout the city quite a few cracks occurred away from intersections, but these are not really serious to the utility of the pavement because it very seldom occurs that rutting follows; at the worst, no greater injury follows than that which occurs to each individual brick where soft fillers are used. In no case, however, have they occurred where expansion cushions have been provided.

There occurred a rupture at the intersection of Decker avenue and East 80th street, neither of which have any provision at all for expansion relief along the curb or transversely. The expansion force necessarily found relief at the intersection. You ask, why at the intersection. Simply because it was the only place that the concentration of the forces found in the four streets could concentrate. The force of expansion concentrated at the intersection square, in comparison with that directed against any other portion was the greater and so the resistance was weak and could but yield to the strain. Any other part of either street could be approached by the force of expansion concentrating from but two directions, but in the intersection the force was fourfold. The compressive resistance was no more than in a single street, so that a rupture followed. Observing gentlemen in the neighborhood informed me that it raised five feet at the intersection. A nine year old boy

with mental equipment for accuracy informed me that the men did not know what they were talking about, but that he did as he measured it with a rule and the highest portion of the rupture stood just three feet and one-half above the sand cushion. It could easily be discerned that there was a slight movement in these four streets at a distance away from the intersection of more than 100 feet. Evidences were apparent that along with this movement had been an outward force pushing against the curb, increasing as it approached the place of rupture.

Fifty-six hours after the rupture a change of more than 40 degrees in temperature had taken place. The contraction that followed drew the pavements away from the curb. Nearby the intersection and next to the curbs on either side, the contraction showed itself to be a full inch, photograph of which is shown you, together with other photographs showing the crushing strength of the expansive forces. See Nos. 1, 2, 3, and 4.

Another rupture, of which, I was unable to secure photographs, but one where I had an opportunity to observe while the expansive force was in operation. Evidences were easily noted 200 feet back from the intersection in which were placed four manholes. The portion of the street approaching this intersection from the opposite direction had the advantage of a much more perfectly constructed pavement. It was built by a different contractor and under different specifications. The cement filler was in the joints, filling them completely from top to bottom. The mixture was uniform and the expansion cushion fairly adequate. This portion of the street, although subjected to the heat of the sun equal to the other portion, with the assistance of the four manholes stood apparently immovable. It had no transverse expansion cushion, but relief from expansion was sufficient at the curb; at least with what was held in compression the brick retained perfect contact with the sand bed.

The street opposite, approaching the intersection in which the expansion movement was particularly noticed, was not so well constructed. The cement in the interstices was irregular; the sand cushion had not been properly compressed, so that there was an uneven flow of the sand in the interstices from the original rolling of the brick; there was no compressive relief apparent in the street at all. As the intersection was approached, it was observed that the outward force of the street was much more severe near the rupture than 100 feet away from it, but the snattering and the crushing was all confined within that portion of the street improperly constructed. No part of that portion of the street properly constructed was harmed at all.

An "Experiment" with Weak Cement Filler

It so happened that prior to the construction of the Indianapolis Motor Speedway a temporary brick surface was put down about 16 feet in width and 200 feet long, for the purpose of merely testing a brick surface as to its adaptability as a race course, before it was finally decided to brick the entire track. This particular portion was poorly constructed, particularly in the application of the cement filler; the interstices were neither filled completely to the bottom, nor were they full and flush with the surface. And, though we warned of disaster to come and urged that it be eliminated, for the sake of economy it afterwards became a part of the track as finished. But little of this entire track was finished with the expansion cushion—simply a case of putting off until a more convenient season. Along this temporary portion no expansion provision had been made. On account of weakness of the cement filler, it was unable to sustain a uniform compressive strength with the rest of the pavement. A bulge occurred at this weak side. The superintendent of the speedway at once concluded that

he ought to relieve the strain by taking out two courses of brick across the entire pavement. Proceeding from the point of rupture in the better constructed portion of the pavement, he soon discovered that as he weakened the pavement there was a slight movement or creeping of the entire pavement. He then went to the opposite side of the track and began to take out two courses of brick at that side of the pavement, but there was a time when the equilibrium was past and the resisting force at the centre of the pavement was too weak to withstand the expansion pressure and the force found relief in a sudden crush, frightening the workmen so much that one declined to have anything more to do with it.

Two things were shown clearly to have occurred: The weak portion received the greatest rupture from the crashing force. The pavement sheared in the center and crept on the sand cushion the full width of the brick more than the other portion. The other portion of the pavement, being uniform throughout in strength, did not show a rupture, but simply closed up the crevices, from which had been extracted two courses, and stopped. It is clearly obvious that the expansive force of this portion of the pavement had found relief in compression. Yet in this stretching out process no crack occurred, so tough and strong was the pavement in its monolithic structure.

It had been decided by the owners of the speedway to change an overhead bridge to a subway passage. This change, in the interest of economy, necessitated taking up a strip of pavement the full width of the track. The superintendent, on account of his experience as described was a little at a loss to know how to proceed. The writer advised that, as he took out his first line across the track, he insert wooden blocks in a way to be drawn simultaneously and to do the work in the night time taking advantage of the lowest possible temperature. This course was pursued, an opening made which was followed by extreme high temperature. The closure followed from either direction nearly the entire width of the brick and then the pavement, by contraction, receded one-half the width of its advance and again no crack occurred in this action of contraction and expansion.

From this observation and experience gained, we are confirmed in several matters, sustaining our No. 1 directions. First, demonstrating conclusively the force at work, destructive of the courses of brick that are found on either side of every transverse expansion provision. It is simply a jamming together,—a movement of the entire street in opposite direction toward a weak portion; many examples of this character can easily be seen in this city of Grand Rapids. It confirms us in the view that no transverse cushion should be provided. Second, it fully supports our contention and insistence for a uniform mixture of sand and cement. It is easily discerned that much of the expansive force can and is taken up in compression. If the character of the pavement is uniform in strength, much relief in compression is afforded and can be depended upon. Third, in every operation of compression from two opposite directions, a certain portion of relief at least is diverted to another direction. You may say that this last statement is not exactly borne out by the observations and experiences cited. But suppose it is not entirely proven and you do not provide for a full and complete relief of all of the expansive forces in the other two directions by a cushion along the curb, then you have at least relieved the pavement of one-half its expansion force, and it together with what relief is found in compression, the pavement is relieved or held intact to such an extent that the pavement is scarcely subject to any injury whatever from expanding and contracting forces.

To further assure us that no bad results will follow if

proper provision for expansion is made along the curb, it is necessary to heed the importance of having the cement filler uniform in strength, so we insist that the sand cushion be compressed in order that there shall be no flow of sand into the joints, which should be occupied in full by the cement filler, thus affording a uniform strength throughout the monolithic structure, lessening the chances for rupture, for, just to the extent that the filler lacks in strength and uniformity will a crack, rupture or destruction of the pavement follow.

To what extent cracks appear in pavements, or if at all, due to the variations that follow a wet and dry condition, we are unable to say. That a certain minimum amount of contraction and expansion parallels the condition, no one can doubt but it is believed that the strength of a monolithic structure is such that a crack occurring from such cause rarely takes place. There is no question but that cracks frequently occur due to the expansion caused by frost, or more particularly resulting from the expansive force of the frozen ground underneath the pavement—dry earth is in no way affected by low temperature. The action which is disastrous to all pavements alike, and all kinds of roadways in fact, which results from low temperature only happens under the combined influence of moisture. The remedy, therefore, is found in perfect drainage.

We have, then, but two elements with which to deal in preventing cracks and ruptures in cement filled brick pavements. First, simply a provision along the curb for an expansion cushion, which is an easy matter and only requires very simple implements to make effective the necessary provision. The trouble generally has been either a determination not to make proper provision or undertaking to do it without any implements at all, merely substituting some one makeshift or another for the purpose.

Perfect Drainage Always

As to the cracks due to low temperature, it is simply a question of drainage. The manner and method of proper drainage is controlled entirely by the character of the soil and grades. Most soils are easily drained by tiles along either side, either within or without the curb, surplus water being taken out through "T" outlets at intervals of short distances. Long drains underneath the road bed are obviously objectionable for many reasons, though they are sometimes resorted to. A better method of drainage where the soil is such that by capillary attraction the moisture climbs to the highest point, is by alternate side drains heading slightly beyond the center line.

Drainage in some cases is greatly assisted by placing upon the sub-grade two or three inches of broken stone or gravel upon which the concrete base is to be laid; this not only assists actual drainage but relief from low temperature expansion is found in the voids.

As to the economy of cement filled streets, why anyone would advocate the use of any other kind of filler than that made from a mixture of sand and cement is utterly unreconcilable with good judgment. The only other kind that is at all permissible is simply clean, sharp sand. By using a cement filler where perfect drainage is possible, even an artificial foundation of any kind is not important. The whole matter of economic value in favor of the cement filler is readily appreciated when we consider that in the pavement made up of units which are bound together into an unyielding monolithic structure—the pavement acting as a bearing plate—as against one of a type of pavement where each unit received the whole load, the punishment transmitted is in its result as the size of the unit is to the monolith. None other can approach the sanitary condition anywhere near that of the cement filled pavement and no pavement in the world approaches its ease of traction.

Trade News from Montreal

Office of the Contract Record,
Montreal, November 6, 1911.

The Building Inspector of the city of Maisonneuve, Mr. C. A. Reeves, during the month of October issued 29 building permits, representing an estimated expenditure of \$49,500.

Messrs. Laurin & Leitch, 5 Beaver Hall Square, Montreal, expect to finish the contract of placing the 72-inch intake pipe for the Montreal Water Works system about December 1st. This pipe is of lock-bar steel and will be about 3,000 feet long.

Mr. Herbert Ames, M.P., has promised to address the members of the Montreal Builders' Exchange at their fortnightly "Noonday Talk" on Wednesday, November 8th. Mr. Ames will speak on labor conditions in the Antipodes, with special reference to the working of labor boards and compulsory arbitration.

There is a possibility that the negotiations for the purchase of St. James Methodist Church, Montreal, may fall through owing to the conditions attached to the offer of \$2,000,000. It was at first supposed that the property was intended as a site for the new Canadian Northern terminals, but it is now stated that the railway company has another site in view on Dorchester street.

After five weeks' illness, Mr. Alexander MacDougall, Montreal, has died at the age of 86. Mr. MacDougall was a Scotchman and came to Montreal in 1848. He was employed in the engineering department of the Grand Trunk Railway, but afterwards became connected with the construction and operation of the Montreal Grain Elevating Company, of which he eventually was the managing director.

Messrs. Laurin & Leitch expect to commence work this fall on the new 1,300 foot reinforced concrete bridge over the Richelieu river at St. Johns, Que. A bascule bridge will span the canal. Tenders for it will be called during the winter by the general contractors who will have plans and specifications at their office, 5 Beaver Hall Square, Montreal. The entire cost of the bridge is estimated at \$150,000.

The Carlton Company has decided to enlarge the plans of the hotel, the construction of which has been commenced by the George A. Fuller Company at the corner of Drummond and Sherbrooke streets, Montreal. The number of rooms is to be increased from 170 to 240; the building will be ten storeys high, and the exterior constructed of Indiana limestone. The name of the hotel is to be changed to the Carlton-Ritz.

During the month of October the building permits issued in Montreal totalled 395, the cost being estimated at \$1,659,955. For the corresponding month last year the permits were 284 and the estimated cost \$1,910,240. From the first of January until October 31st the permits issued were 3345 with a total expenditure of \$13,079,165.

A number of amendments to the by-laws governing the Montreal Fire Commissioners' Department are recommended by Mr. R. Latulippe, fire commissioner. He advises the board of control to authorize the fire commission to inquire into, not only the origin of fires but the causes of their spreading, and especially to examine gas conduits and electric wires. He wants the city to make it obligatory on every person whose property has been burned to report the fire within twenty-four hours, under penalty of a fine.

Before the Canadian Society of Civil Engineers, Montreal, on October 26th, Mr. A. W. Robinson (M. Can. Soc. C. E.) read a paper on the rectification of the River Nile. Mr. Robinson has made two visits to the upper Nile in

the capacity of consulting engineer on the dredging operations and designer of the dredges. The paper, illustrated by lantern slides, dealt exhaustively with irrigation methods, the Assouan dam, the barrages, dredging and embanking operations, and various other features of the great irrigation works in Egypt.

Sir John Jackson, M.P. for Devonport, England, and the head of one of the largest British contracting firms, has opened an office in Montreal. Mr. Albert Brooks, who is in charge, has been some time with Sir John Jackson, having been his agent in South Africa. Sir John has been on a visit to Montreal on his way home from Chili, where he is engaged in some extensive railway works for the Government. It is reported that Sir John is about to enter into negotiations with the Canadian Government in connection with the Georgian Bay Canal, but on being questioned on the subject he declined to make a statement.

In their Bulletin No. 1, the Ambursen Hydraulic Construction Company, engineer-constructors, of Montreal, Boston and New York, present some interesting statistics on the failure of dams. The subject is emphasized by the recent disaster at Austin, Pa. Previous authenticated failures during the period Jan. 1, 1890, to Oct. 15, 1911, total 81. Of these, 35 were solid concrete or masonry dams. Against this the Ambursen Company have constructed 66 dams without a single case of failure. The oldest of these structures has been standing eight years. In this bulletin the company make the significant offer to furnish Lloyds insurance on every dam they build.

A plant for the National Brick Manufacturing Company, Limited, is being constructed at Delson Junction, near Laprairie, P. Q., by P. Lyall & Sons, Limited, Montreal. The buildings, which are now about half finished, will cover an area of 40 acres, in addition to which there are 1,000 acres of land. The property contains practically unlimited quantities of clay and shale. The most modern plant is being installed by Messrs. Lyall. The total cost of the buildings and machinery will be about \$500,000. At first the annual output will be 30,000,000 of shale, plastic and common brick, but ultimately it will reach double that amount, with about 10 million face brick.

After working for about eighteen months, the Standard Quarries, Limited, of 30 St. James street, Montreal, has just been incorporated. The quarries are situated at St. Vincent de Paul, P.Q., and comprise about one hundred acres. They furnish crushed, dimension, rubble and lime stone. The president of the company is Mr. J. H. Morin, of Sudbury, Ont., and the secretary-treasurer, Mr. W. D. Vaughan. The company has just purchased from Mussels, Limited, a new crushing plant, including a $7\frac{1}{2}$ Austin gyratory; a 48-inch Symons disc crusher, and two jaw crushers, which, driven by electric power, have a capacity of 1,000 tons per day. The other plant comprises a steam derrick, steam drills, and compressed air drills. A spur from the main line of the C. P. R. runs on to the property.

Messrs. Laurin & Leitch, Beaver Hall Square, Montreal, are making good progress with the Strauss bascule bridge over the St. Charles river at Quebec and expect to have the contract completed about the first of next April. This bridge will be for street car, pedestrian, and vehicular traffic. It will be 240 feet long, about 30 feet wide, and will be supported by four piers and two approaches. There will be three spans. The spans next to the approaches will be 45 feet long and the central span 150 feet. Electric power and counter weight will lift the bascule over the centre span in one leaf. Messrs. Laurin & Leitch have the general contract and are doing the concrete work. The approaches consist of reinforced retaining walls filled with earth. The Canadian Foundry Company of Toronto have

the sub-contract for the steel work. The electrical contract has not yet been let, but will be shortly. The total cost of the undertaking will be about \$155,000.

Report on Hamilton Waterworks

The second portion of the report on the needs of the waterworks system in Hamilton, which has been prepared by City Engineer Macallum, and Mr. Willis Chipman, of Toronto, has been issued. The first section published last August, advised the building of a new intake and a complete high level pumping station and the installation of additional pumping capacity and mains and a storage reservoir, if possible. The report as given out now deals with a number of much-needed additions to the system. The following is a summary of the estimated cost of proposed improvements and extensions to the system now essential:—(a) Intake and crib, \$60,000; (b) high level station, \$67,000; (c) Beach station, \$70,000; (d) force mains, \$296,000; (e) Submains, \$42,000; (f) conduit, \$30,000. Total, \$565,000; less amount now authorized by by-law, \$35,000.

Amount required for present extensions and improvements, \$530,000.

Estimated cost of additional improvements and extensions:—(g) additional submains, \$73,000; (h) reservoir, \$120,000; (i) 2,000 meters, set, \$27,000; total, \$220,000.

Toronto Contractors and Local Unions

A delegation of various trade unions of Toronto waited recently upon the property committee of the Board of Education to lodge a complaint against alleged unlawful practices on the part of school contractors. Union men declare that a number of contractors persist in working their men more than the eight-hour union day and that in some cases union wages are not being paid. The Fred Armstrong Company's representative stated that his firm had workmen who were paying for homes and who were only too glad to work an extra hour overtime each day. Mr. W. Williamson, a contractor on the Frankland school, testified that his men had been required to work a considerable amount of overtime, for which they were paid time and a half. The representative of Keith & Fitzsimons knew of no case in the company's business where the union wage was not paid. Replying to a trustee who was desirous of settling the matter permanently, Mr. C. H. Bishop, superintendent of buildings, gave it as his opinion that the differences could best be adjusted if the Provincial Government or the City Council appointed a fair wage officer to supervise the work on all public buildings in the city. The property committee reserved further discussion.

Announcement is made that Mr. J. D. McArthur of Winnipeg, and several associates, have acquired a charter for a railway extension from Edmonton to Fort George, B. C. The proposed line will traverse the richest portion of the Peace River district, entering British Columbia via the Pine River Pass, north of the Yellowhead Pass, and opening up a vast region in the northern portion of British Columbia. It will be over one thousand miles long and will take the shape of two sides of a triangle whose apex will be at Pine River Pass, which has a low altitude. An exploratory survey party is now going over the route to secure data preliminary to undertaking the location work. It is expected that the line will be completed and in operation within four years as, it is understood, arrangements for financing the proposition have already been completed. This road, when completed, will connect with the Grand Trunk Pacific at Fort George, providing a link in a through route from Vancouver to the Peace River district.

A New Belt Conveyor for Transporting Building Material

Improvements in mechanical devices for handling all kinds of material are constantly being made. Where regular horizontal transportation is required, endless chain or belt conveyors are usually employed. The former possess disadvantages due to their great weight and also to their inability to discharge the material carried at any point of the track. The latter class of conveyor eliminates these disadvantages to a great extent, but the belts in use (balata, cloth or rubber) do not possess the wearing qualities indispensable to conveyors for handling rough materials.

The Sandviken Ironworks in Sweden have made an interesting departure by manufacturing thin, hard, flexible belts rolled from the highest quality of Swedish steel. These are made in lengths of 330 feet, varying in width from 8 to 16 inches with a thickness of 3 or 4 hundredths



Transporting Firewood on Sandviken Belts

of an inch which can readily be riveted together to give any required length.

These conveyor belts are endless and are set moving in suitable troughs by belt pulleys preferably electrically driven. They are particularly suited for transporting logs, coal, ore or cement, and as their initial cost and upkeep is small they are being extensively adopted in Sweden.

The Canadian Boving Company of Toronto, who have been responsible for the introduction of many Swedish specialties into Canada have put these belts on the market. They have recently received an order for an endless steel belt 850 feet long and 12 inches in width for a well known paper and pulp mill in Quebec.

According to a dispatch from the Federal Capital, Mr. Newton J. Ker, city engineer of Ottawa, has received from Pennsylvania two valued relics—the original musket used by Chief Joseph Brant, and a Masonic apron over a hundred years old. The musket is the one of the Chief of the Six Nation Indians carried in the battles of Queenston Heights, Lundy's Lane and others in which he fought as the ally of General Brock. There is no doubt as to its being the genuine original, as it has been in the Ker family for many years. City Engineer Ker has been trying for a long time to get it back to Canada, and on the recent death of the owner, a relative in Pennsylvania, was successful. The Masonic apron is Indian work on leather, the Masonic emblems being splendidly worked in colors. It was formerly the property of Captain Ker. They will probably be given to the institution at Niagara.

Construction News and Notes

Kingston, Ont., building permits total approximately half a million dollars to date.

The Llewellyn Iron Works of Seattle, have opened an office at 303 Pender street west, Vancouver.

The Toronto city council have decided to reorganize the Works department. A separate head will be obtained for the Waterworks department.

Fourteen tenders were received for the construction of the tube railway for the city of Toronto. The prices submitted range from \$2,600,000 (M. J. Haney & Company, Toronto) to nearly \$4,000,000.

Building permits issued at Montreal last month totalled \$1,659,955, against \$1,910,240 for October, 1910. The total for the year to date is \$13,079,165, compared with \$14,953,632 for the ten months of 1910.

The "ambitious city" of Hamilton, Ont., has eclipsed all previous building records. The total up to the end of October, 1911, was \$3,884,630, over a million and a half dollars greater than the figure for the corresponding period of 1910.

Announcement is made that an additional sum of \$1,250,000 will be required to complete the new General Hospital now under construction at Toronto. This will bring the total cost to \$3,500,000. This is a far cry from the original estimate of \$1,400,000.

One of the most noteworthy building increases in the country is at Calgary, Alta., where the permits issued from January to October this year totalled \$11,651,538, compared with \$4,644,690 for the corresponding period of 1910.

Three contracting concerns are stated to be in the field for the Québec harbor improvements, namely, the old local company, the St. Lawrence Dock Company (headed by Sir Robert Perks), and the English firm of Norton Griffiths & Company, with which ten local capitalists have associated themselves.

An address on city planning was given last week by Mr. N. Cauchon, C.E., before the Ottawa branch of the Canadian Society of Civil Engineers. The attendance numbered about 75 members and friends. Among those who spoke subsequently were Mr. C. P. Meredith; Mr. James White, of the Conservation Commission; Mr. Victor Brayley, Mr. S. J. Chapleau and Dr. P. H. Bryce.

The British Canadian Company, headed by Sir Henry Pellatt, and capitalized at \$10,000,000, has been organized to build a dry dock and repair plant at Sydney. Besides Sir Henry Pellatt, Lieutenant-Governor Gibson, Toronto, and A. C. Ross, of Sydney, are the Canadian directors. The British directors are John Brown & Company, and the Fairfields, of Glasgow, the latter being the largest firm building

warships in the world. The promoters are expected to proceed at once to complete financial arrangements for the commencement of the undertaking.

Messrs. Waddell & Harrington, civil engineers, of Kansas City, with offices in Vancouver, have been awarded the contract for designing and superintending the construction of ten steel bridges along the route between Cisco and Kamloops by the Canadian Northern Railway. The total cost of these bridges is estimated at \$1,100,000. There will be two crossings of the Fraser River, seven of the main Thompson River, and one of the North Thompson River. The Fraser will be bridged just above the C. P. R. bridge at Cisco, and also at a point a short distance below Lytton.

Toronto's permits for the ten months ending October 31st amount to \$20,306,697, an increase of more than two and a half millions over the corresponding period of last year, when the total was \$17,734,488. There is every evidence that the city will set up a great building record this year. The following figures show the value of the permits issued in each year since 1896:—1896, \$657,168; 1897, \$951,130; 1898, \$1,701,630; 1899, \$2,011,000; 1900, \$1,888,066; 1901, \$3,568,883; 1902, \$3,854,923; 1903, \$4,356,457; 1904, \$5,896,120; 1905, \$10,347,915; 1906, \$13,160,398; 1907, \$14,225,800; 1908, \$11,795,436; 1909, \$18,154,047; 1910, \$21,127,783.

The North British Building, Quebec, designed by Mr. J. P. Ouellet, architect, Quebec, for Mr. A. E. Scott, has just been completed and is a notable acquisition to the lower town. The structure is of firebrick, faced throughout at all openings with cut stone. The interior is spacious, lofty and well lighted. The floorings throughout are of hardwood excepting the ground floor, where Terrano has been used. The new Honeywell heating system is installed. The contractors for the building were: masonry, Arthur Frenette; woodwork, J. H. Gignac; plumbing, John Walker; electricity, Thomas D. Lonergan (sub-contractor); painting, Simard Bros.

"Prime White" Road Oil

Elsewhere in this issue will be found the full page announcement of the "Prime White" Road Oil Company, Cincinnati, Ohio, setting forth the various practical advantages of "Prime White" road oil. Of the many strong



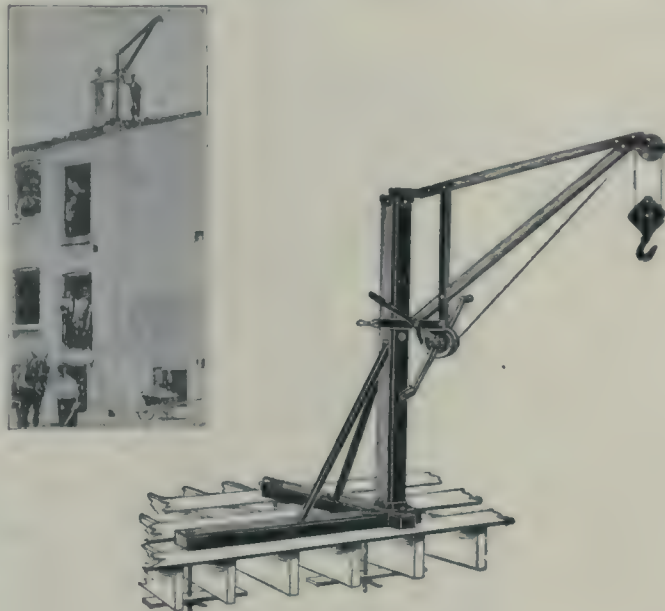
Road Treated with Prime White Road Oil

points of this material may be noted its easy application, its entire absence of odor, and its economy. It has highly preservative qualities and improvement is readily noted in roads treated with this material. It will not only meet the requirements of the engineer but it will doubtless appeal strongly to the man in the street, whose strongest objection to black road oils is the accumulation that is

tracked into his home. The company furnish samples of "Prime White" oil upon application.

Sasgen Circle Swing Contractors' Derricks

Until the advent of the Sasgen circle swing derrick contractors all over the country had been badly in need of a small handy portable derrick for hoisting timbers, joists, flooring, window frames, girders, etc., on to buildings. The Sasgen derrick, shown herewith, is reported to be meeting with ready sale in Canada. This derrick is patented and is the only one of the kind obtainable in the Canadian field. Its weight is only 250 pounds and it has



The Sasgen Derrick.

a lifting capacity of 1,500 pounds. It can be set up on a building in fifteen minutes and can be operated by one or two men. The derrick stands 8 ft. high and has a circle swing of 12 ft. It is equipped with 110 ft. of steel cable, and swivel block.

The larger illustration shows the Sasgen circle swing derrick with windlass, as set up on a building. In the smaller view the derrick is shown equipped with wheelbarrow boom and operated by horse power.

The exclusive rights for the manufacture and sale of this derrick in the Dominion of Canada are owned by the Ideal Concrete Machinery Company, Limited, of London, Ont., from whom catalogues and further information may be obtained.

Track laying has been completed on the Canadian Pacific branch line from Victoria Harbor to Bethany. The new line starts from the docks at Victoria Harbor and crosses the Toronto-Sudbury line of the C. P. R. 13 miles out of Bethany. Fourteen miles west of Peterboro it forms a junction with the main Toronto-Montreal line of the C. P. R. The Toronto Construction Co. has had the work of building the road. It is 88 miles from Victoria Harbor to Bethany and 85-lb. rails have been laid. In connection with the new line the Canadian Pacific has spent large sums of money in equipping Victoria Harbor as the Western terminus of the line. Two wharves 3,600 ft. long and 60 ft. wide have been built on either side of the harbor and these are separated by a waterway 600 ft. wide, giving ample room for the berthing of a dozen large lake boats at the same time. There have also been built a large storage elevator, a boiler house, two 1,000-ft. freight and flour sheds, boarding houses, cottages, etc.

Contracts Department

News of Special Interest to Contractors, Engineers, Manufacturers and Dealers in Building Supplies.

Information for insertion in these columns is invited from Architects, Contractors, Engineers, etc.

Waterworks, Sewerage and Roadways

Coleman, Alta.

A new system of waterworks to replace the old one is under consideration; will be a gravity supply costing about \$65,000. Mayor, Alex. Cameron; designing engineer, Robert Potter, city engineer, Fernie, B. C.

Edmonton, Alta.

The Hudson's Bay Company have petitioned for a large amount of paving sidewalks, grading, etc., involving an additional outlay of about \$250,000. City engineer, A. J. Laternel.

Edmonds, Alta.

Tenders were called until Nov. 6 for erection of 300,000 gal. reservoir, M.D.L. 187, Burnaby. Clerk, Wm. Griffiths; engineers, Cleveland & Cameron, Winch Building, Vancouver.

Hamilton, Ont.

Tenders will be called shortly for cement walk and combined curb, \$307; cement walk and independent curb, \$614; creosoted wood block pavement, \$3,640. Mayor, Geo. S. Lees; engineer, A. F. Macallum.

Tenders will be called in about two weeks for pipe sewers and water mains. Pipe sewers about \$10,023.09; water mains, about \$5,691.88. Mayor, Geo. S. Lees. Council decided to do work.

London, Ont.

Report of engineer deals with various costs of pavements; also recommends immediate action to be taken to remove water before pavements are laid. A by-law relating to storm water drains will probably be submitted. City engineer, Geo. W. Wright.

Mose Jaw, Sask.

By-law submitted for extension of fire alarm system, \$17,000. Extension to waterworks, \$550,000. Cement walks, \$36,000. W. F. Heal, city clerk.

Montreal, Que.

Tenders are called until Nov. 13 for construction of sewers in Notre Dame de Graces Ward, Hochelaga, St. Denis and Mt. Royal wards. Information from S. Howard, superintendent of sewers, City Hall. L. N. Senecal, sec. Board of Commissioners.

Vancouver, B. C.

City Engineer F. Fellowes has proposed the erection of asphalt plant for street repair work, also at some later date, a wood block plant.

Victoria, B. C.

Local Improvement notice, paving, \$46,047. City of Victoria; purchasing agent, W. W. Northcott. Asphalt paving will be constructed on Linden avenue, from Front street to Dallas road. Cost \$46,047.

Railways, Bridges and Wharves

Calgary, Alta.

The C. P. R. will apply to Ottawa next session for authority to construct from points on Estevan-Forward branch at or near Sedgwick, north of Battle river, etc., and extension of time on several lines. Engineer, J. B. Brown, Calgary.

Durham Bridge, N. B.

Tenders are called until Nov. 27th for the construction of a retaining wall. Department of Public Works, Fredericton. Chief Commissioner Public Works Hon. John Morrissey.

Montreal, Que.

Dry dock for Vickers Sons & Maxim. Canadian representative, F. O. Lewis, c/o Lewis Bros., Bleury street, Montreal. Tenders to be opened this week. Announcement regarding award probably made in a few weeks. Excavation is expected to commence this fall and material assembled this winter for early operations in spring. Probable expenditure, \$5,000,000.

Nanaimo, B. C.

The B. C. Hydraulic Co., Victoria, have offered to instal a railway provided council guarantees interest on bonds of \$150,000. A by-law is being prepared. Ald. Wilson is interested. City engineer, A. G. Waters.

Owen Sound, Ont.

Town is contemplating a street railway. Mayor, Wm. Lemon; town engineer, R. Macdowall, C.E. Engineer's estimate, \$100,000 covering 6 miles.

Plaisance, Que.

Corporation of Plaisance are contemplating the erection of a steel bridge with concrete abutments over Nation River.

St. John, N. B.

Edmund Bristol, M.P., of Toronto, who was in this city a few days ago, is understood to be identified with a company which are making a bid for the contract for building the St. John Valley Railway.

Toronto, Ont.

The following tenders were received for tube railway: Pearson & Co., New York, \$5,000,000; Patrick McGovern, Boston, \$3,840,000; Coleman Bros., Boston, \$3,840,000; Nawn Contracting Co., Boston, \$3,628,857; E. E. Smith & Co., New York, \$3,613,000; Larkin & Sangster, St. Catharines, \$3,509,000; Jas. Stewart & Co., New York, \$2,924,000; F. F. Cranforth, Brooklyn, \$2,856,000; H. J. Haney & Co., Toronto, \$2,600,000; five other tenders, among whom were, A. M. Orpen & Co., and J. H. McKnight & Co., local firms.

Three Rivers, Que.

The by-law carried to provide electric cars for street railway to cost \$800,-

000. Engineers, Evans & Oliver, Quebec, Que.

Winnipeg, Man.

Plans prepared by the Strauss Bascule Bridge Co., Fort Dearborn Building, Chicago, Ill., have been accepted and call for a 55½-ft. single-leaf highway span bridge over St. Andrews Locks. Dept. of Public Works, Ottawa. Asst. chief engineer, A. R. Dufresne.

Wolfville, N. S.

Contemplated station. Dominion Atlantic Railway, Kentville, N. S., are planning to build a brick and stone station.

CONTRACTS AWARDED

Fort Steele, B. C.

The C. P. R. has let the contract for 21 miles of tracks to Skookumchuck on the Kootenay Central Rr. Plans have been filed for the extension from the railway's northern stopping point for a distance of 60 miles. The entire length of the railway is 200 miles. Its terminal points are Golden on the main line of the C. P. R. and Jukeson on the Crow's Nest Pass branch of the same railway.

Quebec, Que.

The contract will be let in about two weeks for electrical installation required to operate the bascule bridge (Strauss). Particulars from general contractors.

Ste. Eustache, Que.

Structure for bridge for Canadian Northern, St. James street, Montreal; general contractor, J. P. Mullarkey, 224 Coristine Building, Montreal; sub-contractors, Montgomery, Todd & Hillman, 204 Lake of the Woods Building, Montreal. Substructure bridge, 20 ft. above water, 14 piers, 4 abutments; requiring 2,500 cu. yds. of cement besides masonry. Work just started.

Ste. Rose, Que.

Concrete bridge for Canadian Pacific Railway, Windsor street; contractor, J. McDonald & Co., Montreal; 4 piers, concrete under water and masonry above; new piers reduce span from 160 to 80 ft. and raise tracks 6 ft.; 3,500 cu. yds. concrete besides masonry; preparing. Material being laid on ground to double track.

Public Buildings, Churches, Schools, etc.

Calgary, Alta.

Loyal Order of Moose are contemplating the erection of a lodge building on 11th avenue. Secretary, F. Synder, 213 Leeson & Lineham Bldg., Calgary. Building to contain reading room, gymnasium, etc. Dimensions of site 50 x 140.

Clifford, Ont.

Tenders are called for erection of a 6-room school; also 6-room school and assembly hall. Plans, etc., at office of secretary. Received by secretary for entire buildings or separate trades until 6 p.m. Nov. 14th. Public School Board; secretary, Jno. R. Scott.

Caughnawaga, Que.

Lighting system is wanted for the Golf Club House of the Outremont Golf Club, Montreal; secretary, J. D. Baile, 69 McGill street, Montreal; property has been secured here for links, but it is not decided whether an electric or gas plant will be chosen.

Chatham, Ont.

Tenders are being called for Hotel Dieu, for Sisters of St. Joseph. Engineers, Canadian Domestic Engineering Co., 5 Beaver Hall Square. Tenders call for heating, ventilation and electrical plant including wiring, conduit, and electric fixtures; hot water heating, radiation, etc.

Coal Harbor (near Vancouver, B.C.)

Mr. F. Heath, president Tacoma Park Board, Tacoma, Wash., submitted plans for a stadium structure, seating capacity, 50,000; reinforced concrete. The matter was favorably considered by commissioners and will be dealt with later. Mr. Heath has an office in Metropolitan Building, Vancouver. Chairman Park Commissioners, Mr. Lees.

Guelph, Ont.

Tenders are called for several trades in connection with Central Heating System, County Buildings. Plans, etc., at office of architect. Received until Nov. 7th by T. J. Moore, clerk, city of Guelph. Architect, W. A. Mahoney, Douglas street, Guelph.

Kentville, N. S.

The ratepayers voted to build next year a brick and stone school building. Town clerk, John Carroll.

Ladysmith, B. C.

The council and school board agreed on market square as the site for the erection of a new high school.

Lennoxville, Que.

Heating tenders are being called for school building to cost \$15,000, for Protestant School Corporation, Lennoxville, Que; architect, J. W. Gregorie, Sherbrooke, Que. Plans, etc., at office of Canadian Domestic Engineering Co., Ltd., 5 Beaver Hall Square, Montreal. Tenders call for heating and ventilating system.

London, Ont.

The Victoria Hospital Trustees have under consideration a new heating system. Chairman, Col. W. M. Bartshore, care McClary Manufacturing Co.; Supt. of Hospital, T. H. Heard. Investigation to be made into the heating systems in use elsewhere previous to the installation of a new one in Victoria Hospital.

City Architect Nutter submitted plans for an incinerator to cost \$30,000 with capacity of 50 tons per day. A site in manufacturing district is favored.

Montreal, Que.

Work is in progress for erection of a church on St. Joseph Blvd. for St. Giles Presbyterian Congregation; pastor, Rev. J. R. Dobson, 1173 St. Denis street, Montreal; architect, E. & W. S. Maxwell, Beaver Hall Square, Montreal.

Excavation contractor, Reid, McGregor & Reid, 668 St. Catherine west, Montreal. Only foundation put in this fall. Other contracts not awarded.

Tenders will be called for erection of a library for The Sulpician Fathers; architect, E. Payette, 103 St. Francois Xavier street, Montreal; engineers, Canadian Domestic Engineering Co., 5 Beaver Hall Square, Montreal. Tenders on general contract received by architects about first of new year. Plans are being prepared by engineers for heating and ventilating system.

St. Irene Roman Catholic Church, Delisle street, Montreal, destroyed by fire Oct. 31st. Estimated loss, \$90,000. Rev. Father Deschenes states that church will be rebuilt.

The Roman Catholic School Commissioners are about to build a house for the Friars, Ryan street, stone and brick, metal roof, hot water heating, to cost \$19,000; arch., J. Finlay.

A chapel is contemplated for the Methodist Church, de Lorimier Ward, stone and brick, asbestos wall finish, hot water heating.

Owen Sound, Ont.

A site has been purchased for a hockey rink on 1st avenue. Parties interested, F. W. Harrison and A. J. Creighton; 200 x 110, concrete and steel. Joint stock company being formed. Operations expected to commence at an early date.

Port Arthur, Ont.

Plans are being prepared for the erection of Sailor's Institute, to cost \$30,000, for the Island Mission; superintendent, Mr. Potter. Construction will begin in the spring.

Richmond, B. C.

Plans are being prepared for the erection of an addition to school to cost \$7,500. School architect, Jos. H. Bowman, Crown Building, Vancouver. 2 storey, frame, shingle roof, 68 x 36, hot water heating.

St. Vital, Man.

Tenders were called until Nov. 3rd for heating and ventilating administration building for Department of Public Works, Winnipeg; Minister of Public Works, Colon H. Campbell; Provincial architect, S. Hooper, Fort Garry Court, Winnipeg; plumbing in Administration Building, Agricultural College. Plans, at office of architect.

Saskatoon, Sask.

The Board of Governors of the University have offered the Hospital Governors the lease of 8 acres of land on certain conditions as a site for the new hospital. Mayor, Clinkskill.

Sherbrooke, Que.

Tenders are called until Nov. 4 for lighting and ventilation of Notre Dame Academy, for Catholic School Commissioners, Sherbrooke; architect, J. W. Gregorie, Sherbrooke; engineers, Canadian Domestic Engineering Co., 5 Beaver Hall Square, Montreal.

Plans are prepared for boiler house in seminary; general contractors, Simon-eau & Dion, Sherbrooke, \$300,000; engineers, Canadian Domestic Engineering Co., Ltd, 5 Beaver Hall Square; architect, J. W. Gregorie, Sherbrooke. Plans for new boiler house ready for tenders on January 1, 1912, and may be seen at office of engineers. Brick building completed; central heating plant, combina-

tion steam and hot water, awarded to Gadieux & Briard, 1277 St. Dominique street, Montreal; contract for cold storage awarded to Kent Co., Ltd., refrigerating engineers, 713 Canadian Express Building, Montreal.

Toronto, Ont.

Tenders are called for alterations to church on Davenport Road, for Davenport Road Methodist Church; architect, David E. Smith, 77 Victoria street, Toronto; S. S. addition, 2 storey, 62 x 64, brick, shingle roof, electric wiring and fixtures, art glass, ornamental plaster, steam heating, plumbing, furnishings and seating required.

Tenders are called for erection of Graphic Arts Building (Shephard and Richmond, for Toronto Saturday Night Publishing Co., Adelaide street, Toronto; removal of old building, sheet piling and street protection, excavation and masonry, structural steel, sheet metal, roofing, painting and glazing, marble and tile floors, plumbing and heating, electric wiring, elevators, carpentry, lathing and plastering, hardware, iron mongering. Architect, F. S. Baker, Traders Bank Building, Yonge street, Toronto.

Vancouver, B. C.

Plans are being prepared for addition to schools. Board of Education; secretary, C. W. Murray; city supt., W. P. Argue; 8 rooms to Cecil Rhodes school; 8 rooms to school in blk. 128; 8-room building in blk. 39, Hastings township and another in D.L. 301.

Work is in progress for University building at Point Grey for Provincial Government; architect, F. M. Rattenbury, Victoria. Tenders for clearing of the 175 acres all in work to start shortly. Site to be ready by spring. Plans are being prepared by provincial architect for 3 of the dozen building proposed.

Victoria, B. C.

The city has been approached by municipality of Oak Bay in regard to erecting jointly a branch fire hall at eastern boundary.

The tenders for high school, Fernwood road and Grant street, were as follows: Norton Griffiths Co., \$381,000; Dinsdale & Malcolm, \$329,000; Luney Bros., \$365,928; Sound Construction Co., \$428,000; Westholme Lbr. Co., \$359,950; Thomas & Hodson, \$410,435; Island Construction Co., \$285,000; Thomas Catterall, \$379,995; Armstrong, Morrison Co., \$364,995. Ventilating and heating.—Bids with alternative offers for the ventilating and heating were received from the following: Barr & Anderson, \$41,658, \$43,658, \$43,918, according to the type of apparatus installed; J. R. Tacey, \$47,775, \$50,270, \$46,975, and \$47,575; Louis A. Borde, \$46,112, \$47,297, \$47,012, and \$47,212; E. F. Surtham, \$42,750; R. J. Knott, for plumbing, heating and ventilating, \$77,000. Bids for plumbing follow: A. Sherrett, \$12,487, \$11,270, and \$11,074; Colbert & Co., \$12,786, \$12,306, and \$12,326; W. R. Menzies, \$11,154; \$9,999, and \$13,313; Hayward & Dodds, \$14,200 and 13,200. Bids for installation of electrical equipment were received from the following: Hinton Electrical Co., \$19,950; Standard Engineering Co., \$18,460; Hawkins & Hayward, \$22,420; Louis A. Borde, \$21,873; D. L. Hickey & Co., \$20,881; Empire Construction Co., \$20,921.

Winnipeg, Man.

Tenders are called for heating and plumbing, &c., for General Hospital; architect, J. D. Atchison, Bank of Toronto Building, Winnipeg; successful contractor, Carter Halls Aldinger Co., Winnipeg. Received by architect until Nov. 13th for plumbing, heating, ventilation and electrical work. Each tender to be accompanied by cheque for 10 per cent. of amount.

CONTRACTS AWARDED**Calgary, Alta.**

A permit has been granted for cottage school to cost \$4,300, Grand Trunk street; architects, Holman & Gotch, Calgary; general contractor, J. H. Whittleton, Calgary; 2 storeys, 30 x 30, frame, steam heating, electric lighting, shingle roofing, hardwood interior finish.

Dorval, Que.

School to cost \$14,000 on St. Joseph street, for Roman Catholic School Commissioners; architect, L. G. T. Decary, 70 St. James street, Montreal; general contractor, A. Ganthier, Lachine; 2 storeys, 68 x 44, brick and terra cotta (glazed) cornice, concrete foundation, hot water heating, electric light.

Hamilton, Ont.

Work has started for grandstand to cost \$40,000 for Hamilton Jockey Club, Hamilton; steel work contractor, Hamilton Bridge Co., Hamilton; foundation contractor, Geo. E. Mills, 614 King st. east, Hamilton. Contracts awarded October 26th. Other contracts will not be let until spring.

Kamloops, B. C.

Church to cost \$22,950; architects, G. A. Horel; 25th and Main streets; general contractor, S. Olsen, S. Vancouver. This does not include stone work, heating, nor electrical work.

Montreal, Que.

Church to cost \$9,000 on Ainsley rd., for Episcopal Congregation, Montreal West; architect, Peden & MacLaren, 20 St. Alexis, Montreal; brick work, McDonall & McCall, Prud'homme avenue; carpentry, J. J. Kirkpatrick, Montreal W.; concrete foundation, hot air heating, electric lighting, Canada slate roofing, interior finish oak, cement, cut stone, marble, tile, mantels, ornamental iron, sheet metal, cornice, electric work, telephone system, electric bells, sheathing and deafening paper, iron columns, ornamental columns and cap. Plastic relief work, art glass.

Alterations to post office to cost \$250,000, St. James street, for Dominion Government; architect, Theo. Daoust, 90 St. James, Montreal; general contractor, Jos. Bourque, Hull, Que.; contractor for steel, Dominion Iron & Steel Co., Ltd., 112 St. James street, Montreal. Alterations to interior and roof, mainly stone exterior; brick, cement and terra cotta interior; metal roofing, steam heating, electric and gas lighting.

Prince Rupert, B. C.

Church to cost \$18,000 for Methodist Church of Canada; chairman building committee, G. L. Proctor, Prince Rupert; architect, G. L. Proctor Prince Rupert; general contractor, E. Kauffman, Prince Rupert; plumbing and heating, Smith & Mallett, Prince Rupert. Trane system of heating specified. Cement and frame, steam heating, electric lighting, shingle roofing.

Victoria, B. C.

High School on Fernwood road, for Board of Education; architect, A. E. Walkins, Green Block, Victoria; general contractor, Vancouver Island Construction Co., Victoria, B. C., entire building, \$285,000; basement, \$114,000; heating and ventilating, Barr & Anderson, 114 Hastings, Vancouver; plumbing, W. R. Menzies Co., 518 Cormorant street, Victoria. System in the two latter contracts has yet to be decided. Electrical tenders not awarded. Construction on basement to start this fall. Full construction awaiting passing of by-law authorizing expenditure of \$250,000.

Winnipeg, Man.

Isolation hospital. 4 storeys and basement, 280 x 40, structural iron, artificial stone passenger and freight elevator, metallic lath, concrete tile, steel casements; all specifications for mechanical equipment to come out later. Sec. Board of Control, M. Peterson; architect, H. B. Rugh, 928 Union Bank Winnipeg; general contractor, Claydon Bros, 444 McMicken avenue, Winnipeg, \$190,734.

Residences**Brantford, Ont.**

Work will commence shortly on a residence to cost \$2,800 for Harold Creasser, 103½ Colborne street, Brantford; 2 storeys, 29 x 32, sand lime brick with pressed brick facings, stone and concrete foundation, hot water heating, shingle or asbestos roof; interior finish—ground floor, hardwood—rest pine. Plumbing and heating have not been let. Owner supervising work.

Calgary, Alta.

J. Bleakley, 14th street, contemplates erection of two residences, \$3,000 each.

A. Martin, 2nd avenue, is contemplating the erection of an apartment to cost \$20,000 on 14th avenue; 3 storeys, 50 x 50.

Two residences, \$4,000, 2-storey, 22 x 24, frame, concrete foundation, hot air heating, electric lighting, shingle roof, owner, W. Wamop, 1309 5th street east, Calgary.

Residence, \$3,500, 2-storey, 26 x 36, frame, concrete foundation, hot air heating, electric lighting, shingle roofing, hardwood finish; owner, W. H. Mills, 1223 14th avenue west.

Permit granted for residence, \$3,500, 2-storey, 30 x 32, frame, concrete foundation, hot air heating, shingle roofing, hardwood interior finish; owner, M. Rowley & McPhail, 111 7th street west.

Excavation has commenced for four residences to cost \$8,000, for T. G. Whitelaw, Box 1254, Calgary; 2 storeys, 10 x 36, frame, concrete foundation, hot air heating, shingle roof, electric lighting.

Residence, \$4,000, 2-storey, 36 x 36, frame, concrete foundation, hot air heating, electric lighting, shingle roofing, hardwood finish; owner, Mr. Spencer, 1734 11th avenue west, Calgary; architect, Holman & Gotch, 1734 11th avenue west, Calgary.

Residence to cost \$4,000; two storey, 26 x 36, frame, concrete foundation, electric lighting, hot air heating, shingle roof, hardwood interior finish; owner, W. A. Munro, 1232 15th avenue west.

Permit granted for residence, \$4,000,

2-storey, 23 x 31, frame, concrete foundation, hot air heating, electric lighting, shingle roofing, hardwood finish; owner, J. G. Porteous, 320 25th avenue west, Calgary.

Hamilton, Ont.

Tenders are called for residence to cost \$6,000 on Blake street, for J. Patterson, 117 East avenue S.; architect, Stewart McPhie, Bank of Hamilton Building, Hamilton; 2½ storeys, 32 x 34, stone foundation, brick and stone hot water heating, electric lighting and gas lighting, shingle roof, tile, mantels, metallic lath, sheet metal work, electrical work, electric bells, shingle stain, roofing, plate glass, art glass, refrigerator.

Montreal, Que.

A. Deschamps, 1308 St. Hubert street, will build thirty flats to cost \$24,000; 3 storey, 25 x 95, brick, concrete foundation, gas and electric lighting, gravel roof.

Foundations are in for twelve flats, \$8,000, 3-storey, 60 x 60, Roman stone and plastic brick, cement foundation, gas and electric lighting, gravel roofing; owner, H. Leduc.

Three flats, \$2,500, 2-storey, 25 x 40, pressed brick, concrete foundation, stove heating, electric lighting, gravel roofing; owner, Henri Forget, 1956 Dufferin street, Montreal.

Excavation is completed for five flats, \$3,000, 3-storey, 25 x 50, brick, concrete foundation, gravel roofing, artificial stone fire walls; owner, J. A. Roy, 532 LaSalle street, Montreal.

Excavation is completed for nine flats to cost \$12,000, on Christophe Colomb, for P. J. Charlebois, 1234 St. Hubert street, Montreal; 3 storeys, 25 x 36, brick and wood, concrete foundation, electric lighting, gravel roofing.

A block of residences to cost \$100,000 will be built on St. Urbain and Esplanade, for O. Lamoureux, 96 George Cartier Square, Montreal; 3 storeys, 110 x 178, Indiana stone facing, solid white brick sides and rear, marble, tile and hardwood finishings, stone foundation. 42 dwellings contained in block.

H. Charpentier, L'Epiphanie P.O., will build 6 flats to cost \$6,000 on Cartier street; 3 storeys, 46 x 40, stone foundation, gas lighting, gravel roofing.

Work is pending for six flats to cost \$6,000 for Corbeil, Savard & Corbeil, 1220 Chabot street, Montreal, 2 storeys, 75 x 25, brick encased, cement foundation, gas and electric lighting, gravel roofing.

Outremont, Que.

E. Laliberte, 2509 Esplanade avenue, will build four flats to cost \$5,000; 2 storeys, 25 x 32, brick and wood, stone foundation, electric lighting, hot water heating, gravel roofing.

E. G. Dalaire, 70 St. Germain street, is excavating for two cottages to cost \$14,000 on Sturt street; 2 storeys, 32 x 42, solid brick, stone and concrete foundation, hot water heating, electric lighting, gravel roof.

Red Deer, Alta.

Work is in progress for residence, to cost \$2,800, 1½ storey, 26 x 32, hot air heating, electric lighting, shingle roof; owner, E. E. Roberts, Red Deer.

Toronto, Ont.

Excavation is done for two suite dwellings, northeast Summerhill Gar-

dens, 2 storey, stone, brick, concrete, steel; owner and builder, Thos. Knight, 108 Summerhill avenue; architect, J. H. Stanford, Yonge street Arcade.

Work is in progress for erection of a residence to cost \$6,000 in Wynchwood Park, for W. A. Langhton, 88 King st., east, Toronto; 3 storeys, brick, slate roof.

Excavation started on residence, 647 Carlaw avenue, \$4,000, 2 storey and attic, 26 x 120, detached, electric lighting, brick; owner, A. Hawthorne, 84 Chester avenue.

J. S. Case, 154 Close avenue, will build a pair residences to cost \$6,000 on Pauline avenue; solid brick, slate, tar and gravel roofing, electric lighting, hot air heating.

Excavation has started for sixteen dwellings to cost \$24,000 on Connaught avenue, for K. McWhinney, 1922 Daventry road; frame, rough cast, brick front, 18 x 120.

Excavation is completed for 3 attached dwellings to cost \$4,000 on Boulthbee avenue, for A. Lane, 8 Dartford road, Toronto; 2 storeys, brick front, and rough cast sides.

Excavation is done for three dwellings to cost \$4,000 on Dingwall avenue; architect, J. Keeler, 226 Major street, Toronto; 2 storeys, attached, brick front, and rough cast sides.

Work is in progress for residence to cost \$4,200, 254 Conduit st., for Fisher Bros., 20 Rowland avenue, Toronto; architect, A. S. Fisher, 373 Roncesvalles street, Toronto; 2 storey, brick.

Work is in progress for erection of two dwellings to cost \$4,500 on Balmoral avenue, for N. McDaragh, 182 Howland avenue; 2 storeys and attic, semi-detached, brick, stone foundation.

Excavation is started for residence to cost \$6,000 on Brunswick avenue, for Edith F. Williams, 43 Kendal avenue, Toronto; builder, C. S. Williams, 43 Kendal avenue; 2 storeys and attic, stone and brick.

Work is in progress for erection of 1 pair dwellings to cost \$4,000, Bloomfield street, for J. W. McClarty, 102 Queen east, Toronto; architect, P. H. Finney, 43 Victoria street; tar and gravel roof, gas light, hot air furnace.

Edith Williams, 43 Kendal avenue, Toronto, will build four residences to cost \$9,000, 48-54 Duggan avenue; architect, C. S. Williams, 43 Kendal avenue, Toronto; 2 storey and attic, stone and brick, hot air heating, tar and gravel roof, electric lighting.

Tenders will be called shortly for erection of a residence to cost \$11,000, (garage) W. Russell Hill Drive, for H. W. Tisdale, 72 Brunswick avenue; architect, J. Hartley Galloway, 23 Toronto street, Toronto; 2 storey and attic, brick and stone, shingle roof, hot water heating, Keenes' cement required for interior finish; pitch and gravel roofing on garage.

Vancouver, B. C.

Plans are being prepared for erection of three residences to cost \$40,000, (Shaughnessy Heights); architects, Jones & Aspell, 347 Pender street. Specifications call for one—stone for basement and 1st storey; frame for upper two, cost \$20,000; each house will have hardwood floors, hot water heating, art glass, etc.

Verdun, Que.

Excavation is under way for six flats to cost \$5,000, 2 storey, 50 x 38, brick encased, concrete foundation, stove heating, electric lighting, gravel roofing; owner, F. X. & J. O. Hamelin, 246 Church street, Verdun.

Excavation has started on five flats to cost \$6,000, for L. Duchesneaux, 15 Regine street, Verdun; 3 storeys, 25 x 40, brick, stone front, concrete foundation, electric lighting, gravel roofing.

Westmount, Que.

Excavation started for residence to cost \$4,600, 2 storey, 20 x 47, brick and stone, electric lighting, hot water heating, tar and gravel roofing; owner, A. J. Martin, 336 St. Paul street.

CONTRACTS AWARDED

Calgary, Alta.

Residence, \$4,500, 2 storey, 38 ft. 6 in. x 38 ft. 6 in., frame, concrete foundation, hot air heating, electric lighting, shingle roofing, hardwood finish; owner, J. L. Gibson; architects, Holman & Gotch, Calgary; contractor, Johnston Bros., 6 McTavish Blk., Calgary.

Apartment house to cost \$8,000 (Sun-alta), for Wilfred Chambers, Y.M.C.A. Building, Calgary; general contractor, H. Sykes, 240 11½ street, N.W.; 2 storeys, 48 x 40, frame, hot air heating, electric lighting, shingle roofing, hardwood finish, two furnaces, 2 fireplaces.

Permit granted for residence to cost \$4,000, 2 storey, 30 x 38, frame, concrete foundation, hot air heating, electric lighting, shingle roofing, hardwood finish; owner, L. Thornley; architect, Holman & Gotch; contractor, Johnston Bros., 6 McTavish Block, Calgary.

Montreal, Que.

Work is in progress for erection of residence to cost \$25,000, for C. I. De Sola, 71 McGill Coll. avenue, Montreal; architect, Messrs. Saxe & Archibald, 59 Beaver Hall Hill, Montreal; carpentry contractor, Laird Paton & Son, Ltd., 485 St. James street, Montreal; roofing, G. W. Reed & Co., Ltd., 37 St. Antoine street, Montreal; electric and gas lighting, hot water heating, refrigerator, hardwood and tile interior finish. Foundation done and walls started.

Outremont, Que.

Two cottages to cost \$4,000 each, for E. Cote, 447 Durocher street, Montreal; general contractor, J. L. David, 79 Cathedral street, Montreal; 2 storeys, 25 x 38, stone foundation, hot water heating, pitch and gravel roof, hardwood floors.

Toronto, Ont.

Excavation is completed for 2 pair dwellings to cost \$8,000 on Chester avenue, for J. B. Jarvis, 18 Toronto street, Toronto; contractor, J. Bodie, 159 Victor avenue, brick veneer, rough cast sides.

One pr. residences to cost \$3,600 on Shaw street, for Jno. Dyce, 852 Palmerston avenue, Toronto; contractor, Jno. Brown, 697 Lansdowne avenue, Toronto; 2 storeys and attic, stone foundation, brick, electric light, hot air heating.

Lakeview apartment to cost \$35,000, at 1600 Queen west; owner and builder, A. B. Coleman, 191 Dowling avenue, Toronto; architect, C. J. Gibson, James Building, Toronto; stone and brick construction, 36 bathrooms, tar and gravel roofing, artificial stone.

Westmount, Que.

Excavation has commenced for a residence to cost \$17,000 (West Boulevard) for Robertson MacAulay, c/o Sun Life Assurance Co., 142 Notre Dame street west, Montreal; architect, R. Findlay, 10 Phillips Place, Montreal; masonry contractor, Robertson Bros., Chestnut avenue, Montreal; 3 storey, 37 x 73, brick and stone, electric and gas lighting, slate roof, hardwood interior finish, furnace heating. Tenders on remainder of work not called.

Business Buildings and Industrial Plants

Calgary, Alta.

The Carlyle Dairy Co., are contemplating extensions to dairy; 3 storeys, tile construction; cost \$5,000.

Scott & Hartvonft, Grain Exchange, are contemplating the erection of an 8-storey, 50 x 130, fireproof office block.

The Crown Lumber Co., Grain Exchange, are going to put up a lumber yard in the C. P. R. Industrial district.

The W. Drummond Clothing Co. 8th avenue E., Calgary, have option on property on 8th avenue as a building site for new store.

Tenders are called by the Quinlan-Carter Construction Co., Ltd., Glenbow, for the removal of plant from Glenbow and erection of same in Calgary. Cost \$95,000.

The Western Canada Foundry Company have purchased a building site in C. P. R. industrial division for erection of a factory and foundry. Probable cost, \$250,000.

Negotiations are in progress for securing of trackage property from city authorities in Manchester Industrial Division at a site for box factory for the Riverside Lumber Co.

Plans are being prepared for erection of a business block to cost \$150,000 for S. Beveridge; architects, Messrs. Lage & Major, Board of Trade Building, Calgary; 6 storey, 75 x 130.

Gorman, Clancy & Grindley, 9th avenue west, Calgary, have purchased a 10-acre site in new official C. P. R. townsite for erection of warehouse offices. Firm deals in building supplies.

The Canada Life Insurance Co. have purchased a site on 8th avenue, 75 x 130 ft., for erection of a 6-storey office building, steel construction, reinforced concrete; approximate cost, \$200,000.

Canadian Northern Railway are contemplating the erection of an hotel in vicinity of their new depot on 17th avenue. The depot and hotel will probably be built in conjunction. Cost \$1-000,000.

Plans are being prepared for business block to cost \$300,000; architect, A. A. Rose, Linham Block, 8 storey, 100 x 130, fireproof throughout; foundations probably put in this fall. Building to commence in the spring.

Chippewa, Ont.

The Norton Company (head office Worcester, Mass.) Chippewa, will double their plant in the spring; concrete, reinforcing, structural steel, electric furnaces, grinding machinery, motors, conveyors, etc. Company manufactures grinding wheels.

(Continued on page 61)

Tenders and For Sale Department

To Engineers

Every man who puts in a tender on your jobs has got to see your plans and specifications first. If you are in Montreal and he is in Vancouver the inspection of your plans is a problem. Let us solve that for you. Place on file copies of your plans and specifications in any or all of the "Contract Record" offices.

More contractors and manufacturers read the "Contract Record" than any other Canadian publication. It is the logical place to look for tenders called, and where all important works are advertised.

Send along your plans for your next job and put a line in your ad. to that effect.

Contract Record

Montreal—B34 Board of Trade.
Toronto—220 King Street West.
Winnipeg—Commercial "Travellers" Bldg.
Vancouver—441 Seymour Street.

CITY OF MOOSE JAW SASKATCHEWAN

TENDERS

Sealed tenders addressed to the undersigned will be received up to the hour of 8.30 p.m. on Monday, December 4th, 1911, in the Council Chamber, Moose Jaw, Saskatchewan, for supplying the Fire Department of the City with one Pumping Engine, with a capacity of 800-850 gallons per minute. Tenders are invited for motor driven pumping engines, motor propelled steam pumping engines, or horse drawn steam pumping engines.

Tenders must specify the time in which delivery can be guaranteed, and complete specifications must be furnished for the apparatus proposed to be supplied. Tenders for steam pumping engine must comply with the provisions of the "Steam Boilers Act" of Saskatchewan, particulars of which may be obtained from the office of the Chief Steam Boiler Inspector, Department of Public Works, Regina.

All tenders to quote price f.o.b. Moose Jaw. The right to reject any or all bids expressly reserved.

W. F. HEAL,
City Clerk.

44-48

CITY OF MOOSE JAW SASKATCHEWAN

TENDERS

For Fire Alarm Boxes

Sealed tenders addressed to the undersigned will be received up to 8.30 p.m. on Monday, November 13th, 1911, in the Council Chamber, Moose Jaw, for the supply of twenty (20) non-interfering type alarm boxes complete. Tenders must contain complete specifications for the boxes proposed to be supplied and tenderers must be prepared to furnish a sample fire alarm box if requested to do so. Tenders must also specify the time in which delivery can be guaranteed and must state price f.o.b. Moose Jaw. The lowest or any tender not necessarily accepted.

W. F. HEAL,
City Clerk.

44-45

To Manufacturers of Machinery

A firm wishing to take up the manufacture and marketing of the most complete and up-to-date concrete machinery in the United States or Canada. A proposition will be considered for just the manufacturer. Please address Box 348, Contract Record, Toronto, Ont. 44-49

Debentures for Sale

The Corporation of the Town of Bracebridge offers the following five per cent., 20-year debentures for sale:

Local Improvements	\$3,447.45
Local Improvements	4,442.93
Power Extension	8,300.00

The above are all payable in twenty equal annual instalments of principal and interest and have interest coupons attached.

Sealed tenders for the block or each debenture, will be received by the undersigned up to 6 p.m. on Tuesday, November 14th, 1911.

ALEXANDER C. SALMON,
Town, Clerk, Bracebridge, Ont.

44-45

BOARD OF EDUCATION TORONTO

Tenders Wanted

Sealed tenders, addressed to the Secretary-Treasurer of the Board, will be received until Friday noon, November 10, 1911, for

Iron Stairs

1. Roden School.
2. Fern Avenue School.
3. Manning Avenue School.
4. Caledonia Road School.
5. Essex Street School.

Plumbing

6. Roden School.
7. Fern Avenue School.
8. Essex Street School.

Electrical Wiring

9. Roden School.
10. Fern Avenue School.
11. Earls Court School.
12. Caledonia Road School.
13. Essex Street School.

and until Monday noon, November 13, 1911, for

Cabinet Work and Plumbing for Science Rooms, etc.

1. Humberside Collegiate Institute.
2. Oakwood High School.
3. Technical High School.
4. Annette Street Public School.

Specifications may be seen and all information obtained at the office of the Superintendent of Buildings, City Hall. Each tender must be accompanied with an accepted bank cheque for five per cent. of the amount of tender or its equivalent in cash. Tenders must be in the hands of the secretary-treasurer at his office in the City Hall not later than 12 o'clock noon on the said day, after which no tender will be received.

The lowest or any tender will not necessarily be accepted.

W. C. WILKINSON,
Secretary-Treasurer.

W. W. HODGSON,
Chairman of Committee.
Toronto, Ont.

45-45

Auction Sale

McCoy & Wilford, Limited, offer for sale, in block, by public auction at Cardinal, Ont., on November 16th, inst., at 10 o'clock a.m., one lot Concrete Plant in good working order, comprising one No. 2½ Smith Mixer; one Gould Centrifugal Pump, No. 6; one Upright Boiler; one Steam Drill; one Machine Drill; one Blacksmith Shop, Double Wagon and Harness, Cars and Track, also numerous small tools. Terms cash. 45-45

To Architects

The Toronto Stock Exchange will receive competitive plans on January 2nd, 1912, for a new building for the Exchange to be erected at Nos. 86 and 88 Bay street, Toronto.

The conditions of competition will be mailed to those applying to

W. H. BROUSE, President
Toronto Stock Exchange,
Toronto.

45-47

Proposals Wanted

Sealed proposals will be asked for during the next two months by the Hamilton Hydro-electric Department for bids on the following classes of materials required in the construction of a distribution plant for Hydro-electric power, throughout the City of Hamilton:—

- A.—Substation buildings, heating, lighting, plumbing, etc., for same.
- B.—Station equipment, including transformers, switches, switchboards, lightning arresters, instruments, oil tanks and other appurtenances.
- C.—Wood poles, cross arms, pins, sideblocks, braces, insulators, machine bolts, lag screws, brackets, anchors, pole steps, guy wires, etc.
- D.—Reinforced concrete poles, condulets, conduit, steel reinforcing, cross arms and castings.
- E.—Underground conduit system construction, including cable racks, manhole and hand hole castings, structural steel, fuse pillars and castings.
- F.—Conduit ducts (Tile, fibre or other system for underground distribution).
- G.—Weatherproof and rubber covered copper and aluminum solid and stranded wire, lead encased cables and installation of same, distribution boxes, pot heads and connectors.
- H.—Line transformers, meters, cutouts and devices, lamps, wiring supplies or other appliance, device, apparatus or material entering into the construction and equipment as above mentioned.
- I.—Printing, stationery, office systems, and books of account and record.

Companies, firms or individuals desiring to tender on any of the foregoing equipment must file application for specifications with the undersigned engineer, stating specifically the portions and sections they desire to tender on and for sections A. B. and E. must deposit with the engineer a marked cheque payable to the City of Hamilton Hydro-electric Department for the sum of \$10, which will be returned in the event of receipt by the Corporation of bona fide tender on the work specified accompanied by the complete plans and specifications with tender.

The lowest or any tender not necessarily accepted.

GEO. H. LEES, Mayor.

E. I. SIFTON, Consulting Engineer,
City Hall, Hamilton.

44-45

Sewer Excavator

For sale for immediate use, a Vulcan "Little Giant" Steam Shovel with extra long dipper handle for excavating to 16 feet below surface, mounted on traction wheels, dipper 1 1/4 yd. capacity. Machine just overhauled; new chain, and extra large new boiler; weighs 32 tons; low price. Address

WILLIS SHAW MACHINERY Co.,
39 South LaSalle Street,
Chicago, Ill.

42-t.f.

TOWN OF NEEPAWA PROVINCE OF MANITOBA

Waterworks and Sewerage

Notice to Contractors

Sealed tenders will be received by the undersigned Secretary-Treasurer of the Town of Neepawa until 8 p.m. on Friday, December 15th, 1911, for the following works:—

- Contract A.—Labor for laying Water Pipes and Sewers.
- Contract B.—Pump House and Filter Room.
- Contract C.—Water Tower.
- Contract D.—Cast Iron Water Pipes.
- Contract E.—Gate Valves, Fire Hydrants, etc.
- Contract F.—Mechanical Filters.
- Contract G.—Pumping Machinery.
- Contract H.—Dam, Intake, and Reservoir.
- Contract M.—Wooden Stave Pipes.
- Contract S.—Sewer Pipes.
- Contract W.—Laying Conduit.
- Contract X.—Sewage Disposal Works.

Plan, specifications, etc., may be seen at the Town Hall, Neepawa, or at the Engineer's offices, Winnipeg and Toronto, on or after Wednesday, November 15th, 1911.

No tender necessarily accepted.

W. H. GOSSEL, Mayor.
R. H. FUSEE, Chairman.
J. W. BRADLEY, Sec.-Treasurer.
CHIPMAN & POWER, Engineers.
44-44

CITY OF EDMONTON ENGINEERING DEPARTMENT

1912 PAVING

Sealed tenders, addressed to the undersigned, and endorsed "Tender for 1912 Paving," will be received at the office of the City Commissioners, Edmonton, Alberta, until twelve o'clock noon (12.00 M.) on Friday, December 1st, 1911, for approximately 100,000 square yards of street grading and paving with curb.

Preliminary plans, and specifications, and all information may be obtained at the office of the City Engineer; plans and specifications are on file also at the office of the Canadian Engineer, 62 Church street, Toronto, and the Contract Record, 220 King street west, Toronto. A deposit fee of Five (\$5.00) Dollars is required. This fee will be refunded when plans are returned.

Tenders are invited for Wood Block, Asphalt Block, Sheet Asphalt, Bitulithic, or other kinds of pavement.

Proprietors of patented pavements are required to furnish their special specifications.

Tenders are required to submit bids as follows:—

- Tender No. 1.—Unit prices, for whole work.
- Tender No. 2.—Unit prices, for 75,000 sq. yds.
- Tender No. 3.—Unit prices, for 50,000 sq. yds.
- Tender No. 4.—Unit prices, for 25,000 sq. yds.

An accepted cheque for five per cent. (5 p.c.) of the amount of tender must accompany each bid.

The lowest or any tender not necessarily accepted.

CITY COMMISSIONERS
Office of the City Commissioners,
Edmonton, Alta., Oct. 19, 1911. 43-47

Positions Wanted

Advertisements under this heading one cent a word per insertion. Box No. ten cents extra.
Minimum charge 25 cents

WANTED—Position as manager of a combination electric and steam heating plant or either one separate. Have had 10 years experience in all branches of the business. Am 30 years old. Employed at present, but wish to go to Canada. Box 349 Contract Record, Toronto, Ont. 44-45

Positions Vacant

Advertisements under this heading two cents a word per insertion. Minimum charge 50 cents

Architectural draughtsman for general office work, steady employment; one who can detail and make up work drawings from sketches, etc. Apply stating experience and salary wanted. Box 355, Contract Record, Toronto, Ont. 45-45

Miscellaneous

Advertisements under this heading two cents a word per insertion. Minimum charge 50 cents

Agents Wanted

U. S. firm manufacturing cement mixers wants representatives in Eastern and Western Canada. Apply Box 362, Contract Record, Toronto, Ont. 45-46

Representatives Wanted

American firm manufacturing crushing plants for contractors and road builders wants representatives in Toronto, Montreal, Winnipeg, Vancouver. If interested write Box 361, Contract Record, Toronto, Ont. 45-46

Business Building and Industrial Plants

(Continued from page 59)

Fredericton, N. B.

The Fredericton Nutlock Co., with a capital of \$20,000 are applying for incorporation. Those interested—Philip A. Logan, St. John; T. A. Brewer, Gibson, N.B.; Joseph Thornburn, Stanley, N.B.; and Alderman P. A. Guthrie and A. D. Thomas of Fredericton. There are four different sets of nut locks on which patents have been granted in the United States and Canada. The inventions, which are by Messrs. Logan & Brewer, have been inspected by the C. P. R. and I. C. R. and declared to be practical.

Hamilton, Ont.

Plans are just finished for store and dwellings for E. A. Martin, 479 King east; architect, Stewart & Witton, 2 Hughson S. Hamilton; 3 storey, 70 x 18, brick and steel, stone foundation, shingle roofing, electric and gas lighting, hardwood interior finish, fittings for store, telephones, electric bells, plate glass, electric work, refrigerator. Work will be done by day labor.

Plans are prepared for erection of a factory to cost \$15,000 for Laidlaw, Bail Tie Co., Ltd; manager, E. Hodson Adams, South Cannon; general contractor, Geo. Mills, 614 King street E., Hamilton; 2 storey, 80 x 100, mill and timber construction, stone foundation, steam heating, tar and gravel roofing, ash interior finish; dynamos, electrical work probably required. Firm manufacture wire nails, barrels, etc. No tenders were called.

Plans were prepared for addition to factory for Canadian Drawn Steel Co., manager, H. J. Waddie; 1 storey, 35 x

70, stone foundation, brick and steel, steam heating, electric and gas lighting, tar and gravel roof, concrete floors, reinforced concrete, structural iron, sheet metal work, cornice and skylights, steel beams. No machinery required. Architect, Stewart McPhie, Bank of Hamilton Chambers, Hamilton.

Hammond, B. C.

Plans are prepared for erection of a bank building for Bank of Hamilton, Hamilton, Ont.; architect, Grant & Henderson, Williams Building, Vancouver; 2 storey, 40 x 75, concrete, brick and perhaps stone facings.

Hope, B. C.

The Renfrew Lumber Co. propose building a new sawmill on Silver Creek near here.

Kingston, Ont.

A by-law for \$100,000 bonds to promote erection of hotel will be submitted on the 16th of November.

Longueuil, Que.

The I. X. L. Ladder Company of Montreal have applied to the council of Longueuil for certain concessions on conditions that they secure a site and erect a factory.

Merritt, B. C.

Tenders are called for cold storage building to cost \$15,000 for Nicola Valley Meat Co.; 2 storeys, 50 x 70. The main floor and basement will contain two refrigerating rooms and an ice storage room. Public hall and offices in building. Refrigerating plant has been purchased. Required: 40 h.p. gasoline engine to operate plant.

Montreal, Que.

Foundations are in for a store to cost \$5,000 on Mt. Royal avenue, for B. Damiens, 898 Mr. Royal east; 2 storeys, 29 x 25, brick, hot water heating, gravel roof, gas and electric light.

Excavation is completed for two stores and dwelling, \$4,000, brick, concrete foundation, gas and electric lighting, gravel roofing; owner, Joseph Dupuis, 65 Delinell street.

Alterations to store, \$3,000, stone construction, electric and gas lighting, gravel roofing; owner, N. Perodeau, Place d'Armes. Changing Mansard roof to flat gravel and remodelling upper storey.

Alterations to hotel and dwelling, \$4,000, concrete foundation, gravel roof; owner, Mrs. M. Dayneault, 207a Church street; general contractor, T. Daijneault, 207 Church street.

The Royal Trust Co., 107 St. James street, N., Montreal, are contemplating the erection of a 10-storey fireproof office building or possibly only new quarters for owner and Bank of Montreal.

Excavation is finished for two stores and dwellings to cost \$4,000 on St. Eliz du Portugal street, for J. Dupuis, 65 Delinelle street; 2 storeys, 25 x 34, brick construction, gas and electric lighting, gravel roof.

North Vancouver, B. C.

Plans are being prepared for 2-storey by architect, Jos. H. Bowman, Crown Building, Vancouver.

Paisley, Ont.

Negotiations are in progress towards the establishment of a furniture factory here.

Port Colborne, Ont.

The Union Furnace Co., Buffalo, N. Y., Jas. Salmon, manager, will probably erect a small steel plant here.

Prince Albert, Sask.

M. C. Tyren, Prince Albert, will build extension to hotel to cost \$50,000 on Central avenue; architect, Olaf Albrectson, Prince Albert; 5 storey, 38 x 50, brick foundation, steam heating, electric lighting, gravel roof, freight and passenger elevators, fireproof throughout. Excavation started. Tenders are called to close as soon as possible. Contracts let locally where possible.

Quebec, Que.

Tenders are called for erection of a branch bank to cost \$25,000 on Crown and Defosses streets, for Bank of Hochelaga, Montreal; architect, A. H. Papierre, 30 St. James street, Montreal. Building to be altered for banking business. Architect has received a number of tenders.

Regina, Sask.

The Overland Automobile Co. of Canada, Ltd., announce their intention to locate a plant in Ontario.

Ridgeville, Ont.

The Pelham Canning Co. will build large pea and corn canning plant to their factory. Machinery will be required.

Toronto, Ont.

The Governors of Girls Industrial Refuge, Belmont street, Toronto, will build a new laundry; president, Mrs. Gunther; secretary, Mrs. Pardoe.

Tenders closed for garage, 167 King west, \$2,600, 1 storey, 138 x 30, brick, tar and gravel roof, skylights; owner, Andrews Bowman & Co.; architect, Leonard Foulds, 21 Leader Lane.

Excavation has started on stable, to cost \$7,000, 385 Front street east, steel beams, brick and frame, mill construction, skylights, metal cornice; owner, F. Hodgson, 81 Front street east; architects, Chadwick & Beckett, 18 Toronto street.

Tenders are called for erection of a store and dwellings to cost \$3,000 on Dufferin avenue, for Jas. Manchester, Dufferin and Bird avenue; architect, L. Foulds, 21 Leader Lane; 2½ storeys, brick and stucco. No date specified for receiving tenders.

Tenders are called for additions to office to cost \$5,000 on Bay street, for Baillie, Wood & Croft, Bay street, Toronto; architects, Darling & Pearson, 2 Leader Lane, Toronto; hardwood trimming, metal cornice, felt and gravel roof. No date specified for calling for tenders.

Tenders are called for addition to warehouse to cost \$9,000 on Adelaide west, for Gurney Foundry Co., Adelaide west; architect, A. R. Dennison & Stephenson, 20 King west, Toronto; 1 storey, fireproof doors, pitch and gravel roof, wood-framing, freight elevator. No date specified for receiving tenders.

Tenders will be called shortly for a warehouse to cost \$30,000, on Richmond street west, for C. S. Boone, 142 Crescent road, Toronto; architect, Chadwick & Beckett, Canada Permanent Building, Toronto; ornamental glass, tiling, hot water heating, electric lighting, steel sash, Duplex hangers, hardwood trimming.

Vancouver, B. C.

Blouvel, Stewart & Welch, Ltd., capital \$500,000, Bellington, Wash., Canadian headquarters, Winch Building, Vancouver; main works, Myrtle Point, near crane not wanted till later, steel work,

Van Andra, B. C., propose to build a saw-mill at some convenient point on the coast; holdings amounting to 11,800 acres already acquired.

Contemplated branch factory for E. C. Atkins & Co., Ltd., Indianapolis, Ind., Can. branch, Hamilton, Ont.; local manager, W. C. Birdsall; asst. manager, A. F. Arnett. Lease of 6-storey building at 109 Powell street—work to be carried on—grinding saws and finishing inserted tooth saws.

Welland, Ont.

The Henrietta Hotel Co., Welland, capitalized at \$200,000 are negotiating for a site for the erection of a new hotel.

Wingham, Ont.

The Western Foundry Co., Ltd., manufacturers of stoves, etc., at a meeting of the directors on Oct. 25th decided to build addition to plant quadrupling present capacity. Required—construction material; new boiler, engine and machinery.

Winnipeg, Man.

Work is in progress for business building on Notre Dame avenue, for Farmers Advocate Publishing Co., London.

CONTRACTS AWARDED**Brantford, Ont.**

Extension to bank, \$4,500. Canadian Bank of Commerce, H. W. Filton, mgr.; architect, J. R. Nichol, Dominion Realty Co., Ltd., Toronto; general contractors, Schultz Bros. Co., Ltd., Brantford; heating and plumbing, T. A. Cowan; tar and gravel roofing, electric lighting in conduits, hardwood interior finish.

Calgary, Alta.

Contemplated block to cost \$30,000 (East Calgary); contractor, L. R. Burns, Centre street; 3 storey, brick, 75 x 130.

Hamilton, Ont.

Equipment is required for garage, to cost \$3,000 on John street, for Thos. Ramsay, Market street; architects, E. B. Patterson, 167½ King east; general contractor, Howard & Webber, 23 Mary st. carpentry, A. Grissette, 50 East avenue N.; brick and steel, steam heating, tar and gravel roof, concrete floor, office furniture, oil tank, vault and electric wiring required. Contracts let Oct. 26—permit issued; excavation begun.

Equipment is required for a boiler house to cost \$3,000 on Sherman street for International Harvester Co., Ltd.; general supt., A. E. McKinstry; contractor, Geo. Mills, 614 King east (tenders let privately Oct. 30th); 1 and 2 storey, 30 x 70, stone foundation, electric lighting, slate roof, concrete floors; required, one boiler for heating wood shop.

Plans have been completed for manufactory to cost \$30,000 on Waterbury street, for Hamilton Bridge Works Co.; general manager, R. M. Roy, Stewart street; architect, Prack & Perriene, Hill-yard street, Hamilton; general contractor, Geo. E. Mills, 614 King street east, Hamilton; private tenders, awarded Oct. 30th; 1 storey, 70 x 180, steel and corrug iron, stone foundation, electric lighting, corrugated iron roof, concrete floors and vault for patterns, etc.; iron working machinery required, travelling handled by company; girders to be manufactured.

Montreal, Que.

Factory for The Industrial & Manufacturing Co., Ltd., 227 Wellington st., Montreal; heating installation awarded to H. Blake, 227 Wellington street. Mr. Blake is in the market for purchase of two low pressure, cast iron boilers.

Stores and dwellings to cost \$6,000, for James Proulx, 99 James street, Montreal; general contractor, F. & D. Proulx, 99 St. James street; 3-storey, 50 x 52, stone foundation, gas and electric lighting, gravel and tar roof. Excavation started.

Work is in progress for offices to cost \$40,000, Longue Pointe Ward, for Montreal Locomotive Works, Ltd., 41 Bank of Ottawa Building, Montreal; contractors, Shearer, Brown & Wills, 225 St. Patrick street; 2 storeys, 40 x 80, concrete and brick, steam heating, electric lighting, gravel roof. Brick work started. Building to be finished Jan. 1st.

Extension to can factory to cost \$8,000, 736 Mullins street, for A. R. Whittall, 736 Mullins street, Montreal; architects, Comber & Comber, 4113 Dorchester street, Montreal; general contractor, S. Whitaker, 285 Highland avenue, Montreal; brickwork, S. Marchessault, 8 Pacific street; painting and glazing, W. H. Reid, 4903 Sherbrooke west; roofing, Douglas Bros., 19 St. Maurice street, all of Montreal.

Bank and clerk's rooms on Park avenue, for The Molson's Bank, St. James street, Montreal; architect, Philip J. Turner, F.R.I., B.A., 21 Board of Trade, Montreal; masonry, etc., Byers & Anglin, 65 Victoria street; plumbing and heating, Selkirk Bros., 109 St. Viateur street; 2 storey, 30 x 55, buff pressed brick, hot water heating, electric light-gravel roof, hardwood interior finish.

Work is in progress for erection of a warehouse (Shannon and William streets) for Marlatt & Armstrong Co., Ltd., 305 Craig street west; architect, E. & W. S. Maxwell, Beaver Hall Square, Montreal; excavators, Masonry-Reid, McGregor & Reid, 668 St. Catherine street, Montreal; 4 storey and basement, 60 x 100, electric lighting, gravel roof, brick, no machinery. No other contracts given out. Work to go on in winter.

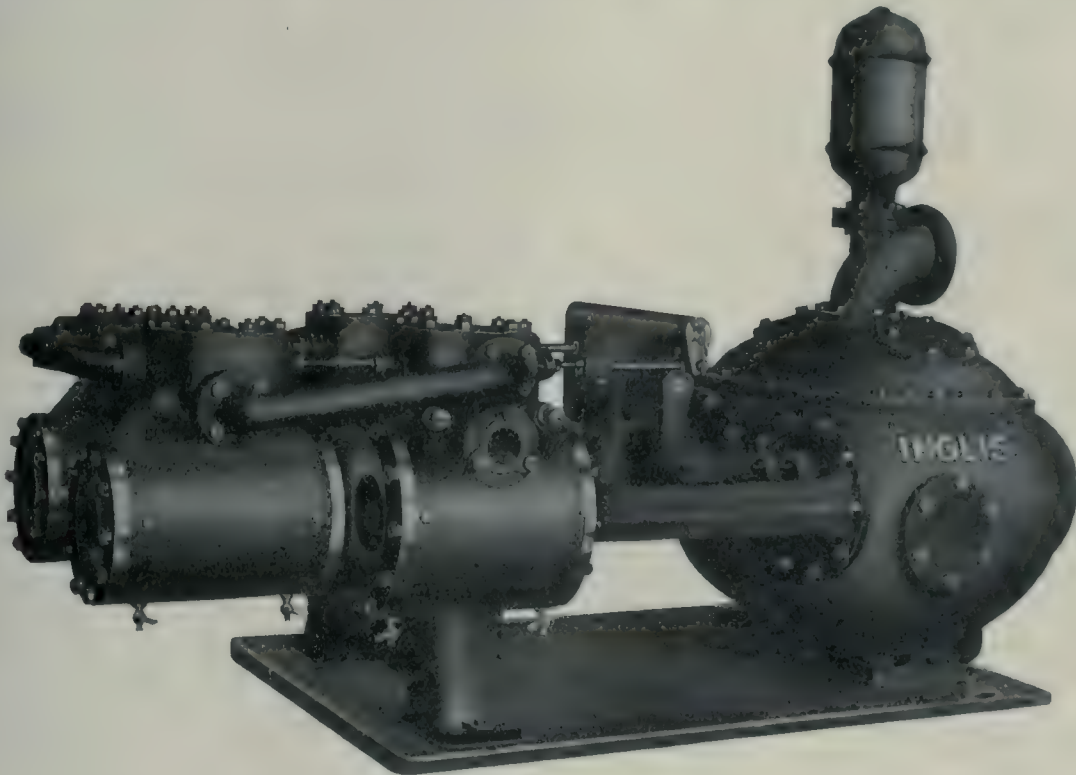
Garage to cost \$25,000 on Amherst street, near Craig street, for Harry Weaver, 85 St. Famille street, Montreal; architects, Finley & Spence, 46 Beaver Hall Hill, Montreal; general contractor, E. G. M. Cape, 57 St. Peter street, Montreal; 3 storey, reinforced concrete, hot water heating, electric lighting, tar and gravel roofing. Tenders for freight elevator, heating system and electric lighting not yet closed.

Clothing factory extension to cost \$30,000, for Campbell Manufacturing Co., Ltd., Elmiere street, Montreal; architect, Jos. Perrault, 2106 Park avenue, Montreal; general contractor, Shearer-Brown & Wills, Ltd., 225 St. Patrick street, Montreal. Extension to clothing factory will be finished in a few weeks. Some sewing machines, motors and shafting will be required. Most of the addition is for stock room space. Other sub-contracts not yet awarded.

Factory to cost \$112,000 for The Gillette Safety Razor Co. of Canada, Ltd., owner; architects, Lockwood & Grace, Boston. The following are the contracts let: Sprinkler system, Rockwood Sprink-

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ler Co. of Canada, Ltd., 143 Maurice st.; exterior marble, the Missisquoi Marble Co., Ltd., 631 Coristine Building; interior marble and slate, Smith Marble & Construction Co., Ltd., 145 Van Horne; mosaic and tile, the Calkins Tile & Mosaic Co., Ltd., 458 Bleury street; flooring, Georgian Bay Shook Mills Co., 5 Laval avenue; cement and brick, Al-las Construction Co., 745 St. Catherine west; electric wiring, the Sayer Electric Co., 87 Gleury street; elevators, Otis-Fensom Elevator Co., Ltd., 368 St. James street; door (wooden), V. E. Traversy, 15 Josephat lane; plumbing & heating, Conroy Bros., 291 Centre street; roofing, the Metal Shingle & Siding Co., Ltd., 91½ Delorimer avenue; contractor for iron work, Dominion Arch Iron Works, Ltd., 63 Dalhousie street.

Niagara Falls, Ont.

Extensions to block, \$3,500; A. E. Dell, Main street; carpentry contractor, Thos. Bowman; masonry, S. Miller, both of Niagara Falls S.

Nanaimo, B. C.

Addition to telephone exchange to cost \$7,500 for The B. C. Telephone Co., 555 Seymour street; contractors, Masher Bros, Nanaimo; 2 storey, brick and concrete.

Saskatoon, Sask.

Work is in progress for garage and warehouse to cost \$60,000 for McLaughlin Carriage Co., Oshawa; architect, Wm. Fingland, 334 Portage avenue, Winnipeg; general contractor, J. W. & H. P. Find, Winnipeg; 3 storey warehouse.

St. Albert, Alta.

The foundation Company, Ltd., Bank of Ottawa Building, Montreal, has the contract for sinking of shaft 35 ft. in diameter to a depth of 200 ft. for the development of the coal mine of St. Albert Collieries Ltd., Montreal.

Toronto, Ont.

Ice house to cost \$6,000, Keele and St. Clair, for Swift Canadian Co., Keele and St. Clair; contractor for concrete work, Wells & Gray, Confederation Life Building, Toronto.

Machinery is required for blacksmith shop to cost \$3,500, for Canadian Ornamental Iron Co., Ltd., 147 Sumach st., Toronto; contractor, Thompson Bros., 151 Rusholme road, Toronto; brick, tar and gravel roof.

Office and warehouse, \$75,000; structural steel, steel stairs, sheet iron vaults, cast iron vents, steel sashes; architect, Curry & Sparling, 90 Yonge street; owner, G. J. Foy, 34 Front street west; builder, E. Reynolds.

Factory to cost \$3,000, S. side Lake street, for Wilson Lumber Co., 1 Spadina avenue, Toronto; builder, E. E. Woodley, 158 Davenport road, Toronto; frame, brick foundation, covered with galvanized iron, tar and gravel roof.

Addition to factory for Delany & Pettit Co., Ltd., 113 Jefferson avenue, Toronto; architect, Langley & Howley, 169 Bay street, Toronto; painting, Taylor & Co.; masonry, Witchall & Son; metal, A. B. Ormsby; carpentry, A. A. Grant; elevator, Turnbull Elevator Co., all of Toronto.

Warehouse to cost \$35,000 on Ter-auley street, for T. Eaton Co., 190 Yonge street, Toronto; contractor, Thompson Bros., 151 Rusholme Road, Toronto; 4-

storey and basement, brick and lumber, felt and gravel roofing, c.i. columns, steel sprinkler system, hose.

Addition to factory for Delany & Pettit Co., Ltd., 113 Jefferson avenue, Toronto; architect, Langley & Howley, 169 Bay street, Toronto; painting, Taylor & Co.; masonry, Witchall & Son; metal, A. B. Ormsby; carpentry, A. A. Grant; elevator, Turnbull Elevator Co.; all of Toronto.

Work is under way for the erection of a warehouse to cost \$5,000 at 178 Spadina, for Wettlauffer Bros., Spadina avenue; contractor, Thompson Construction Co., 34 Yonge street, Toronto; 1 storey, concrete, 98 x 34, felt and gravel roofing. Firm manufactures concrete machinery.

Office building to cost \$900,000, cor. King and Yonge streets, for Canadian Pacific Railway, Montreal; architect, Darling & Pearson, 2 Leader Lane, Toronto; general contractor, Geo. Fuller & Co., 208-14 King street east, Toronto, or Jacobs Building, Montreal. Steel, Dominion Bridge Co. Tenders called on plumbing, heating, refrigerating, elevators in about ten days when plans come from New York.

Warehouse to cost \$40,000, 73 Wellington street, for E. B. Eddy Co., Front street east, Toronto; architect, Chadwick & Beckett, 20 Toronto street, Toronto; general contractor, Chalkey & Son, Janes Building, Toronto; 4 storeys, and basement, brick, stone and mill construction, art stone, tiling, steel beams, 600m. brick, boiler, metal frames, felt and gravel roofing, fire doors, Dunham Vassum system, Dunham Radiator traps electric wiring and gas piping, sprinkler system, electric elevators. Excavation started.

Vancouver, B. C.

Hotel to cost \$1,000,000 on Georgia street; architect, W. S. Painter; contractor, Skene & Christie, 770 Howe street, Vancouver. Central portion 16 storeys. Foundations for main building started at once.

Four-storey brick mill, store and rooming house, Main street, tar and gravel roof, wire glass, hard wall plaster, \$25,000; architect, Hugh Braunton, Exchange Building; contractor, M. Parsons, 1445 Semlin Drive.

Victoria, B. C.

Hotel to cost \$65,000, for Challoner & Mitchell, Victoria; architect, Thos. Hooper, Royal Bank Chambers, Victoria; general contractor, Luney Bros., 10 Lee Building, Broad street; pressed brick, limestone, 16 sets of bath and plumbing fixtures, steam plant, elevator. The building will include 2 stores and grill room in basement.

Westmount, Que.

Excavation started for stable, to cost \$3,000, 2 storey, 30 x 35, Plastic brick, electric lighting, roof part slate and part felt and gravel; owner, A. McD. Drummond, Aberdeen avenue; architect, R. Findlay, 10 Philips Place; contractor, Robertson Bros., 10 Chestnut street.

Winnipeg, Man.

Garage to cost \$50,000 on Water st., for G. Stirrett, 406 McGreevy Block, Winnipeg; general contractor, John McQuarrie, Nanton Block, Winnipeg; 3 storey, 50 x 108, Turners Mushroom fireproof, concrete foundation, steam heating, electric lighting, tar and gravel roofing, dynamos, freight elevators.

Power Plants, Electricity and Telephones

Vancouver, B. C.

Tenders received for 286 5-light standards were as follows: Evans, Coleman & Evans, \$65.75 each, and Ross & Howard Iron Works, \$13,585 for the whole number, and \$47.50 for each additional. For a supply of Galvaduct conduits, the Northern Electric & Mfg. Co. tendered \$3,101.79. Referred to city electrician.

Victoria, B. C.

Tenders are called for supply of 2,600 12-in. r.i. globes and 100 14-in. globes for the new standards being placed on streets. Received by purchasing agent until Nov. 3rd. Purchasing agent, W. W. Northcott.

Miscellaneous

Hamilton, Ont.

City has decided to get tenders on auto police patrol. Particulars are also being secured by City Hospital, Dr. Langrill, Supt., as to an auto ambulance.

London, Ont.

Tenders are called for fire department supplies; 1,000 ft. of 2½-in. cotton rubber lined hose, with No. 1 couplings to fit our threads, six fire duty helmets; one set of runners for service truck. To be delivered before Nov. 27. Further information from chief fire department. Received by city clerk. Ald. Ashplant, chairman No. 3 Committee; John Aitken, Chief Fire Department.

Moose Jaw, Sask.

Tenders are called until Nov. 13th for supply of 20 non-interfering type fire alarm boxes complete. Received by city clerk, W. F. Heal.

Tenders called for fire apparatus; one pumping engine, capacity 800 to 850 gal. per minute; also motor-driven pumping engines, motor-propelled steam pumping engines or horse drawn steam pumping engines. Received by city clerk until 8.30 p.m. December 4th. City clerk, W. F. Heal.

Niagara Falls, Ont.

The Fire, Water and Light Committee will ask council to submit by-law in January to raise \$2,500 to buy aerea truck, also drop harness for fire purposes.

Temiskaming, Que.

Tenders are called until Nov. 15th for supply of 6,000 bbls. on C.P.R. about 40 miles north of Mattawa. Plans, etc., at offices of J. L. Michaud, Esq., district James street, Montreal, and J. G. Sing, district engineer, Confederation Life Building, Toronto. Department of Public Works, Ottawa; secretary, R. C. Desrochers.

Toronto, Ont.

The Board of Control have secured the services of Moore & Scollan, King west, who will figure on the comparative prices of electric trucks for the service of the city.

Vancouver, B. C.

No tenders were received for the plant of the Sechelt Brick Co. at Storm Bay. Plant is now for sale. For further information apply Vancouver Financial Corporation, Ltd., Dominion Trust Building.

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Vol. 25 November 15, 1911 No. 46

Inadequate Publicity on Toronto Subway

Attention has frequently been directed in these columns to the need for greater publicity in the case of important engineering works. It seems, however, that much remains to be said and done before definite improvement can be recorded.

The proposed tube system for the city of Toronto furnishes the latest example of inadequate advertising. It will be recalled that a week or so ago Capt. Yates, representing the English firm of Perry & Co., appeared before the Board of Control at Toronto and asked for an extension of time to enable him to figure on the subway construction. He stated that the specifications had not reached his company forty-eight hours when he took steamer for New York and hurried on to Toronto in order to obtain time to tender. Capt. Yates made application for an extension of time which was supported by Mayor Geary and others, but the request was refused owing to Controller Hocken's anxiety to get the project before the people on January 1st. From enquiries we have made it would appear that the first intimation Capt. Yates received of Toronto's proposed subway was from a small paragraph in the "Standard of Empire." He at once made enquiries at the London office of the Ontario Government. Here he was unable to obtain detailed particulars, but he finally succeeded in getting the specifications and took steamer on October 20th, arriving Saturday, October 28th. Owing to the Thanksgiving holiday he was unable to make his application to the Board of Control until Wednesday, November 1st.

The mayor suggested that it would be better to grant the extension and submit the matter to the rate-payers in February. The consensus of opinion was against him, however, and the eagerness with which certain of the Controllers insisted that the matter should be voted upon on January 1st is conclusive proof that Toronto's pet scheme is not altogether

dissociated from electioneering. Surely, in such a case, where millions of dollars of the city's money are involved, every consideration should have been given British contractors, especially those whose previous experience qualified them pre-eminently for the work.

Capt. Yates pointed out that his firm had constructed no less than twenty-five miles of subways in the city of London, including the well-known Bakerloo tube under the River Thames. He was disappointed at the lack of consideration shown him after the special effort he had made to compete for the work.

Civic Officials Poorly Informed

With such sentiments as disappointment we have little concern. But with the well-advised expenditure of public funds and the interests of the British contractor we are closely identified. It appears that advertisements for this subway were given two insertions in a couple of British engineering papers. This is surely not sufficient publicity in a country which possesses in its capital city a greater number of inhabitants than we have in the whole of Canada. What results could be expected from such advertising in Canada? How much more ridiculous is it, then, to expect satisfactory results from such publicity in Great Britain and Europe? If the work was worth advertising at all and if the city authorities were really anxious not only to give British firms a chance to tender but to obtain the benefit of the experience which they have acquired on similar construction, surely the work should have been advertised far more extensively. As a matter of fact, the officials at the Toronto City Hall seem to have little information about British institutions and British publications, and this despite the facilities for reference afforded at the Public Library, the Engineers' Club of Toronto, etc. If such publicity is to be placed to the best advantage certainly the authorities should be sufficiently informed to designate the particular journals in which their advertisements are to appear. Primary consideration would appear to have been given to advertising the work in Boston and New York, and publicity in the Old Country left more or less to chance. It appears that a notice calling for tenders on the Toronto subway was published in the October 20 issue of "The Engineer" (London). If the city paid for this advertisement it was money wasted, for tenders closed in Toronto at noon, November the first. It would be interesting to have a detailed explanation as to the weak-kneed publicity given to this work in the Old Country.

Experimental Work Expensive

Apparently the authorities have yet to learn that economy in engineering construction is not necessarily in obtaining low figures, but in obtaining the best prices for the most permanent and reliable construction. We do not contend that because a firm has never carried out a certain work that it is impossible for it to do so according to specifications, but it cannot be gainsaid that experience always tells, and that experimental work, however little of it there may be, is generally expensive. The great British firms have all the requirements for such work, if experience, skill and capital are the desiderata. But perhaps they are not.

How is it that there is always the same lack of foresight; and why is it that the municipal authorities throughout the country will insist upon this

"penny wise and pound foolish" policy of publicity? What is a hundred dollars more or less in advertising work involving an expenditure of millions?

It may well be argued that English contractors show little enterprise in not following up closely the announcements of such work in Canadian technical publications, but for all that the responsibility of the city is none the less. Inadequate notice of such work opens up avenues of possible expense which would be closed effectively, economically and permanently by due publicity.

U. S. and Canadian Trade Conditions — A Contrast

In striking contrast to the activity prevailing in the Canadian engineering and building fields, trade conditions over the border are anything but flourishing. The situation there is summed up by Engineering News, of New York, in part as follows:

"The volume of business being transacted by contractors and manufacturers is the cause of much complaint. In the manufacturing line, especially, the pessimism must be attributed to over-confidence during the boom of 1906. Then the producing capacities of almost all plants in the country were taxed to their utmost and manufacturers, believing there could be no limit to the demand for their product, to the extension of credit or to the supply of labor, provided additional capacity; in numerous instances doubling the existing plants. This is the cause of the complaint of poor business today. Manufacturing facilities increased faster than the consumptive demands, and with plants now running to 75 per cent. of their capacity, the output is 50 per cent. in excess of five years ago. With many competitors struggling for business, the resultant profits are particularly narrow.

"The cement industry is a striking example of this. The production has more than doubled in five years, but the price is now lower than ever before.

"The small margin of profits accruing to manufacturers is not a theory, but a condition. In each case it will have to be worked out according to the particular lines. Any scaling down of wages will be extremely difficult under the present era of high-priced food stuffs, and with the present temper of labor organizations.

"New contracting work has been falling off to a marked degree within the last fortnight. This is noticeable in all sections of the country. In the building trade, particularly, there has been a sharp contraction of business."

Compare such conditions with those obtaining in Canada. From every section of the country the most favorable reports continue to be received. Despite the lateness of the season, building operations and municipal work are being pushed forward aggressively and the announcement of important new projects from every town and city in the Dominion is received daily with unerring regularity. The last daily budget of advance news issued by MacLean Daily Reports, Limited, is a revelation as to the state of Canadian trade at this advanced period of the year.

Among the items noted in one day's reports are the following:

Toronto, Ont.

Competitive plans called for Stock Exchange Building.

Contracts awarded for Obstetrics Building and Private Patients' Building, Toronto General Hospital.

Montreal, Que.

Residences, etc., involving a cost of approximately \$200,000.

Alterations to factory, Imperial Tobacco Co. Winnipeg, Man.

Contemplated—New Court House for Provincial Government.

New Theatre for Sullivan & Considine Circuit. Estimated cost, \$300,000.

Fort William, Ont.

Plans for C. P. R. subway. Estimated cost, \$150,000.

Neebawa, Man.

Tenders called for waterworks and sewerage. Estimated cost, \$100,000.

Calgary, Alta.

Plans prepared by city for bridge. Estimated cost, \$100,000.

Vernon, B. C.

Contract awarded for Court House, \$174,000.

Vancouver, B. C.

Permit for King Edward High School, \$125,000.

Permits for residences; approximate total, \$100,000.

Galt, Ont.

Tenders to be called for Y.M.C.A. Building.

The above items are selected casually from a list of perhaps a hundred announcements and the volume of work upon the particular date on which they were issued is by no means in excess of the average, while it is considerably lower of course than the average prevailing in the height of the season or even earlier in the year. Add to these things a brief consideration of the building returns from our principal cities and one's convictions are still further strengthened. During the ten months of the year ending October 31st, the building permits issued at Toronto totalled \$20,306,697; at Montreal \$13,079,165; at Winnipeg \$16,939,650, and at Vancouver \$15,065,645. In each instance new records have been made and the predictions of the most optimistic prophets surpassed. An example of this may be found in a letter indited recently to the Contract Record by Mr. S. H. Jarrett, Building Inspector, Vancouver, of which the following is an extract:

"In the early part of the year I estimated the year's building operations at fifteen million dollars. This estimate has been exceeded in ten months and there are good prospects of increasing this total two or three millions during November and December."

The Engineering News has to devote a full column to a story of trade depression; to an account of the complications attendant upon the proposed dissolution of the U. S. Steel Corporation; to the low prices ruling in the supply market, and to the comparatively unsatisfactory conditions obtaining in the labor world. This is a very different task from our own. Our manufacturers are prosperous and have the enjoyment of rapid yet normal growth; "trusts" are

cutting small, if any, figure with us; a healthy demand in every line of business is characteristic of our supply market, and we have no labor troubles.

We entertain the most friendly feelings towards the manufacturers of the United States and we have always advocated equal conditions wherever possible and wherever equitable in the competition for Canadian business. At the same time we cannot but congratulate ourselves that our trade is not subject to the depressing influences of certain American institutions. Everyone has read the story of Bunyan, who exclaimed when he beheld the criminal: "There, but for the grace of God, goes John Bunyan." We for our part might say with equal sincerity, if not perhaps with the same devoutness: "These, but for the grace of God, might be the conditions of Canadian trade."

The more we look around us and the more we study other fields, the more satisfied are we with our heritage and the boundless possibilities of our own country. Our American contemporaries will possibly regard this as a pharisaical utterance; but it is not so. Rather is it an evidence of that enthusiasm which is inhaled with the very atmosphere of this Northern zone.

Technical Training for Road Engineers

The Annual Report of Mr. W. A. McLean, Provincial Engineer of Highways for Ontario, is reviewed elsewhere in this issue. The subject of technical training for road engineers is, however of such far-reaching importance as to be worthy of special prominence. Mr. McLean says:

A definite technical training in road construction is a growing need in association with Schools of Engineering. Roads and streets are the first works to be undertaken through municipal organization. Their universal use has led to the general feeling that no skill is needed in their construction, and this in turn has brought about a great misuse of public money. A better understanding of the situation is steadily growing, and a demand for engineers experienced in road-building has arisen.

It is greatly in the public interest that trained road builders should be employed, and to encourage this it is necessary that engineers should be so educated that they can immediately prove the value of their services when opportunity arises.

In European countries wherever good roads are built, engineers are employed for their supervision. In France, L'Ecole Nationale des Ponts et Chaussees is maintained by the national government, and from it their corps of highway engineers is drawn. Students, who are nominated by the President, receive a training extending over three years, in all details of highway engineering. In England and Germany, public opinion demands that roads shall be under the direction of engineers of recognized standing. The United States Office of Public Roads at Washington is giving a one-year post-graduate course in highway engineering, in which graduate engineers may receive theoretical and practical training. Road building courses have been established in State Universities of New York (Columbia), South Carolina, Washington, and Alabama.

The theory of road building is neither difficult nor extensive. The fundamental parts are now included in all engineering courses. Bridge design, a division of highway engineering, is fully covered. But there

is a need that, as mathematics and strength of materials are taught to students through bridge design, so the rudiments of road building and paving, including physics, chemistry, geology, etc., should be brought before them in a practical way by a study of their application to road building and paving. A course of lectures covering accumulated experience respecting all forms of pavements and roads, and details of construction; together with a laboratory for the testing of materials, would render valuable service to the Province.

Intrigue Revealed at Victoria, B. C.

City Engineer Smith of Victoria, B. C., who was recently indicted by the mayor, submitted his defence to the council in the form of a report covering thirty foolscap pages. In this report Mr. Smith demonstrated clearly to the satisfaction of the aldermen that he had been the object of intrigue. As a result the council have since been very severe in their criticism of the un-British treatment which Mr. Smith has received at the hands of the chief magistrate. It is to the credit of the community of Victoria that they have finally come out openly in favor of fair play, but it is a gross injustice for a municipal engineer to have to go through an ordeal of this kind, for no monetary considerations can remove a stigma once attached to a good name. The Victoria press congratulates their city engineer upon having gained immensely in the favor of the citizens and expresses the hope that from now on politics will be eliminated from civic administration. With all of which we agree.

Gratifying Public Interest in City Planning

A marked public interest which promises well for the advancement of civic art and city planning was manifested last week in Toronto at the illustrated lectures given in the University Convocation Hall by Mr. Thos. Mawson, the well-known English expert. The lectures were given under the auspices of the University of Toronto, the City Council, the Civic Guild, the Board of Trade, and other public bodies, and the chair was taken at the various lectures by such well-known public men as Sir James Whitney, His Honor the Lieutenant-Governor and Sir Edmund Walker. The subjects discussed included: City Building—The Ideal and First Principles of City Planning; The Civic Survey, and the Preparation of Data upon which to Found a Plan; Street Planning with special reference to Traffic Problems incidental to Manufacturing, Commercial and Residential Areas.

City engineers would appear to be cheap in Ontario, according to the "Standard" of St. Catharines, which records the appointment of a city engineer at a salary of \$300. In point of fact the appointment was given to the waterworks engineer at an increase of \$300 on his former salary.

The Brant Historical Society claims that the musket recovered by City Engineer Ker, of Ottawa, and supposed to have been that of the doughty Indian warrior, Chief Joseph Brant, is a fake. As a consolation the society suggests that Mr. Ker's musket might have been used by Mr. Brant's son, John, who participated in the war of 1812.

The Reader's Viewpoint

Are the Foundations of Canadian Municipal Government Weak?

Editor, Contract Record:

It was with no little satisfaction and, if I may be pardoned for saying so, with some amusement that I read your interesting editorial on Municipal Government at Victoria, published in your last issue. I have had the good fortune or misfortune—I have never really decided which—to have been identified with municipal engineering for nearly twenty years, during which period I have certainly had a sufficient number of bumps from the "bunglers" you criticize, to appreciate your remarks.

What you have to say about the gentlemen of the city council of Victoria should provide them with food for reflection but to my mind the point of your article is contained in the latter portion which deals with the responsibility of the engineer and his relations with those who employ him. The general public always entertained, entertains still, and always will entertain false ideas of economy in regard to municipal engineering work. These ideas are fostered and encouraged by their representatives in council, who, by championing the cause of the almighty dollar, strengthen their own position with their constituents and build up reputations for shrewdness which in nine cases out of ten are totally unmerited. Cities resting upon a basis of such authority are as insecure as a house built upon sand.

The question arises: how are the public to be educated to see these matters? I for one have no desire to shoulder such a colossal task. Perhaps, however, if each one of us uses his influence and sticks out once in a while for his rights, and for the authority which is supposed to be vested in him, there may be some chance for the municipal engineering profession in the next generation. For the present, however, I am none too sanguine.

Sincerely yours,

"One of the Profession."

Co-operation Essential between Council and Engineer

To the Editor of the Contract Record:

Sir,—Your article in the issue of your paper of November 1, on Municipal Administration at Victoria, B. C., will be read with considerable interest by engineers who consider their professional prestige one of their most valuable assets.

One hears so much about the duties of the municipal officials to their councils and through them to the public, that the reverse order of affairs is often overlooked. Every employer knows, or ought to know, that he has a duty to the employee. In this country of rapid development city councils ought to be composed of men of intelligence and unimpeachable integrity and not of the store-keeper type who often have only their own axe to grind. Exactly the same remarks apply to the engineer. The days of the non-descript are past.

A city council should direct on general lines the policy they wish their engineer to follow, leaving technicalities and details of construction to the engineer. How often is the reverse the case? In a com-

mittee perhaps the engineer will be told that a particular drain is either too small or too large, that the concrete is improperly mixed, not enough work being done, etc.

I have known a committee demand to consider all the details of an intricate specification and alter them. The result, as might be expected, was chaos—for which the engineer was blamed. No sane individual would alter his doctor's prescription. Why, then, alter an engineer's? If not satisfied with the prescription, change the adviser.

The municipal engineering profession of to-day is probably one of the most interesting, requiring, as it does, men of the highest theoretical and practical knowledge to cope with the varied problems that present themselves in the development and maintenance of our cities. I can safely add that it is, at the same time, one of the most trying. In view of this it seems to be clearly the duty of city councils to protect their engineer, remunerate him well and make him feel that he is a highly trusted and respected official.

As in all other professions, it is only too true that engineers have many black sheep in their ranks, and it is only by raising the standard of efficiency that these will gradually go to the wall. The Canadian Society of Civil Engineers and kindred institutions are doing much in this way to raise the standard of the profession above that of a "glorified laborer."

Happily some of us are engaged by cities where the most pleasant and agreeable relations exist between the council and its officials, where often a little tact and co-operation on both sides provide the solution to many a difficulty.

Yours truly,

"Main Outfall."

A bituminous road for heavy travel, due to the concentration of traffic by the presence of a street car line, has been constructed in West Springfield. The old surface was first scarified and then about 4 in. of 2½-in. stone was spread over it. A surfacing of ½ to ¾-in. stone was scattered over the top of this mass and it was well rolled. The compacted surface was next treated with Texaco road asphalt, using 1½ to 1¾ gal. per square yard, after which about ½ to ¾ gal. of Texaco paving cement was applied. Finally a layer of screenings was spread over the surface and rolled until it was hard. The claim made for this construction is that the use of large stones from top to bottom will keep the surface just rough enough to give a good foothold, while the covering of screenings will prevent the bituminous material from working to the surface and forming a muddy coat. The bituminous materials were poured with long-handled pots by two men at the rate of 500 sq. yd. per working day.

Sir John Jackson, M.P., of London, Eng., spent a day or two in Toronto last week. Sir John Jackson is many times a millionaire, and one of the largest contractors in the Empire. He was the contractor for the last section of the Manchester ship canal, foundations for the London Tower bridge, Dover harbor and Davenport Admiralty docks. At the present time he is building a harbor at Singapore, and the Transcontinental Railway in South Africa which is to be run from Durban on the Indian Ocean to La Paz on the Atlantic.

The Roberval Apartments, Montreal

The erection of apartment houses is on the increase in Montreal. A 23-apartment house is under construction for the estate of Madame Therese Ouimet, facing on Berri and Laballe streets, near Dorchester street. The bldg. has a frontage of 52 ft. and faces on both of the streets mentioned, while the depth from street to street is 91 feet. There are four storeys besides the basement. Each of the suites comprises five room, and the arrangement is such that every room has direct daylight.

The structure is entirely fireproof. The foundations are of concrete, the first storey is faced with stone and the upper storeys with Milton brick. A special feature of the construction consists of hollow reinforced concrete beams manufactured on the Siegwart system by the Siegwart Co., of Three Rivers. The partitions are of "Keystone" plaster blocks. The entrances and hallways are of marble, the stairs of iron, and the baths of tile. Dumb waiters have been provided for transporting heavy articles to the different storeys.

The architect is Mr. G. A. Monette, 97 St. James street. The contractors are: Marsan Bros. for concrete, brick and stone work; Damien Lalonde, carpenter work; Alexander Mackay & Co., plumbing,



Roberval Apartments, Montreal

heating and roofing; Nap. Depatie, plastering; Joseph Guy, painting and glazing; Dominion Bridge Works, steel work; Joseph St. Amour, electric wiring. The entire cost of the building will be about \$60,000. Plastering has just been begun and it is expected that the apartments will be ready for occupation early in January.

Winnipeg's Asphalt Pavements

The amount of asphalt laid in Winnipeg this year has already eclipsed that of any previous year by 50,000 square yards. Before the close of the season a total of 262,000 square yards will have been laid. This will be over thirty times as large as that of 1897.

An average day's output at the Winnipeg asphalt works is 60 to 65 dump wagon loads per day. To make this, about 30 tons of refined asphalt are used, as well as large quantities of sand and limestone. Recently, improvements made to the plant have increased the daily possible output 30 per cent. An elevator, an engine-drawn steel barrow, and a new drying drum, made in Winnipeg, are among the im-

provements. The power for the whole of the works is supplied by two large boilers, which during the day supply the necessary steam to a large 45-horsepower engine. The whole plant is entirely modern, the main object being to save labor. Elevators lift the coal and sand to the top of the building, and the large bins are filled with sand and limestone by a belt conveyor.

The prevailing opinion among experts in Winnipeg leans toward asphalt for road construction, partly on account of its durability and partly because it is easily removed in laying drains, sewers, etc. Except for this, Winnipeg might have been better fitted, owing to its clay subsoil, for the use of cement.

Road Building in British Columbia

Highway construction in the Rockies is being conducted on a systematic plan, and the British Columbian government, in addition to improving existing roads, is building one from Wardner, on the Kootenay River, to Crows Nest Pass, where it will join the highway system of Alberta. This will be an east and west route of about 75 miles. In addition, a road is under construction from Gateway, on the international boundary, northward to Wardner. The work is done under the general direction of the provincial agent at Fernie. Under him is a road superintendent who does all the construction and maintenance by day labor, no contracts being given out. Special appropriations are made for the bridges needed on these roads. The maximum grades at first are 8 per cent., but it is intended to reduce these to 5 per cent. as rapidly as possible.

Corrosion of Steel Reinforcement

Rusted steel reinforcement was one of the subjects which came up in the discussion of the paper on the proposed reinforced concrete Henry Hudson memorial bridge over Spuyten Duyvil Creek, New York, read by Prof. William H. Burr before the Municipal Engineers of the City of New York and published recently in the "Proceedings" of that society. Professor Burr was asked whether the steel was to be painted or otherwise protected against rust before the concrete was placed. He replied that the material would not be painted or similarly protected. "In fact," said Professor Burr, "it is not clear why anything of the sort should be done in reinforced concrete work. It is a point on which there is room for difference of opinion, but so far as my experience goes any coating put on the steel which would be effective in preventing corrosion would render impossible a perfect bond between the concrete and steel. A little corrosion would not be objectionable. It would roughen the surface of the steel without forming a coating. In other words, it would tend to increase the efficiency of the bond. Loose mill scale should certainly be taken off, but it would be objectionable to paint the steel or give it any protective coating."

Concrete and iron stairways are required by law in Cologne, Germany, in all buildings except single residences of two storeys. It is officially stated that there has not been a dwelling house burned down for many years as there are no wooden structures in the city, and fires in most instances have been confined to one room.

The Regina College at Regina, Sask.

The Regina College has been designed to give facilities for an education of a high character, and at the same time provide accommodation for boarding in order that students may be under supervision. Music is to form a special feature of the institution. The building now being constructed is part of a general scheme, and is being laid out in order to afford scope for future additions, one of which is now under contemplation. The site borders on Wascana Lake, as well as being next the city park, with the land sloping slightly towards the lake. The structure is being fitted temporarily with kitchen and dining room for students in the basement, which space later is intended to be devoted to manual training. The building is a reinforced concrete frame, with the exterior of brick and limestone from the Kettle River quarries. The towers form entrances to a large quadrangle, around which will be grouped other buildings at a future date. The interior is very simply furnished with a view to the purpose for which it is intended, viz.: class rooms, administration, and laboratories. Temporarily the top floor will be used for dormitories, later to be class rooms and laboratories. The architects are Messrs. Brown & Vallance, of Montreal. R. J. Lecky, Regina, has the general contract. The heating and ventilating are being done by the James Ballantyne Company, Ltd., Winnipeg.

Gypsum in Nova Scotia

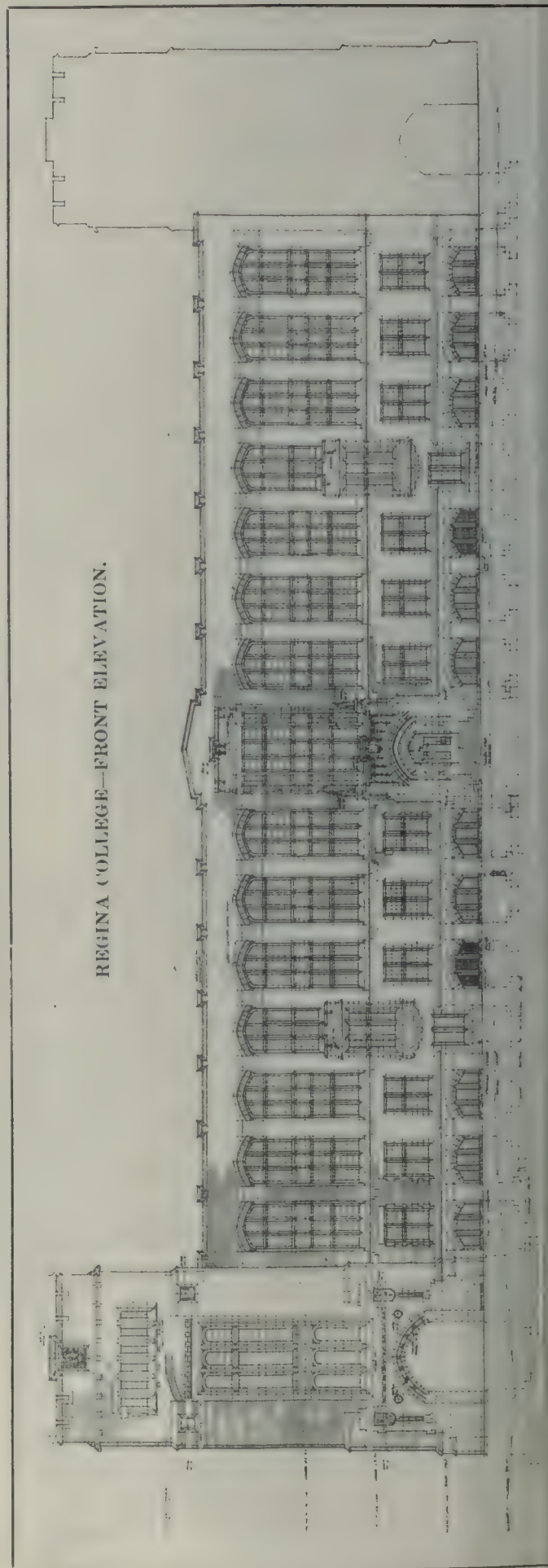
During the year 322,974 tons of gypsum were quarried in the province of Nova Scotia, this being an increase of 23,929 tons over the amount quarried during the previous year. Of the gypsum quarried 10,500 tons were used in the manufacture of gypsum products in the province, the balance was shipped to the United States.

The industry employed an average of 640 men during the whole year. The following properties were operated:—Wentworth Gypsum Company, Wentworth and Meadow, Hants County; Wallace Stone Company, Wallace; Kline Granite Works, Withrod Lake; Middleton Granite and Marble Works, Nictaux.

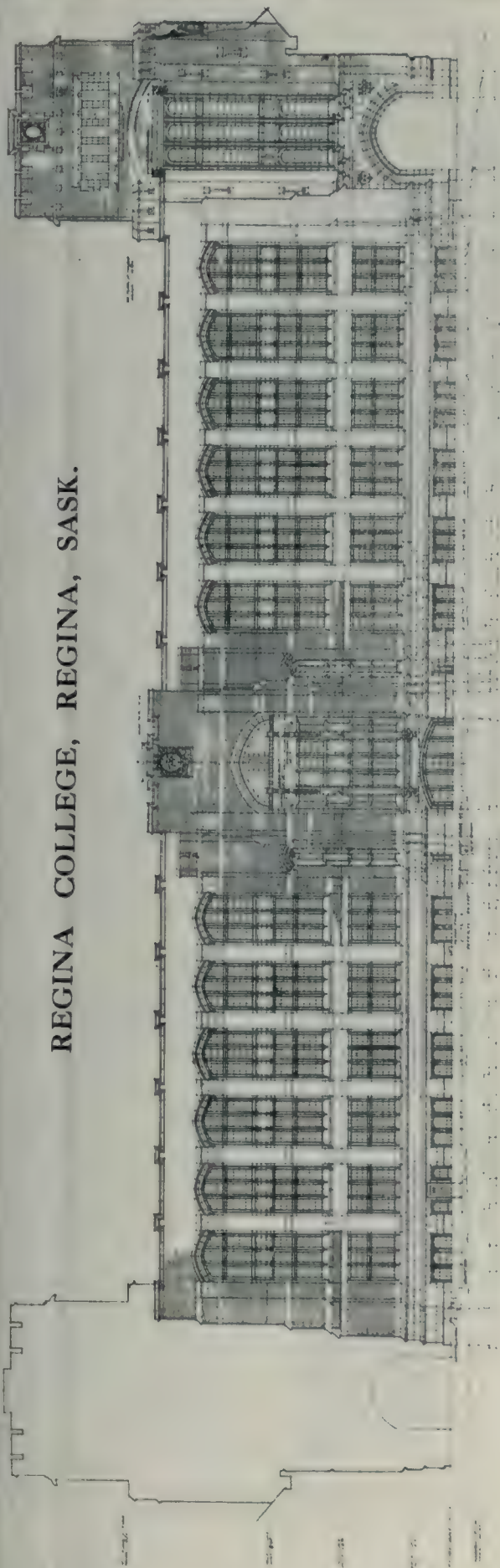
The demand for building stone during the past few years has been greatly lessened on account of the greater use of cement, the output of the quarries falling from 63,861 tons in 1907 to 8,503 tons during the year just ended.

A paint which indicates changes of temperature by changes of color is made, says the Engineer, of a mixture of 7 parts of saturated solution of potassium iodide and 134 parts of saturated solution of mercuric chloride with 1 part of pulverised copper sulphate and the necessary oils and driers. The paint changes its color between 115 deg. and 130 deg. Fahr., and is applied to any surface which it is desirable to know if it is becoming heated.

Pavements in Toronto are grouped into classes and the percentages of each type, as given in the 1910 report of City Engineer Rust, follow: Cedar block, 3.36; stone, 0.54; asphalt, 32.14; asphalt block, 1.04; wood on concrete (treated), 0.16; macadam, 10.68; tar macadam, 0.47; bitulithic, 6.55; brick, 6.37; gravel, 5.40; concrete, 0.72; unpaved, 32.57. The total yardage of asphalt of all classes laid in 1910 was 167,989 sq. yds., representing 11.8 miles.



REGINA COLLEGE, REGINA, SASK.



REAR ELEVATION



Ground Floor Plan



Office Building at Victoria, B. C.

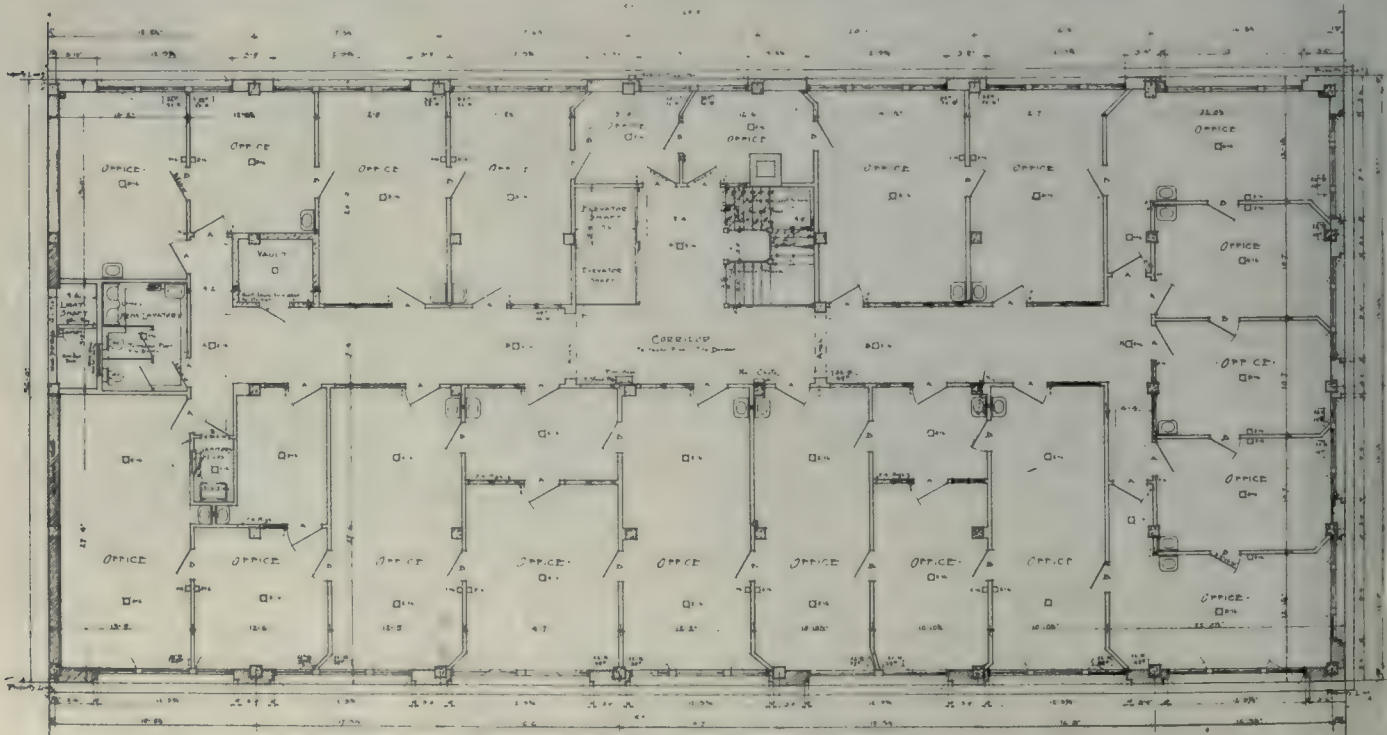
Architect—J. M. Warren, Victoria, B. C.

Reinforced Concrete Office Building, Victoria, B. C.

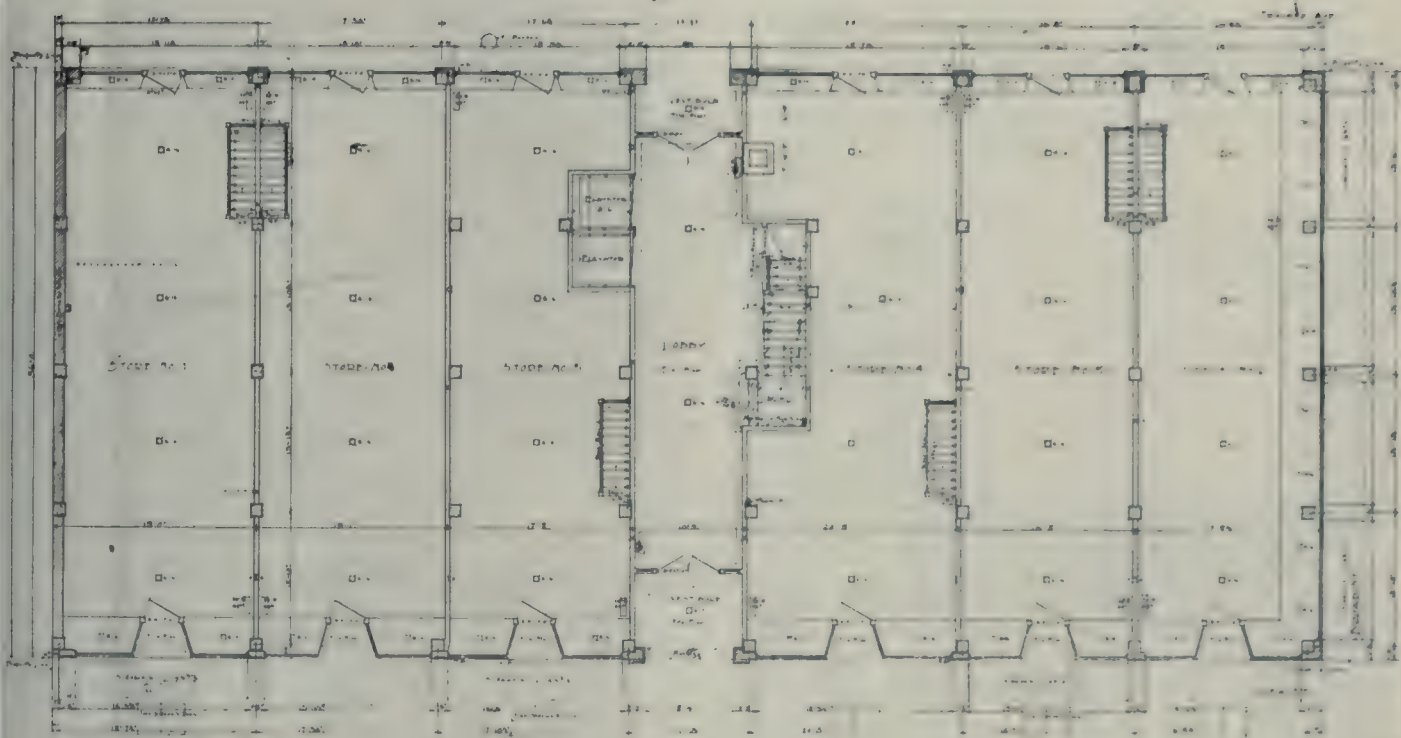
The accompanying view is the architect's perspective of the 6-storey reinforced concrete office building now being erected at Victoria, B. C., for Messrs. McPherson, Fullerton and others. Plans were drawn for four storeys of a six-storey building, but the contracts were eventually signed for the completed building of six storeys. The exterior of the building is being carried out in pressed brick, with terra cotta trimmings. The frame and floors are of reinforced

concrete. On the ground floor there are six stores with a 10-ft. lobby extending through the building from View street to Trounce avenue. On each floor there are 21 offices,—84 in all. The sixth and top floor will be the new home of the Comusen Club, Victoria, B. C.

The building is equipped with two elevators manufactured by the Llewellyn Iron Works. The elevator fronts and stairs throughout will be execut-



First Floor Plan of Building at Victoria, B. C.



Ground Floor Plan of Building at Victoria, B. C.

ed in bronze; marble wainscot and tile floors. On each floor there is to be one large vault with individual steel boxes for each tenant.

The general contract for the building was awarded to the Sound Construction & Engineering Co., of Seattle, Wash.; the plumbing and heating to Cleator & Flemming, Victoria, and the electrical contract to the Empire Construction Co., of Vancouver, B. C. The total estimated cost of the building is \$125,000. Mr. Jesse M. Warren, formerly of Seattle and San Francisco, 414 Sayward Building, Victoria is the architect.

Concrete in Greenhouses

Concrete benches for green houses, in place of cypress, which is usually considered the best material for moist conditions, have been used in thirteen 250 ft. houses at the plant of Behlmann Brothers Company, Morton Grove, Ill., and are being put into use in thirteen new houses of the same size. The bench consists of 6-in. tapered posts, with 10-in. bases, $1\frac{1}{2}$ in. by 6-in. cross beams, 49 in. long, resting in slots in the posts and 2-in. by 4-in. stringers, 6 ft. $2\frac{1}{2}$ in. long, resting on the cross beams. The sides and ends of the box top are 10 in. high and $1\frac{1}{4}$ in. thick, with an angle, $3\frac{1}{2}$ in. wide, cast at the bottom, forming the rest for the bottom slabs. The bench slabs, $1\frac{1}{8}$ in. thick and $9\frac{1}{2}$ in. wide, rest on the sides and the stringer at the centre. With the exception of the stringers, which are reinforced with two $\frac{1}{2}$ -in. bars, each member has galvanized iron wire and several $\frac{1}{4}$ -in square twisted bars for reinforcement. The plant has approximately 37 acres under glass, and all its new foundations, benches, drain, and walk construction are of concrete.

Piling of treated ties beside the track has been considered by one of the committees of the Roadmasters' and Maintenance of Way Association and the opinion expressed that creosoted ties should be

piled as closely as possible to prevent air or rain getting between them, while ties treated with zinc chloride should be piled so as to give maximum exposure to bring about rapid evaporation. In the former case it is not considered necessary to place old ties on the ground beneath the creosoted ties, though many railroads use two ties in this way as sleepers. It is believed that creosoted ties may well be piled all in one direction, the bottom row being laid on two sleepers and each row having one less tie in it than the row below. In addition to close piling this permits of binding with wire to prevent theft and easy discovery of theft. In the case of the ties treated with zinc chloride exposure is provided because the chemical does not wash out of the wood so quickly if the ties are thoroughly dry when placed.

According to a contemporary, the city of Boston is now sprinkling the entire road surface with an emulsion of asphaltic oil made by dissolving 25 lb. soap in 100 gallons of hot water and mixing this with 200 gallons oil. One hundred gallons of this emulsion is diluted with 500 gallons of water in the wagon and spread, using an ordinary Studebaker watering cart. The first application is followed by a second in four days, after which the street is gone over again once in from 15 to 35 days, depending upon the weather and conditions. This was found to give excellent results both as to laying the dust and preserving the roads. Last year the amount of dust swept from the streets was reduced 50 per cent. The only objectionable feature is the condition of the road for the first two or three days after sprinkling, as the heavy black oil forms clots which are picked up by carriage wheels, &c. After it is beaten down, however, the roads have a smooth, hard and clean surface.

A circular filter bed forms part of the new water works at Ebby Vale, England. It is divided into five sectors by radial walls and each unit is fed by a spraying aerator at the center of each filtering area.

New Buildings at Moose Jaw, Sask.

The accompanying illustration is a front elevation of the handsome new court house to be erected at Moose Jaw, Sask., and for which tenders were called in September. We are indebted for the drawing to

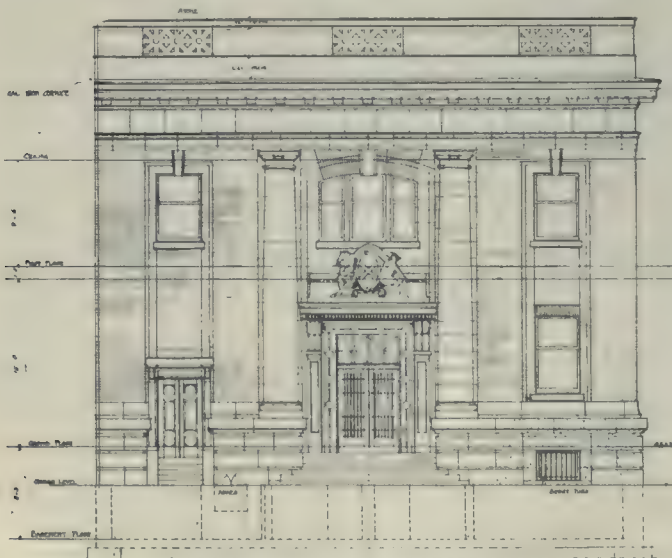


Proposed Court House, Moose Jaw, Sask.

Mr. David Ewart, Chief Architect of the Department of Public Works, Ottawa.

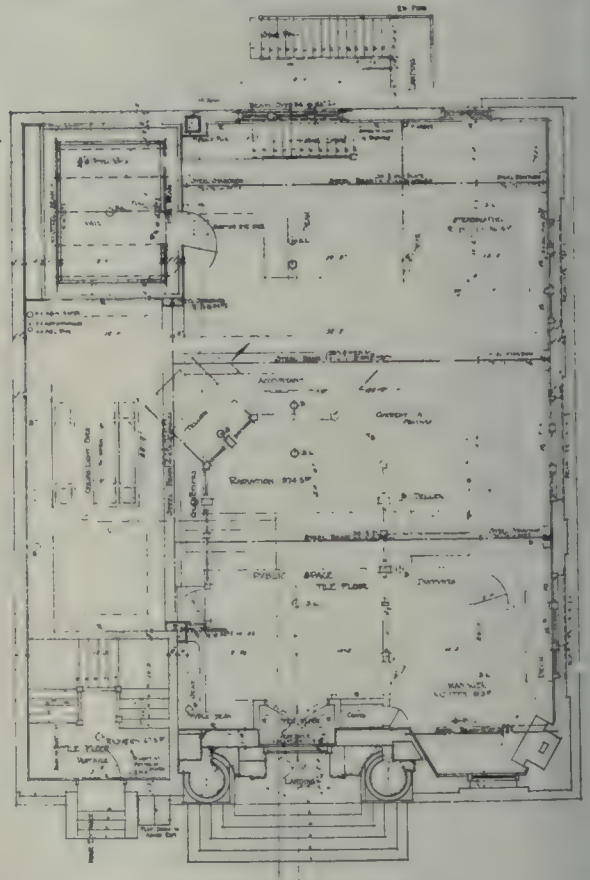
The new branch of the Bank of Montreal at Moose Jaw was designed by Messrs. Peden & McLaren, of Montreal.

The building is built of No. 1 "Menominee" brick, laid in Flemish bond. All the stonework is in Roman stone, manufactured by the Roman Stone Company, of Toronto. The base course, to a height of 6 feet



Front Elevation, Bank of Montreal, Moose Jaw, Sask.

from the street line, is in Stanstead granite. The building is 42 feet from the street line to the top of the parapet. The internal arrangement of the counter is on the centre-feed principle with wickets for seven clerks at the counter. The vault is roomy, to allow for future expansion, and is so placed that the banking room may extend around it. A large well-ventilated stenographer's room is provided. The public space is laid with Rust's mosaic tile. From the main street a stairway leads up to the clerks' quarters above. Accommodation is provided on this floor for six bedrooms, with large sitting room, dining room, kitchen and reading room, with lavatories and toilet accommodation. A wide metal additional stairway gives further egress from this floor to the ground. In the basement a large room is provided for clearing



Ground Floor Plan, Bank of Montreal, Moose Jaw, Sask.

house work, the balance of space being used for book vaults, stationery room, lavatories, locker room and furnace room. The cost of the building is in the neighborhood of \$55,000.

The cost of a concrete silo, 15 ft. in diameter and 36 ft. high, with solid walls, is said to be about \$238. The forms are movable, consisting of two circular shells 3 to 4 ft. high, with a 6-in. space between for the wall, and a horizontal framework of 2 x 4-in. timbers cut to a circle and covered with sheet metal or wooden lagging. A 1:2:4 mixture of concrete is used with $\frac{3}{8}$ -in. reinforcing rods 10 ft. long laid horizontally at variable distances on centers; vertical rods are spaced 18 in. apart. Concrete footings 1 x 2 ft. are set 1 ft. below ground and a 4-in. concrete floor laid on the natural clay bottom. The concrete roof is cone-shaped, with a rise in the center of 2 ft. and an overhanging of 1 ft.; the roof is reinforced with $\frac{3}{8}$ -in. rods laid radially and spaced 18 in. at the eaves.

Progressive Highway Work in Ontario

Illuminating Data furnished by Mr. W. A. McLean, Provincial Engineer of Highways—Road Laws and Administration—Standard Specifications

That the work of highway improvement in Toronto is in excellent hands and that a systematic and forward policy of practical instruction is being pursued, is evidenced in the comprehensive and valuable report (1911) just issued by Mr. W. A. McLean, the Provincial Engineer of Highways. During his tenure of office Mr. McLean has worked indefatigably along the lines of his predecessor, Mr. A. W. Campbell, who it will be remembered left the provincial service to become Deputy Minister of Railways and Canals for Canada. Mr. McLean brought with him a long experience in road building, and his intimate knowledge of every phase of administration, construction and maintenance, which he is at all times so ready to disseminate, is one of the most valuable assets of the goods roads cause in the province of Ontario. The information published in this report has been gathered from many sources and will be found at once interesting and instructive.

The report shows that there are now nineteen counties having county highway systems under construction. Of these there were seventeen operating under the Highway Act in 1910,—the counties of York and Haldimand being the two most recent additions to the list. Expenditure under the Highway Improvement Act in 1910 was \$553,312.61, of which the municipalities paid \$368,875.07, and the province the remaining one-third, or \$184,437.54. The total expenditure under this Act to date on county roads of the Province has been \$2,681,435.54.

Reference is made to the cost of road per mile, and the factors which tend to increase or decrease the expenditure. Ontario road laws are outlined, and motor traffic is commented upon. It is stated that:

The principal fact to be faced in this regard is that motor vehicles tend to concentrate their traffic on main roads; that a dust nuisance in an intense form is created, and that the ordinary type of water-bound macadam and gravel road is subjected to severe wear by this constant traffic, especially that of heavy touring cars travelling at high speed. While the limitation of speed is in some degree necessary, the greater experience of England, France, and many of the American States has led to the taxation of motors and the construction and maintenance of main country roads adapted to this form of traffic, rather than to the placing of speed restrictions which are difficult and at times impossible to enforce. The oiling of roads is a simple treatment, adaptable to roads where traffic is not too severe, but the greater tendency is toward the building of roads bound with tar, asphalt, or other material which prevents the forming of dust, strengthens the road and reduces the cost of maintenance; a more extended description of these materials and forms of construction being elsewhere given in this report.

The importance of road maintenance is emphasized, as is the need for technically road trained engineers, and proposed experimental work on the Niagara River Boulevard is outlined.

With respect to municipal procedure, it is stated that:

The increasing expenditures and responsibilities of

municipal councils has approached the stage in this Province, in which the full confidence of the public and of the ratepayers must be maintained if the co-operation possible through municipal organization is to reach its full degree of usefulness.

Municipal councillors in making important appointments, purchasing machinery, letting bridge contracts and transacting other important business could profitably adopt a standard of English, Scottish and Irish procedure, where the general rule regarding applicants for municipal contracts, appointments and tenders, is that any contractor, applicant, or tenderer approaching an official, or canvassing any member of the Council, Board, or other body, is absolutely disqualified from tendering, contracting, or competing for an appointment. There is no law on this point, but it is a general rule adopted by nearly every public body. A municipal councillor would not be disqualified by permitting himself to be approached otherwise than in open council.

The York County road system, the necessity for publishing financial statements by county councils, the usefulness of the log drag, the making of legislation regarding farm entrances, the more common defects of road construction, and the value of wide tires are all commented upon.

An Act of the last session of the Legislature respecting specifications for permanent bridges, is quoted as follows:

"618a. Every iron, steel, concrete or stone bridge constructed by or under the jurisdiction and control of the corporation of a county shall be built in accordance with specifications approved of by the Engineer of Highways of the Department of Public Works of Ontario."

Standard Bridge Specifications

Under this Act, standard specifications for steel and concrete bridges have been prepared and are included in the report. It is pointed out that:

This provision is timely inasmuch as, at present, numerous old wooden bridges are failing and are being rebuilt. The use of the more permanent materials will result in ultimate economy, but to this end there is urgent need that councils should have a clear understanding of the situation.

A large number of inferior steel bridges have been built throughout the Province due largely to the method followed by municipal councils in awarding contracts. In the past, wooden bridges of a serviceable kind have been built without engineering supervision. This was reasonably satisfactory, for the quality of timber was a matter of common knowledge, and the framing of a bridge a work that a carpenter could undertake.

Steel is a vastly different material from wood as regards quality, design and fabrication. The public and municipal councillors have been loth to recognize the fact that steel is a material demanding the services of a competent engineer versed in the details of steel construction, and the calculations that have to be made. A specification for a steel bridge is necessarily intricate and cannot be simplified to the plane of every-day knowledge. Every municipal council contracting for the erection of a steel bridge

should engage the services of an engineer to act in the interest of the municipality.

The argument sometimes is advanced that the municipality can save the fee of an engineer "by allowing the bridge company to do the engineering for the municipality," on the theory that a company of standing has its reputation to maintain and will therefore see that the work is properly done. This is true to a limited extent only. For instance, the material may be good, and the shop work excellent, but bridges are usually put up by foremen, whose chief object is to "get the job done," and careless erection will largely discount the best intentions of the company. In a similar manner, hurried designing frequently permits errors of a serious kind in plans, and careful checking is absolutely necessary for safe results.

But councils who trust to the reliability of the bridge company seldom use discretion in this regard, and too often award the contract not to the best company, but to the lowest tenderer. They cannot properly judge the merits of the several plans and specifications offered, and the work is given to the contractor who is willing to build the poorest bridge for the least money.

It should be the duty of the municipal engineer to determine the special requirements of the bridge, and the most suitable type of bridge, combining this with the general bridge specification prepared by the Provincial Engineer of Highways, in such a manner that all contractors will tender on a uniform basis; to advise the council as to the merits of the several tenders, and to then see that the specification is enforced. He should prepare plans and specifications for the substructure and see that they are satisfactorily carried out.

A large capital expenditure involving heavy depreciation and a large charge for maintenance is being put into highway bridge construction in Ontario. Railway corporations employ a large organization and staff for designing and caring for their bridge investment, though not more important than that of Ontario municipalities.

Equal precaution on the part of councils is a necessity if the best public interests are to be served. The number of steel bridges in the Province that are too light, badly designed, poorly riveted, carelessly erected, and rapidly rusting to ruin for lack of painting, is already too numerous.

The report contains a large amount of material relating to practical construction. The more advanced types of roads, suitable for heavily travelled main roads and suburban roads entering large cities, are described. The use of better stone, the construction of tarred roads, asphaltic binders, vitrified brick, concrete roads, oiling and dust laying of special materials, are described.

Roads Laws and Administration

An important section of the report deals with road laws and administration, and briefly outlines the systems in use throughout the countries of Europe, the Provinces of Canada and the United States. In this regard the writer says:

The road systems of the more progressive countries of Europe are not centuries old as is commonly supposed, but were principally constructed during the first half of the nineteenth century in accordance with the principles developed by Macadam, Telford and Tresaguet. Public attention was diverted by the introduction of steam railways, but the foremost countries of Europe are now maintaining their roads more zealously than ever.

A study of conditions and laws under which good systems of highways have been built, suggests certain basic features common to the more successful systems.

(1) In no country has a general system of good roads

been constructed by municipal effort alone. The roads of France have been built by authority centralized in the national Government; in Germany they were built as military highways by the Imperial Government; in England they were created by turnpike trusts, have passed to county and district authorities, but national influence is now being restored.

(2) Good road systems have been the result of special effort for first construction. In England, as previously stated, they were produced by the turnpike trusts; in France and Germany for military purposes and in a broad way. The same fact is instanced in Ontario, where practically the only good roads have been built by toll road companies, under present or past county systems, or under provincial authority.

(3) Good road systems, after construction, receive careful and systematic maintenance, usually under the department of Government by which they were constructed. The road systems of progressive European countries are now principally a matter of maintenance, and their existing organizations and expenditures are for that purpose.

(4) Main and local roads are classified for construction and maintenance; no one local or national authority effectively controls all roads. In England main roads are under county control, and the less important roads under district authority; in France roads are divided into three classes—national, provincial and communal—corresponding to national, or state, county and township. In Germany roads are divided between the state and the municipality. In the United States, where the more progressive legislation has been adopted, roads are being assumed by the state; state aid is extended to county systems and, at times, to townships.

(5) General systems of good roads receive the supervision of technically trained men and a body of experienced superintendents and workmen. In France and Switzerland, road-engineers are required to have diplomas from national colleges of highway engineering. In England and Germany public opinion demands that roads should be under the direction of engineers of recognized standing. The United States Federal Government is giving graduate engineers a post-graduate course in highway engineering, and several of the states have, in their state universities, chairs of highway engineering.

(6) The cost of main roads, county and state roads is distributed over the whole people, rural and urban, and is not left as a charge upon rural districts only. This is accomplished principally through the national or state contribution, or a general county tax. It is recognized that the improvement of town and city streets has a local value, making a frontage tax equitable; but that main country roads, in addition to their local value, have so important a place in national development that national or state expenditure and administration becomes advisable, as a means of fairly distributing the cost, and of securing economical, adequate and uniform roads.

(7) A central intelligence bureau for collecting and distributing information respecting roads and pavements, including the testing and investigation of road materials, is directly or indirectly, a function of state and national government, under effective systems of road administration.

Road management and all features of construction pertaining to the building of the ordinary type of country road, are outlined in such a way as to form a manual for the use of road superintendents.

A standard specification for roads is included in the report, and published elsewhere in this issue.

The general specifications for steel highway bridges published in the report are a complete re-

vision of specifications heretofore used, and contain many new features, which will undoubtedly result in a greatly improved type of permanent bridge for the Province. The increasing amount of traffic on country roads has been kept in view, and the details of these specifications are such as to provide for any increase of traffic that may be reasonably expected. The concluding pages of the report contain plans for short concrete bridges with slab tops, suitable for spans of from 6 to 16 ft., which should be of material service to many municipalities throughout the Province.

ROAD SPECIFICATIONS

A standard specification should not be understood as one to be followed rigidly under all circumstances. Properly treated, no two miles of road should be constructed in precisely the same way. For this reason every road should be a problem in itself, to be treated in accordance with local conditions and requirements, always, however, following the scientific principles underlying the making of good roads. A standard specification is one that may be drawn upon to meet average conditions, but in every case it should be varied to meet the special requirements of the work undertaken.

Owing to the great variation in requirements, particularly in the grading and drainage of a new road, it is exceedingly difficult to draw up a specification which will not be cumbersome, and which will not, because of intricacy and indefiniteness, cause contractors to be alarmed to such an extent that their prices will be considerably advanced. For this reason the great majority of municipal councils have been in the habit of building roads by day labor rather than by contract. In justice to the work, road specifications should be simple and definite, but the necessity of safe-guarding the municipality from "scamped" work makes an ideal difficult to reach.

As between work wholly performed by day labor, and the other extreme of contract work, there is a middle field of safety to the municipality. It is that all earth work, including draining and grading should be done by day labor under the municipal road superintendent. For this work he could use the grading equipment which all municipalities possess, and could carry on the work at the most favorable seasons of the year. Having provided for grading and drainage, with incidental details, the placing of stone or other road metal could readily be let by contract.

The standard specifications in this report have been prepared with a view to the simple treatment of all classes of work performed under contract, but should be modified to meet special requirements. They possess a standard required for county road systems, but in their application to municipal work should be accompanied by general conditions such as those attached to the specification for steel bridges.

STANDARD SPECIFICATION FOR STONE AND GRAVEL ROADWAYS

1. **Scope of specifications.**—The work covered by these specifications is to include the supplying of all labor, machinery plant or materials which are needed to construct durably and expeditiously and to fully complete ready for travel a roadway which is, in general, to be straight and in the centre of the road allowance, with a uniform width between the inside of open ditches. Roads are to be given an easy, flowing grade, cutting hills and knolls, and filling depressions. The steepness of hills is in no case to exceed a rise of four per cent. On roads not previously metalled, earth excavated from the ditches is to be drawn to the centre to form the grade or turnpike. On old stone or gravel roads, earth shoulders are in general to be turned

away from the centre, across the open ditches if so directed and the crown of the road restored by placing new metal on the old stone or gravel base.

2. **Plans, stakes, etc.**—All work under these specifications is to be in accordance with the plans, profiles, and schedules forming part of these specifications, and to the lines and levels given on the ground by the engineer. Stakes and bench marks placed for this purpose are not to be moved or effaced when avoidable.

3. **Width of road.**—The width of road shall be uniform unless otherwise directed, for curves or other irregularities, widths of grade between shoulders to be twenty-four feet, and the stone or gravel 8 feet wide for single track roads and 15 feet wide for double track.

4. **Crown.**—The finished and consolidated roadway is to be circular and have an average crown of one inch to the foot from side to centre. Earth excavation and the placing of stone are to be uniformly such as will produce that camber, except as otherwise directed by the engineer in case of hills, swamps, rock outcrops, and other irregular conditions. Where the width and quality of stone



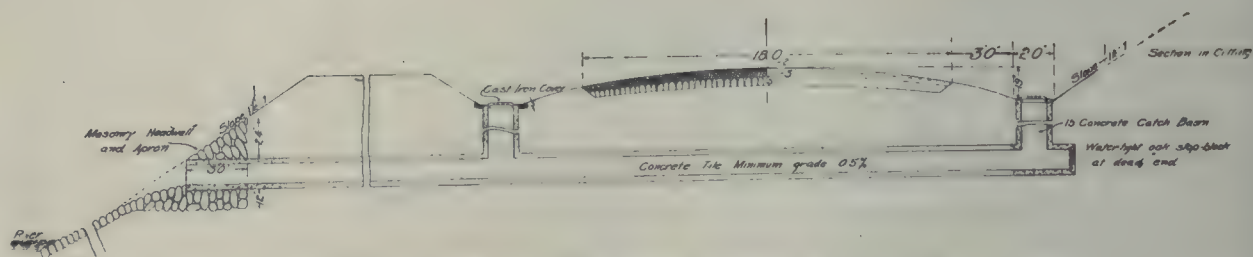
Mr. W. A. McLean
Provincial Engineer of Highways for Ontario

used in the road will permit, the average crown may be reduced to one-half an inch to the foot if so directed by the engineer.

5. **Excavation and fill.**—Excavation or fill is to be made in all cases to the required depth below the elevation of the finished roadway. Surface soil, vegetable mould, logs, stumps, or other weak or perishable material are to be removed to a sufficient depth to secure a firm foundation, and such excavation shall be filled with durable material to the height of the sub-grade. The sub-grade thus obtained is to be made thoroughly firm and solid by pounding and rolling. In swamp land, roots and muck are, if practicable, to be removed in advance of fill, to a firm bearing.

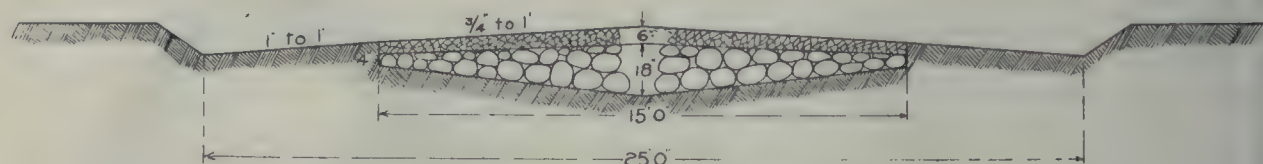
6. **Roadsides.**—The land at the sides of the road, between the gutters or open drains, and the fences, is to be graded from margin of the roadway, as may be directed, the roadsides to be left smooth by grading and levelling, care being taken not to injure or bark trees and shrubs that may be marked for preservation, or where such preservation is directed by the engineer.

7. **Lane and road intersections.**—All intersections of roads, lanes and entrances are to be properly graded, and



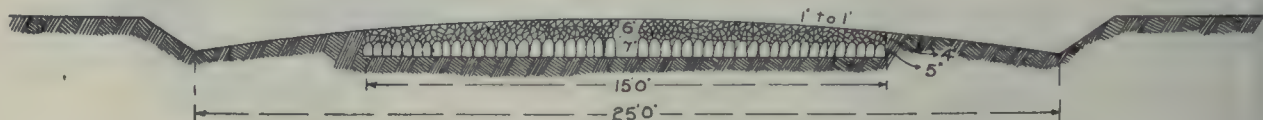
STANDARD CROSS-SECTION OF THE NIAGARA RIVER BOULEVARD

A Telford foundation is provided, with 5 inches of broken stone surface. Local limestone is used. The concrete tile are placed at intervals, with catch-basins to carry surface drainage to the river.



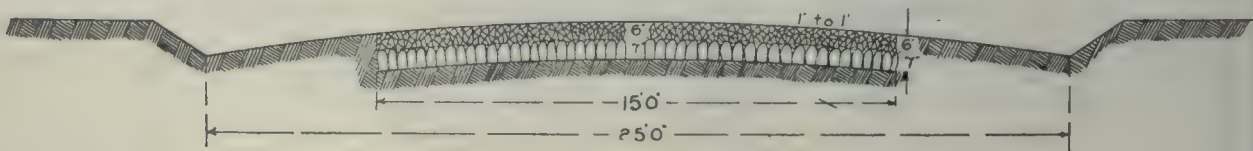
CROSS-SECTION OF A MASSACHUSETTS STATE ROAD

This method of using a boulder or field stone foundation is characteristic of the State highways of Massachusetts.



A CROSS-SECTION OF THE TELFORD ROAD, ENGLAND

The chief characteristic of the Telford Road is the foundation of stone laid on edge. Larger stones were used at the centre and smaller at the sides, to provide a camber. Over this was spread a layer of fine broken stone. The foundation was about two-thirds of the thickness of the road.



CROSS-SECTION OF THE TRESAGUET ROAD, FRANCE

This shows the method advocated by the early road builders of France. Stones are laid on edge as with the Telford road, but they are of uniform height, and the earth sub-grade was given a camber.

stoned or graveled as directed, to conform to the finished grades of the intersecting roadways; and tile or other culverts or crossings are to be well laid under instructions from the engineer.

8. **Broken stone surface and quality of stone.**—The surface of the roadway is to be covered with crushed stone to a minimum depth of eight inches after consolidation, to be regularly and perfectly spread over the whole of the roadbed to a depth to conform to the cross section shown on the drawings. The crushed stone is to be durable limestone, granite or field stone, of such quality and broken to such dimensions as may be approved by the engineer. All stone used must be free from clay, loam or earthy material. Samples of material to be used are to be placed with the engineer, and all material is thereafter to conform to the quality of such samples.

9. **Placing stone on the roadway.**—The broken stone is to be placed on the roadway in the following manner:

(a) Coarsely crushed stone or "tailings" of a size that will pass through a four-inch ring, and be retained by a two and one-half inch ring, is to be placed over the central portion of the sub-grade to such a depth and width as the total depth of stone will permit; this is to be rolled dry to a firm and even surface, and additional stone is to be added wherever depressions appear, or the camber becomes too flat under the roller. Where "tailings" are not available, their place shall be taken by the grade of stone described in the following sub-section.

(b) Upon this shall be spread a layer of crushed stone, such as will pass through a three-inch ring, and be retained by a one and one-half inch ring, to be four inches in depth after consolidation at the centre, and such further depth at the centre and sides as will bring the roadway to the line of the finished grade, this to be rolled dry, to a firm and even surface. Additional stone is to be added wherever depressions appear or the camber becomes too flat under the roller.

(c) The roadway so formed shall be coated with screenings; these to be thoroughly saturated and rolled until perfectly consolidated to the satisfaction of the engineer. Screenings are to consist of stone chips and dust, such as will pass a one and one-half inch ring, an excess of dust to be removed by a dust jacket attached to the screen if required by the engineer. Screenings are not to be dumped from wagons on the stone, but are to be spread from the wagons or from piles deposited along the roadside.

10. **Screenings not to exceed necessary amount.**—Special care must be taken that the screenings shall not be in excess of the quantity necessary for consolidating the road, nor shall less be used than is needed to maintain a smooth surface. The screenings shall be uniform and thinly spread, and additional quantities shall be added as may appear necessary after watering. Screenings are to be added to or removed from the surface as may appear necessary to the engineer, at any time during the progress of the work.

11. **Manner of rolling and wetting roadway.**—Rolling shall be commenced at the edges or curb of the road, working towards the centre, and shall be continued until the earth sub-grade and each layer in succession is firmly set. The final rolling must be continued until the roadbed is perfectly consolidated and unyielding, to the satisfaction of the engineer. During the whole of the final rolling herein specified, a sprinkling cart is to pass immediately in front of the roller, so that at all times the surface of the road will be saturated with water.

12. **Gravel.**—Gravel where expressly permitted by the engineer shall have a minimum consolidated depth of eight inches, and the widths of metal, drainage, grading and all

other details and requirements wherever applicable, as stated elsewhere in this specification, shall apply. The gravel used shall be clean, free from an excess of clay, loam or sand; shall be compact and composed of varying sized grains up to two inches diameter. If the gravel contains large stone these are to be removed at the pit, or if drawn to the road may be raked forward and spread in the bottom of the road. Should the gravel contain an excess of large stone, or of fine material, treatment by crushing or screening, or both, shall be provided, such as is necessary to produce a satisfactory road metal. Where gravel does not consolidate readily or sufficiently by rolling, approved material, such as limestone screenings, may be lightly spread over the surface to provide the necessary bond. The gravel, spread to a uniform depth, shall be made wet by sprinkling and rolled until thoroughly consolidated. When crushed or screened gravel is used, care should be taken to use no more screenings on the surface than is necessary for consolidation. The quality of gravel, preparation, method of placing on the road, and means of consolidation must be, in all respects, approved by the engineer.

13. **Surface drainage.**—Open drains or gutters shall be formed along each side of the roadway, of sufficient capacity to carry to an outlet all water entering them, the grade of such drains to follow where practicable that of the roadway, but preferably having a minimum fall of three inches in 100 feet. The slope of gutters is to be uniform and without pockets or depressions. On hills and hillsides, where suitable outlets cannot otherwise be obtained, surface water shall be received into catch-basins at suitable intervals, and discharged to an outlet through underground tile, vitrified sewer pipe being preferably used for that purpose. On hills, concrete or cobble-gutters may be required where the rush of surface water is likely to cause erosion.

14. **Tile drainage.**—Tile drains, where required to remove an excess of sub-soil water, to tap springs, to effectively dispose of surface water, to protect hills or road intersections, shall in general be placed along the side of the roadway, under the open drain or gutter, and shall be of not less diameter than five inches. The tile are to be placed in an eight-inch trench, the bottom of the trench to be 26 inches below the sub-grade of the roadway. They are to be uniformly and evenly laid with a fall of not less than three inches in one hundred feet to a proper outlet, and with ends closely abutting. All tile used shall be of the best quality of clay, manufactured expressly for drain purposes, in lengths not less than one foot, and of uniform diameter throughout. Earth excavated in the laying of these drains shall be returned to the trench, being consolidated on hills or slopes if considered necessary by the engineer, to prevent its being washed out, and in every case so disposed of as not to interfere with surface drainage. When the bottom of the trench is in quicksand, satisfactory means are to be used to keep the tile in a true line, and free from sediment, by laying on a board, surrounding with cinders, sawdust, cotton or cheesecloth.

15. **Foundation of large stone, etc.**—Where the natural roadbed is weak, or for other reason a strong foundation is desirable, a foundation shall be laid below the stone referred to in Section 9 of this specification, such foundation to be constructed of cobble stone, coarse gravel, or rough quarry stone of a size not exceeding eight inches in largest dimension, and of such depth as, in the opinion of the engineer, the work may require. This foundation is to be rolled to the satisfaction of the engineer; this to be followed by crushed stone as described in Section 9 of this specification. Roads of light or blow sand are to have an eight-inch layer of clay, or gravel containing clay, laid as a base for the metal covering, such as clay or gravel

to be thoroughly rolled and consolidated before the metal surface is applied.

16. Side slopes.—Side slopes in cuts and fills are to be one and one-half feet horizontal to one foot vertical. Earth for fills on side hills and through ravines, where the grade cutting does not provide sufficient material, is to be obtained from the tops of hills, or such other point as directed in order that the natural slope of the earth may be maintained and slipping prevented as far as practicable.

17. Rip-rap.—Rip-rap where required to protect the face of embankments or the foot of slopes, unless otherwise directed, shall be of undressed field or quarry stone, laid by hand to a uniform thickness, each stone to be firmly embedded, and at a slope not exceeding one foot horizontal to one foot vertical. The largest stone adapted to the work is to be used.

18. Concrete tile culverts.—Concrete tile culverts where required are to be of such size and length and at such depths as may be determined by the engineer, and are to be placed where shown on the plans, hereto attached. Culverts are to be laid with a good fall and free outlet, so that water will not stand in them. The spigot end is to be down grade and joints are to be fitted and made tight with cement mortar. The trench to receive the tile is to have a concave bed, so that the tile will have an even bearing, the earth is to be firmly packed and rammed around the tile, and a minimum depth of one foot of earth is to cover the tile. Each end of the culvert is to have a concrete headwall sunk below the frost line and of such dimensions as may be necessary for a retaining wall to suit the situation. Concrete tile are to be strong and of the best quality, sound, free from all defects, smooth, uniformly circular and made in accordance with an approved specification.

19. Catch basins.—Concrete catch basins in accordance with the plans hereto attached are to be placed and connected with tile drains at such point and at such depth as the engineer may designate (iron covers for this purpose to be provided).

20. Cobble-stone gutters.—Cobble-stone gutters will generally be three feet wide, but are to be of such width and contour as the situation may require. They are to be made of stones from 4 inches to 6 inches long, and from 2 inches to 4 inches wide, set on end and bedded in an 8-inch layer of gravel or coarse sand. The upper interstices of the stones are to be filled with fine gravel or coarse sand, and the whole thoroughly rammed to a firm bearing.

21. Concrete gutters.—Concrete curbs and gutters, if required, shall, unless otherwise directed, be in accordance with the dimensions shown on the drawings hereto attached. The Portland cement, all materials, methods and workmanship shall conform to the best of modern practice and standards. The curbing and gutters shall be laid on a six-inch bed of gravel or broken stone, which shall be thoroughly tamped and consolidated. The curb and gutter shall consist of a concrete core or backing, with a one-inch surface coat of mortar; the concrete core to be mixed in the proportion of one part of Portland cement, three of sand, and five of broken stone; the surface coat to consist of one part of cement and two parts of sand.

The entire exposed surface shall be neatly faced by floating and trowelling with a coat of neat cement, and finished with a dampened bristle brush, so as to give a uniform color throughout.

The work shall be carried on as rapidly as the concrete can be thoroughly rammed, and the whole curb and gutter shall be completed while in a soft and plastic state, so that it will be monolithic when set.

Good Roads in Quebec

The Good Roads movement in the Province of Quebec has assumed such prominence in recent years, that while the total Government expenditure on roads in the older parishes amounted in 1905-06 to \$9,661, the sum appropriated for the current year is \$250,000, which amount is likely to be largely exceeded by the rapidity with which the different municipalities of the province are fulfilling the necessary conditions entitling them to a share of Government aid.

The additional sum of \$125,000 is being expended by the Provincial Department of Public Works upon the construction of iron bridges in different parts of the province, and no less a sum than \$170,000 was spent last year in the making and improvement of colonization roads in the newer sections of the province, by the Colonization Department, while local contributions to the same roads amounted to \$17,859.49.

It is roughly estimated that for the current year some 300 municipalities will be entitled to the grant of \$400. If any of such municipalities further expends \$1,000 or upwards in any one year in gravelling or macadamizing roads or portions of roads, it is entitled to an additional subsidy of \$500. So many municipalities are qualifying for these grants that the total amount of expenditure on good roads is likely to materially exceed the \$250,000 voted by the Legislature for the purpose.

Wherever the macadamizing of roads is made, a Government instructor has entire charge of a macadamizing plant. These are very costly, consisting of a number of different machines, of which the province now owns several sets, and which are lent to the municipalities free of charge. Each plant consists of a steam-engine of 15 to 18 horsepower, a stone crusher delivering 10 to 15 tons of broken stone per hour, an elevator, a bin to receive the broken stone and to load the carts, a steam roller of 12 tons, a sprinkling wagon of 300 gallons, a road machine and a road plough.

The stone is furnished by the municipality and the labor paid by it, and at the end of the year the amount of government aid to which the municipality is entitled, is paid over to it.

Noteworthy Good Roads Congress

All arrangements have now been completed for the American Good Roads Congress and 8th annual convention of the American Road Builders' Association, to be held at Rochester, N.Y., November 14-17. From all accounts that have reached the Contract Record this event will mark a definite advance in the good roads movement. The Congress will be opened by President Taft. There will be an exhibition of road building and street paving machinery, materials and appliances, which will include road rollers, traction engines, paving plants, dump wagons, rock crushers, culverts, and all kinds of material. The entire subject of highway improvement will be covered by the convention, the phases for discussion including all the practical and theoretical branches of the work. At the morning session on Thursday, Nov. 16th, a formal paper will be read introducing a discussion on "The Problems of the Contractor." This subject will be sub-divided as follows: Bonds and Deposits; Delayed Payments; Labor Laws; Percentage Bidding; Lump Sum, or Unit Price Bids. Growing interest is reported to be manifested each year by Canadian road builders and we understand that the Maple Leaf will be well represented at the coming Congress. The secretary of the American Road Builders' Association is Mr. E. L. Powers, 150 Nassau street, New York.

The Design of Manufacturing Buildings

Preliminary Problems of Location, Utility and Finance—The Fundamental Considerations Which Determine the Type of Design*

By H. E. Darling, Assistant Engineer, Hamilton Bridge Works Company, Limited

The actual design of a manufacturing building, as a structure which is to be built of certain materials, to carry given loads, does not, as a rule, present any engineering difficulties which cannot be satisfactorily solved by the usual methods given in books that treat on this subject. It resolves itself simply into the problem of ascertaining, as nearly as possible, the stresses which the loads produce, and of proportioning the materials to take care of those stresses. The preliminary problems however, which fix the nature of the building, its size, shape, arrangement, the materials to be used, and the loads to be provided for, all form an immensely broader subject, extending beyond the bounds usually set for the engineer, and touching the very heart of the world of business and manufacturing.

These preliminary problems bear the same relation to the detail design that the work of the locating engineer on a new railroad bears to the work of the man who stakes out the line, only in the case of manufacturing buildings they are more complex.

The preliminary problems relating to the design of any particular plant may be discussed under three heads:

1. The problems of utility.
2. The problems of location.

3. The problems of finance; but while the discussion may be thus separated, in an actual case, the problems are so interdependent that they must be weighed, one against the other, in order to attain the highest possible efficiency. Efficiency in this case means the greatest ultimate value for every dollar expended.

Some of these problems can be handled by means of mathematics, with precision. Some can be settled by the obtaining of definite data. The facts once known, the question is settled beyond discussion. Some conclusions are reached instinctively, or through natural habit without conscious thought. But by far the larger part are a matter of judgment and the more highly this faculty is developed in the designer, the greater knowledge, the wider his experience, the more accurate will be the solution.

Problems of Utility

The use to which the building is to be put, will of course, largely determine the general type of design. In many lines of manufacture the building is virtually a tool or machine and as such it should have the same careful attention of an expert as is given to any part of the equipment. Many a plant with the latest and most expensive machinery is handicapped for all time by the poor design of the building that contains it.

Plants for the manufacture of similar products will probably resemble each other but need not necessarily be alike, for different methods, different ideas or special conditions may mean an entirely different lay-out. Fortunately the designer is not usually called upon to design the process of manufacture but it is essential that he have a thorough understanding of the routine through which the materials have to pass.

The amount of floor space, head room, light, ventilation, etc., that each process will require must be decided upon. The question of light receives a great deal more attention

these days than formerly, and the effect on the design is quite marked. The different rooms or buildings must be so arranged that the materials may pass from one to the next with the minimum amount of handling or transportation. Provision must be made for the receiving of raw materials and for the shipping of the finished product. Necessary store rooms must be provided at convenient locations. The power plant should be so located as to make the distribution of power convenient and economical. The same rule applies to the heating and lighting plants and water-works systems, and all this must be done with an eye to the health, convenience and safety of the employees.

The method and order of erection must always be kept in mind. The cost of putting certain materials in place may be greatly increased unless the work can be done in a certain order, or at a particular time.

Problems of Location

The actual location of a manufacturing building is usually determined by the owner from business consideration with which the designer has nothing to do, but the site once fixed, the effect on the design of the building or plant is far reaching.

For every line of manufacturing there is an ideal lay-out, but to realize it one would have to have an ideal site, ideal facilities for obtaining power, labor, materials and transportation, and ideal climate, and an ideal balance in the bank. Since such conditions are seldom, if ever, obtainable, it becomes the designer's aim to adapt his design to the special conditions and circumstances, and make the best use of what he has.

The nature of the climate where the building is to be erected must be taken into consideration. The extremes of heat and cold, the violence of storms, the possibility of cyclones and earthquakes, the maximum snow fall the roof will have to sustain, the depth of the frost line for foundations, etc., are some of the questions that depend on the climate. If the plant is to be operated throughout the winter in a northern locality, the problem of heating becomes an important item. As a rule it is poor economy to put up a cold building and then install an expensive heating system to keep it warm. Apart from the mistakes made in this particular, nearly all the other questions will be taken care of by following local customs which have been found to give the most satisfactory results after long years of trial.

The locality in which the building site is situated also has a very important bearing in the design. The very nature of the building will depend upon the facilities for obtaining building materials and their cost. The conveniences for transportation and handling heavy girders, etc., must often be considered. The designer must not only have a knowledge of the cost of brick, lumber, cement, stone, steel, terra-cotta, etc., at the place where they are produced, but must know the nearest source of his supply, the transportation charges, duty, etc., and the cost of labor required for placing the materials in the building. These latter considerations often prohibit the use of what would otherwise be economical and desirable construction.

Government restrictions and regulations for the health and safety of the employees and the protection of the pub-

*From a paper read before the Engineering Society, University of Toronto, November 1, 1911.

lic must be carefully observed. If the site is in a large city, the building laws will probably place further restriction upon the designer and give him something to puzzle over in his spare moments. In addition to this, there are usually many special by-laws relating to smoke, noise or other nuisances. In order to obtain reasonable insurance rates the rules of the Fire Underwriters must be carefully followed. Labor conditions must be studied, not only in their relation to the cost of the work, but there are places where the Unions can dictate what the nature of the building is to be. The size, shape and position of the lot will practically determine the proportions and arrangement of building or buildings. In some cases the position of railway switches, and the like control the general lay-out.

The probability of future extension must be taken into consideration from the start and a general scheme sketched up for as far ahead as possible. A good plan is to build the plant in units so that the addition of a unit to each department will maintain the proper proportions of the whole plant. The installation of one machine in one department may require the addition of a whole wing, to the building, to take care of the corresponding increase in another department. In this case, provision should be made for as many wings in proportion to the space provided for such machines. However it is not always possible to apply this system. For example, in a plant where there are to be many electric motors (and the number is likely to increase), it would show great lack of foresight if the transmission system were so designed that it were necessary to re-wire the plant and put in larger distribution mains every time another motor was added to the equipment. Here is an instance where it would be true economy to anticipate the greatest capacity that would ever likely be required and provide for it at the start. Now the building itself is usually a construction to which this rule applies. Not only should a reasonable amount of room be provided for future needs, but it is even more important that the probability of any increase in floor loads or the capacity of crams, etc., be taken into account at the start. It is usually very unsatisfactory, and always expensive, to try and strengthen a building for loads greater than originally planned for, even though the type of construction will permit it. No one who has had to face such a problem and be responsible for the results, can appreciate what it means, besides, it is exceedingly aggravating to the owner to find a scheme of extension blocked or crippled just through the lack of a little foresight in making the original lay-out.

(Concluded in next issue)

Publications Received

The Making of a Great Canadian Railway.—The story of the pioneer survey, scientific survey and the construction of the nearly completed Grand Trunk Pacific Railway, from the Atlantic to the Pacific, with some account of the thrilling adventures of its constructors. By F. A. Talbot. With 43 illustrations and map; demy 8vo.; 16s. nett. A copy of this interesting narrative should pass through the hands of every Canadian engineer and contractor. The author not only takes up the Grand Trunk Pacific Railway project from its inception, but forecasts the future of the system and its effect upon Canadian development. Each section of the line from Halifax to Prince Rupert is dealt with, together with the character of construction, the engineering difficulties encountered and the obstacles overcome by the contractors. Costs and quantities are among the data collected. We have said that this book should appeal to the engineer because we,

differing somewhat from the author in his prefatory notes, are inclined to think that the average professional man does not confine himself exclusively to the "purely technical side of the work" but is interested also in "the romantic side of railway building" which is, of course, the stronger element in this book. "The Making of a Great Canadian Railway" will be read with avidity by all having interests at stake in the G. T. P. For the rest, we believe with the author that it will be valuable as serving "to introduce the young engineer, waiting to win his spurs, to the conditions surrounding the laying of the steel highway in the Dominion."

"If it is made of wire, we make it." This is the text of the motto of the Canada Wire & Iron Goods Company., 182-186 King William street, Hamilton, Ont. It will be found on the prefatory page of their catalogue No. 3, a copy of which has just reached us. The company are so well known to Canadian building interests that it is almost superfluous to mention their principal lines of manufacture. Whatever is made of wire, as the company claim, they make—and it is stamped in the making with the hall-mark of trade approval. Among the many products may be mentioned wire cloth and perforated sheet metal, ornamental wire and iron work, elevator enclosures, gates, brass and wire work, and wire goods of every description.

The Kerr Engine Company, Limited, of Walkerville, Ontario, the well known valve manufacturers, have commenced the manufacture in Canada of the Simmons Patent Packless Valve, better known in the United States as the C. H. S. Packless Valve. It is claimed by the manufacturers to be perfectly packless, and an all metal valve, there being no destructible composition rubber rings, or discs in the packless feature. The valve is substantial in construction, and one which will doubtless fill a long felt want in the heating trade, and especially on vacuum systems.

"Buildings as They Should Be" is the title of an interesting booklet received from the Dahlstrom Metallic Door Company, Jamestown, N.Y. This booklet is profusely illustrated with excellent half-tones from photographs of buildings equipped with door and trim manufactured by this company. A perusal of this publication emphasizes the fact that the only way in which to properly fireproof a building is to use no inflammable material in its construction. Briefly, the Dahlstrom Company diminish the fire risk and increase the safety of buildings by substituting steel for wood and other inflammable materials heretofore used in making doors, window casings, partitions, moulding, wainscoting and all necessary trim. These doors have been approved by the Underwriters' Laboratories after successfully passing through one of the severe fire tests, so that the company's claims that they are absolutely fireproof are substantiated by actual facts. In their manufacture an elastic, baked enamel is used in a choice of plain colors, or grained to match any kind of wood so closely as to defy all but experts to detect that they are not really wood. The artistic finish of Dahlstrom metal doors is a strong recommendation to the trade.

"The Lesson of the Singer Fire," an interesting pamphlet which accompanies the booklet, contains a reprint from the New York Globe in which public attention is directed to the fact that a serious conflagration was prevented by the fireproof construction of the great tower. Dahlstrom products were used throughout.

The Dahlstrom Metallic Door Company have a special information department, whose particular work is to furnish prospective builders and architects with data and specifications.

Gateway of Time, Trade and Commerce

Vancouver's Latest Definition, as given by Mayor Taylor at the Annual Banquet of the Master Builders' Association — A Great Meeting

The annual banquet of the Master Builders' Association, held at the Elysium Hotel, Vancouver, was one of the most successful functions of the kind ever held at the coast. In addition to practically all the members of the association some of the leading architects of the city were in attendance, as well as a number of visiting contractors. Mr. F. W. Nicholson, of the Norton-Griffiths Construction Company, the president of the association, acted as chairman and toast-master. He was supported by Mayor Taylor and Mr. A. G. McCandless. The proceedings were enlivened by Dan Green's orchestra, and we have it on reliable authority that the dinner itself was all that could be desired.

Ex-Alderman Hepburn, who proposed "The City of Vancouver," spoke of the recent development of the city and of its architectural achievements, which he considered compared favorably with those of any other city of the same age that he had ever heard of. Mayor Taylor urged that architects, builders and others vitally interested in the development of the city should co-operate so that Vancouver would ultimately be known as "The City Beautiful." He urged that a civic improvement guild be formed to prepare comprehensive plans for the future. The Mayor concluded by an optimistic allusion to Vancouver as the "Gateway of Time, Trade and Commerce."

The toast of "The Architects" was proposed by Mr. Booker and responded to by Messrs. Leech, Grant, and W. T. Whiteway. Both Messrs. Grant and Whiteway dealt with the early struggles of the city's pioneer architects and advocated the re-organization of a local architects' association. Mr. Leech supported the contention of the Mayor that a commission composed of leading architects and builders should be appointed to formulate development plans for the city, so that Vancouver in future years might be famed as the beauty spot of the Pacific Coast. The speaker also emphasized the need for uniformity in specifications and a higher code of ethics in the building trade.

Mr. A. G. McCandless, President of the Board of Trade, gave some interesting reminiscences of the city's early days. He related some stirring incidents of the historic fire of June 13, 1886, when the budding city was devastated. He evoked considerable laughter by describing the city's dilemma in the discovery of a huge tree stump at the corner of Cordova and Carrall streets. The stump was so large that the relative economy of moving the street or the stump was debated seriously, but to the lasting credit of the city it was finally decided that the stump should make room for the march of progress. Going on to speak of the various business organizations of Vancouver, he dwelt on the work of the Vancouver Board of Trade. It had been fighting a battle with the C. P. R. for over a year to secure better freight rates. Mentioning the opening of the Panama Canal and what that event would mean for the commerce of Vancouver, he said that it had an important bearing on the trade of northern British Columbia. He pointed out the need of a railway connecting Vancouver with the Peace River district and northern British Columbia. There were nearly fourteen million acres of choice agricultural land in the Peace River district alone, to say nothing of other extensive tracts in the northern portion of the province. The board of trade was actively pushing the matter, and while it was not back-

ing any one of the several projected lines which were contemplating building that much-needed line, it was endeavoring to impress strongly upon the government the absolute necessity of having the line built at the earliest possible moment.

Mr. S. H. Jarrett, the city building inspector, when called upon to speak, humorously described his position at the banquet as analogous to one standing between the devil and the deep sea, alluding of course to his intermediary duties between the architect and the builder. Speaking of Vancouver's building progress he predicted that in another five years Vancouver would pass Winnipeg and occupy third place among the cities of the Dominion. In twenty years Vancouver would head the list.

"Visiting Contractors" was proposed by Mr. J. J. Dissette, secretary of the Master Builders' Association, and responded to by Mr. Edward Cook, who congratulated the body upon what they had achieved through organization.

Among those present were Mayor L. D. Taylor, F. W. Nicholson, C. J. DuCane, S. H. Jarrett (city building inspector), Mr. A. G. McCandless (president of the Vancouver Board of trade), Messrs. J. J. Dissette, E. S. Booker, Walter Hepburn, J. L. Skene, R. H. Gale, J. S. Christie, G. P. Bowie, W. M. Horie, Wm. J. Risk, F. T. Sherburne, Jas. Young, W. W. Brehaut, S. B. Birds, William Frederick Gardiner, Arthur J. Bird, Hugh A. Hodgson, N. H. Leech, Walter M. Thornton, E. G. Baynes, E. Cook, W. P. White, D. B. Campbell, W. T. Whiteway, O. G. Whipple, C. F. Boyce, Hoult Horton, G. W. Grant, A. G. Bagley, W. F. Findlay, H. R. Kenvyn, Jas. B. Goodwin, Claude P. Jones, W. M. Dodd, A. E. Henderson, Geo. F. B. Adams, J. J. Donnellan and Hugh Wilson.

Calgary Builders' Exchange

The Calgary Builders' Exchange is undergoing re-organization. The membership of the Association is at present 110, but it is hoped that it will be increased shortly to 200. Arrangements have been made for regular meetings during the winter months. At these meetings papers will be presented dealing with practical trade topics. A syllabus of the subjects to be discussed is now being prepared by the secretary, Mr. Arthur Chamberlin. Arrangements are being made with the architects for copies of all plans upon which competitive tenders are being called to be sent to the Exchange. Regular meetings are held on the second and fourth Wednesdays of each month. The Exchange will endeavor to evolve a policy of friendly co-operation with the unions in order to eliminate labor troubles as far as possible.

Montreal Builders' Exchange

Although not strictly bearing on building and kindred subjects, the address on labor conditions and wages boards in Australia by Mr. H. B. Ames, M.P., at the noonday lunch of the Montreal Builders' Exchange, held on Nov. 8, was of much interest to Canadian firms. The lunch was very well attended, and was presided over by Mr. J. Ballantyne. Mr. Ames traced the history of the labor movement and described the causes which led to the power of that party in Australia. The workmen, he said, made four demands—reasonable hours of labor; proper conditions un-

der which to work; limitation of the labor market; minimum rate of wages and enforcement of that rate by law. These various demands were enlarged upon by Mr. Ames, who also spoke of the establishment of wages boards, composed of an equal number of employers and men, who agreed on what was fair wages, and whose decision had the force of law. While it must be confessed that this legislation had rendered Australia a workmen's paradise, it could not be denied that, taken as a whole, it had a tendency to keep Australia back. Canada, under her more free conditions, had gone ahead, while Australia had stood still. Mr. Ames deprecated the idea that such legislation, while it might suit Australia, could be transferred to Canada without modification. He suggested that they might get some excellent ideas by studying Australian legislation on capital and labor questions.

All building records for Victoria, B. C., were broken during the month of October, when permits were issued for structures aggregating in value \$541,325, bringing the total for the ten months of the year to \$3,145,340, a total greater than that for the entire year of 1910. Compared with the corresponding period of a year ago the figures for the ten months show an increase of \$1,183,340, a gain of fifty per cent., while the October figures show a gain over the same month last year of 335 per cent.

Grant-Holden-Graham, Limited, Ottawa, Ont., who recently obtained articles of incorporation, will carry on a wholesale manufacturing business with a jobbing department catering principally to the requirements of contractors and lumbermen. According to the personnel of the company this firm should have an inside knowledge of the requirements of the trade. The president, Mr. Hugh Grant, is a transcontinental railway contractor, and the vice-president, Mr. A. J. Hendry, has an extended connection among the lumbermen of the Ottawa Valley and surrounding districts. Mr. S. S. Holden, who has been factory manager for Woods, Limited, for the last six years, will have the management of the new factory. Mr. B. W. Graham, who is well known among the contracting fraternity of eastern Canada by virtue of his position as special contractors' salesman with Woods, Limited, becomes sales manager. The factory and warehouse of Grant-Holden-Graham, Limited, will be located on Albert street, Ottawa. The company's business will be devoted in the main to eastern Canada and the territory will be covered thoroughly from Cape Breton to Port Arthur. The western interests of the firm will be handled by Messrs. Finnie & Murray.

Rapid Progress on the G. T. P.

Mr. J. W. Stewart, managing director and partner of the firm of Messrs. Foley, Welch & Stewart, returned last week to Vancouver from a trip of inspection of the G. T. P. line. Mr. Stewart, who was accompanied on his trip by the chief engineer, Mr. B. B. Keillier, stated that the rails have already been laid across the summit of the Rockies at Yellowhead Pass and that tracklaying gang working down the western slope are expected to reach a point twenty miles east of Tete Jaune Cache before the middle of the month. Equally fast progress is expected to be made with the completion of the 415-mile gap across central British Columbia between Aldermere in Bulkley Valley and Tete Jaune Cache. The right-of-way along the south fork of the Fraser to a point fifty miles west of Tete Jaune Cache and in the direction of Fort George has already been cleared. At the western end of the work clearing of right-of-way has been finished for sixty miles east of Aldermere in the direction of Fraser Lake. When the working gangs moving in opposite directions meet

and link up Messrs. Foley, Welch & Stewart will enjoy the distinction of having built the entire line from Saskatoon, Saskatchewan, to Prince Rupert, comprising a mileage of nearly 1,400 miles.

Montreal Notes

Mr. F. O. Lewis, of Montreal, the Canadian representative of Vickers, Sons and Maxim, has left for England via New York, in connection with the proposed dry dock at Montreal and the various tenders just received for the buildings.

Plans are being drawn for a considerable addition to the Chateau Frontenac of the C. P. R., Quebec. The exact cost cannot be stated, but it is probably in the region of \$750,000. The extension is part of the scheme for improving the whole of the C. P. R. hotels.

For the month of October the building permits in Westmount totalled thirteen, the value for new work and alterations being \$191,600. The fiscal year ended on October 31, and for this period the permits issued were estimated at \$1,334,071, as compared with \$1,974,670 last year.

The Builders' Exchange and other bodies in Montreal have, by deputation, asked the Premier of Quebec to abolish or reduce the tax on commercial corporations. It was argued that the tax hindered the development of the province, but Sir Lomer Gouin declared that he could not see his way to abolish a tax which would leave a deficit of \$400,000, although the cabinet would consider a reduction.

Hon. Frank Cochrane, Minister of Railways and Canals, and Hon. F. B. Monk, Minister of Public Works, were in Quebec recently and paid a visit to the harbor and its proposed improvements. Included in the party were also Messrs. R. W. Leonard, chairman of the Transcontinental Commission; Chief Engineer Grant, St. George Boswell, harbor engineer; A. E. Doucet, district engineer, and a number of prominent citizens. The harbor sites for terminals, the graving dock, the dock extensions, and other points were visited and fully inspected.

The Montreal Harbor Board and the city are engaged in friendly litigation as to who shall bear the cost of diverting certain sewage which now empties into the Elgin Basin, where it is an acknowledged nuisance. The city and harbor commissioners have agreed on a plan by which, at a cost of \$150,000, the outlet will be abolished, and the effluent diverted to a main trunk sewer. A new pumping station is to be erected, and the sewage discharged into the St. Lawrence at a point much lower down. The present outlet is many years old, and runs along the course of the St. Pierre River. The city and harbor commissioners have agreed to rush the work and provisionally divide the cost, but appeal to the court is being made as to who is, under the circumstances, responsible for the expenditure.

The proposed construction of a dry dock at Maisonneuve, Montreal, has necessitated the town adding another section to their sewage system. At the present time the effluent is discharged into the St. Lawrence from land to be occupied by the dock, and the town is now constructing a sewer across this property to enable the discharge to be made on the opposite side. The work is being done by Harris Construction, Limited, according to plans drawn by Mr. J. Emile Vanier, civil engineer, Montreal. Part of the sewer is constructed in the river, and in order to do this a cofferdam 200 feet long, had to be erected. The sewer is partly of brick and partly of 34-inch steel pipe, 5 feet in diameter, this being the first time, we are informed, that steel pipe has been used for this purpose. The pipe is rivetted, has flexible joints and is coated inside and out with pioneer mineral rubber pipe coating. When finished

Winnipeg the Hub of Western Activity

Building Expenditure will total Seventeen Millions—Progress Notes on Larger Work—An Important Discussion affecting St. Boniface

Office of the Contract Record,

Winnipeg, November 10, 1911.

Now that the Western building season is practically closed, so far as outside work is concerned, contractors are able to pause and look back at what has been accomplished. The building permits issued show that this work will be well over the \$17,000,000 mark. This means a total of \$126,000 of new buildings for every thousand of population in the city.

The first cold weather caught many of the contractors somewhat unprepared and for the past week there has been literally a rush to cover. Every available man has been worked to the limit to complete outer walls and roofs on the structures that have advanced to that stage, or to get in the foundations of those started late in the season. For instance, on the Sterling Bank building, brick on the upper storeys was placed at the rate of a storey a day until within two flats of the top, when the brick-layers ran into a shortage of face brick and have been hung up since. However the tile floors are all in, the bottom floors have been boarded up and the contractors are in a position to proceed with the interior work on all but the two top flats. There is a possibility that the weather may moderate sufficiently to permit the brick work being finished this fall if it is carefully laid with cement mortar.

Progress on Large Building Work

The Bank of Commerce building is all closed in but a section of the roof where the "elephant" stands and it is expected that the derrick frame can be removed within a week. This building is pronounced by many the handsomest and most striking in the city, though it has not cost anything like as much as the Bank of Montreal two blocks to the south. The latter building is rapidly nearing completion and the marble gangs are at work in the interior. To the architect this is probably the most striking building in the city and the interior finish is without question the most massive and costly.

The past week has seen the announcement of the first of the big provincial government works which are to be undertaken in the city. This is the court house, and the plans so far prepared show that it will be most admirably adapted for the purpose for which it has been designed. The location will be to the south of the present court house, which it will ultimately replace. Though the detail plans are not yet available, your correspondent is instructed that the structure will be more in keeping with the needs of the province than the present building in which the courts are housed, and that strictly modern ideas will be followed throughout. Work will not be started until spring.

It is expected that before this work is started that plans will be in readiness for the new government buildings and vice-regal residence. The department of public works has issued instructions for their preparation and they will be rushed through in order that their cost may be included in the estimates brought down at the January session of the House. Negotiations are progressing with the Dominion Government for the acquisition of the old Fort Osborne site, immediately to the west of the present government buildings, which it is agreed will be a most suit-

able location. This will entail the removal of Fort Osborne barracks. It is probable that they will go to a point south on the Red River, near the Agricultural College.

Most satisfactory progress is being made with the work at the new Agricultural College, but there still remains some four millions of brick to be laid. Foundations have all been placed and on some of the buildings the walls are already well advanced. In fact the whole site is beginning to take definite form. There is a strong agitation in progress for the construction of adequate roads to the new buildings, with street car connections, and the public works department has announced that this work will be undertaken first thing in the spring. At the present rate many of the buildings will be in readiness by the opening of next fall's term.

Down town there are several buildings which have been caught by the early arrival of cold weather. In the Contract Record of October 25 a brief description of the excavation work on the Fort Garry hotel was given. Since that time two additional steam shovels have been placed in commission and are plugging away for fully ten hours a day. Even with the energy displayed, it is doubtful if the contractors will be far enough advanced for any of the foundation work to be undertaken before the advent of zero weather. For the first ten feet the contractors have been driving through a gray and yellow clay loam, but below that they have struck a stiff clay marl, as tough as Ontario blue clay, and this has retarded progress. A test pit has been driven on the work and hard-pan struck at 60 feet, where progress was stopped by water. A casing will be put down and the pit continued to bed rock.

At the W. J. Boyd block, on Portage avenue, practically all of the excavation has been completed and the greater part of the concrete retaining walls placed. The gang is now at work on the footings and pier beds. It is expected that this work will be completed so that the steel erection may be completed before spring. A little to the northwest of this building the walls of the new Y.M.C.A. are growing rapidly, the rear elevation being almost completed and the front up to the third floor. This promises to be a very handsome structure, with sufficient room to meet the needs of the association for many years to come.

Proposed By-law re Garage Buildings

The new garages are now under construction in the city and one of them, on Smith street, will be roofed in before the end of the year. The city council is at present laboring with a new by-law governing garages and gasoline handling, and though it will be some time before it reaches the final stage, the first draft has had a great effect on this class of work. Buildings must be of fire-proof construction, and those now in course of construction are of brick and steel, two storeys in height. It is proposed that all existing garages be given a time limit within which they must be remodelled to meet the new requirements. If this is adopted it will mean considerable activity for next year, as Winnipeg at present is much handicapped for adequate garage accommodation. Property in the down-town districts is so valuable and money so high that few investors care to go into this class of

building, for car owners will not pay the prices necessary to give returns.

G. T. P. Terminal Facilities at St. Boniface

There is a question with something of a political significance at present agitating Winnipeg and St. Boniface, and that is the entry of the G. T. P. into Winnipeg. From time to time the Contract Record has published descriptions of the work being carried forward on the huge viaduct which leads into the city from a point several miles east of St. Boniface. The line crosses the latter city on a high level track, and in Winnipeg a great deal of money has been expended on the viaduct work which could be completed with but a couple of weeks work.

Recently an agitation has been started for terminal facilities in St. Boniface, and the project has been mooted for extensive works and depot facilities for the C.N.R. on the east side of the river. It has been suggested that these be made joint terminals for the C.N.R. and G.T.P. If this is carried out along the lines suggested it would mean the abandonment of the viaduct. However, the whole plan is only in embryo, but if it is carried through it will mean the expenditure of tremendous sums in St. Boniface before the work can be completed.

The railway construction has practically closed, so far as the prairie provinces are concerned. The C.P.R. has opened the Regina-Colonsay line for traffic, 133 miles, and there is a branch line of 19 miles to Bulyea also in operation, leaving at Valeport. This company is making extensive preparations for next season's work, and applications will be made for several new lines.

The order to stop work on the Hudson's Bay railway construction has come as something of a surprise and will have the effect of throwing many men out of winter employment in the camps. However, it is expected that there will be a heavy demand for men in the wood and log camps, so that there should be no hardships from lack of work. The work in the Rockies, too, will absorb many hundreds of men who have been working in the harvest during the fall.

Personal News and Notes

Mr. Alex. Milne, superintendent of the Waterworks Department at St. Catharines, Ont., has been appointed City Engineer of that city.

City Engineer Clark of Saskatoon will be one of the delegates at the forthcoming convention of the Canadian Health Association at Montreal.

At London, Ont., the building permits for the first ten months of 1911 totalled \$822,785, compared with \$710,315 for the corresponding period of 1910.

North Vancouver's building permits for the ten months of the current year ending October 31st, amount to \$665,783. Mr. J. W. Fugler, Building Inspector.

Among recent incorporations we note that of Anglo-Canadian Contractors, Limited, capitalized at \$250,000, to carry on a general contracting business in Toronto.

According to a local paper, "a tremendous building season" is expected in Guelph next year. Plans are under way for several large buildings, and architects are working overtime.

An unprecedented increase in building permits is recorded at Galt, Ont., whose building total to date is \$5,000,000, double the amount of building carried out during the whole of last year.

The cornerstone of the new Y.M.C.A. building at Fort William, Ont., was laid on November 1st. The estimated

cost of the structure is \$75,000. Mr. R. E. Mason is the architect and Mr. M. H. Braden the contractor.

Regina's building permits to date total \$4,472,720, compared with \$2,280,575 for the corresponding period of 1910. This has been a great year for Regina, but 1912 is confidently expected to be the greatest ever.

Mr. Edward Crutwell, representing Sir John Wolfe Barrie, who has been retained by the Burrard Bridge & Tunnel Company to design the proposed bridge across the Second Narrows at Vancouver, arrived recently in that city.

Vancouver architects are forming a provincial architects' association which will be known as the British Columbia Society of Architects. Chapters of the Association will be organized in the principal towns and cities of British Columbia.

A recent visitor to St. John, N. B., was Mr. Edward Bath, consulting engineer to Messrs. Cammel Laird & Company and Norton Griffiths & Company. Mr. Bath was optimistic concerning the city's prospects for securing the proposed dry dock and shipbuilding plant.

Among the recent incorporations it is of interest to note the Polson Dry Dock & Shipbuilding Company, Limited, of Toronto, with a capital of \$1,000,000. Simultaneously comes the announcement of the St. Lawrence Dry Dock & Shipbuilding Company, of Quebec, capitalized at the same amount.

Mr. H. W. Meech, building inspector, Lethbridge, Alta., reports the total for building permits for the first ten months of 1911 at \$1,058,719, against \$1,116,085 for the ten months of 1910. Writing to the Contract Record Mr. Meech states that he is looking for considerable improvement in business with the settlement of the coal strike.

The building permits issued at Vancouver last month totalled \$1,506,375, as compared with \$1,286,995 for October, 1910. The total for the year to date is \$15,065,645, as against \$10,298,355 for the ten months of 1910. 2,396 permits have been issued so far this year,—over 400 in advance of the total this time last year.

Mr. H. N. Ruttan, city engineer of Winnipeg, has obtained extended leave of absence owing to ill health. He is now on his way to Great Britain and Europe, where during his vacation, he will devote himself to a study of sewage disposal methods in the larger centres of population. Upon his report and recommendations will depend to a large extent the action of next year's council in devising a permanent plan for sewerage in Winnipeg.

Announcement is made by C. H. Dancer, chief engineer of public works of Manitoba, of the appointment of Mr. V. W. Horwood as provincial architect, to succeed the late Mr. Samuel Hooper. Mr. Horwood is a native of Somersetshire, Eng. He received his professional education at Ottawa and later obtained valuable experience in Montreal, Toronto, Chicago and St. Paul. In 1904 he went to Winnipeg, in which city a number of excellent buildings are a standing monument to his ability.

There is every promise of outstanding activity in Winnipeg next spring. According to reports received from the western capital many important building projects are being discussed. City architects say that 1911 was a record year for them, but they look forward to an even greater season in 1912. Usually at this period of the year they are more or less slack, but now they are all busy, and some of the leading men have enough work on hand for twelve months. Plans are being rushed for spring building and some of the concerns are so anxious to commence their new buildings that operations are being put in hand even at this late date.

Contracts Department

News of Special Interest to Contractors, Engineers, Manufacturers and Dealers in Building Supplies.

Information for insertion in these columns is invited from Architects, Contractors, Engineers, etc.

Waterworks, Sewerage and Roadways

Alvinston, Ont.

The council of Brook Tp. have authorized construction of drain. Tenders will be called. W. G. Willoughby, clerk.

Berlin, Ont.

The sewer committee will recommend that a by-law be introduced at the coming elections for extending the sewer main.

A by-law to raise \$100,000 to build a million gallon concrete reservoir, install electric pumps, build new water tower, 2,000 ft. 10 in. mains, put down \$10,000 additional mains and install new pumps at Glasgow street station. Will be voted upon in January. Superintendent of W. Works, H. Hyman.

Galt, Ont.

City engineer, E. O. Fuce; Dr. Varndon, M.H.O. Board of Health has given the necessary authorization for the laying of the sewer extension on Water street north to intersection of Stone road.

Hamilton, Ont.

Tenders are called until Nov. 21 for about 400,000 direct feet of underground conduit. Specifications at office of consulting engineer; for Hamilton Hydro-Electric Department. Consulting engineer, E. I. Sifton, City Hall; mayor, G. H. Lees.

Tenders were called until Nov. 13th for construction of sewers on the following streets; Niagara street, Brant to Munro street; Burton street, Emerald to Wentworth street, and relaying sewer on Burton from Emerald to Clark avenue. Chairman Board of Control, Geo. H. Lees, Mayor; City clerk, S. H. Kent.

New Hamburg, Ont.

A movement is on foot to have a great deal of paving done in the town next spring. Leon G. Pequegant is interested.

Neepawa, Man.

Tenders are called for all labor and certain materials necessary for laying water pipes and sewers. Tenders on complete work called for Dec. 15th. Tenders on Contract A. to be in by 8 p.m. Nov. 10th, on condition that a total amount of about one mile of 6 in. & 8 in. water pipe be laid before Dec. 16th. Acceptance of tenders depends on decision of C. N. R. Sec.-treas., J. W. Bradley; R. H. Fusee, chairman of committee; engineers, Chipman & Powers, Toronto and Winnipeg.

Tenders are called for contract and all labor and certain materials necessary for laying water pipes and sewers. Tenders on complete work called for Dec. 15th. Tenders on contract A to be in by 8 p.m.

Nov. 10th, on condition that a total amount of about one mile of 6-inch by 8-inch water pipe be laid before Dec. 16. Acceptance of tenders depends on decision of C. N. R. Sec.-treas., J. W. Bradley; R. H. Fusee, chairman of committee; engineers, Chipman & Powers, Toronto and Winnipeg.

Point Claire, Que.

Municipality intends to build drains, waterworks and electric light. Tiles, iron pipe, engine and boiler, pump, dynamos, hydrants, hose, etc., will be required.

Regina, Sask.

Contemplated asphalt and bitulithic paving to cost \$200,000. City engineer, L. A. Thornton. Tenders probably called about January 1st.

St. Thomas, Ont.

The city has under consideration the macadamizing of Alma street from Talbot to city limits.

Toronto, Ont.

Tenders are called for construction of sewers on six streets, Helena avenue, McKay ave., etc. Specifications at office of City Engineer. Received until noon, Nov. 21st, by chairman, Board of Control, G. R. Geary.

Upton, Que.

Municipality is planning the construction of drains, waterworks and electric light plant. Tiles, iron pipes, engine and boiler pump, dynamos, hydrants, hose, etc., will be required.

Vancouver, B. C.

Tenders were called until Nov. 14th for construction of sewer on Willow street, from 12th avenue to 16th avenue and temporary sewer 12 avenue. Willow to Laurel street. Plans, etc., at office of city engineer. City clerk, Wm. McQueen.

Victoria, B. C.

The plans for the extension of the sewer system in Victoria West, and also in the northeastern section of the city, have been approved by the secretary of the provincial board of health.

Railways, Bridges and Wharves

Calgary, Alta.

Plans are prepared for bridge to cost \$100,000. City engineer, J. T. Child. 450 ft. long to accommodate 2 sets of street railway tracks and also for vehicular and pedestrian traffic. No date given for calling for tenders.

Edmonton, Alta.

The Board of Education has fixed the value of \$210,000 on the site which the Grand Trunk Pacific have in view for their station.

Eglinton, Ont.

Tenders are called for excavation on Mount Pleasant road; construction of bridge over Belt Line Railway on Mount Pleasant road. Plans at Town Hall, North Toronto. Award of contract subject to action of North Toronto Council and Dominion Railway Board. Received by Wm. C. Norman, Eglinton, until Nov. 16th. Chairman Board of Works, F. Howe; Town Engineer, E. A. James.

Fort William, Ont.

The Canadian Pacific Railway, Montreal, are planning the construction of a subway to cost \$150,000. Architects, Anderson & Co., Winnipeg, Man. Concrete and steel; to be completed June 1st.

Hamilton, Ont.

Tenders are called until Nov. 21 for supply, construction and installation of transformers, switching equipment and lightning arresters for sub-station No. 2. Plans, etc., at office of engineer. For city of Hamilton Hydro-Electric Dept. Mayor, G. H. Lees. Consulting engineer, E. I. Sifton, City Hall, Hamilton.

Lake Magantic, Que. 6

The Lake Magantic Pulp Co. will build a dam on River Chaudiere to develop 1,500 h.p. Concrete, stone, square timber, chains, iron. Turbines will be required.

Moose Jaw, Sask.

The Grand Trunk Pacific have purchased the northeast corner of Main and Caribou streets, and it is stated that a union station for the Grand Trunk Pacific and the Canadian Northern Railway will be built.

Port Hope, Ont.

Survey for electric line through Peterboro, Omemee and Lindsay to Orillia is under way under supervision of Graham & Mann. It is supposed that the C. N. R. are behind the project.

Quebec, Que.

The Canadian Northern Railway Co. will commence work on round house, work shops and other buildings shortly at Limoilon. No plans have been made public so far. Estimated cost \$400,000.

The plans for the new Dorchester bridge will be sent on to the government with the recommendations of the Road Committee. Plans call for bridge of bascule type, 40 feet wide with footpaths and driveway.

Tenders will be called shortly for improvement of terminal for Canadian Pacific Railway. Work contemplated: new station, extension sheds, wharves, etc. Many millions will be spent. Work to commence very soon.

Renfrew, Ont.

Tenders are called for construction of storage dam at the outlet of Round Lake on Lot No. 8, con. XIII, tp. of Hagarty, Co. of Renfrew. Plans, etc.

at office of the Commission, Toronto, or from J. R. Stewart, town engineer, Renfrew, Ont. Received by chairman until noon, Nov. 17, 1911; for Hydro-Electric Power Commission of Ontario. Chairman, Hon. Adam Beck, Continental Life Building, Toronto.

Sudbury, Ont.

Franchise is granted to Louis Laforest for operation of electric railway to run to Copper Cliff.

Toronto, Ont.

The Canadian Northern Railway are contemplating the erection of a new suburban station in Rosedale.

Trenton, Ont.

The Canadian Pacific Railway will, it is expected, be laying track into Trenton next year. A large bridge is included in the plan.

CONTRACTS AWARDED

Port Burwell, Ont.

Arthur Pebble has been awarded the contract for new bridge over the Otto river.

St. Catharines, Ont.

W. H. Weller, of this town, has been awarded the contract by Ottawa Government for building lock and entrance at the southern end of St. Peter's Canal, Cape Breton.

Public Buildings, Churches, Schools, etc.

Amherstburg, Ont.

Tenders are called for public library to cost \$10,000; architects, Crane & Pennington, Windsor; stone steam heating, electric lighting, slate and tin roofing; cement work, cut stone, brick, fireproofing, artificial stone, sheet metal work, weather strips, roofing, sheathing and deafening paper, plate glass. Complete heating and lighting equipment, shelving and all interior appointments will be purchased for library now being built.

Berlin, Ont.

Contemplated, new sanatorium for the Berlin Sanatorium Association; president, Rev. F. E. Oberlander. Site will be selected at once and new building erected in the near future.

Berthier-en-Haut, Que.

Addition to school to cost \$40,000, for Catholic Brothers School; architects, Prefontier & Drouin, 55 St. Francois Xavier street, Montreal; 5 storeys, 54 x 84, stone and steel frame, stone foundation, hot water heating, mausard and metal roofing, hardwood floors. Tenders will be received by architects after Dec. 15th; close Jan. 1st, 1912.

Brantford, Ont.

A by-law will probably be submitted shortly to raise \$50,000 for a new school, which will be built next year.

Brock, Sask.

At a recent meeting of the council it was decided to have plans and specifications prepared for the erection of a rink here. Building to be 160 x 66 ft., cost \$3,000.

Galt, Ont.

Tenders are to be called for Y.M.C.A. building, Queen's Square; local secretary, W. R. Cook; architects, Shattuck & Hussey, Chicago; 3 storeys, 70 x 122, red brick, stone facings, stone foundation, steam heating, electric light, likely

slate roofing, hardwood interior finish, vault and fire escapes, swimming tank, gymnasium, bowling alley, billiard tables. The Grand Hotel on Queen's Sq. is to be torn down.

Guelph, Ont.

Steps will be taken by the council at once to have a new fire hall built and new fire apparatus purchased as soon as possible next spring.

Hamilton, Ont.

City will ask for plans for alterations to basement of City Hall. It is to be cut up into offices and furniture and safe will be wanted.

Hamilton, Ont.

Plans will be prepared for erection of a church to cost \$50,000 for Congregation of St. Giles Presbyterian Church. Pastor, Rev. J. B. Paulin, 14 Fairleigh Crescent; architects, Stewart & Witton, 2 Hughson street south. Work will not be started until spring.

Kentville, N. S.

Presbyterian Church of Canada are contemplating the erection of a church to cost \$25,000. Pastor, Rev. Geo. McMillan; brick and stone. Church to be built next year.

London, Ont.

St. Nicholas Parish is contemplating the erection of a school to cost \$7,500, Colborne, North. Priest, Father Hanlon; architects, Moore & Munro, London; 1 storey, 55 x 60, stone and cement block foundation, steam heating. Plans are under consideration. Desks and school equipment will be installed.

A by-law will be submitted in January for equipping a garbage disposal plant; estimated cost \$50,000. City engineer, Geo. W. Wright.

Mitchell, Ont.

W. Trench has started work on large new skating rink. Seating and lighting equipment will be required.

Medicine Hat, Alta.

Arrangements are completed for a theatre, seating capacity 1,500; W. J. Christie, of Winnipeg, Man., and Wm. Cousins, Medicine Hat, are interested.

Montreal, Que.

The Oblate Fathers have purchased 65 acres of land for \$23,000, at Ste. Anne de Bellevue (Lachine), on which, it is stated, a large educational and religious institution will be established in the near future.

New Glasgow, N. S.

It is reported that a brick and stone church will be build here next year for Presbyterian Church of Canada.

Ottawa, Ont.

Tenders have been called for erection of a theatre for F. W. Carling; architect, C. P. Meredith, Sparks street; 35 ft. high, 60 x 125, solid brick, fireproof, steam heating, tar and gravel roofing.

Port Arthur, Ont.

New City Hall. By-law to expend \$200,000 will be submitted in January. Mayor Ray.

Quebec, Que.

Fire Station No. 5, destroyed by fire, Nov. 2. Loss \$6,000, will be rebuilt immediately, stone and brick, concrete foundation, metal roofing, hardwood finish, iron pillars, electric lighting, hot water heating.

St. Thomas, Ont.

Plans are prepared for new isolation hospital to cost \$10,000; architect, Mr. Findlay. The ratepayers will likely be asked to vote on proposition in January.

It is reported that the present armouries will be sold shortly and larger ones built at a more central place. Options on property on Talbot and Flora streets are being secured.

Ste. Anne de la Perade, Que.

Work is in progress for an addition to Superior College (Sacred Heart) to cost \$15,000; hot water heating, electric lighting, metallic roof, hardwood interior finish.

Stanhope, Que.

Roman Catholic Diocese are contemplating the erection of a church to cost \$40,000. Parish Priest, Rev. A. Goyette; stone, concrete foundation, metal roofing, hot water heating, electric lighting, hardwood finish.

Toronto, Ont.

Tenders were called until Nov. 10th for plumbing, electric work, iron stairs, etc., for five schools. Plans, etc., at office of superintendent. Board of Education; sec.-treas., W. C. Wilkinson; chairman of committee, G. W. Hodgson.

Tenders were called until Nov. 13th for cabinet work and plumbing for Science rooms in three high schools and one public school. Specifications at office of Supt., City Hall. Advertisement in "Tenders & For Sale Dept." of this issue. Bd. of Education; sec.-treas., W. C. Wilkinson.

Excavation is done for the new Y. M. C. A. building on College street; architects, Burke, Horwood & White, 28 Toronto street. Masonry tenders called; close in about a week. To be called—marble work, tiling, reinforced concrete and brick, mantles, moulding, direct steam heating, tar and gravel roofing, ornamental iron, Terrazo, art stone, cut stone, vacuum cleaning, hardwood interior finish.

The Toronto Methodist Social Union have purchased a site on Pauline avenue, north of Bloor; cost about \$10,000, on which they will erect a church.

Tenders are called until Nov. 21st for structural steel work for new Government House, Chorley Park, Rosedale. Plans, etc., at Dept. Accepted cheque for 5 per cent. of amount of tender to accompany each tender. Department of Public Works, Ontario; secretary, H. F. McNaughten.

Winnipeg, Man.

A by-law will be submitted next month for the purpose of raising \$600,000 for new schools.

The Shaarey Zedek Synagogue has been sold and a new site, Lily street, and Logan avenue, received as part payment. Construction will probably not start till the spring on new synagogue.

Sullivan & Considine, Circuit Theatre, contemplate a theatre to cost \$300,000 to accommodate 1,800. Stairs to gallery to be inclined passages. It is also proposed to build houses at Ft. William, Regina, Moose Jaw, Edmonton and Saskatoon.

The Winnipeg Development & Industrial Bureau are planning a new building on Main and Water streets; 2 storeys, 200 on Main street old foundations of Manitoba Hotel to be used. The

"Hall" will probably be built this winter. No plans have been prepared.

Contemplated court house on Kennedy and Broadway, for Provincial Government. Provincial architect, V. W. Horwood, Ft. Garry Court; 3 storeys; fireproof, brick and stone, stone foundation, steam heating, passenger elevators. Building will not be commenced before 1912.

CONTRACTS AWARDED

Calgary, Alta.

Church to cost \$4,000 for Christian Science Trustees; architect, D. S. McIlroy, 118a 8th avenue west, Calgary; contractors, Randall & Dippier, 1024 1st avenue N.W. Calgary; 1 storey, 25 x 80, frame and brick, concrete foundation, hot air heating, electric light, rubberoid roofing, hardwood finish.

Calgary, Alta.

Craddock & Sweeny have secured the contract for erection of city storehouse and machine shop, at a cost of \$29,233.

Montreal, Que.

Church for Fairmount Baptist Congregation; architect, J. E. Adamson, St. Catherine street west, Montreal; roofing contractor, The Metal Shingle & Siding Co., Ltd., 91½ Deloremier avenue, Montreal. Walls nearly up. Electrical wiring, heating, painting and plastering contracts not yet awarded.

Messrs. Cadieux & Briard have been awarded the contract for the heating, ventilating and plumbing in the Boulevard Academy and the Infant Jesus School, St. Denis Ward, Montreal. D. Viau, 76 St. Gabriel street, architect; Canadian Domestic Eng. Co., 5 Beaver Hall Square, engineers.

Theatre to cost \$100,000 on St. Catherine street, for The Canadian Amusement Company, J. H. Aloz. Orpheum Bldg.; architect, Ross & McFarlane, Belmont street, Montreal; general contractor, C. E. Deakin, 11 St. Sacrament street; 3 storey, 85 x 180, brick and concrete, concrete foundation, electric lighting. Building to be completed July 1, 1912, seating capacity 1,650.

School to cost \$25,000 for Montreal Protestant School Board, Peel street, Montreal; architects, MacVicar & Heriot, 104 Union street; general contractor, Gray & Wighton, 244 Pine avenue, W. Montreal; carpentry, Wm. Evelyn, 499 Bleury street, Montreal; 2 storeys and basement, concrete foundation, concrete roof; foundations are in. Work delayed while plans are being changed from mill construction to fireproof material.

Foundations are in for church to cost \$25,000, 50 x 100, stone and brick, concrete foundation, furnace heating, electric lighting, gravel roofing; owner, Trustees Shaw Memorial Methodist Church; architect, Peden & McLaren, 20 St. Alexis; contractors as follows: Reid, MacGregor & Reid, St. Catherine west; carpenter, Jackson & Co., 335 Hibernia street; plumbing and heating, G. R. Woodburn, 177 Fulford street; iron work, Phoenix Bridge & Iron Works, Ltd., 83 Colborne street.

Toronto, Ont.

Club house to cost \$100,000, Wellington and Jordan, for Ontario Club, Lumsden Bldg., Toronto; 5 storey and basement; concrete and brick; steel, Dominion Bridge Co.; reinforced concrete, Crescent Cove Co., Temple Bldg.; reinforced steel, Clarence W. Noble,

Home Life Bldg., Toronto; plumbing and heating, low pressure, vacuum steam heating and indirect in summer, Keith & Fitzsimmons, 111 King west. Contracts will be called on Interior finish, plastering, fixtures, marble, tile, terrazo, electric lighting and fixtures.

Obstetrics building, Toronto General Hospital, Toronto; architects, Darling & Pearson, 2 Leader Lane, Toronto; masonry, Thompson Bros., 151 Rusholme road; steel, Dominion Bridge Co., Can. Life Building; marble, Hordge Marble Co., 34 Price; roofing, Duthie & Co., 30 Widmer; plumbing, Taylor & Co., 9 Bloor east; hardware, Aikenhead, 17 Temperance street; galvanized iron, Douglas Bros., 124 Adelaide west; plastering, Darcey & Son, 220 Howland avenue; ornamental iron, Dennis Wire & Iron, 12 Queen east; all of Toronto.

Private Patients building, College street, for Toronto General Hospital; architects, Darling & Pearson, 2 Leader Lane, Toronto; steel architect, Dominion Building Co., Confederation Life Building; roofing, H. J. Williams & Co., 23 Toronto street; plastering, Hoidge & Sons, 34 Price; painting and glazing, A. E. Phillips, 49 Richmond E.; marble, Hoidge Marble Co., 34 Price; hardware, Aikenhead Hardware, Ltd., 17 Temperance street; wiring, W. J. McGuire, 86 King west; plumbing, heating and ventilation, Purdy Mansell, Ltd., 63 Albert street; all of Toronto.

Verdun, Que.

Recreation Hall to cost \$53,000 for Protestant Insane Hospital; architects, F. & W. S. Maxwell, Beaver Hall Sq., Montreal; general contractor, Jno. Quinlan, 4412 St. Catherine street west, Montreal; 1 storey, 60 x 120, hot water heating, gravel roof, electric light, seating capacity 400.

Church, \$15,000, 1-storey, 45 x 90, brick, stone foundation, hot water heating, electric lighting, gravel roofing, hardwood finish; owner, Verdun Presbyterian Church; architect, Hutchison, Wood & Mills, Royal Insurance Building, Montreal; contractors as follows: electric fixtures, The Sayer Electric Co., 87 Bleury street; plastering, MacIntyre Plastering Co., Ltd., 55 Latour street; excavation, Reid McGregor & Reid, 668 St. Catherine west; carpentry, T. S. Hudson & Co., B12 Board of Trade Bldg.; painting and glazing, W. E. Potter & Co., 46 Benoit street; plumbing, Metal Shingle & Siding Co., Ltd., 91 Delorimier avenue; iron work, Structural Steel Co., Ltd., Longue Pointe; all of Montreal.

Vernon, B. C. (Okanagan District)

Court house to cost \$174,000. Department of Public Works, Victoria. Public Works engineer, J. E. Griffiths; contractor, T. Burns, Nelson, B. C. Contract awarded Oct. 27th.

Westmount, Que.

Work is in progress for church to cost \$60,000 for St. Mathais Church. Priest in charge, Rev. E. Bushell, 20 Churchill A.; architect, Ross & McFarlane, 1 Belmont street, Montreal; plastering, R. G. Hamilton, 515 Victoria avenue; mason and brick, C. J. Brown, 4263 St. Catherine west; carpenter, D. M. Long, 39 Windsor; painting and glazing, Castle & Son, 568 St. Catherine west; plumbing, Walter Ryan, 31 Chomedy street; roofing, Geo. W. Reed & Co., Ltd., 37 St. Antoine street; brick and stone, electric lighting, slate roof-

ing; roof and interior ready for plastering. Heating contract not yet awarded. Plans prepared by Canadian Domestic Engineering Co.

Residences

Calgary, Alta.

Permit granted for residence, \$5,000, Mt. Royal, 2 storey, 30 x 40, frame, concrete foundation, hot air heating, electric lighting, hardwood finish; owner, S. S. Adell, Calgary; architect, A. A. Rose, Lineham Block.

Permit has been granted for an apartment house to cost \$8,000 for S. H. Haslum, 222 15th avenue east, Calgary. Architect, Leo. Dowler, Alexander Blk., Calgary; 2½ storeys, 32 x 54, brick construction, concrete foundation, hot air heating, electric light, shingle roofing, hardwood finish. Outside stairs will be required.

Hamilton, Ont.

Stewart & Witton, 2 Hughson street south, have started on plans for erection of apartments near corner McNab and King streets; cost \$60,000.

Lauson, Que.

Work pending for a residence to cost \$5,000, stone, concrete and brick construction, soft wood finish, hot water heating, electric lighting; owner, Mrs. Chas. Bouchard.

Maisonneuve, Que.

Work to commence on residence to cost \$5,500, brick, stone foundation, metal roofing, asbestos plastering, hot water heating, electric lighting, iron stairs; owner, Jos. Bousquet, 646 Maisonneuve street.

Montreal, Que.

Richer & Frere, 1817 Christophe Colomb street, will build 25 flats, 3 storeys, 150 x 60, rustic brick, concrete foundation, electric lighting, gravel roofing. Cost, \$25,000.

Work to commence on three dwellings to cost \$5,700, 3 storey, concrete, stone and brick, metal roofing, hot water heating, electric lighting, hardwood finish; owner, Jules Schiers, 447 Joliette street.

Plans are to be prepared for erection of a residence (Redpath property, Mt. Royal) for F. N. Beardmore; architect, H. C. Stone, 84 St. Francois Xavier street, Montreal. Rock excavation will be done during the winter and construction will proceed in the spring.

Ottawa, Ont.

D. Cuthbertson, 166 Clemow avenue, has commenced excavation for the erection of a residence on Echo Drive to cost \$4,500.

Tenders will be called for dwelling to cost \$4,800 on Daly avenue, for Thos. Bolis; architect, W. C. Noffke, Central Chambers; brick veneer.

Tenders will be called at once for a residence to cost \$4,500 on Stewart avenue, for Wm. Fields, 620 Cumberland street, brick detached dwelling.

Toronto, Ont.

Ten pair dwellings, cost \$36,000. Campbell and Sarnia; L. C. Shephard, 17 Adelaide street east; 2-sty. and attic, 32 x 90 each, hot air htg. elec. lgt.

Tenders are open for erection of residence, cost \$3,000, for Morris Smith, 47 Ward street; arch., W. S. Clayton, 358 Wallace avenue, Toronto; 2-storey, brick.

H. Bernstein, 147 Bathurst street, will

build pair dwellings, cost \$4,000, Maher and Barber; architect, W. Milleship; 2-sty., brick, hot air heating, electric lighting, rubble foundation.

A. E. Armstrong, 61 Farnham ave., is planning the erection of a residence on Farnham avenue 2½-storeys, brick, brick mantles; asbestos under shingles. Cost \$3,200.

Excavation is completed for a residence to cost \$5,000 on S. W. corner Humberside, for Geo. E. Case, 296 Indian road; 1 pair semi-detached, slate, tar and gravel roof, hot air heating.

One pair semi-detached, \$3,300, Westmoreland avenue, 2-storey, 37½ x 60, brick construction, brick foundation, electric lighting, shingle roofing; for Fred. Tampsett, 435 Westmoreland.

Tenders are open for erection of 3 pair dwellings to cost \$15,000, 2 Hewitt avenue, for E. G. Shutzer, 139 Springhurst avenue, Toronto; 2 storeys and att.; brick, hot air heating, electric light.

A. Lainson, 105 Fort street, has had plans prepared by Architect A. V. Day, 1874 St. Clair avenue, for erection of a 2-storey residence and stables to cost \$4,000, on Fairview avenue. Tenders to be called shortly.

Permit applied for pair semi-detached residences, \$6,000, 2-storey, 50 x 40, brick and stone, stone foundation, electric lighting, gravel roofing; owner, J. W. Clare, 547 Perth avenue; architect, H. Sterry, 105 Lappin street.

Plans prepared for apartment house, \$4,000, 2½ storeys, brick construction, stone foundation, electric lighting, gravel and pitch roofing; owner, J. A. Steele, Room 19, 43 Victoria street; architect, P. H. Finney, 43 Victoria.

Excavation is completed for three attached dwellings, cost \$5,400, on Shirley street, for H. T. Love, 52 Metcalfe st., Toronto; arch., A. Trainor, 64 Grace st., Toronto; 2-sty., brick, stone fndn., tar and gravel roof, hot air htg., elec. lgt.

Dwelling to cost \$6,000, 2½ storeys, semi-detached, brick; owner, Dr. Laker, 213 Dundas; architect, E. G. Wilson, 77 Victoria street; masonry contractor, McGowan & Wells, 773 Bathurst street; iron roofing, Chas. J. Mic., 144 Dundas street.

Plans are prepared for residence to cost \$11,000, S. W. corner Warren road and Heath, for Wm. C. Brent, Howland avenue; architects, C. Thetford, 26 Tyn-dall avenue; 2 storeys and attic, 30 x 50, brick, brick foundation, electric lighting. Permit has been applied for.

Vancouver, B. C.

Plans have been prepared for erection of a residence to cost \$20,000, Shaughnessy Heights, for A. Cotton; architect, G. A. Horel; 3 storeys, 60 x 38, concrete foundation, artificial stone, hot water heating. Tenders will be called for about next March.

Verdun, Que.

Antoine Filiatrault, 344 Church street, will build 12 residences to cost \$12,000; 3 storeys, 75 x 40, brick encased, electric light, gravel roof.

Excavation under way for six flats \$5,600, 3 storeys, 44 x 30, pressed brick, stone foundation, electric lighting, gravel roofing; owner, J. E. Robin, 533 Ninth avenue.

Excavation under way on three flats, \$3,500, 3-storeys, 25 x 43, stone, concrete foundation, electric lighting, gravel roof-

ing; owner, Joseph Asselen, 203 Beau-lieu street.

Work to commence on two dwellings, \$5,600, brick, stone foundation, metal roofing, hot water heating, electric and gas lighting; owner, A. Charland, 412 Montcalm street.

Foundations under way for six flats, \$6,500, 3-storeys, 50 x 38, brick encased, concrete foundation, electric lighting, gravel roofing; owner, F. X. & J. O. Hamelin, 246 Church street.

Residence, \$6,500, brick, stone foundation, metal roofing, hardwood finish, asbestos plastering, hot water heating, electric lighting, iron stairs; owner, T. Demers, 321 Amherst street.

Foundations started on three flats, \$5,000, 3-storeys, 25 x 36, brick encased, concrete foundation, electric lighting, gravel roofing; owner, Oscar Dandurand, 302 Gertrude street.

Foundations started on five flats, \$5,600, 3-storeys, 25 x 40, brick with stone front, concrete foundation, electric lighting, gravel roofing; owner, Louis Deschesneaux, 15 Regina street.

Excavation under way for four flats, \$6,000, 2-storeys, 25 x 45, brick and wood, stone foundation, electric and gas lighting, tar and gravel roofing; owner, Lemire & Chapelle, 2585 St. Hubert street.

Work to commence on residence, \$8,000, 3-storeys, stone and brick, concrete foundation, metal roofing, hot water heating, hardwood finish, electric and gas lighting; owner, John Allan, 300 Atwood avenue, Montreal.

West Montreal, Que.

Work commenced on a residence, to cost \$25,000, cut stone and brick, concrete foundation, metal roofing, asbestos plastering, hardwood finish, hot water heating, electric and gas lighting, plate glass, iron stairs, hot house; owner, Sir Wm. Van Horne, 513 Sherbrooke.

Westmount, Que.

Work is in progress for four dwellings to cost \$24,000, for A. A. Maurice, 2229 St. Urbain street, Montreal; 2 storeys, 85 x 59, solid brick, concrete foundation, hot water heating, electric light, gravel roofing.

CONTRACTS AWARDED

Calgary, Alta.

Permit granted for three residences to cost \$6,600, 2 storeys, 20 x 34, frame concrete foundation, furnace heating electric lighting; owner, F. Crascoigne, 1504 17th avenue west; contractor, J. A. Anderson, 1836 16th street west.

Permit granted for residence to cost \$8,000, 2 storey, 50 x 50, brick, concrete foundation, hot water heating, electric lighting, shingle roof, hardwood interior finish fireplaces; owner, W. T. D. Lakewell, 1430 Buckingham avenue; general contractor, J. Harrison, Box 1243.

Residence to cost \$20,000 for Dr. Blow, 7th avenue west, Calgary; architect, Lang & Major, Calgary; general contractor, A. R. Blow, East Calgary; 2 storey, 43 x 50, stone and brick, stone foundation, steam heating, electric lighting, metal shingles, hardwood finish.

London, Ont.

Residence to cost \$3,500, Marley Pl., 2-storey, red brick, hot water heating, electric lighting, shingle roof; owner, Watt & Blackwell, London; general contractor, J. Evans & Son; carpentry, A. Hogg.

Work is in progress for residence to

cost \$3,500, Sydenham street, 2-storey, 34 x 35, red brick, hot water heating, electric lighting, shingle roof; owner, J. G. Noyes; architect, Watt & Blackwell, Bank of Toronto, London; general contractor, L. H. Martyn; masonry, John Mulkins.

Montreal, Que.

Block of residences to cost \$100,000, St. Urbain and Esplanade, for O. Lamoureux, 96 George Cartier Square, Montreal; architect, R. Charbonneau, 52 St. James street; masonry, N. Galarneau, 2403 St. Dominique; carpentry, owner, 3 storey, 210 x 167, Indiana stone facing, solid white stone foundation, hot water heating supplied to the 86 flats contained; flat gravel roof, Cabot quilt deafening for floors, tile baths, marble halls, oak and chestnut finish.

Ottawa, Ont.

Terrace for Ottawa Building Co., architect, Jas. Mather, Wellington street, Ottawa; general contractor, J. & C. Love. Heating, plumbing and electrical work still open.

Outremont, Que.

Residence to cost \$4,400, 2-storey, 25 x 55, brick, cement foundation, hot water heating, electric lighting, tar and gravel roofing; owner, William Cromarty, 287 Delorimer ave.; contractor, S. Whitaker, 285 Willard street.

Excavation started for five flats, to cost \$3,800, brick encased, concrete foundation, gas and electric lighting, gravel roofing; owner, Ed. Gauthier, 572 Marie Anne street; contractor, 1041 Marie Anne E.

Residence, \$25,000, stucco and brick, masonry foundation, hot water heating, electric and gas lighting, metal roofing; tile finish; owner, C. J. DeSola, 71 McGill ave. Contractors as follows: elec. wiring, the Sayer Electric Co., 87 Bleury st.; plastering, R. D. Clark & Sons, 26 Lincoln ave.; excavation, masonry and brick work, Fussing & Jorgensen, Centre street; carpentry, Paton & Son, Ltd., 485 St. James street; painting and glazing, Murphy & Son, 150 Mansfield street; plumbing and heating, Thos. O'Connell, 183 Ottawa street; roofing, Geo. W. Reed & Co., Ltd., 37 St. Antoine street.

Quebec, Que.

Apartments, cost \$175,000, 144 Grand Allee, for Grand Allee Apartment Co., Ltd., Quebec. Architects, McDowell & Henderson, Bank of Toronto, Montreal; general contractor, G. W. T. Nicholson. Eastern Townships Bank; ornamental iron, Fred MacKay & Co., 18 St. George street, Montreal; millwork, E. T. Nesbitt, Quebec; elevators, Otis Fensom Co., Montreal; painting and glazing, Messrs. Gaethier & Frere, Quebec; roofing, Douglas Bros., 19 St. Maurice street, Montreal; gypsum blocks, Eadie-Douglas, Ltd., 12 University street; 6-storeys and basement, reinforced concrete with brick facing, elec. and gas light, gravel rfg. Heating not decided.

Toronto, Ont.

Residence to cost \$4,500, St. Andrews Gardens N.; contractors, Bailly & Cummings, Balsam avenue; architect, S. W. Siddall, King and Yonge sts.; 2 storey, brick and stone, shingle roof.

Residence, cost \$7,500, for D. J. Fraser, 32 Howard ave., Toronto; architect, J. Francis Brown, 503 Board of Trade Bldg., Toronto; builders, Elgie & Page, 21 Havelock street, Toronto. Two storeys and attic, cut stone.

Verdun, Que.

Dwelling to cost \$3,000, 2 storey, 25 x 35, brick encased, concrete foundation, electric lighting, gravel roofing; owner, Thos. Clarke, 161 Gordon avenue; contractor, T. Harrison, 141 Ash avenue.

Westmount, Que.

Residence to cost \$17,000, West Boulevard, for Robertson MacAulay, c/o Sun Life Assurance Co., 142 Notre Dame street west, Montreal; architect, R. Findlay, 10 Phillips Place, Montreal; masonry contractor, Robertson Bros., Chestnut avenue, Montreal; 3 storeys, 37 x 73, brick and stone, electric and gas lighting, slate roof, hardwood interior finish, furnace heating. Balance of tenders to be called and closed next week.

Business Buildings and Industrial Plants**Berlin, Ont.**

J. Kaufman is excavating for an office and store room to be added to planing mill on King street; 2-sty., 30 x 30, concrete and pressed brick. Work will be done by day labor.

Brockville, Ont.

The Cossitt Company, scale manufacturers of cream separators, have completed plans for a 2-storey addition to its plant.

Goderich, Ont.

The council is considering the proposition made by L. P. Brodie to establish mammoth salt works here and manufacture salt by an electrical process. The company offers to sell Goderich electric power at \$28 per h.p. By-law may be submitted soon.

Hamilton, Ont.

G. D. Membrey & Sons, 28-31 Severn street, Hamilton; G. D. Membrey, proprietor; burned out on Nov. 2nd. Will require mattress-making machinery, spring-making machines, to cost about \$15,000.

Hamilton, Ont.

National Drug & Chemical Co., Toronto, have purchased a site near King street station of G. T. R. for the erection of a store and warehouse. Cost \$50,000; work to commence in the spring.

Kentville, N. S.

Royal Bank of Canada are contemplating the erection of a branch bank to cost \$30,000. Local manager, A. A. Thompson. Brick and stone construction.

Kitsilano, B. C.

Plans have been completed by Ferry & Nicolais, 324 Pacific Building, for a 2-storey frame and rustic store and apartment building to be erected by the Great West Construction Co. Building to be 50 x 75 and will contain three stores and eight apartments, tar and gravel roofing, burlap panelling, fir interior finish, hard wall plaster, shingle stain.

Kingsville, Ont.

The Volcanic Co. of Windsor Northern Pipe Line Co., United Fuel Supply & Ridgetown Gas. Companies have formed a merger and big extensions are planned. S. L. McKay of this place is interested.

Lethbridge, Alta.

The Great West Saddlery Co. are contemplating the erection of a 3-storey block here.

International Harvester Co. have purchased 11 lots, Block C, facing tracks for a warehouse to cost \$100,000; 4 storeys and basement, 125 x 125. Work will be started early in the spring. A spur track will also be put in this winter. General manager, Chas. McCleneghan.

London, Ont.

Wilfrid Mara is having plans prepared for a new dry goods store on Dundas street to replace one destroyed in recent fire. Brick, 4 storeys; cost, \$25,000.

John Purdon's store on Dundas street damaged in the fire will be completely remodelled. Complete new fittings for modern hardware store will be required.

Montreal, Que.

Messrs. J. Rosenthal & Sons, wholesale jobbers, 223 Notre Dame street west, are planning to erect a business block on St. Catherine and Dorion streets. Work may start within a month.

Foundations are completed for two stores to cost \$10,000 for B. Damiers, 898 Mount Royal east, Montreal; 2 storeys, 50 x 92, stone and brick, cement foundation, hot water heating, electric light, flat gravel roof.

Moose Jaw, Sask.

It is reported here that the C. P. R. has made an offer for St. Andrews Church property as a building site for their new offices.

Mount Forest, Ont.

The ratepayers will vote on the granting of loan of \$14,000 to the Carriage Co. who will operate their plant here.

Nanaimo, B. C.

Plans are prepared for erection of an hotel. Architects, Parr & Fee, 570 Granville street, Vancouver; 8 storeys, concrete and brick. Owner will award all contracts in Nanaimo. Building will probably not be commenced until spring.

Nelson, B. C.

It is stated that work will commence during the winter on a \$100,000 hotel. A syndicate of local and Spokane capitalists are said to be behind the proposition. Building to be brick and cement, 3 storeys, and basement.

North Battleford, Sask.

The North Battleford Manufacturing Company will erect a new factory and use their present one as a warehouse. Their capitalization is being increased to \$50,000.

Ottawa, Ont.

The Bronson Lumber & Saw Mills Co., Ltd., have taken out a permit for the erection of a pulp mill to cost \$30,000, at the Chaudiere. Work has already commenced.

A permit has been granted for a shop and dwelling to cost \$13,000 on Kent street, for H. Martin. Architect, Geo. Tomlinson, 348 Waverly street. Solid brick.

Port Arthur, Ont.

F. H. Keefer is reported interested in the construction of a manufacturing plant at Bare Point, to cost about \$40,000.

Port Colborne, Ont.

Work has commenced on extension to the plant of Robinson Bros. Cork Co. It is expected that it will be completed in about six months.

Negotiations are under way for securing a branch of a large American firm in the steel business that will probably employ two hundred men.

Quebec, Que.

The Rock City Tobacco Co. will build an addition to factory, 250 x 45, concrete, stone and brick, superstructural steel, metal rfg., hwdwood finish, steam hgtg., elec. lighting. Work will commence shortly.

Canadian Pacific Railway are planning the erection of an addition to the Chateau Frontenac, that will cost a million dollars. Plans are now being prepared, but work will not be commenced for some time.

Ridgetown, Ont.

D. Marshall, M.P.P., Aylmer, Ont., is taking up the matter of building a big new canning factory with council and it is likely that a by-law to grant a free site will be submitted to the electors shortly.

St. Barnabe, Que.

It is reported that the sawmill of Arthur Benoit was destroyed by fire, loss \$10,000, and that he intends rebuilding at once, requiring saws, planers, boiler and engine, steam pump, piping, etc.

St. Catharines, Ont.

The Steam & Radiation Co., Ltd., Toronto, will build a foundry, 120 x 240 ft., and a machine shop, 200 x 200 feet, here.

Sydney, N. S.

A large fertilizing plant is being erected by Messrs. A. Cross & Sons, Ltd. Dimensions, boiler house, 36 x 57; engine house, 24 x 18, mill house, 100 x 48; storage warehouse, 365 x 150. Reservoir will provide for the storage of 800,000 gallons of water for use of plant. Engineer in charge, John Midgley.

South Vancouver, B. C.

Plans have been approved for the exchange for the B. C. Telephone Company and submitted to the council. Total expenditure, \$40,000.

Stratford, Ont.

A firm to be incorporated as The Bennewitz Mfg. Co., Ltd., Paul Bennewitz manager, have taken over the factory of the Perth Flax & Cordage Co. The firm will manufacture piano stools and benches, music cabinets, etc.

Toronto, Ont.

Massey-Harris Co., King street west, will build a core room on King street west, 3-sty. and basement, brick, concrete and steel beams, tar and gravel roof. Cost \$25,000.

Permit granted for store and dwelling to cost \$4,000, 3 storey, 67 x 19, brick, brick foundation, electric lighting, pitch and gravel roofing; owner, F. J. Sharpe, 330 Sunnyside avenue.

Toronto Stock Exchange, 20 King st. east, are calling for competitive plans until Jan. 2nd, 1912, for a new building to be erected at 86-88 Bay street. For further information apply to W. H. Brouse, president.

Plans have been prepared for store and dwellings to cost \$24,000, for R. C.

(Continued on page 63)

Tenders and For Sale Department

Tenders for Bridge

Tenders will be received till December 5th for the erection of a steel bridge over the Saugeen River, 10th concession of Township of Brant. Bridge to consist of two spans of 125 feet and one span of 90 feet; with concrete floor; also for two abutments and two piers for the same.

An accepted cheque for \$100 must accompany each separate tender.

The lowest or any tender not necessarily accepted.

JAMES WARREN.

Walkerton, Nov. 11, 1911.

46-46



To Structural Steel Workers

Separate tenders, endorsed "Tender for New Government House," addressed to the undersigned, will be received at this Department until noon of Tuesday, November 21st, for the Structural Steel Work for the New Government House, in Chorley Park, Rosedale, Toronto. Plans and specifications may be seen at this Department.

An accepted bank cheque, payable to the order of the Hon. J. O. Reaume, Minister of Public Works, for five per cent. of the amount of the tender, and the bona-fide signatures and addresses of two sureties, or the bond of a guarantee company, approved by this Department, must accompany each tender. Cheque will be forfeited to the Crown in the event of the successful tenderer refusing to carry out the work within ten days after acceptance. The Department will not be bound to accept the lowest or any tender.

By order,

H. F. McNAUGHTEN,
Secretary, Public Works Dept.

Department of Public Works, Ontario.
Toronto, Nov. 7, 1911.

Newspapers publishing this advertisement without authority will not be paid for it. 46-46

CITY OF MOOSE JAW SASKATCHEWAN

TENDERS

Sealed tenders addressed to the undersigned will be received up to the hour of 8.30 p.m. on Monday, December 4th, 1911, in the Council Chamber, Moose Jaw, Saskatchewan, for supplying the Fire Department of the City with one Pumping Engine, with a capacity of 800-850 gallons per minute. Tenders are invited for motor driven pumping engines, motor propelled steam pumping engines, or horse drawn steam pumping engines.

Tenders must specify the time in which delivery can be guaranteed, and complete specifications must be furnished for the apparatus proposed to be supplied. Tenders for steam pumping engine must comply with the provisions of the "Steam Boilers Act" of Saskatchewan, particulars of which may be obtained from the office of the Chief Steam Boiler Inspector, Department of Public Works, Regina.

All tenders to quote price f.o.b. Moose Jaw. The right to reject any or all bids expressly reserved.

W. F. HEAL,
City Clerk.

44-48

To Manufacturers of Machinery

A firm wishing to take up the manufacture and marketing of the most complete and up-to-date concrete machinery in the United States or Canada. A proposition will be considered for just the manufacturer. Please address Box 348, Contract Record, Toronto, Ont. 44-49

To Architects

The Toronto Stock Exchange will receive competitive plans on January 2nd, 1912, for a new building for the Exchange to be erected at Nos. 86 and 88 Bay street, Toronto.

The conditions of competition will be mailed to those applying to

W. H. BROUSE, President
Toronto Stock Exchange,
Toronto.

45-47

Proposals Wanted

Sealed proposals will be asked for during the next two months by the Hamilton Hydro-electric Department for bids on the following classes of materials required in the construction of a distribution plant for Hydro-electric power, throughout the City of Hamilton:—

- A.—Substation buildings, heating, lighting, plumbing, etc., for same.
- B.—Station equipment, including transformers, switches, switchboards, lightning arresters, instruments, oil tanks and other appurtenances.
- C.—Wood poles, cross arms, pins, sideblocks, braces, insulators, machine bolts, lag screws, brackets, anchors, pole steps, guy wires, etc.
- D.—Reinforced concrete poles, conduits, conduit, steel reinforcing, cross arms and castings.
- E.—Underground conduit system construction, including cable racks, manhole and hand hole castings, structural steel, fuse pillars and castings.
- F.—Conduit ducts (Tile, fibre or other system for underground distribution).
- G.—Weatherproof and rubber covered copper and aluminum solid and stranded wire, lead encased cables and installation of same, distribution boxes, pot heads and connectors.
- H.—Line transformers, meters, cutouts and devices, lamps, wiring supplies or other appliance, device, apparatus or material entering into the construction and equipment as above mentioned.
- I.—Printing, stationery, office systems, and books of account and record.

Companies, firms or individuals desiring to tender on any of the foregoing equipment must file application for specifications with the undersigned engineer, stating specifically the portions and sections they desire to tender on and for sections A. B. and E. must deposit with the engineer a marked cheque payable to the City of Hamilton Hydro-electric Department for the sum of \$10, which will be returned in the event of receipt by the Corporation of bona fide tender on the work specified accompanied by the complete plans and specifications with tender.

The lowest or any tender not necessarily accepted.

GEO. H. LEES, Mayor,

E. I. SIFTON, Consulting Engineer,

44-45F

City Hall, Hamilton

To Engineers

Every man who puts in a tender on your jobs has got to see your plans and specifications first. If you are in Montreal and he is in Vancouver the inspection of your plans is a problem. Let us solve that for you. Place on file copies of your plans and specifications in any or all of the "Contract Record" offices.

More contractors and manufacturers read the "Contract Record" than any other Canadian publication. It is the logical place to look for tenders called, and where all important works are advertised.

Send along your plans for your next job and put a line in your ad. to that effect.

Contract Record

Montreal—B34 Board of Trade.
Toronto—220 King Street West.
Winnipeg—Commercial Travellers' Bldg.
Vancouver—441 Seymour Street.

CITY OF EDMONTON ENGINEERING DEPARTMENT

1912 PAVING

Sealed tenders, addressed to the undersigned, and endorsed "Tender for 1912 Paving," will be received at the office of the City Commissioners, Edmonton, Alberta, until twelve o'clock noon (12.00 M.) on Friday, December 1st, 1911, for approximately 100,000 square yards of street grading and paving with curb.

Preliminary plans, and specifications, and all information may be obtained at the office of the City Engineer; plans and specifications are on file also at the office of the Canadian Engineer, 62 Church street, Toronto, and the Contract Record, 220 King street west, Toronto. A deposit fee of Five (\$5.00) Dollars is required. This fee will be refunded when plans are returned.

Tenders are invited for Wood Block, Asphalt Block, Sheet Asphalt, Bitulithic, or other kinds of pavement.

Proprietors of patented pavements are required to furnish their special specifications.

Tenderers are required to submit bids as follows:—

- Tender No. 1—Unit prices, for whole work.
- Tender No. 2—Unit prices, for 75,000 sq. yds.
- Tender No. 3—Unit prices, for 50,000 sq. yds.
- Tender No. 4—Unit prices, for 25,000 sq. yds.

An accepted cheque for five per cent. (5 p.c.) of the amount of tender must accompany each bid.

The lowest or any tender not necessarily accepted.

CITY COMMISSIONERS

Office of the City Commissioners,
Edmonton, Alta., Oct. 19, 1911.

43-47

Miscellaneous

Advertisements under this heading two cents a word per insertion. Minimum charge 50 cents

Agents Wanted

U. S. firm manufacturing cement mixers wants representatives in Eastern and Western Canada. Apply Box 362, Contract Record, Toronto, Ont. 45-46

Representatives Wanted

American firm manufacturing crushing plants for contractors and road builders wants representatives in Toronto, Montreal, Winnipeg, Vancouver. If interested write Box 361, Contract Record, Toronto, Ont. 45-46

Sewer Excavator

For sale for immediate use, a Vulcan "Little Giant" Steam Shovel with extra long dipper handle for excavating to 16 feet below surface, mounted on traction wheels, dipper 1 1/4 yd. capacity. Machine just overhauled; new chain, and extra large new boiler; weighs 32 tons; low price. Address

WILLIS SHAW MACHINERY Co.,
39 South LaSalle Street,
Chicago, Ill.

42-41.

Tenders Wanted

Tenders will be received by the Rev. R. C. Lehmann, Mildmay, Ont., until 5 o'clock Tuesday, December 12, for all trades, except heating and lighting, required in the erection and completion of the Church of the Sacred Heart, Mildmay, Ont.

Plans and specifications may be seen at the Presbytery, Mildmay, Ont., and also at the office of the undersigned. Satisfactory security will be required for the faithful performance of the work.

The lowest or any tender not necessarily accepted.

ARTHUR W. HOLMES, Architect,
10 Bloor Street, East, Toronto.

46-47

Business Buildings and Industrial Plants

(Continued from page 61)

Bustard, Health street; architect, J. Hunt Stanford, Yonge street Arcade, Toronto; 3 storeys, 100 x 50, brick, concrete foundation, electric lighting, felt and gravel roofing.

Tenders are called for structural steel for hotel, 163 Yonge street, for P. J. Mulqueen (prop. Tremont House); architect, J. Wilson Gray, Confederation Life Building; 5 storeys, brick with terra cotta front, felt and gravel roofing, steam heating, electric light, telephone system.

Foundations are in for a factory to cost \$30,000, Keele street, for Russell Motor Car Co., Keele street, Toronto; 2 storeys, 150 x 124, brick, concrete, fire-proofed with porous terra cotta, tile coping, cut stone, iron hangers, steel beams, metal sash, tar and gravel roofing. Architect, E. J. Lennox, 104 Bay street.

Vancouver, B. C.

A permit will be issued to M. Conlin for the erection of a 10-storey reinforced concrete hotel for the corner of Vernon drive and Keefer street, building to cost \$300,000.

Plans prepared for stores and apartments to cost \$50,000, corner Bridge and Broadway, for E. A. Marshall; 3 storeys and basement, 50 x 125, brick and concrete, hot water heating. Building will contain 6 stores and 24 apartments. Contract will probably be awarded to B. Davidson, Dawson Building, Vancouver.

Expansion of telephone exchanges for B. C. Telephone Co.; Supt. of Construction, C. F. Bollschweiler, Vancouver. Plans prepared for the exchange on Turner street, have been changed to allow over 1,000 more square feet of floor space. This and other unexpected extensions will necessitate a larger expenditure than the original estimate of \$2,000,000.

Victoria, B. C.

Plans are being prepared for office building to cost \$200,000 on Wharf street

for R. D. Rorison, Vancouver; architect, H. S. Griffiths, 1006 Government street, Victoria; 8 storeys, 100 x 114, marble and tile, pressed brick, elevators. Tenders are now being taken for excavation which consists entirely of removal of rock.

Walkerton, Ont.

Henderson Black & J. Connors, of the Binder Twine Factory, expect to build an addition. Gunns Ltd. are laying foundations for their extension. S. A. Rife & Co. have purchased the hosiery factory here and the woolen factory at Cayill, which will be operated in conjunction.

Winnipeg, Man.

Commissioners have been authorized to call for tenders and to secure lease of land for new Board of Trade Building.

A by-law to raise \$250,000 for the erection of an office building, to form part of new city hall, will be introduced in the council at next meeting. If council consents by-law will be presented at coming elections.

Wingham, Ont.

On Nov. 29th the electors will vote on a by-law to loan the Western Foundry Co. \$10,000, for which it agrees to make big extensions to its plant.

CONTRACTS AWARDED

Brantford, Ont.

Cold storage plant to cost \$5,300 (Marlboro) for Edward Cutmore, Brantford—Brantford Cold Storage Co., Ltd., is being formed; architect, Madison Cooper Co., Calcium, New York; general contractor, James Faulkner; plumbing, Reg. Martin, both of Brantford; general contract also includes roofing and iron work; 3 storey, 25 x 38, sand, lime and brick, concrete foundation, gas heating, electric lighting, Brantford roofing, hemlock interior finish; 4 motors, 7 1/2 h.p. each for driving fans; one freight and 1 ice elevator will be installed.

Bridgeburg, Ont.

Equipment is required for grocery store to cost \$5,000, for Fred & Wm. Hanes, Dufferin street; general contractor, Oscar Teal; excavation, Ernest Benner; plumbing and heating, F. T. Polard; 2 storey, 45 x 25, concrete blocks, concrete foundation, gas heating, electric lighting, tar roofing, hardwood finish. Required—one fire escape, refrigerator, 2 telephones, electric light, gas furnace, show cases, cash register, account register and furniture for ripper, which will be rented as a flat.

Calgary, Alta.

Dairy to cost \$5,000, 5th avenue S., for Carlyle Dairy Co., Calgary; general contractor, Ruddy & Weare, Underwood Block, Calgary; 1 storey, 27 x 52, brick, concrete foundation, steam heating, electric lighting, tile floor.

Galt, Ont.

Auto factory to cost \$4,000, First avenue, for Canadian Motors Ltd., Galt; architect, Wm. Scott, Galt; contractors, Thomas & Hanock; 1 storey, 200 x 50, brick, electric lighting. Contract let about Nov. 1st.

Hamilton, Ont.

Factory, \$30,000; owner, Laidlaw Bale Tie Co.; builder, Geo. E. Mills, King street east, Hamilton; permits were al-

so granted to Mr. Mills for buildings for International Harvester and Hamilton Bridge Works.

Store and flats; owner, F. R. Martin, 479 King E.; general contractor, Mitchell & Riddell, 12 Ferguson avenue N.; roofing, Dennis & Jocelyn, 13 Walnut S.; electric work, Electrical Supply Co., 43 Hughson S.

Kerrisdale, B. C.

Two stores and apartments to cost \$15,000 for Reeve Bowser; architects, Parr & Lee, 570 Granville street, Vancouver; general contractor, E. L. Ryan, 768 Granville street; will contain 8 stores and 26 rooms. Tenders will be called for sub-contracts in about a week.

Lacolle, Que.

Dairy and ice house to cost \$5,000 for J. Reid Wilson, 132 Craig street west, Montreal; architects, Saxe & Archibald, 59 Beaver Hall Hill, Montreal; contractors, Bishop Construction Co., 904 Eastern Townships Bank, Montreal; 2 storeys, 42 x 22, brick and concrete, cement foundation. Building to be completed in 6 weeks.

Montreal, Que.

Fifteen stores to cost \$10,500, Grey and Dorchester streets, for W. J. Carrique, 21 Bank of Ottawa, Montreal; general contractor, Bonnell Bros., Guy street, Montreal; 1 storey, 172 x 32, brick, cement foundation, stove heating, gas and electric lighting, tar and gravel roofing, galvanized iron cornice.

Excavation is completed for store and two dwellings, for Beaudry Estate, Credit Foncier Building; architect, Raoul Lacroix, 7 Place d'Armes, Montreal; contractor, H. Mathieu & Co., 14 St. Charles Borromee street, Montreal. 3 storey, 30 x 41, brick, concrete foundation, gas and electric lighting, gravel roofing.

Factory, cost \$16,000, Vallee, for Rowan Bros. & Co., 23 Vallee, Montreal; architect, W. E. Doran, City and District Bank Bldg., Montreal; general contractor, C. E. Deakin, 11 St. Sacrament street, Montreal; 3 1/2-sty., 43 x 64, concrete fndn., brick and concrete, gravel and felt rig., steam hgt., fr. elevator, concrete stairs.

Factory to cost \$200,000 for H. Vineburg & Co., 163 St. James street, Montreal; architect, C. Dufort, La Patrie Building, Montreal; general contractor, Atlas Construction Co., 745 St. Catherine street west, Montreal; 5 storey, 175 x 105, cement and steel, concrete foundation, steam heating; electric lighting, tar and gravel roofing, hardwood floors. Sub-contracts will be awarded in a few days. Elevators and sprinkler system will be required.

Hotel power house, cost \$80,000, on Windsor street, for Windsor Hotel Co.; engineer, R. S. Kelsch, Power Bldg., Montreal; general contractor, G. W. T. Nicholson, Eastern Township Bank, Montreal; plumbing and heating, Douglas Bros., 19 St. Maurice street; iron work, Dominion Bridge Co., Lachine; ornamental iron, F. MacKay & Co., 18 St. George street; 5-sty., 47 x 110, elec. and gas light, gravel rig., concrete floors, steam heating. Painting and glazing not let yet.

Warehouse and offices, cost \$125,000, on Lagauchetiere and St. Alexander sts., for J. C. Wilson Co., Ltd., Craig street west, Montreal; arch., Ross & McFar-

lane, 1 Belmont street, Montreal; general contractor, G. T. Nicholson, Eastern Tp. Bank Bldg., Montreal; elevators, A., Hughes-Charles; 5-sty., 94 x 142 brick, stone and concrete, terra cotta, cornice, gravel rfg., iron stairs, sprinkler system, steam hgt., wired glass, plumbing; plastering and roofing contract not let yet.

Hotel, cost \$1,500,000, Sherbrooke st., for the Ritz-Carlton Hotel Co. (Hon. Lionel Guest); architect, Warren & Wetmore, East 33rd street, New York, U.S.A.; concrete, F. J. Jago & Co., Montreal; heating and ventilating, Vickers & Smith, New York; terra cotta, Federal Terra Cotta Co., New York; plumbing, Wells & Newton, New York; steel work, Dominion Bridge Co., Montreal. Ten-stories, 187 x 142, reinforced concrete, stone and brick, concrete masonry fndn., steam hgt., elec. light, hardwood finish, cement, marble, etc., stairs, elevators, roof garden, tiled floors, etc.

Winnipeg, Man.

Garage, William ave., for Frank C. Knight, 41 Purcell ave., Winnipeg; general contractor, John Heslip, May st., Winnipeg; concrete blocks, steam heating, elec. lgt. Iron for building not yet bought; tenders are called by general contractors. Heating and lighting under supervision of owner.

Red Deer, Alta.

Creamery, \$4,000, 1-storey, 32 x 50, concrete foundation and brick veneer, electric lighting, hot air heating; owner, Trimble Bros.; general contractor, Paradis & Roberts; excavation, T. H. Gudmunson; carpenter, Paradis & Roberts; plumbing and heating, Smith & Gaety, all of Red Deer.

Sherbrooke, Que.

Garage to cost \$8,000, Wellington st., for Sherbrooke Ford Co.; excavation, Wm. Hawker, carpentry, Sherbrooke Construction Co.; 2 storey, 40 x 80, brick, cement foundation, hot air heating, gravel roofing, electric lighting. Light machinery for auto repairing will be installed.

Toronto, Ont.

Addition to hotel to cost \$5,000, 2-storey and basement, concrete foundation, electric lighting, roof 7/8-in. x 6in. T. & G. dressed boarding; owner, Jno. Laxtow, King and Queen west; architect, T. H. Herbert, 65 Adelaide east; general contractor, M. Manley, 1058 College street.

Power Plants, Electricity and Telephones

Fort William, Ont.

The Canada Iron Corporation will erect a gas plant in connection with its works; estimated cost \$50,000.

Napancee, Ont.

Sub-station for Seymour Power & Electric Co., 550 Confederation Life Building, Toronto. Contractors, Midland Construction Co., Confederation Life Building, Toronto; ready to start work.

Stave Falls, B.C. (35m. from Vancouver)

The Western Canada Power Company Ltd., have completed the installation of two units, or 10,000 kw. each, here. The first unit will be in operation by Nov. 15th. R. F. Hayward, general manager,

Carter Cotton Building, Vancouver, and Stave Falls, B. C.

Trenton, Ont.

Power house (dam No. 5) for Electric Power Co.; president, J. G. G. Kerry, Confederation Life Building, Toronto; general contractor, F. H. Wilford, Lindsay, Ont.; brick, cement, structural steel, electric work. Machinery probably purchased from same people who made installation at power house dam No. 2.

Miscellaneous

Niagara Falls, Ont.

The city is in the market for purchase of 100 steel flag poles. Town engineer, J. C. Gardner; clerk, W. J. Seymour.

Stratford, Ont.

The chairman, fire & light committee will call for tenders soon on 300 feet of hose at 25c. per foot, and 400 feet of fire hose; also for firemen's overcoats and trousers.

Winnipeg, Man.

Tenders are called for weatherproof wire and cable; twin conductor wire and cable; cross arms, insulators, guy wires, bolts, screws, galvanized iron pipe braces, brackets, etc.; 1,500 cedar poles. Specifications at office of general manager, City Light & Power Dept., 449 Main street, Winnipeg. Tenders received by chairman Board of Control until 11 a.m., Nov. 10th. City of Winnipeg. Man. M. Peterson, secretary Board of Control.

New Companies

The Bowmanville Realty Company, Limited, Bowmanville, Ont., has been incorporated with a capital of 50,000, to carry on a general land and building business. Provisional directors: Clifton Hugh Carlisle, of Toronto, and Arthur Nelson McMillan, of Bowmanville.

The MacKay Paulin Construction Co. Ltd., Hamilton, Ont., has been incorporated, with a capital of \$40,000. Provisional directors: Adam Brown MacKay, John Wallace Nesbitt and John Gordon Gauld, K.C., all of Hamilton.

Commercial Construction Limited, Sudbury, Ont., has been incorporated, with a capital of \$40,000, to carry on business as bridge builders, railroad engineering contractors, etc. Provisional directors include Edward Hamilton Low and John Ferguson Black, both of Sudbury.

Mountjoy Lumber Co., Ltd., Toronto, Ont., has been incorporated, with a capital of \$100,000. Provisional directors:—Geo. Alex. Grover and Daniel Western O'Sullivan, both of Toronto.

Moncrieff & Endress, Limited, Winnipeg, Man., have been incorporated, with a capital of \$50,000, to carry on a general building and construction business. Incorporators, Geo. W. Endress, Cyril G. Barnardo and Hugh Glen Moncrieff, all of Winnipeg.

The Phoenix Lumber Co., Ltd., Transcona, Man., have been incorporated, with a capital of \$20,000, to carry on business as timber, lumber and pulp manufacturers, general contractors, etc. Incorporators, John W. Morrison, Leo J. Carey, John Sutherland and Edgar J. Tarr, all of Winnipeg.

Reid & Whitman, Limited, Winnipeg, Man., have been incorporated, with a capital of \$50,000, to carry on business as builders, contractors, etc. Incorporators, Alfred H. Whitman, Royal Burrit, and Dickson R. Reid, all of Winnipeg.

Winnipeg Builders Limited, Winnipeg, Man. Incorporated with a capital of \$100,000. Incorporators, Patrick Callaghan, builder; Wm. Walker Kennedy, barrister, and Anthony Cabral, real estate agent; all of Winnipeg.

Moose Jaw Land and Development Co., Winnipeg, Man., has been incorporated with a capital of \$20,000, to carry on a general land and building business. Incorporators, Edwin Barrie Reynolds, Edward Francis Coke, and Benjamin Cronyn Parker, Jr., all of Winnipeg.

Alberta British Columbia Lumber Co., Limited, Cranbrook, B.C., has been incorporated with a capital of \$500,000.

The Capilano Rock and Gravel Company, Ltd., Vancouver, B.C., has been incorporated with a capital of \$250,000, to carry on business of a light, heat and power company in all its branches.

Lumbermen's Trust Company, Limited, Vancouver, B.C., has been incorporated, with a capital of \$1,000,000.

Coquitlam Lumber Co., Ltd., Coquitlam, B.C., has been incorporated with a capital of \$10,000.

Business Notes

Hamilton, Ont.

Peter S. Green's Woollen Mills at Progresston, completely destroyed. Loss about \$10,000.

Melville, Ont.

John R. French's evaporator, barrel factory, saw and grist mill, were destroyed by fire on the 5th. estimated loss, about \$15,000.

Pembroke, Ont.

The Thomas Pink Company's office, storerooms, engine room and machine shop destroyed by fire. Loss \$50,000. Company propose to rebuild at once.

South Clinton, Ont.

Robert Conkle's planing mills completely destroyed by fire. Loss \$10,000.

Roxton Falls, Que.

Rodolphe Favreau's butter factory burned; the loss is several thousand dollars; he will probably rebuild at once, requiring entire new plant, steam piping, building concrete, stone and brick, engine and boiler, metal roofing.

BAIN & ROSS Contractors

for Bridges, Subways, Breakwaters, Reinforced Concrete work. Estimates Furnished. Correspondence Solicited. :: :: ::

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November 22, 1911

No. 47

Is the New Central Y. M. C. A. at Toronto to be a Fire-Trap?

Investigations made among members of the Building Committee of the Y. M. C. A. disclose the fact that it is proposed to only partially fireproof the proposed new building for the Y. M. C. A., which is to be erected at an estimated cost of \$500,000. The first floor alone, we are informed, will be absolutely fireproof. Both the members of the Building Committee and the architects are peculiarly reticent about the type of construction and the materials to be employed, but the information may be regarded as authentic that the building will be of brick and steel, with fireproof columns throughout and possibly fireproof stairways.

In a building of this character—practically an hotel, we fail to see how the very idea of this type of construction could have been entertained for one moment. Surely in the central building of the Y.M.C.A., whose cubicles or sleeping rooms will at times be called upon to accommodate one hundred or possibly two hundred men, the factor of expense should not have outweighed the important consideration of adequate protection against fire. According to one of the most active members of the Building Committee, the latter body were persuaded that total fireproofing was not essential in a building only four storeys in height. The history of disastrous and fatal fires owes its compilation, in no small measure, to fallacies of this kind. The building interests will doubtless agree that a four-storey building whose upper floors will be set apart for dormitories should be absolutely fireproof throughout, the same measure of protection being insured as in the King Edward Hotel, Toronto, and many other structures typical of what has come to be recognized as standard building practice.

If the matter of extra expense prevented the committee from selecting the most satisfactory type of construction, it would have been far better to have deferred the commencement of operations until the com-

paratively small additional money had been raised. In this connection it may be pointed out that the extra expense involved in fireproof construction would be offset largely by the decreased cost of up-keep and reduced fire premiums. Indeed, the difference between the higher rate on the premiums that will be levied on the building—if erected according to the scheme outlined above—together with the cost of up-keep, and the interest payable on an additional sum sufficient to cover the approved standard type of fireproof construction, is almost a negligible factor.

However these things may be, it seems rather late in the day to warn the Y. M. C. A. against the risk it is running, for thanks to the reticence of those concerned, practically no authentic details have been given the public. We have every sympathy with members of building committees, for such service is generally thankless and unprofitable, but the members of the Y. M. C. A. Building Committee are the trustees of public funds and have a well-defined duty by those who were so zealously canvassed for subscriptions. The expenditure of a large amount of money is involved, and this, if ill-advised, will be an ineffaceable blot upon an otherwise praiseworthy project.

The responsibility has been shouldered by the Building Committee, but the public are entitled to the assurance that their money, so freely given, is not to be jeopardized by investment in a type of construction that is practically obsolete.

The boom in real estate in Montreal during the last two months has a certain bearing on the question of building, inasmuch as many of the sites which have changed hands, particularly within this last month, will be utilized for the erection of modern structures. Old buildings are being purchased by strong financial syndicates, who are willing to put large amounts of capital into modern structures to meet the ever-increasing demands for office accommodation. In many instances of course, properties have been purchased for purely speculative purposes, and excellent profits have been secured; in fact all along the line prices have jumped up, and the prospect is that the top has not yet been reached. The downtown aspect of Montreal is being changed by the erection of these commodious structures, and judging by the reports to hand, next season should see still greater activity in the contracting business. Building is going on with increased activity in nearly all the suburbs, and here too land has changed hands in increasing quantities and at higher prices.

The value of water storage as a means of improving its quality has been investigated for the Metropolitan Water Board by its director of water examination, Dr. A. C. Houston. He carried on extensive experiments of the comparative vitality of uncultivated and cultivated typhoid bacilli in artificially infected samples of river water from the river, and reached the conclusion "that even a week's storage of raw river water is an enormous protection, and less than a month's storage an absolute protection against typhoid fever." He further asserts in his report that "the possibility of London water conveying epidemic disease may be finally dismissed from the minds of the inhabitants of the metropolis as a fear which, on convincing experimental evidence proved to be baseless." The subject is particularly important in London because storage is relied on as an important step in purifying the supply.

Ignorance of the Coefficient of Sliding Friction Between Rock Substrata a Cause of Dam Failures.

Eleven years ago a large masonry dam at Austin, Texas, failed by the sliding on each other of the horizontal strata of the rock on which the dam was founded. On September 30 a large concrete dam failed at Austin, Pa., and failed, according to the best evidence available, from the same cause.

Engineer writers drew many lessons from the Austin, Texas, dam failure, and the same and other lessons are now being deduced by them from the Austin, Pennsylvania, dam failure. Such labor, however great, is well worth while; the consequences of ignorance are too disastrous to permit it being granted any pardon. There can be no palliation of such a disaster as occurred at Austin, Pa.; nor can there be permitted even the thought of shifting the blame for it from where it belongs, whether it appertains to the design, the construction or to the caretaking after completion. Partisan devotion to a man or a body of men, to a profession or a policy, has no place in fixing responsibility in cases like this one. Nor can it be permitted any influence in proportioning a divided responsibility.

The circumstances at Austin, Pa., give nearly positive evidence that the builders (contractors) were not at fault. All reports assert the concrete to have been of good quality. The mere fact that the dam wall cracked through and moved out in full height sections without breaking down is almost certain indication that the material was sound. Finally, the fact that partial failure occurred months before the final failure and that its cause was determined and was not poor construction, completely absolves the builder from responsibility.

Turning now to the engineering and to the caretaking after completion, the evidence shows both to have been faulty. The initial failure was due to faulty engineering alone. The continuation of the initial failure to final destruction was due to faulty caretaking alone. Unless the owner restricted the engineers by parsimony or interference, in making the original design, the owner certainly cannot be charged with any portion of the blame for the initial failure. The owner, on the contrary, was evidently specifically at fault in letting this initial failure be continued to final destruction, when he had months in which to adopt preventive measures. Unless the engineer was unduly supine in accepting the owner's neglect to remedy the initial failure he cannot well be charged with sharing the fault. There is no definite evidence that the owner restricted the engineering. Also, there is no evidence to show that the engineer was unduly negligent in urging repairs. It is a fact that the engineer prepared plans for strengthening the ruptured dam, and it is also a fact that his services stopped at that point.

As an engineering journal we are naturally most interested in the extent and nature of the fault which may be charged to engineering in the case of the Austin, Pa., dam failure. Much has been said of the responsibility of upward water pressure for this failure. Whatever importance the flotation theory may have in dam design in general, no upward water pressure is needed to account for the failure of the Austin, Pa., dam.

Let us recall that the dam was founded on horizontal rock strata. The excavation for a foundation

bed on these strata was just deep enough to get sound rock. The foundation bed was grouted to secure adhesion between it and the concrete dam bottom. Anchor bolts were set across the point extending up into the concrete and down into the rock. At the heel of the dam a concrete cut-off wall 4 feet wide was carried down 4 feet into the rock foundation. Now, be it recalled, all the evidence showed that the initial failure was due to the sliding of the rock substrata on each other at a level below the bottoms of the anchor bolts and therefore below the dam base and cut-off wall. All that held the dam from sliding was then the friction between the rock strata.

When the Austin, Pa., dam first showed signs of failure by sliding, Mr. E. Wegmann was called in consultation by the designer of the dam. Mr. Wegmann estimated that at 135.4 lbs. per cu. ft. the concrete dam weighed 113,190 lbs per lin. ft., and that the horizontal thrust of the water was 78,031 lbs. per lin. ft. of dam. From these figures we deduce that if the dam were to resist sliding solely by virtue of its own weight, the coefficient of sliding friction would have to be greater than $78,081 \div 113,190 = 0.69$.

Since the face of the dam was vertical, there was no weight of water assisting in holding the dam down. Hence all that had saved it from failure long ago was the existence of an undetermined amount of river gravel and soft bed rock on the down stream side of the dam. Let any considerable part of this matter be removed by erosion, and failure was certain to occur, for the dam itself did not have sufficient weight to resist sliding. We make this statement on the assumption that the coefficient of sliding friction was less than 0.69, so let us consider briefly the soundness of this assumption. The following coefficients of sliding friction are taken from Trautwine's "Engineers' Pocket-Book," and are based chiefly on Morin's experiments:

Polished marble on common bricks	0.44
Common brick on common brick	0.64
Soft limestone well dressed, on the same	0.64
Hard limestone well dressed, on the same	0.38
Masonry and brick work, dry	0.6 to 0.7
Masonry and brick work, with wet mortar	0.47
Masonry and brick work, with slightly damp mortar	0.74
Masonry on dry clay	0.51
Masonry on moist clay	0.33
Marble sawed, on the same, dry (by Trautwine)....	0.40
Marble sawed, on the same, damp (by Trautwine)....	0.55
Polished marble, on the same (by Trautwine).....	0.16

From these data it is perfectly clear that the coefficient of sliding friction of one stratum of smooth stone on another stratum is approximately 0.4 to 0.5, which is far below the coefficient needed to prevent the Austin, Pa., dam from sliding, if only its own weight was available to resist sliding. It is also apparent that if clay seams existed between the horizontal strata of the bed rock, a coefficient of friction of 0.33, or less, must have existed. In the face of such facts as these, need we look farther for a reason why the Austin dam failed? We think not, for here was a dam built with no factor of safety at all against sliding, even if we assume the highest coefficient on record for stone on stone.

If the dam was so unstable in itself, it may be asked why it stood as long as it did. The answer is not far to seek. For most of its length, if not for all, the foundation had been excavated to a depth of about

four feet in the soft sandstone, until a hard stratum was encountered. The four-foot layer of this soft rock and its superimposed burden of river gravel served to prevent the dam from sliding immediately. Erosion doubtless removed a portion of this natural bed below the down-stream toe of the dam, and left at least a section of the dam unsupported from sliding, save by its own weight. The failure followed.

Precisely the same phenomenon occurred at the

other Austin dam, in Texas. In that case the erosion of the soft rock below the dam had progressed far enough to create quite a hole in the bed rock. Sections of the Austin, Texas, dam slid bodily down stream, just as at Austin, Pa. Both dams rested on horizontally stratified rock, the rock at Austin, Texas, being limestone, and that at Austin, Pa., being sandstone. Clay seams are reported to exist between the strata in both places.

The Relative Corrosion of Metal Pipes

Effect Produced by Variations in the Composition of Natural Waters — Extent of Corrosion Under Mechanical Filtration

A preliminary report submitted to the Massachusetts State Board of Health by Messrs. Clark and Gate outlines the effect of certain factors in the action of different classes of water upon pipes. An investigation of this matter was commenced by the above-named authority in 1910, the object in view being to determine to what extent various methods of water purification were responsible for corrosion; to ascertain what effect variations in the composition of natural waters might produce; and to devise remedies if possible.

The general method of making experiments is as follows: For tests with cold water, pipes 1 in. in diameter and 30 ft. long, with one coupling at the middle and two elbows, one at either end, are used. One elbow is fitted with a plug and the other with a 6-in. nipple closed with a cap. These pipes are laid with a slight pitch, the top of the plugged elbow and the top of the 6-in. nipple being on the same level. The pipes hold about $\frac{1}{2}$ gal. of water, and are filled and emptied through the short rising nipple at the lower end. When testing the action of hot water, pipes 1 in. in diameter and about 6 ft. long, capped at each end, have been used, these pipes being laid directly upon the top of a steam boiler. The temperature of the water in the long pipes has ranged from 50 deg. to 70 deg. Fahr., while the temperature of the water in the short pipes laid on the steam boiler has ranged from 125 deg. to 135 deg. Fahr. The practice has been to empty and refill each pipe generally at intervals of seven days during those experiments when only comparisons of cold water were being made, and at intervals of three days when comparisons of both hot and cold water were being made.

Relative Corrosion by Several Waters.—In this experiment, river water and the effluents from a mechanical filter, operated with the use of aluminum sulphate, and water from a pond and from a driven-well supply were allowed to remain in the pipes for periods of one week. In the town using the pond supply more or less trouble has been experienced with rusty water, particularly in houses having iron hot-water supply pipes, while in the town using the driven-well supply there has been some complaint of the corrosion of iron tubes.

The individual results varied considerably from one another; the absorption of iron by the mechanically filtered water was always very much greater than that by any of the other waters, and the amount of iron absorbed by the effluent from the slow sand filter was usually slightly greater than that absorbed

by the river water. Both the pond water and the driven-well water were more corrosive than the river water or the effluent from the slow sand filter. The driven-well water showed a somewhat greater absorption of iron than the pond supply experimented with.

Corrosion by Mechanically Filtered Waters.—In the previous experiments it was found that mechanically filtered water was more corrosive than the same water before filtration or when purified by slow sand filtration. Experiments have also been made to determine to what extent the degree of alkalinity of mechanically filtered water governs its corrosive action, and if this corrosion can be lessened by increasing the alkalinity by the addition of soda ash or of lime. In these experiments, both Merrimack River water and the water from a certain lake supply, concerning the purification of which by mechanical filters an application had been made to the board of advice, were studied. The raw waters were treated with sulphate of alumina in amounts sufficient to remove coloring matters (1.3 to 1.5 grains per gallon), and after standing until coagulation occurred (three to eighteen hours, at different times), were filtered rapidly through a sand filter. Soda ash or milk of lime was then added in amounts sufficient to produce the desired alkalinity, and the waters so prepared were placed in the pipes and allowed to remain for seven days.

In general, the results of these experiments indicated that waters made alkaline with lime were slightly less corrosive than when the same amount of alkalinity was produced by the addition of soda ash, and that there was a slight decrease in the corrosive action of the lime-treated water as its alkalinity or hardness was increased. This decrease was relatively small, however, unless its alkalinity was increased to such a point that the hardness would be noticeable to the consumer. An increase in alkalinity by the addition of soda ash apparently had little effect upon the corrosive action of the waters. As in the preceding experiments, the mechanically filtered waters were much more corrosive than were the corresponding waters before treatment, the only exception being those waters to which an excessive amount of lime was added after filtration.

Relative Corrosion by Hot and Cold Water.—In many places where complaint has been made of "red water troubles" the most serious has occurred with water after passage through household hot-water tanks and plumbing fixtures. The water fronts used

to heat the water are either of cast iron or of brass, the hot-water tanks may be of copper, galvanized steel, while the piping may be either of iron, steel, galvanized or ungalvanized, or of brass. The problem is frequently complicated by the use of these various metals in different parts of the hot-water plumbing, with the probability that a portion, at least, of the corrosion is due to galvanic action at the junction of unlike metals. Only the action of hot and cold waters on iron and galvanized-iron pipes used alone has been investigated up to the present time, the waters being allowed to remain in the pipes three days in each case. The mechanically filtered lake water used in this experiment was prepared as described in the preceding experiment, the alkalinity being due to added lime.

With both the plain iron and galvanized-iron pipes the absorption of iron was much greater when in contact with hot water than with cold water when using waters of about the same degree of alkalinity. The effect of varying the alkalinity is peculiar, however, an increase in the alkalinity causing an increase in the absorption of iron from both kinds of pipe when filled with cold water. As noted in the preceding experiments, the absorption of iron was much greater by mechanically filtered waters than by the untreated waters or by the effluent from the slow sand filters. The results show the value, for a time at least, of the protective coating on the galvanized pipes in the prevention of red water, in every case the amount of iron in the waters from the galvanized pipes being very much lower than in the same waters from the uncoated pipes. The sources of the iron in the samples of water from the galvanized pipes were undoubtedly the places where the iron was unprotected, owing to defective coating or by the cutting of threads in jointing the pipe. In the majority of cases the amount of iron in waters from these galvanized pipes, though small, appears to be gradually increasing, and tests for zinc indicate that the protective coating is being gradually eaten away as the pipes are continued in use.

Effect of Amount of Dissolved Oxygen.—In order to study the effect upon corrosion of the amount of dissolved oxygen in water, two sets of pipes, each consisting of a plain iron and a galvanized-iron pipe, have been operated with distilled water containing different amounts of oxygen, the water being allowed to remain in the pipes seven days in each case. The distilled water used in filling one set of pipes was thoroughly aerated, while that used in filling the other set was blown out with steam to remove dissolved air, and cooled before use. Considerable difficulty was experienced in preventing the absorption of oxygen in this water during the operations of cooling and filling the pipes. After numerous experiments the method of cooling the water and of filling the pipes under an atmosphere of illuminating gas was adopted as most successful. Usually the pipes could be completely filled in this manner with a water of low oxygen content, although it was seldom possible to have the water absolutely free from dissolved oxygen after placing it in the pipes. Determinations of the amount of dissolved oxygen in the water in each pipe were made immediately after filling, and after the seven-day period in each case.

The amount of oxygen in the water in each pipe fluctuated through considerable limits, but no regular relation was to be observed between the amount

of oxygen in the water and the amount of iron dissolved by the water. The absorption of iron by the water originally of high oxygen content was much greater than that by the water of low oxygen content in both the plain iron and galvanized-iron pipes; and the absorption of iron from the galvanized-iron pipes was very much less than from the plain iron pipes. The absorption of zinc from the galvanized pipes was practically the same with both waters, averaging about 2.46 parts per 100,000 for the water high in oxygen and 2.35 parts for the water low in oxygen. In all cases the amount of dissolved oxygen in the water was very much reduced after standing seven days in the pipes.

New C. P. R. Subway, Montreal

A subway under the C. P. R. tracks, on St. Lawrence Boulevard, in the north end of Montreal, has been opened recently. This improvement has been carried out at a cost of \$200,000 by W. Duquette, from plans prepared by Mr. J. Emile Vanier, civil engineer, Montreal. Prior to its construction, people had to cross the railway tracks on foot, and as the district developed, this method became not only dangerous to the public but inconvenient to the railway company. The subway is 950 feet long, 70 feet wide, and has a 17-foot clearance on the roadway. The walls and balustrades are of concrete, with a steel bridge for the railway tracks; these are five in number, the length of the lines over the subway being 130 feet.

The bottom of the subway is below the level of the sewers, and a special drainage system, consisting of a drainage collecting well and electric discharge pumps of a capacity of 300 gallons per minute, has been provided. A row of steel columns down the centre divides the subway, and the electric cars run close to this. The distance between the sidewalks is 45 feet, and the surface of the road is paved with Scoria blocks. The sidewalks on either side are carried down to half the depth of the subway, thus reducing the grade for foot passengers and affording protection from accidents and from being splashed by passing vehicles. There is a clearance of 9 feet over the sidewalks. Electricity is employed for lighting, arc lamps being suspended on iron standards at intervals along the balustrade for the illumination of the approaches.

The cost of the work, borne by the Canadian Pacific Railway, the city, and the street railway, has been apportioned as follows: Excavation, concrete walls and balustrading, paving permanent sidewalks, drainage system, electric pumps and lighting system, \$130,000; street superstructure, waterproof construction over subway, \$49,999; engineering and expropriation expenses, \$21,000. The electrical plant was supplied by the Canadian Fairbanks-Morse Company, Limited.

A Concrete Floor 5998 Ft. Long

The longest concrete floor in the world is probably that of the recently completed Armour-Swift-Burlington Bridge across the Missouri river at Kansas City. This bridge is of unusual interest as it is the longest riveted truss in the world. The contractors by careful planning were able to mix all the concrete with one Ransome mixer which was stationed on the shore with an extensive hoisting tower adjacent.

City of Winnipeg's Isolation Hospital

Features of the Design awarded First in Competition and according to which the Building is now being erected

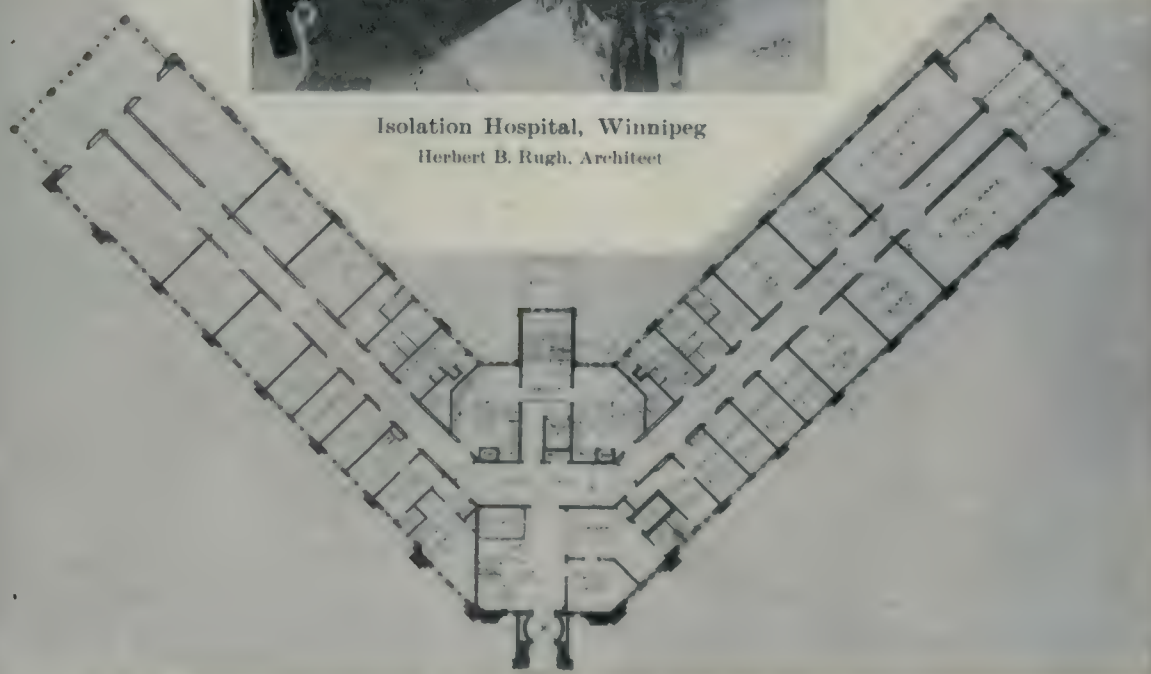
The accompanying design was submitted in competition with thirteen others and won by Herbert B. Rugh, who has since consolidated his business with Ross & McFarlane in respect to their Western work.

The arrangement of the different rooms was pronounced by the Hospital Expert and Jury of award,

line to first floor window sills is to be cut stone, and the balance of the building finished in brown vitrified brick with cut stone trim. The foundation of the building will be concrete, properly waterproofed. The construction is to be fireproof, with structural steel frame. The floor construction is to be reinforced



Isolation Hospital, Winnipeg
Herbert B. Rugh, Architect



First Floor Plan

as the best layout they had ever seen for an institution for the treatment of contagious diseases. Perfect control is obtained by the arrangement of inside lobby and the double protection and isolation of each wing from the other by having the doctor and nurses enter the various wings by going into the doctor's room from the inside lobby, removing their outer garments and then stepping into the chart and gown room, where they put on their gowns and prepare themselves for their work, entering the ward from this room ready for work. In this way the double doors to the ward corridor are kept closed, except for the removal or admittance of a patient. Only two minor changes were made in the plans.

The exterior finish of the building from the grade

concrete or tile. The corridor partitions are to be double four-inch hollow tile, so constructed that the space inside the partition may be used for ventilation flues. The main stairway will be of ornamental iron, with marble steps. The floors of all bath rooms, sink and service rooms, lavatories and toilets are to be tiled with 6-in. square flint tile and the walls tiled 6 ft. 6 in. high with sanitary wall tiling, having sanitary cove at floor and sanitary corners, etc. The floors of corridors, wards and other rooms are to be covered with Battleship linoleum, cemented down to concrete, with plastic cove and border at floor. All ceilings are to have plaster cove. All windows will be steel casements, the lower casement section to open in with adjusters, etc., and the upper transom sec-

tion to be hinged at bottom to open in and down with adjusters, etc. Storm sash will be provided to cover entire opening outside with ventilator at bottom; screens also to cover entire opening.

The heating and ventilation are to be of the most modern type, all wards, corridors, etc., to be supplied with direct radiation, using the modulation system. All service rooms, kitchens, toilets and wards will have "Vacuum" ventilation. Fresh air is to be taken from a point above the roof of the building to fans located in the basement, there to be heated, washed, etc., and blown into the wards through galvanized iron ducts located in false ceiling of corridors, the foul air to be taken up in vents in corridor partitions, to space under roof, then discharged by exhaustive fans through the roof at the opposite end of the building from fresh air intakes. Vent openings are to be placed at floor and ceiling, so that in hot weather air can be drawn from the upper part of room as well as the lower. The plumbing and laundry fixtures are to be modern in every respect. The building will be equipped with vacuum cleaning system throughout.

The plans need very few words of explanation. The sexes are separated and each floor is arranged to be used as an elastic ward, or for a single disease. The main stair and elevator lobby is entirely shut off at each floor and from this lobby, another entirely enclosed vestibule has to be passed before the ward is reached, so that perfect isolation is attained for each wing of each floor. The doctor has a room with private lavatory in each wing, entered from the inside lobby, in which he removes his outer garments then steps into the chart and gown room, and from there into the ward. The ward doors in corridors need not be used except for bringing in or removing patients. In the sink room on each floor of each wing there is a specimen closet with vent connection for ventilation. The soiled linen chute, also in this room, is made of 15-inch vitrified pipe, imbedded in cement, so arranged that it can be flushed or sterilized at any time.

The building is designed to accommodate one hundred and fifty patients and contains 686,174 cubic feet, including porches, entrances, etc. Each patient is given 1,232 cubic feet. An efficient elevator service, lavatories and all conveniences are provided.

Underpinning a Concrete Factory Building

A delicate job of underpinning was required by unexpected conditions encountered in the foundations of a reinforced-concrete factory building in Cincinnati. The building is 60 x 200 ft. in plan and two storeys high, according to details given by the Engineering Record. It is divided into three equal longitudinal bays by two rows of columns. The first floor rests directly on the ground. The second floor, designed for a live load of 1000 lb. per square foot, is supported by beams and girders between the two rows of columns within the building and a row of columns in both side walls.

The site of the building is crossed transversely about midway by an old gravel pit. The latter had been filled with cinders and rubbish to bring it to the present street grade, the depth of the fill varying from 14 to 25 ft. This fill was made long previous to the erection of the building and was considered to have compacted sufficiently to provide ample bearing capacity for the loads to impose on it. The

floor spans are 18 x 20 ft. in plan, thus bringing a load of 360,000 lb. on each of the columns. The latter were each provided with a pyramidal footing, 6 ft. 6 in. square at the base, which took bearing on the soil.

During construction and before the building was loaded serious settlement caused the building to crack, near the transverse center line, into practically two parts. Work was discontinued and steps made to devise means of underpinning the columns.

The settlement was confined largely to ten columns at one end of the building, five in each of the two central rows. The bases of these columns had gone down from 1 in. to more than 3 in., on account of the inability of the old fill to carry the load imposed on it by them. The plan adopted was first to shore up the affected columns and cut off the base of each of them. Then four Simplex concrete piles were built under each column and a new pyramidal base, 7 ft. square, was constructed on them to carry the column.

Each column was picked up separately, but the shoring of the adjacent columns in each row was made to react together. By means of clamps the load of each column was transferred to a pair of 12-in. I-beams, which were set horizontally and supported by jack screws on the shoring. On two opposite sides of each column notches were cut in the concrete. The notches provided bearing for short sections of 12-in. channels, which were held in place by four 1-in. round rods. The ends of the latter were tapped through the short sections of channel, and the latter were clamped tight against the columns by nuts on the rods. The two short pieces of 12-in. channel against the columns transferred the load to the two 12-in. bearing I-beams in the opposite direction.

The shoring for each two adjacent columns was arranged to act together by using long enough timbers to extend from under the end of one pair of bearing beams across under the end of the next pair. The ends of each pair of bearing beams were seated on a timber carried by three 15-ton jack-screws. Each set of screws in turn stood on short planks spanning between 12 x 12-in. timbers laid crosswise on the timbers resting on the ground. This arrangement made the shoring act as a cantilever.

When the columns were shored their loads were transferred to the shoring by extending the jacks. Then the footings were uncovered and cut away from the columns at the base of the latter. Pits were dug in the middle of the floor bays and the old footings dragged over into these and buried. The concrete piles then were driven and the new footings built.

The casing used in constructing the concrete piles had to be driven and the work all handled in a 14-ft. clearance. A special pair of very short leads were built by the contractor to carry a 3000-lb. Vulcan drop hammer. This hammer was handled by a Lidger wood hoisting engine supplied with steam from a boiler outside of the building.

The sections of the casings were made with male and female joints having a cotter-pin connection. When each casing was driven it was filled with concrete and then pulled gradually, the concrete being forced out of it at the bottom into the hole. The cotter-pins were removed and each section taken on as soon as it was high enough. Working in this manner the piles were driven to a depth of 16 to 2 ft. without difficulty. After they had set at least seven days the new footings were built on them.

New Waterworks System for Moose Jaw, Sask.

By an almost unanimous vote the ratepayers of Moose Jaw, Sask., have authorized the issue of \$550,000 for the construction of a new source of water supply for the city. The present supply is entirely inadequate owing to the city's rapid growth, and the existing source, Snowdy Springs, having been developed to its limit. The proposed new source is a stream known as Sandy Creek, which flows down a valley about twenty miles west of Moose Jaw from above Besant to a point a mile or two west of Caron. The water of this stream is clear and cold, and has been pronounced of good quality for domestic purposes.

The general scheme is as follows: An infiltration gallery about a mile long, and consisting of 21-inch vitrified tile pipe, laid with open joints, will collect the surface water and will lead it to a large sump or collecting well. Combined with this infiltration gallery there will probably be a series of driven wells extending across the valley. These will be pumped by means of air lifts to the collecting well. The water from the collecting well will be pumped through an 18-inch steel pressure main to a head works reservoir situated on the prairie above the bed of the valley and about half a mile distant from the well.

From the head works reservoir, which will be of about half a million gallons capacity, an 18-inch coated steel pipe will carry the water to Moose Jaw. The pipe line, eighteen miles long, will follow the right of way of the C. P. R. from near the Nord water tank to the outskirts of the city, an arrangement having been made to this effect with the railway company. It will then follow 6th Avenue northward to Albert and Montgomery Streets, where the pipe will enter the distributing reservoir, whose capacity will be 2,000,000 gallons. For the purpose of increasing the pressure, alongside of the distributing reservoir will be an elevated tank on a steel tower. The tank will be automatically filled with water by means of electrically operated pumps, and the city service mains joined to it will thus be assured of a good pressure.

Construction has already been started, the head works now being built by day labor under the supervision of the consulting engineers, Walter J. Francis, C.E., and Frederick B. Brown, M.Sc., of Montreal, who are the members of the firm of W. J. Francis & Company. Tenders for the steel pipe are now being considered. Work is to be rushed with all possible speed, and it is hoped to have it finished by the end of next summer.

Tenders will be called shortly for a large amount of work, consisting of reservoirs, head works, machinery, equipment, laying of steel pipe, elevated work, and electrically driven pumps.

A submerged sewer outfall, extending into Buzzards Bay, has been proposed at New Bedford, Mass., by Mr. William F. Williams, city engineer. It will discharge into 30 ft. of water, and in order to obtain the greatest amount of diffusion of the sewage, Messrs. Metcalf & Eddy, consulting engineers, recommend a number of orifices instead of a single point of discharge. Each orifice may consist of a 12-in. vertical cast-iron riser in the top of the 60-in. outfall pipe, having on its end a horizontal 8-in. tee, through the ends of which the sewage will discharge in opposite directions. The tees are set approximately parallel to the line of the shore or nearly at right angles to the pipe line. The 60-in. pipe is to be de-

creased in diameter gradually as the discharge pipes are taken off of it and will have an open end of 10 or 12 in. in diameter. With this open end the outfall pipe may be freed from any heavy matter carried along its bottom by the velocity of the discharging sewage.

Proposed C. P. R. Hotel, Calgary

Detailed plans for the Canadian Pacific Railway's huge new hotel at Calgary, Alta., show that it will be a most magnificent building. Calgary has long been in need of an hotel of this kind, and when the new million-and-a-half dollar edifice of the C. P. R. is completed it will be a distinct acquisition.

The building will be thirteen storeys high, rising to a height of 169 feet, and will have a frontage of 228 feet and a depth of 164 feet. At present the building will be completed only as far as the eighth storey, as it is desired to open the hotel for business at as



Proposed C. P. R. Hotel, Calgary

early a date as possible. The building is beautifully laid out, and, it is expected, will afford ample accommodation for years to come. The frame will be of steel, with reinforced concrete floors, and concrete foundations. The plans show terra cotta partitions faced with cut stone and brick throughout. The roof will be of slate, with a deck roof of tile. The main roof will be used as a promenade. The main entrance is in the centre of the building, and the vestibule leads directly to the main office. To the west of the office is a large drawing room, and off this is the dining room, which extends the whole depth of the building.

East of the office there is a large rotunda, 43 by 52 feet. There is another large rotunda south of the offices, and the kitchen is located in the central portion of the back part of the ground floor. There is also a cafe on this floor. On the first floor there is a large banquet hall and ball room. Here also are sitting rooms and other apartments. There are fifty-two bed rooms on each flat, the total being over 350.

P. Lyall & Sons, of Montreal, have the contract for the foundations. The contract for the superstructure has not yet been let. E. & W. S. Maxwell, of Montreal, are the architects.

The Canadian bank clearings for the month of October were of record proportions, amounting to \$669,822,800. These figures exceeded those of September by twenty-one per cent., and were at the same time 12.4 per cent. in excess of those for October, 1910.

Harbour Development at Montreal, Que.

An Undertaking upon which approximately \$12,000,000 has already been Expended—Constructional Details of Present Work—Miscellaneous Facilities

The extensive programme of harbor development undertaken by the city of Montreal is attracting universal attention. Particulars of the scheme and of the actual work under way have been given at various times in these columns. Up to 1909 the total expenditure on harbor improvements at Montreal aggregated about \$10,000,000. In 1909 the harbor commissioners submitted to the government plans involving a further cost of \$6,000,000. These were approved without opposition. The work is to be extended over four years. Mr. F. W. Cowie is chief engineer of the harbor commissioners.

The whole history of the work, together with an outline of the features of design and construction, are given in a comprehensive article in the *Engineering News*, from which we have extracted the following particulars:—

NEW PIERS AND FREIGHT SHEDS

The recent improvements at the upper end of the harbor, plans for which were adopted in 1898, include two piers 1,000 ft. long and one 850 ft. long, all 300 ft. wide and separated by slips 550 ft. wide; also 14 steel-frame freight sheds, two grain elevators, and other auxiliary works.

The piers are of solid construction, having walls of timber cribbing, built of squared face timbers and round tie timbers. The cribs are 57 ft. high, 42 ft. wide at the base and 14 ft. at the top. Some of them are founded on the rock and others on hard silt, at a depth of 32 ft. below low water. No foundation piles were used. The filling is of rock for the front compartment of the cribbing, and a considerable part of the second compartment, up to high water level. The remainder of the cribbing, and the entire width of the pier between the crib wall, is filled with rock and earth dredged out of the slips between the piers and out of the neighboring channels and basins. In this way, the deepening of the harbor was utilized in the construction of the piers. The cribwork walls are strengthened against the earth pressure by two rows of 1½-in. tie rods, spaced about 10 ft. apart; these reach from the face timbers (near the water line) to about 60 ft. back in the filling, where they are secured to timber anchorages. The length of the rods is 24 ft. in the top row and 64 ft. in the lower row.

A plank floor 11 ft. wide extends from the edge of the pier to the shed. The shed floors are of concrete, and are 3 ft. 6 ins. above the general pier level. The roadways and the railway tracks between the sheds are paved with scoria blocks laid on concrete.

The bulkhead crib wall is practically the same as that of the piers up to the low water line, except that the spaces between the cross tie timbers of the front compartments are filled with timber so as to make a solid timbering to assist the face timbers in carrying the concrete wall above. The wall of the cribbing is anchored by 3-in. tie rods, to assist in resisting the horizontal pressure of the earth in the rear. These rods are 14 ft. apart horizontally, and about 16 ft. below the top of the wall. They extend back about 64 ft., and each is secured to a concrete

block 8 x 8 ft., 3 ft. thick, set on edge and embedded in the filling. The concrete wall in front of the elevator, which is some 30 ft. in width and carries two marine towers for unloading vessels, rests in front on the cribwork and in the rear upon the foundation walls of the elevator. It is of cellular construction, and is covered by a thick concrete slab in which are laid the rails for the traveling marine towers.

Each side of the pier is occupied by two freight sheds, or rather by one long continuous shed divided into two parts by a concrete partition wall. Two tracks are laid along the inner side of each shed, and the intervening space forms a roadway which is about 45 ft. wide clear of the tracks. The whole space between the sheds is covered with a concrete foundation floor 8 ins. thick under the tracks and 5 ins. under the roadway. Upon this is laid a paving of scoria blocks the tops of which are flush with the tops of the rails. The blocks are laid on a 2-in. bed of cement mortar (1:2), and the joints are filled with cement grout. This makes a smooth even floor from shed to shed, suitable for trucking or for wagons, and giving access to the sides of the sheds for either wagons or railway cars as may be needed.

At some of the sheds there is a railway track on the 11-ft. planked space on the water side of the pier. On the remaining piers the floor slab is extended 3 ft. outwards from the side of the shed and supported on steel cantilevers in order to form a platform for more conveniently landing freight from the steamers.

The wharf or shore line property at this part of the harbor is separated from the adjacent city street by a cut-stone wall about 7 ft. high, which protects the lower part of the city from being flooded when the river is raised to excessive height by ice jams. The space between the flood wall and the bulkhead is from 210 to 250 ft. in width. Next to the bulkhead are freight sheds and the Harbor Commissioners' grain elevators, the remaining portion of the width being occupied by railway tracks and roadways. Along the flood wall is a 30-ft. roadway, and next to this are two railway tracks; two of these are main tracks, forming part of the harbor railway system, and the others are reserved for switching and standing cars. All are connected to the spur tracks leading to the piers by means of frequent crossovers; other spurs and sidings lead to the elevators and to the sheds along the bulkhead.

The entire space between the flood wall and the bulkhead and the piers (except that occupied by buildings) is paved with granite blocks, this paving being flush with the tops of the rails and with the paving of the adjacent street, and also flush with the scoria block paving of the piers. In this way the entire area not actually occupied by standing or moving cars is available for wagons. The roadways and railway tracks are carried through the flood wall at frequent openings, these being closed by watertight gates at time of flood.

Freight Sheds.—Of the 14 new freight sheds, there are four (in two rows) on each pier, and two on the

bulkheads between the piers. They are double-deck sheds of uniform design, having a width of 96 ft. and a length varying from 365 ft. to 650 ft. They are of steel frame construction, with floors and roofs of reinforced concrete (monolithic) and the walls of corrugated iron sheeting. The foundations are groups of piles driven in the filling of the pier, and supporting concrete footings and pedestals. In seven of the sheds, wood piles 20 to 30 ft. long and 10 to 15 ins. diameter were used; these have an average load of 25 tons per pile. In the other sheds, Raymond concrete piles were used; these are about 17 ft. long, 19 ins. top diameter, and carrying loads of 30 to 50 tons each.

The steel structure has four rows of columns, those of the two outer rows 21 ft. apart, and those of the inner rows 42 ft. apart. They are spaced 15 ft. 10 ins. longitudinally, except that in the upper floor the alternate columns are omitted, giving a spacing of 31 ft. 8 ins. for the columns which support the roof trusses. The outer rows of columns are not in the line of the walls, but are placed 6 ft. inwards, so as to give clear openings at any point for ships gangways on the outer or water side and for car doors and wagons on the inner side of the lower storey. In the first storey each column is composed of an I-beam (8 x 6 ins.) and two 12-in. channels; those of the upper storey are composed of pairs of 12-in. channels with lattice bars over the flanges. The floor beams are plate girders, 40 ins. deep in the central span and 36 ins. deep in the side spans. Between these are 20-in. I-beams 7 ft. apart.

On the outer sides of the sheds at which there is no railway track between the shed and the edge of the pier, the lower floor is extended on cantilever beams for 3 ft. beyond the line of the shed, so as to serve as a landing stage. The transverse girders of the upper floor also are carried out as cantilevers to support the 2½ ft. extension of this floor and to carry longitudinal lattice girders to which are attached the runways for the sliding doors of the lower floor directly under the doorways and walls of the upper floor. On the land side of the shed, the transverse beams of the upper floor extend 6 ft. beyond the outer rows of columns, to carry similar lattice girders to which are attached the runways of the sliding doors, which are directly beneath the doors and walls of the upper floor, as on the other side.

The roof over the central span is supported by 42-ft. trusses; the top chords of these (each composed of two 9-in. channels) extend over the side spans, and have knee-brace connections to the columns. From the projecting ends of these channels (over the cantilevered floors) are suspended the trusses of the upper floor. Five lines of 20-in. I-beam purlins (over the columns and at the ridge) carry 9-in. I-beam rafters spaced about 5 ft. 3 in. apart. There is no continuous monitor roof, but in each roof panel there is a raised skylight 10½ x 24 ft., with a height of 5 ft. This is fitted with hinged sashes. On the water side of the sheds the roof carries the steel framing of the gallery for the grain conveyor system.

The lower storeys have no walls, but are closed by the rows of continuous sliding doors, so arranged as to allow of being opened at any point. On the upper storeys the walls or sides are galvanized corrugated sheets attached to a light steel framing by means of hook bolts. This siding, however, occupies only every alternate panel, the remaining panels being closed by sliding doors, each forming a complete

panel. On the lower floor, there is a door to each panel, while in the upper floor they form alternate panels. The two floors and the roof are of concrete (1:2½:5) 7 ins. thick, and reinforced with wire cloth. The finish is formed simply by flushing the cement to the surface, but the inclined approaches for teams are paved with granite blocks. The roof is covered with felt laid in an asphalt composition. The structural steel, sheathing, etc., are painted with three coats of oil paint, the color of the finishing coat being light gray. The upper floors and the roof are designed for live loads of 600 lbs. and 45 lbs. per sq. ft. respectively. The concrete of the lower floor is on the solid filling of the pier, and therefore will carry any weight. Teams are driven directly into the lower floor. One pier has an electric elevator with platform large enough to take a 5-ton wagon and its team to the upper floor.

GRAIN ELEVATORS

The Harbor Commissioners' Grain Elevator.—The grain elevator No. 1, now in use, is of steel construction with 36 cylindrical bins 21 ft. in diameter and 85 ft. high. Curved sheeting between the outer walls of adjacent bins forms small exterior bins, while most of the interior intermediate spaces are also used as bins. Four of these latter spaces, however, are left open for the reception of the operating legs. The building is 190 x 84 feet, with pile foundations capped by a heavy slab of reinforced concrete, while concrete beams and columns support the steel superstructure. The storage capacity is nearly 1,000,000 bushels, and the elevator handled 8,660,000 bushels in 1908, and 11,554,000 in 1909. Above the bins is a structure containing the distributing floor and cupola, the latter being 42 x 67 ft.

The receiving tracks pass through the building (beneath the bottoms of the bins), and the railway cars discharge the grain into large receiving hoppers beneath these tracks; four elevating legs raise the grain to 1,600-bushel garner in the cupola, from which it falls to scale hoppers of similar capacity, and from the scales it is delivered to belt conveyors. The grain may be loaded directly into the cars or vessels at the elevator by means of spouts, but nearly all of it is delivered to vessels at their berths by means of a system of belt conveyors extending over the sheds on the piers and bulk-head walls.

Two special features of the elevator are the traveling marine towers for unloading grain from lake steamers and barges, and the belt conveyors for loading grain into ocean steamers. The two towers are nearly alike, the second one having been built in 1910. Each is of structural steel and about 150 ft. high. It is mounted on four trucks which travel on a double track on the cellular concrete bulkhead wall, the construction of which has been described already. The marine leg is suspended from the top of the tower, and when not in use it is housed entirely within the tower. It can be lowered 67 ft. and the bottom can be swung out 20 ft. from the side of the bulkhead wall, so that it can reach and fully unload the largest steamers. The grain discharged at the top of the marine leg is delivered to a garner feeding a 200-bushel scale hopper, and falls then to a second garner from which it is delivered by spouts to the receiving hopper of the main building.

To obviate the delay and inconvenience of moving ocean steamers from their berths to the elevator, a conveying system has been installed. In each direc-

tion from the elevator a belt in a conduit along the wharf extends to a tower at the corner of the adjacent pier, where elevator legs raise the grain to the level of galleries which extend across the end of the pier (at an elevation of about 60 ft. above high water), and along each side of the pier and the adjacent bulkhead wharves. The latter galleries are upon the roof of the sheds, as described above. These galleries have loading spouts 62 ft. apart, and the grain may be discharged by any of these by placing the belt tripper at this point. In each gallery there are two 36-in. rubber belt conveyors, and there are in all about five miles of these belts. Each belt can deliver 15,000 bushels per hour, making a total capacity of 60,000 bushels per hour, which can be delivered simultaneously to four ships lying at any one of the 14 freight sheds. This conveyor system is operated by 31 electric motors aggregating 1,785 brake h.p., while the elevator machinery is operated by 13 motors aggregating 925 h.p.

Grain elevator No. 2 for the Harbor Commissioners was commenced in 1910. This is located on the wharf between the Jacques Cartier and Victoria piers. It has a roadway on the water side and railway tracks at the rear. A small pier or jetty is built out from the bulkhead wall, on which will be operated two traveling marine towers, so that two of the largest lake steamers lying at this pier can be unloaded simultaneously. The bins, walls and floors are of reinforced concrete. It is 314 x 100 feet in plan, and has a storage capacity of 1,772,000 bushels. It is founded on wood piles covered with 3-ft. slab or mattress of concrete. In addition to loading in grain from lake vessels it will be able to receive grain from 28 cars at once, seven cars on each of the four tracks which run through the building. This is equivalent to 280 cars per day, or approximately 280,000 bushels. There will be an extension of the conveyor system also, so that the elevator can serve any one of the 20 berths between the Victoria Pier and the Lachine Canal.

Grand Trunk Ry. Elevator.—This elevator is at the upper or west end of the harbor, on Windmill Point Pier; it has the entrance lock and basin of the Lachine Canal on one side, and a deep water basin on the other side with loading berths for two ocean steamers. The two railway tracks enter the building for cars to be loaded and unloaded. On either side are legs and spouts for unloading or loading barges in the lock basin. On either side is a gallery for belt conveyors delivering to a row of spouts for loading ocean steamers moored at the elevator. The bins are of steel, but are of square section, 14 x 14 ft.; the sides being stayed by a patented system of construction of the Metcalf Co. The walls of the bins are strengthened by 1¼-in. diagonal tire-rods across the corners, the points of attachment being about 4 ft. 8 ins. from each corner. Each side of the bin at this point is formed by bent plates forming a vertical hollow rib about 5 x 5 ins., through which the tie rods pass and are secured by nuts on each side. These ribs are finally filled with concrete. The rods are about 3 ft. apart vertically. There are 102 bins (in 17 rows), 70 ft. high, 101 of which are for storage with a capacity of 1,100,000 bushels.

One bin is utilized for a passenger elevator and stairway and ten are subdivided to contain the receiving and shipping legs and to form small bins. The building is 84 x 240 ft. with a foundation of piles cap-

ped by a concrete mattress. The gallery for the shipping conveyor extends to the side of the pier, where another gallery extends from it in both directions for 540 ft., making a total length of 1,080 ft., with loading spouts 60 ft. apart. The galleries are 40 ft. above the level of the pier and each contains a 36-in. belt conveyor capable of delivering 15,000 bushels per hour at any spout.

MISCELLANEOUS FACILITIES

Harbor Railway.—A system of railway tracks owned and operated by the Harbor Commission extends along the whole of that part of the waterfront used by shipping; it has about 28 miles of tracks, and is connected with all railway lines so as to provide for direct handling of cars between railways and warehouses or ships. There are spurs to the grain elevators, coal unloading plants, etc., and sidings along the water front. Each of the new piers has four tracks in the middle (two adjacent to each row of sheds), and on some of the piers there is a track between the sheds and the edge of the pier. The tracks have 72-lb. and 80-lb. rails on ties bedded in the concrete foundation of the granite or scoria block paving, as described above, or in the macadamizing of such wharves as are not yet paved. The equipment consists of three large tank engines of the 2-6-2 class, but the engines of the connecting railways operate over the line to some extent. The operation is carried on by the Harbor Commissioners' traffic department.

Where the wharves are at low level and flooded in winter, the two main tracks or running lines extending along the city side of the harbor property have been elevated, partly on a steel viaduct, but mainly on an embankment having concrete retaining walls and abutments and solid-floor steel bridges over streets leading to the water front. The minimum clear headway beneath these bridges is about 12 ft., to permit the passage of heavily loaded wagons.

Floating Crane.—For handling heavy freight (such as boilers, machinery, etc.) there is a floating crane having capacity of 75 tons at a 54-ft. radius. The truss boom is pivoted to the bottom of the outer face, and revolves on this in a vertical plane to give the desired reach. This crane has been used also for raising sunken vessels.

Floating Dock.—The Harbor Commissioners have contracted for the construction of a floating dry-dock having a lifting capacity of 27,000 tons. This dock is to be completed next year, and will be installed in a basin now being prepared at the lower or east end of the harbor in a 36-acre tract of reclaimed land. The dock is being built by Vickers, Sons & Maxim (of London); this firm will also operate the dock, under lease from the Harbor Commissioners, and will establish and operate a ship repair yard in connection with it.

Coal Unloading Plants.—There are several large plants of this kind operated by companies which import coal in steamers owned or chartered by them. The largest are those of the Dominion Coal Co., which has one at each end of the harbor. The one at the upper end is located on the Bickerdike Pier and has an unloading capacity of 18,000 tons per 10-hour day. Each plant has five towers traveling on a trestle along the pier, so as to be adjusted to the position of the ship's hatches. A hinged boom is lowered to

project horizontally over the vessel, and on this runs a hoisting trolley. A self-loading grab bucket of two tons capacity takes the coal from the hold, and is run back to deposit it in a storage bin on the pier; from this it is delivered by gravity through spouts to cars or wagons, or by small trucks to canal boats. Storage for a winter supply is provided also.

Electric Light.—The piers, wharves, sheds and harbor property in general are lighted by electricity, current for light and power being furnished by the Montreal Light, Heat & Power Co.

Construction and Maintenance Plant.—While there is little deposition of silt in the channel or slips and basins, there is a considerable amount of dredging required for enlarging and deepening the harbor. For this work and also for the construction of piers, bulkhead walls, etc. (most of which is done by the Harbor Commissioners) there is an extensive floating plant. This includes three dipper dredges with 7-yd. buckets, a drill boat, five floating derricks, a floating pile driver, concrete mixing plant, six tugs, scows, etc. Repair shops for the maintenance of this equipment are located on the Mackay Pier. Some of the tugs are of heavy construction, being designed for occasional use as ice breakers. It may be noted that the dredging of the ship channel within the limits of the harbor (17 miles) is done partly by the Harbor Commissioners with their own plant, under arrangement with the government.

A Company Specializing in Difficult Work

The construction of deep foundation work in soft and water bearing soils probably calls for greater skill and more efficient organization than any other class of work within the whole sphere of engineering practice. This is a specialty that can only be successfully carried out after long and, in some cases, cost-



A further insight into the Foundation Company's work on the St. Lawrence River Bridge

ly experience. To a certain extent, it may be termed a business without routine, each piece of work being a problem in itself calling for the most careful and expert supervision. We therefore feel that our readers will be interested in a short description of a few typical examples of this class of work now under construction or recently completed by The Foundation Company, Limited, Montreal.

C. P. R. St. Lawrence River Bridge

One of the most interesting engineering works in this country is the double-tracking of the C. P. R. bridge across the St. Lawrence River, near Lachine, Que., the substructure of which has recently been completed by the Foundation Company Limited, Montreal. The bridge has a total length of 3657 feet and is supported on two abutments, two land piers and seventeen river piers in water varying in depth from a few feet to a maximum of about 32 feet. The work on the substructure in connection with the double-tracking consisted in the enlarging of all the original



C. P. R. Bridge at Lachine, showing 1,000-ft. tramway built by The Foundation Company to facilitate erection of piers



DOMINION EXPRESS BUILDING, Montreal — one of the Foundation Company's many noteworthy contracts and incidentally one of the city's largest modern office buildings. The structure is built on Pneumatic Caisson Foundations, carried down to bed rock ninety feet below street level.



Sinking a Concrete-Lined Shaft, at St. Albert, Alta., for the St. Albert Collieries, Limited

piers and abutments to about their original length, increasing the height of four existing piers by 19 feet, and the construction of four new river piers. All the work is of rock faced limestone ashlar on massive concrete footings carried down to bed rock. The work on the river piers presented unusual difficulties on account of the heavy current, which under ordinary circumstances ran from 8 to 10 miles an hour, but in the early spring was as high as twelve miles an hour. The river bottom contained from 6 to 10 feet of gravel and boulders overlying the rock, forming an extremely porous bed which had to be contended with in unwatering operations.

Several of the river pier extensions were constructed on pneumatic caissons. The balance of the extensions and the four new river piers were constructed in open cofferdams. The type of cofferdam was a crib with solid double walls, which was sunk by loading stone in pockets provided for the purpose.

The space between the walls, about 5 ft. wide, was then filled with clay puddle which effectively protected any serious leakage. For the pier extensions, these cofferdams were constructed with three sides only, and so arranged that the sides overlapped and fitted closely against the cofferdams of the original pier which had been left in place as a protection to the masonry. The joints between the old and new work were caulked by divers. As was anticipated, the old cofferdams leaked considerably, but by means of an adequate pumping installation, the water was easily handled.

The work was commenced in July, 1910, and carried on continuously through the winter. All of the submerged work on the first river pier was done during 1910 and a force of masons kept busy through the winter completing these piers ready to receive steel. During the present year, pneumatic caissons were sunk for the seven remaining piers. These are now completed and are ready to receive steel.

Dominion Express Building, Montreal

The new office building of the Dominion Express Company at the corner of St. James and St. Francois Xavier streets, Montreal, will be one of the finest structures of its kind in that city. Its erection has marked a new era of building construction in Canada, it being the first building in this country to be founded on pneumatic caissons. In all, forty-two monolithic piers, 6 ft. 6 in. in diameter, were sunk to bed rock at depths of from 90 to 95 feet below the curb. These supported the 42 main columns of the building. The subsoil at the site was composed mainly of sand and gravel, with intervening veins of quicksand. One of the most interesting features in connection with the work was the shoring of the Royal Bank building, immediately adjoining the site. Although only five storeys in height, this building is of massive construction, containing in its interior a great deal of expensive marble. The banking room itself is three storeys in height and occupies the entire width of the building. This feature rendered the building most difficult to shore successfully, on account of the great unsupported wall and owing to the entire absence of the floors for a height of three storeys. By means of spur shores engaging a 48-inch plate girder rivetted to the wall columns, this building was maintained without settlement, notwithstanding the fact that the excavation for the Dominion Express building extended many feet below the footings of the Royal Bank building.

Coal Mine Shaft at St. Albert, Alta.

The Foundation Company, Limited, are now engaged in sinking a concrete lined shaft for the St. Albert Collieries, Limited, at St. Albert, Alta. This is to open up the large coal measures at that locality. The shaft is to be sunk a distance of 200 ft., through water-bearing sand, gravel and clay. It will be sealed to the rock at that depth and thus do away with the pumping made necessary by the usual timber lined shaft. The Foundation Company have constructed some twenty-five shafts of this nature, under similar conditions, all having been carried to successful completion.

Concrete Lined Tunnel at Shawinigan Falls

A few years ago the Foundation Company built for the Northern Aluminum Company, at Shawinigan Falls, a concrete-lined tunnel, about 1,000 feet in length. This is used as a penstock for supplying water to the turbines in the power house at the foot of the falls. The tunnel has a neat inside diameter of 13 ft. and is built of concrete, heavily reinforced.



Shawinigan Falls Tunnel

The work was executed by driving four headings simultaneously,—one from each of the extreme ends and two from a shaft sunk at about the middle point of the tunnel. The material encountered was mostly a clay of varying densities. The photo shows the concrete forms set up. These had an upper and lower tramway for disposing of the excavated material and taking the concrete into the tunnel up to the forms. Both the earth and concrete were handled in side dump cars, propelled on portable track.

Among the other contracts executed by the company may be mentioned the foundations for the Windsor Station extension, Montreal, P. Q.; piers in Toronto Bay for the Hydro-Electric towers; river and land piers at the St. Lawrence River crossing for the high tension lines of the Canadian Light & Power Company; reconstruction of a bridge pier at Yamaska.

The head office of the company is in the Bank of Ottawa building, Montreal.

Problems Encountered in Construction

Preliminaries in Road Work—Putting in Underground Structures—Defects in Sub-Grade Accountable for Many Failures—Surfacing*

By W. W. Crosby†

Generally speaking, the first operations are those of grading and of installing the underground structures, such as culverts, abutments for bridges and underdrains.

If any clearing or removing of trees and old stumps is to be done, it should be done promptly and thoroughly. Where practicable, the removal of trees should be accomplished by cutting off the roots around the tree a little distance away from the trunk and then the tree pulled over so as to rip out the stump proper. The roots thus left in the ground will do no serious harm unless within a foot of the road surface. It is sometimes the practice of the speaker to allow trees to be cut off close to the ground and the stump to remain, provided that there is to be not less than two feet of new fill between the top of the stump and the bottom of the surfacing. It may be trite but it is at least safe to remark that in no case should a foreign stump be allowed to be placed in any embankment.

Underground structures should almost always be started as early in the proceeding as practicable, especially those which cross the road. Such procedure not only insures their being out of the way of the later work and gives more opportunity to conveniently handle the public traffic generally to be provided for over a road, but also allows more careful construction and better results in the backfill. Only too often serious defects and extra expense occur in the surfacing over culverts too recently installed before the advent of the surface over them. In this connection, the speaker will state that it is his practice to use vitrified clay pipe for all culverts from twelve (12) to twenty-four (24) inches in diameter where the covering over them is not less than two feet in depth and concrete boxes or cast iron pipe where the "head room" or cover is less. He has experimented in a very few instances with corrugated wrought iron culvert pipes, but is as yet unconvinced of its general desirability. In his experience, he has had no difficulties with the use of first class vitrified clay pipe even under heavy fills of, say, twenty (20) feet or more. Above 24 in., the speaker prefers what is called "double strength" if clay pipe is to be used, but generally concrete boxes would be cheaper. Of course, in the use of clay pipe, care must be had in the laying and backfilling especially to prevent the presence of anything like a stone nearer the pipe than, say, one foot. The speaker has seen a stone about the size of one's two fists forced by the fill above directly through the wall of an 18-in. clay pipe.

The bed on which a pipe culvert is to rest is a consideration frequently slighted. Only too often is it allowed to be of improper or of uneven character. This is of especial importance where short length joints of pipe are used. A bed of sand or fine gravel

on which to lay the pipe is often desirable and advantageous. Even oyster shells or crusher screenings may be used. The speaker had one case some ten years ago where a road crossed a bight of salt marsh by a pile-trestle about two hundred feet long. It was proposed to fill in the space instead of making the necessary renewal of the old wood work and to care for a small stream crossing the road through the marsh by means of a double line of 30-in. cast iron pipe. The surface of the marsh was at about mean high tide and the marsh mud of unknown depth. Therefore, along the slight stream depression through the marsh, the speaker laid a bed of oyster shells,—the cheapest available mineral material—about ten feet longer than the pipe and about twelve feet in width. The shells were dumped from carts through the floor of the old bridge and spread out as necessary to probably an average depth of two feet and with their upper surface level and just above high tide. The pipes were then laid on the centre of this bed and the filling over them placed. The results have been entirely satisfactory.

Drainage Requires Special Attention

Especial attention to drainage is necessary in Maryland work owing to both the prevalence of loamy or clayey soils and to the "open" character of the winters. A great deal of "French drain" is used. The pipe is vitrified clay and generally four inch—sometimes six—in diameter with bell and socket joints. Stone, gravel or shells may be used for backfilling with apparently equal results. We think it preferable to install the underdrain just ahead of the surfacing work in most cases.

Practically all pipe ends should be protected by masonry head walls as a matter of protection and economy to say nothing of appearance. Generally, our masonry is concrete—a "one-three-six" mixture—and on designs made in our own office. Flat slabs or girders, reinforced when necessary by twisted or corrugated steel rods, are usually sufficient. Occasionally special circumstances warrant an unusual design. In such a case, bidders are given the opportunity to submit their offers with their own designs. These latter are checked by our office and the comparison made between the offer and the office plans and estimates so that a decision may be had.

Of course, the key to success in bridge work is in a proper foundation and this is a subject by itself. Not much more can be said here than that almost all kinds of foundations have their place and the real problem is one of proper selection of each case.

Notes on Sub-Grading

Preliminary to the placing of the surfacing comes the preparation of the roadway for it, or what is generally known as "sub-grading." The speaker considers the matter of a proper sub-grade one of the most important of all construction problems, and regrets to be obliged to state that it seems to be one too often neglected. In his judgment, more failures in the surfacing have had their rise in defects of the

* Paper read at the Annual Convention of the American Road Builders' Association, Rochester, N. Y., Nov. 14-17, 1911.

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sub-grade than in any other source. In fact, the importance of a proper sub-grade can hardly be over-estimated. A proper sub-grade should be firm, even and as little susceptible to damage by water as possible. Gravel—preferably sandy or with no excess of clay—gives an ideal sub-grade when properly shaped and rolled. Clean sand will furnish a most satisfactory one, though it may bring about some waste surfacing material. In many localities, neither sand nor gravel is available. Crusher screenings may be substituted with very satisfactory results. Some clays will make a very good sub-grade, if not too wet so as to be muddy or rubbery, nor too dry so as to be dusty, provided the surfacing and under-drainage are so installed as to keep the clay in its good condition. Other clays cannot be thus handled. The speaker has secured satisfactory results in some instances by the use of a layer of gravel, sand, or screenings from three to six inches thick immediately below the surfacing. Also, rolling a layer of stone into the sub-grade after shaping it, but before applying the first course of the regular surfacing, frequently relieves the defect of the sub-grade. Another way is to prepare the sub-grade by shaping and rolling as usual and then to apply a first course of the macadam of special composition. That is, instead of using for this course, one size of stone, to mix with the ordinary No. 1's, say, 50 per cent. of sand or screenings (for instance by running the screenings and No. 1's together from the screen). Then spread this mixture on the prepared sub-grade, harrow it, and then roll. This has proved a very satisfactory solution in many cases where otherwise the failure of ordinary eight-inch macadam was almost certain. Probably the fine gravel in the No. 1's prevented the coming up of the sub-grade material into the macadam and thus its destruction in freezing and thawing wet weather.

In passing, the speaker wishes to state that he considers this matter of sub-grade is only too often neglected in city work where a concrete base is to be used under the surfacing proper. Too much dependence apparently is placed on this concrete base in many cases and even unnecessary expense is had for such concrete when by proper attention to the sub-grade beneath it, not only would better results, but also much saving in cost, be had.

In the reconstruction of old roads, it frequently happens that but slight changes of grade are desirable. Many of these old roads, such as the "Pikes" have been "stoned" in the past and so massively, but withal so crudely, that they now present to travel surfaces that are solid beds of stone (mostly large) whose unevenness and roughness furnish the main, if not the only reason for their treatment. Many of the audience will recognize readily a statement from the speaker to the effect that those familiar with such an old road are hostile to any idea of digging into or removing, if only for the purpose of breaking up the large stone, the old road bed. Nevertheless such a procedure is often the economical thing to do. If it can be done for any reason and the old stone bed must be allowed to remain, then the grades for the finished surface must be properly adjusted so as to provide at least a minimum thickness of new surfacing on top of the high points of the old stone. And this minimum cannot successfully be less than four inches in the case of water-bound macadam. With proper care in bituminous work, it can prob-

ably be reduced to two inches and possibly in some cases even less.

Further, in such work, on an old road, the depressions to be removed furnish a problem. It will not do to fill them with an absorbent material like clay or loam, and filling them with surfacing stone may be necessary even if expensive. Frequently, however, a cheaper roadside stone of inferior quality will answer. The same remarks apply to thin layers of material to come between the old road bed and the bottom of the new surfacing.

Various Kinds of Surfacing

In what may seem perhaps to have been a rather cursory way, the speaker has at last reached the problems of surfacing. And here perhaps a breath should be taken in view of the vast outlook.

Is there anything but "problems" in the subject of surfacing? And what a wide field of them offers, which yearly is becoming wider and more diversified, thanks to the activity of the proverbial American ingenuity. To discuss, or even review, a list of all the problems in this field would be beyond the bounds of the present conditions, so the speaker will, in closing, merely mention a few salient points under the various kinds of surfacing on which he has convictions or to which he feels it might be proper to direct your attention.

With sand-clay surfaces, it is important to get an intimate, even, and properly proportioned mixture of the sand and clay.

With unscreened gravel surfaces, it is necessary that the gravel be free from stones larger than, say, a goose egg, and from an excess of fine material,—i.e., either sand or clay. It must have, however, sufficient "fines" to fill the voids of the gravel stones and preferably these fines should be of a highly cementitious character. If too weak in cementing qualities naturally then something, such as pitch, must be added to make up for the lack of bond among the round gravel stones and thus to remedy their tendency toward displacement under traffic, especially in very wet and very dry weathers.

With screened gravel surfaces, when the correction of the sizing is had by the screens, the same remarks then apply. In some cases, screened gravel may be satisfactorily "bound" with limestone screenings. With Marl surfacing, the problem is to secure the necessary uniformity of the material and then to properly compact it in place. Plentiful watering and rolling are important.

With broken stone macadam, in the experience of the speaker, the most necessary, and at the same time, the most difficult, thing to obtain apparently is the proper compaction or interlocking of the broken stone. Almost always the rolling of the different courses is less than it should be for the best results, and the deficiencies in rolling are attempted to be made up for by using the screenings too soon and too profusely. Another problem is the securing of the utmost degree of uniformity in the macadam layer as to thickness, evenness and homogeneity—no irregular depths of stone, no irregular thickness of courses, no pockets of greatly varying in size, material, etc.

And with all these just mentioned surfaces, the speaker at the wish of repeating must again call attention to the problem of getting proper rolling or compaction.

With bituminous surfaces, the main problem is perhaps again the securing of uniformity. Practic-

ally all defects may be traced to the lack of it. The use of mechanical appliances of course always helps in securing regularity and homogeneity and generally tends to economy as well. Their desirability is beyond question.

With pavements of various kinds, perhaps a general statement might be made that one important problem is to get them as dense as possible,—that is, with sheet pavements, such as asphalt, bitulithic, concrete, etc., the mineral portion must be so proportioned that the voids will be at a minimum and the

cement must then fill the voids. The other necessities of homogeneity, or uniformity and compactness also apply. With block pavements, the joints must reach a minimum and then be properly filled. The blocks themselves need uniformity and their placing must be evenly and solidly secured.

The speaker trusts he may have given an idea of the problems to be encountered in construction, if not a solution for all of them. In solving them, one and all, no factors will count more than carefulness and experienced intelligence.

Adaptability of Roads to Local Conditions

Various Types of Pavements Considered and Classified—Notes on British Practice—Problems Identified with Heavy Traffic and Railway Tracks*

By Nelson P. Lewist

Various types of road surfaces or pavements are recognized as possessing different qualities in varying degrees. The most conspicuous physical qualities are durability, smoothness or light resistance to traffic, slipperiness, facility of repair, and sanitary features. In addition to these there is the most important quality of economy—not low first cost, but the lowest annual cost for construction and maintenance when spread over the entire period of the life of the pavement. Each one of these qualities may involve several considerations which it is unnecessary to discuss in a paper upon the particular subject assigned to this session. The writer will simply consider the methods commonly used in determining the kind of roads to be built, the considerations which should determine the selection and emphasize the need of a more careful study of the adaptability and suitability of the different kinds of road surfaces to the particular highway to be improved. There has always been a disposition to draw a sharp distinction between streets and roads, the former being considered as belonging to cities and large towns and the latter to villages and rural districts. They are, however, all highways, and the same considerations of suitability and economy in the selection of the road surface should apply to both. There are many village streets and inter-urban highways which sustain a far greater traffic both in number of vehicles and in tonnage than do the residential streets which happen to lie within the red lines indicating the corporate limits of a great city. It is true that in the city street the need of surface drainage requires a nicer adjustment of grades and a more sharply defined gutter and impervious gutter pavement. It is also true that the abutting property is so valuable that it can, by direct assessment, meet the cost of a more costly road surface than is possible for the much longer suburban or country roads bordered by land, the value of which is trifling in comparison with that fronting upon the most modest of city streets. How has a determination usually been made as to the kind of road surface to be placed upon a highway which is to be improved? Has there been a careful consideration of the local conditions, the rate of grade, the amount and character of the traffic which passes over the highway or which will probably be attracted to it by reason of the proposed improvement, the likelihood of disturbance of the surface in order to repair existing or install new underground structures, the annual charges due to first cost and maintenance, etc.? Has not this important question been determined in most cases by the preferences

or prejudices of some of the abutting owners, whose qualifications for the task it would be hard to discover, or by those whose alleged opinions have been judiciously accelerated by an enterprising agent of some particular kind of pavement? Such a policy would not be considered for a moment in securing a design for a system of sewerage or determining a source of water supply. It is recognized that our water and drainage systems are intimately connected with the public health and that of the individual family, so that questions relating to them are by common consent delegated to experts for solution. The construction and care of our highways are commonly supposed to concern only our convenience and our taxes, and upon these questions every taxpayer considers himself an expert.

Since Tresaguet, in France, and Telford and Macadam, in Great Britain, showed, about a century and a half ago, that roads of broken stone were capable of carrying heavy loads and could be made practically impervious to water and proof against the action of frost, the broken stone road has been considered the highest type of country and village highway, and until recently it has been frequently found in city streets. In Great Britain such roads are extensively used by heavy traction engines hauling trains of loaded wagons. This use of traction engines on rural highways is rapidly increasing. Mr. W. J. Taylor, County Surveyor of Hampshire, having estimated, that there were in use in 1908 about 8,500 such engines on the highways of England and Wales, or about one to every three and a quarter miles of main road.

Influence of Modern Traffic

By the beginning of the present century progressive countries had set about constructing a more or less complete system of waterbound macadam highways connecting the various centres of population. Within the last decade has appeared the high-speed locomotive, or automobile, and it soon became apparent that, while waterbound stone roads stood up fairly well under rolling loads, they were not calculated to resist the action of driving wheels, and it is now universally recognized that a different kind of binding material must be used. The technique of modern bituminous macadam construction does not come within the limited scope of this paper, and no further reference will be made to it except as a modern type of road surface, it being assumed that very little macadam is likely to be laid in the future without the use of a bituminous binding material either by the mixing method or by surface application. While the new type of macadam is calculated to resist the action of self-driven vehicles, the commercial use of such

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vehicles, which is just beginning in this country, both as to the number of vehicles and their carrying capacity, will doubtless increase very rapidly, and this is one of the chief considerations which, in the writer's opinion, should govern the determination of the type of road to be constructed. The English traction engines already referred to, while slow-moving, are very heavy, and haul wagons with correspondingly heavy loads. This kind of traffic will necessitate the provision of strong surfaces and foundations, and it has been predicted that it will be necessary to place under macadam roads which are likely to be subjected to exceptionally heavy traffic a substantial concrete foundation.

There may in some cases be local prejudice against considering adaptability to motor car traffic in determining the kind of construction to be employed, but it must be remembered that in the State of New York owners of automobiles will, during the current year, pay into the highway funds of the state, in the form of registration and license fees, the sum of \$900,000, or enough to pay interest and sinking fund on some \$18,000,000, and the receipts from this source will doubtless increase, rather than decrease. If motor trucks and traction engines are to come into general use, it would be manifestly fair to impose an additional tax upon all vehicles designed for a load of, say, 2,500 pounds or more on each wheel.

Pavements Classified

Without enumerating in detail the different kinds of pavement available for use in road construction, they may be classified under five separate types, as follows:—

1. Broken stone with bituminous binder, or roads of the macadam type.
2. Finely divided or pulverized mineral matter with bituminous binder, which for lack of a better name may be called roads of the asphalt type.
3. Stone blocks of various sizes laid in courses or in some regular pattern.
4. Artificial blocks in the form of brick, slag, cement concrete or bituminous concrete.
5. Sheet or monolithic concrete.

The problem with which we are confronted at the present time is the creation of a great system of good highways, the aggregate mileage of which will be enormous. Nearly all of these highways will be in rural districts, where the cost of their construction cannot be assessed upon the abutting property. The expense must, therefore, be met by the State or by the State, County and Town jointly. The money must be borrowed through the issue of bonds or must be raised when needed by direct taxation. While the annual cost of maintaining these roads will be a serious burden, and this burden should be reduced to the lowest possible amount consistent with efficiency, and while the type of road to be built should be determined with regard to ease and economy of maintenance, the selection of the type of surface will in most cases be controlled by considerations of first cost. Where local stone is available for the entire road, or even for the bottom course, and where exceptionally heavy traffic is not anticipated, there will be no hesitation in selecting type No. 1, or macadam with a bituminous binder. If the traffic is considerable, and if a large proportion of it consists of motor cars, the slight additional expense of employing the mixing method will be amply justified, while if the traffic is light and slow-moving, the somewhat cheaper, but in the writer's opinion, less effective, plan of surface application may answer the purpose. This type of road, where local stone can be used, will permit of the building of the greatest mileage with the funds available.

The importation of foreign stone at 100 per cent. greater cost to build a road which will last only 50 per cent. longer

is not a good business proposition. There are districts where admirable road materials abound, but where the worst examples of roads are also to be found. Again, there are places where there are excellent roads and at the same time no suitable native road material. Why is this? It is simply because a competent road engineer who is compelled to do the best he can with indifferent materials has produced better results than the incompetent or careless engineer who fails to use to advantage the better materials within his reach.

There are certain sections where there is no native stone available for road building and maintenance, and where the cost of transporting it from distant quarries would be so great as to make a stone road unduly expensive. In such cases the most economical surface to adopt would be type No. 4, or one of artificial blocks. In sections which are devoid of stone it frequently happens that there is material from which excellent paving brick can be made, but if brick are not available, other blocks may be used, which may be of slag or of cement or bituminous concrete, while sand or gravel must be supplied as a bed for the brick or blocks, and under-draining will in most cases be essential. In towns which are so located, a road surface of the asphalt type may be used, but this pavement, as commonly laid, requires a concrete or other substantial foundation. It is not improbable that a pavement of the asphalt type will be developed in which the mineral matter, instead of stone or sand, will be loam or clay. The writer has seen samples of such a road surface, which appears tough, malleable, and non-slippery, while if suitable material is readily accessible, it is predicted that its cost will be little more than that of a good macadam road.

Stone Blocks for Heavy Traffic

It is generally recognized that the most durable of all pavements, and the one requiring a minimum of expenditure for repairs, is stone block. Under horse-drawn vehicles with steel tires it is rough and very noisy, and both the horse and the steel tire will be with us for many years. It was but a few years ago that granite or other stone block was considered a proper pavement to be laid upon such streets as Fifth Avenue in New York, or Euclid Avenue, in Cleveland, but whether it is due to a greater appreciation of quiet or to more susceptible nerves, such pavements are now considered entirely unsuited to thickly settled communities, except where there is an intensive traffic, and in streets largely given over to business, and where noise is not a serious objection. The writer believes that stone blocks have not been given the consideration which they deserve for roads where the traffic will be heavy, where noise will not be a nuisance, and where the blocks, once laid, need not be disturbed. A type of road surface which has given very good results in Europe is that known as "Kleinpflaster," and is a pavement formed of stone blocks approximately cubical in shape, about three inches square on top, and three to four inches in depth, laid in concentric rings or curves with different centres, giving an arch or mosaic effect in appearance. This pavement gives a good foothold for horses, offers little resistance to traffic, is much less noisy than stone blocks laid in straight courses at right angles to the direction of travel, and offers an excellent surface for motor traffic. The cost of such a pavement laid over an old macadam, and including the adjustment of the surface, is said to be about the same as that of ordinary granite blocks. On many of the interurban highways of Germany this pavement has been laid to a width of from 15 to 18 feet, and is giving very satisfactory results, while its relative noiselessness makes it unobjectionable on highways where the abutting property is well built up. It is said that pavements of this type have been in use on heavily travelled roads for

twenty-five years with practically no expenditure for repairs. Both the ordinary stone block and "Kleinpflaster" have claims to consideration on our rural highways which have not heretofore been recognized.

Oil-Mixed Concrete

A type of pavement which has thus far had but limited use is that of cement concrete. Some of this pavement when well constructed of sufficient thickness, and on an unyielding foundation, has given excellent service, although, owing to the personal element which appears to make it very hard to secure uniform results in the mixing and laying of concrete, it is difficult, if not impossible, to guarantee success. If too smooth, these pavements are unduly slippery under certain weather conditions, and they are not suitable, therefore, for heavy grades. It is essential that the concrete should be given ample time to set before traffic is allowed upon it. This is of the utmost importance, and it might not be extravagant to say that each additional day after apparent setting that all traffic can be excluded may add a year to the probable life of the pavement. The latest development in the line of concrete pavements is what is known as oil concrete, where a bituminous oil is added to the concrete before it is laid or is applied to the surface of the concrete after it is well set, as a waterproofing coat. If in addition to the surface application of oil there be also added a coating of fine stone or screenings which is renewed as it wears away, a protecting surface may be furnished which will make concrete pavements more generally satisfactory than they have heretofore been.

From a paper by Mr. L. W. Page, presented to the American Society of Civil Engineers on November 1, 1911, describing a series of experiments made in the Office of Public Roads, Department of Agriculture, it appears that the strength of cement concrete decreases as the percentage of oil is increased, while the time required for setting is increased. The resistance of crushing of concrete containing ten per cent. of oil appears to be about twenty-five per cent. less at the end of twenty-eight days than that of ordinary concrete without oil. In toughness or ability to resist blows there appears to be little difference between oil-mixed and plain concrete. The most significant characteristic of the oil-mixed concrete is indicated by the absorption test. Plain concrete absorbed more than six per cent. of its weight of water in one day, while concrete containing ten per cent. of oil absorbed 1.5 per cent. in the same time, and it was found that little, if anything, was gained in this respect by increasing the amount of oil up to twenty-five per cent. It is this low absorption which is the most promising feature of oil concrete.

The writer cannot attempt to specify under precisely what conditions any one of the types of road surfaces which have been enumerated should be adopted. The object of the paper is to point out, in a general way, the adaptability of the several different kinds of pavements to local conditions and to urge a more careful consideration of their availability, instead of assuming that all country or village roads or all parts of any particular highway should be treated in the same way as every other highway.

A few years ago the streets of our cities and towns were, with few exceptions, far better adapted to all kinds of vehicular traffic than were our rural highways. Attention has lately been focused upon the latter, and the improvement of their condition is so marked that the statement is not infrequent that in a motor car trip of hundreds of miles the only bad roads encountered have been in our large cities. A discussion of the adaptability of pavements should not, therefore, exclude the consideration of city streets. While the annual expense of constructing, maintaining and renewing pavements in a large city is very great, the first consideration is not, or should not be, one of cost.

The health, comfort and convenience of city dwellers is so dependent upon smooth, clean, sanitary and quiet pavements that they are cheap at almost any price. In paving city streets it is customary to impose upon the abutting property the cost of at least one pavement, and it is but fair and equitable that the pavement so assessed should be as durable as possible and should be placed upon a substantial foundation which will be available for those which may be subsequently laid; in fact, it would not be unreasonable to say that the underlying foundation is the real pavement and the visible surface only the protection for it. There are some streets where quiet is such an important consideration that a short-lived pavement which is fairly noiseless is much preferred to one which is more durable, and therefore cheaper in the end. It is this aversion to noise, doubtless, that has induced Paris and London to use wooden blocks, which is the most quiet of all pavements, but which, as laid in these cities, must be renewed every few years, with the attendant inconvenience and discomfort inseparable from such an operation. It may be asked why wooden block was not included among the kinds of pavements available for ordinary highways. It was purposely omitted because it is essentially, and, in the writer's judgment, exclusively a city pavement requiring an especially unyielding foundation, while its cost is too great for use elsewhere. It might, in fact, be called a pavement "de luxe." The money value of a clean and quiet pavement on a street devoted to office buildings or high-class hotels and residences is so great that the cost of frequent renewals, if imposed upon the owners in the shape of assessments, would be a small price to pay for the luxury in view of the greater rental value of offices and rooms, while in front of schools, hospitals and churches, such pavements are essential if the institutions are to properly perform the functions for which they are designed. The word renewals as above used will not be construed as applying to that more or less constant operation so much in evidence in our American cities which consists in the restoration of the surface over openings which have been made to get at some one of the numerous subsurface structures with which the modern city streets are filled.

Problems Arising from Railway Tracks

Some of the most serious problems in highway construction and maintenance are caused by the presence of surface railway tracks within the paved area of the highway. Many suburban and country roads have been almost ruined for ordinary traffic by the laying of such tracks. The desire for high speed has lately resulted in the location of such railways on private rights-of-way, or at least well without the traveled roadway if located within the highway limits. Attempts have been made to lay and maintain macadam along and between rails. The results have nearly always been failures and have rarely, if ever, been even moderately successful. Stone, brick, or some other form of block seem to be the only suitable materials for such use. If the rails are heavy and well laid, the joints can be filled with cement or pitch, and there will be little dust. If the track construction is less substantial, and frequent repairs and adjustment are necessary, sand joints will answer the purpose. In city streets which are paved with asphalt or other smooth pavements, attempts are frequently made to use the same kind of pavement between the tracks and rails with the special object of making them as inconspicuous as possible. Why pretend that there are no tracks and use a pavement entirely unsuited for the purpose? It is better to recognize them as a proper and necessary part of many of our city streets and place between them a pavement which will best meet the exacting conditions without regard to which kind may be used on the sides of the street. For this purpose nothing seems better suited than well cut

stone blocks laid upon an unyielding foundation with cement grouted joints, while if quiet is especially desired, properly treated wooden blocks will give excellent results. Where stone or wooden blocks are unduly expensive, the best quality of brick or slag blocks will be an acceptable substitute, but they should be laid in the most substantial manner possible. Our highways are de-signed primarily for vehicular traffic, but the street railway is a necessity. The right to lay tracks in our public streets is a very valuable one, and the corporations enjoying such rights can reasonably be expected to lay and maintain pavements within the space occupied by them in the best possible manner and at their own expense.

Summary of Conclusions

The conclusions which have been reached may be briefly summarized as follows:—

1. In country highways the chief consideration will be first cost, and the cheapest suitable material which is available must be used.
2. In roads where heavy traffic and excessive wheel loads are likely, the most durable material should be employed and the foundations should be capable of sustaining very heavy loads.
3. Where noise is not a serious objection, stone block will be the most durable and economical road surface under heavy traffic.
4. In suburban towns and residential streets a quiet and dustless road surface will be well worth the additional expense involved.
5. In city streets the consideration of cost can properly be subordinated to sanitary qualities, quiet and cleanliness.
6. Between and along surface railway tracks the pavement should be especially adapted to the exacting conditions and should be laid and properly maintained by the railway company without public expense.

The Design of Manufacturing Buildings

By H. E. Darling

(Concluded from last issue)

The Problems of Finance

The questions of finance which the designer has to consider usually have nothing to do with the securing of the money necessary to carry out the work. But the problem which he does have to keep in mind always is how to get the utmost efficiency from every dollar invested. This means more than merely saving money in the construction. "Savings never pay dividends." It means even more than getting good value for the money spent, for every dollar invested is just one more on which must be paid interest, taxes, etc., if the enterprise is to be a success. If instead of putting the dollar into unnecessary expensive construction or some inappropriate ornamentation, it is so used that it will save something in the cost of maintaining or operating the plant, this means increase in profits. The dollar so invested is helping to earn dividends and is not dead capital.

Thus all the financial problems to be considered here center around the principle of the ultimate value. Will it pay in the long run? But until an infallible rule can be discovered to answer this question, it will be necessary after using every device of mathematics and human wits to still trust to Providence for the results.

The success or failure of an investment depends on the rate of interest received from it and time it has to run. In the case of a building these terms mean the amount of service got out of it, its life or period of usefulness, and its final or "scrap" value. Just what constitutes econ-

omical construction for a particular building will depend upon the values given to these conditions.

As an illustration of extreme conditions, take the temporary grand-stand for a foot-ball match, and a ten-storey office building. For the former, which is to be used for a few hours only, the very cheapest type of construction is economical, while for the latter, whose period of usefulness will be fifty years or more, only the most permanent construction in spite of the greater cost, will pay.

Where the answer to this question with reference to some particular building is not so obvious, it is necessary to assume a certain number of years for the period of usefulness and fix on a sum which will fairly represent its value at the end of that period. From these figures it is possible to determine the percent which the value of the building decreases annually. For example, if the original cost of the building is \$10,000 and it is estimated that at the end of twenty years its value will be about \$3,585, it can be shown that the annual decrease in the value is nearly 5 per cent. This decrease is called "depreciation," and if the books of the owner are kept correctly it will be taken care of in one of three different ways.

1. The value of the building as an asset will be decreased 5 per cent. every year. This is an approximate method and is only correct for the 20th year.

2. A sufficient sum of money will be put aside each year and invested as a sinking fund so that at the end of twenty years it will amount of the total depreciation,—in the above case, \$6,415. The amount of the sinking fund at any time gives the depreciation of the building to date.

3. A certain sum will be spent annually in repairs so that at end end of the perior the building will still be worth its original cost, \$10,000.

Assuming that it is possible to get 5 per cent. per annum interest on money, the amount necessary to deposit in the sinking fund every year would be \$194 (all problems of this nature are solved by the regular rules for annuities,—a very interesting and profitable study for anyone having to do with long time investments).

This same amount, \$194, represents the average sum which will have to be spent in repair to keep the building at a constant value by the third method. If to this we add the interest on the investment, 5 per cent. on \$10,000=\$500 we have \$694, which is the actual amount the owner is paying each year for the building apart from such charges as taxes, insurance, etc.

Suppose a cheaper construction were used, so as to save \$2,000 in the cost of the building, but that as a consequence the depreciation amounted to 10 per cent. per annum instead of 5 per cent. Then the value of the building at the end of 20 years would be \$973. The sinking fund would be \$212.44, and the annual cost of the building, 5 per cent on \$8,000=\$400. \$400+\$212=\$612. This means an annual saving of \$82 by using the cheaper construction which in 20 years would amount to \$2,712,—the ultimate saving to the owner, to say nothing of the \$2,000 saved in construction.

In the above example the building has been considered simply as an investment but a far more important consideration in a manufacturing building is its relation to the process of manufacture. Methods are constantly changing, requiring corresponding changes in the building long before it is worn out. In this sense again a manufacturers' building is like a machine,—its period of usefulness is not always measured by its durability. Some little invention or change in process sends it to the scrap-heap. It may be just as good as new but it is worthless.

This relationship is so important in some lines of manufacturing that the method of considering the build-

ing as an investment as above is not worth bothering about except for purposes of bookkeeping. The only question asked is,—will it reduce the cost of manufacturing sufficiently to pay for itself in a reasonable time?

Now the financial problems of manufacturing usually involve amounts of much greater magnitude than have to be considered in the building or plant. It is quite possible that \$100,000 worth of goods could be turned out annually in a \$10,000 building. Hence the great importance of the relation of the building to process of manufacture. In this case if 1 per cent. could be saved in the cost of the goods produced by increasing the cost of the building 10 per cent., it would pay for itself in one year.

If in a plant employing 100 men it were possible by cutting a door in a wall, by changing the location of a machine, by taking out an obstructing column or by some other device, to save 6-10 of a second of each man's time per minute or 6 minutes a day, it would mean that 99 men could then do the work which formerly required 100. If the average rate of wages were 20 cents per hour, it would save \$600 a year. It can be shown that if the owner were to borrow \$2,600 at 5 per cent. to make this alteration it would pay for itself in 5 years.

But it may be that through faulty design in the first place, it is not possible to make this change, and as a result of this, the owner is losing \$600 a year which in 20 years would amount to \$19,846.00.

Many a manufacturer is losing this \$19,846 and much more through carelessness in the design of his plant.

It may be noted here that saving in time in manufacturing is a double saving. Not only is there a saving in workmen's wages but the capacity of the plant is increased as more work can be turned out in a given period. The profit on this extra work must be credited to the change which makes it possible. In addition to this, time in delivery is often a very important factor in securing a contract, and in such cases higher prices may be obtained.

The above discussion is an illustration of what is called "efficiency engineering" or "scientific management" as applied to buildings, a subject that is attracting a great deal of attention just at present. So fine are some engineers figuring that it has been suggested that even the time which the manager of a concern spends in looking after and ordering repairs to a building be capitalized and added to the ultimate cost.

Usually however more weighty reasons make it unnecessary to go to such refinement. In any new venture, which has a struggle before it with a possibility of failure, the first cost must be kept down to the lowest possible figure even at the sacrifice of efficiency, and questions of future growth, may, within reason, be left to take care of themselves.

This brief statement of the preliminary problems in the design of manufacturers' buildings should make clear at least one fact and that is that the final plan must be a compromise,—a compromise between the "possible" and the "expedient," between the "ideal" and the "practicable." In the completed building there may be many things that at first glance look like blunders but a deeper investigation will show a carefully thought out purpose.

A good definition of an ideal building is given by Mr. Charles Day in his book "Industrial Plants." He says: It must so conform with all the industrial requirements that "the work of manufacturing may go forward with pinpoint to point, should, to all intents and purposes, be untrammelled as much freedom as though the building did not exist at all. That is, the workers, whether employed at individual machines or engaged in moving material from

conscious of the existence of the housing structure." The building that will answer all requirements thus efficiently for the least cost,—the period of use being considered,—will be the best solution of the problem.

The Industrial Engineer

This discussion should also bring out the fact that the design of manufacturing buildings is more of an engineering than an architectural work. It will have been noticed that throughout this paper the name "designer" has been used and not "architect" or "engineer." The reason is that neither of these names, used in its usual sense, gives a correct idea of this branch of the profession. A new term has come into use and we now have the "Industrial Engineer."

The average architect is not only entirely incompetent to handle these problems but all his training quite unfits him for this class of work. The ordinary rules of architecture are too narrow to be applied to what is virtually a machine. Besides, in a large number of cases the questions of architecture never enter at all. There are many examples of handsome but inefficient manufacturing buildings. On the other hand there is a great deal of justice in the charge that works designed by the engineer are unnecessarily hideous, and the industrial engineer cannot consider himself properly qualified if he has not a knowledge of the ordinary rules of architecture and aesthetics as applied to buildings.

But as shown above, the work of the industrial engineer requires more than a knowledge of architecture and structural engineering. He must have at least a general knowledge of applied science in all its branches in order to be able to grasp the salient features of any part of the manufacturers' installation, or his process of manufacture. It is not to be expected that he should be able to advise his client in his own business of manufacturing but he will often find that his clients' ideas of what he wants are limited by his lack of knowledge as to what is practicable. Here the engineer can be of assistance. It must be admitted however that more often the engineer will have reason to feel extremely flattered by his client's faith in his ability to accomplish the impossible.

In addition to his professional training, the industrial engineer must have a broad mind free from narrow prejudices to be able to appreciate the good points in special materials and constructions. He must have sound judgment and a fair talent for prophecy to build for the future. He must be a wide-awake, up-to-date business man with more than enough ability to handle the details of his own work, for the financial problems referred to above require a business acumen not usually expected of an engineer.

After all the preliminary problems in connection with some particular building have been threshed out, the actual work on the design and construction can begin, if the engineer has complete charge of the work.

Then follows in natural order the making of the general plans and specifications, the calling for tenders, selecting reliable contractors and awarding the contracts, the laying out the lines of work, the fixing of levels, the checking and approving detail drawings, the inspection of materials and work, the ordering and installing of and putting in operation the equipment and the thousand and one details which have to be attended to in order that the work may be done in an orderly, expeditious and systematic way and be brought to a satisfactory and successful conclusion.

But these problems have to do with the actual design and construction and are beyond the scope of this paper.

Fifth Annual Convention of the Nova Scotia Society of Engineers

The fifth annual meeting of the Nova Scotia Society of Engineers was held in Halifax, November 15-16. Arrangements had been made for a visit to the dry dock and for an inspection of H.M.C.S. Niobe under repairs, and also for a trip to the Nova Scotia car works. The business sessions were held in the Nova Scotia Technical College. On Wednesday evening, November 15, an enjoyable "At Home" was given in this building for members and their friends. A feature of the event was an interesting address on the Foreign Systems of Technical Education, by Professor F. H. Sexton, Director of Technical Education for Nova Scotia. Thursday's programme included the reading and discussion of the following papers: "Development of Electric Power at the Pit Mouth," by P. A. Freeman, Chief Engineer and Superintendent Halifax Electric Tramway Company; "History of Roads in Nova Scotia," by J. W. MacKenzie, Assistant Road Commissioner; "Notes on Cement and Concrete Work," by H. C. Burchell, Manager, Sydney Cement Company.

The annual report of the council showed a greatly improved attendance at the Society's meetings. During the year seven council meetings and seven regular meetings were held. In addition six special meetings were called. Much interest was manifested in the road discussion and some valuable information was obtained for publication in the Society's records. Among the prominent professional men and others who addressed the society were Mr. Justice Russell, Mr. Justice Meagher, Mr. A. V. White, Professor D. S. McIntosh and Dr. Archibald MacMechan. The report issued by the secretary, Mr. J. Lorn Allan, showed a continued increase in membership. A satisfactory financial condition was disclosed by the treasurer's report. Good progress was reported on the formation of branch societies. During the year a committee consisting of Professor E. A. Holbrooke and Messrs. Hiram Donkin and F. W. W. Doane was appointed to supervise all the back papers which have been read before the society preparatory to having them published in pamphlet form. These pamphlets will be ready for distribution at an early date.

Progress and Expenditure on G. T. P.

Good progress is being made in western Canada in the Grand Trunk Pacific railway work. This railroad now has the following lines under construction: Fitzhugh, Alta., to Copper River, B.C., 618 miles; Regina, Sask., via Moose Jaw, northwest, 92 miles; Regina, Sask., to international boundary, 130 miles; Young to Prince Albert, Sask., 112 miles; Oban to Battleford, Sask., 43 miles; Mirror to Calgary, 130 miles; Biggar, Sask., southwest, 105 miles; Alberta Coal branch, 56 miles; Harte to Brandon, 25 miles.

According to the progress reports for October of the District Engineers, a little over two-thirds of the construction work on the National Transcontinental Railway has been completed. Out of 1,845 miles from Moncton to Winnipeg, 1,275 miles of roadbed are now practically finished by the contractors, and rails are laid for that distance. The middle section of the line, however, comprising nearly 600 miles, and constituting the most difficult part, will require at least a couple of years more work to complete, and the present indications are that the whole line will not be opened for traffic until the spring or summer of 1914. By that time, it is expected, the Quebec bridge will also be completed. Meanwhile the New Brunswick section and the section from Winnipeg to Superior Junction will be available for local traffic, and next year there will undoubtedly be considerable settlement in the districts thus served. Approximately \$25,000,000 have been spent in con-

struction work during the past twelve months, and about the same amount will be spent next year. The total amount spent on the road to Nov. 1 is a little over \$207,000,000.

Charter Granted to Dry Dock Company

A charter of incorporation has been granted to the British North American Dry Dock and Shipbuilding Company, Limited, with a capital of \$1,000,000. All the signatories in the charter are Quebec men. They are as follows: Philippe Bazin, J. F. Burstall, V. Châteaufort, William Doebell, Nap. Drouin, J. B. Letellier, William Price, J. T. Ross and William Shaw.

It is understood that this company will immediately make application for subsidies for the construction at Quebec of the largest dry dock in the world, and upon formal acceptance of the scheme by the Government the work will begin at once. The proposed dimensions of the proposed dock are: length, 1,150 feet; width of entrance, 110 feet. There will be forty feet of water on the sill.

From the Commercial Metropolis

Office of the Contract Record

Montreal, November 20, 1911.

Mr. William Robb, city treasurer, has resigned after 47 years' service in the council. He is 77 years of age. The office will probably be abolished.

Mr. W. S. Painter, who recently resigned the position of chief architect to the C. P. R., has been on a visit to Montreal from Vancouver, where he has taken up his residence.

The engineering department of the C. P. R. is now closing up all its work as fast as possible before the winter sets in. No new work of any importance will be undertaken until the spring.

The Ambursen Hydraulic Construction Company of Canada, Montreal, has started on the construction of a dam and power plant at Steep Hill Falls, Magpie River, for the Lake Superior Power Company.

Among other bodies, the Montreal Builders' Exchange was represented on a deputation which asked the controllers to establish a civic bureau of information for the advantage of intending industries for Montreal. The controllers were by no means favorable, they considering that there was at present no demand for such a bureau.

After an illness of two months, Mr. John Keegan, a member of the firm of Keegan & Dillon, died on November 11 at his residence, Montreal, at the age of 51. He was a native of Rawdon, P. Q. Mr. Keegan, in the earlier years of his business life, owned several quarries and brick yards near the city, and later went into contracting, being identified especially with sewer laying. He was a member of many local organizations.

At a meeting of the Council of the Canadian Society of Civil Engineers, Montreal, a resolution was unanimously adopted, on a motion by Mr. G. A. Mountain, seconded by Mr. J. M. Shanly, recording the society's high appreciation of the recent appointment by the Dominion Government of Mr. R. W. Leonard, a prominent officer and member of the society, to the chairmanship of the National Transcontinental Railway Commission.

If the recommendation of Chief Tremblay is agreed to, legislation will be sought by the council compelling the use of water sprinklers in commercial buildings and also the fitting of sprinkler pipes in the basements of high buildings. It is suggested that these pipes have outside connections, by which the firemen could turn on water and

flood the interior without having to send men inside at danger to their lives. The increasing height of buildings and the consequent difficulty of fighting fire is the reason for the proposed change.

Construction News and Items of Interest

Water has been turned on at the city of Toronto's new filtration plant and it is expected the entire system will be in operation in the near future.

Among the most recent registrations at Montreal are the following: Savard & Falardeau, masonry contractors; A. T. A. Chagnon & Company, sewer contractors; Montgomerie & Todd, contracting engineers; John Paterson & Sons, general contractors.

The Provincial Government of Manitoba are about to call for competitive plans for new Parliament Buildings, estimated to cost \$2,000,000. Hon. Colin H. Campbell, Minister of Public Works, will invite drawings from prominent architects throughout the British Empire.

The construction of an international highway from Montreal to New York is regarded as an assured fact. The character of the road will be decided upon jointly by the roads branch of the Province of Quebec and by the New York State Road Engineers. It will be completed at latest during 1913.

The Mayor of Toronto is investigating the merits of the railless car system used at Leeds and Bradford, Eng. In a report issued by a deputation appointed to visit these cities it is stated that the capital cost of establishing the system was about \$8,500 per mile, the cars costing \$3,500 each. Operation costs about 11 cents per mile.

Among the list of successful competitors for civil service appointments published in the last issue of the Ottawa Gazette we note the following: for the position of architect in the Chief Architect's branch of the Department of Public Works, subdivision A of the second division, Arthur James Barclay, Goderich.

The contract for the supply of glazed terra cotta for the exterior of the new Merchants Bank of Canada building at Halifax, N. S., has been awarded to W. Beverley Robinson & Company, Board of Trade Building, Montreal, agents for Doulton & Company, Limited, of London, England, whose "Carrara" will be used.

Arrangements have been completed by the British Columbia Marine Railway Company for the construction of a large dry dock at Lang's Cove, adjoining the present plant. The structure is to be one thousand feet long, 100 feet wide, and 36 feet deep, on similar lines to the big graving dock at Southampton, where the White Star boats make their English headquarters. The intention is to construct it of reinforced concrete with granite facings, and electrically driven apparatus is to be used.

Grading has been completed by Contractor A. Guthrie, St. Paul, on the Great Northern Railroad into the city of Winnipeg, Man., from Oak Point Junction to the freight yards at the corner of Israel street and Ross avenue. Work is being rushed and it is expected that trains will be operating over the new line before winter. Work on the freight sheds and office buildings which are being built at the corner of Israel street and Ross avenue are being pushed forward by the contractors, J. MacDiarmid & Co., and already 75 per cent. of the work has been completed. The buildings are of good size, the freight sheds being 600 ft. long and 50 ft. wide. The subway work across Sherbrooke, Arlington, Tecumseh and Ross streets and Elgin avenue is being done very rapidly, and it is expected it will be finished by the close of the open season. Steel

girders for the superstructure over the streets and across these subways will be on the ground ready for putting into place by the fifteenth of the month, and all the concrete work will be ready in that time for the steel to be laid. The work on the bridge which crosses Portage avenue near Strathcona street is in progress, and the bridge is expected to be completed in a very short time.

Trade Notes

A pamphlet just to hand from Mr. James Taylor, consulting and inspecting engineer, Montreal, contains some interesting information relating to a new paving material called "Ferroterre," which is being introduced on the Canadian market. It is stated that "this composition when completely laid, becomes one solid mass, presenting an even, seamless and jointless surface, and may be laid on earth, concrete, or road metal. One ton will cover 25 square yards 1½ inches thick; it has a special value for footings, basements of buildings, and constitutes a solid water-proof roofing for flat roofed houses. As it can readily be moulded into any form, it may be manufactured into drain-pipes any size or shape, and if broken can very quickly be replaced. In addition to its utility as paving material, Ferroterre, being absolutely impervious, non-oxydisable, and unaffected by frost, is invaluable for pipes, electric cable conduits, etc. In concrete form it can be used for reservoirs, sea, or hydraulic works, in fact, for all constructions where great strength, toughness and homogeneity is required."

The American Blower Company of Detroit, Mich., realizing the importance of the Canadian field, have applied for articles of incorporation for a company to be known as the Canadian Sirocco Company, Limited, of Windsor, Ont. They have acquired from the city of Windsor a tract of land, centrally located, comprising about 4½ acres, situated on the Essex Terminal Railway, and will proceed at once with the erection of an up-to-date plant. The company will have the exclusive patent rights for the manufacture in Canada of the famous Sirocco fans and blowers, which according to all accounts have revolutionized the blower business of the world by their space and power-saving features. The Canadian Sirocco Company will have the complete engineering staff of the parent concern at their disposal; and it is no far-sighted prophesy to predict a successful business career for them.

Considerable attention is being devoted to improvements in the construction of centrifugal pumps for dredging purposes. In order to withstand the abrasive action of stones and sand particles which are pumped through them, the interior of these pumps must be lined with a specially hard steel. A new type of pump, with impeller and special casing of manganese steel, which has recently been placed on the market by the Canadian Boving Company, Limited, of Toronto, marks a distinct advance in the manufacture of this class of pump. As ordinary tools make no impression on the intensely hard alloy steel used for casings and impellers, special grind stones have to be employed when finishing these manganese steel castings. The liners of this pump are interchangeable and the runner, which is of the open type, is balanced to avoid end thrust. A special arrangement is provided to introduce clean water under pressure into the stuffing box, which effectively prevents the entrance of any sand, and consequently avoids wear on the shaft. At the same time this water seals the stuffing box, and so enables the pump to work with high suction heads. It is interesting to note that shortly after this dredging pump was put on the market by the English parent firm of the Canadian Boving Company, Limited, namely, Messrs. Jens, Orten-Boving Company, of London, an order was re-

ceived for fourteen of these pumps for the Australian government.

We have received from Marsh & Henthorn, Limited, Belleville, Ont., a copy of their general catalogue No. 3, an excellent compilation of interesting information relating to the hoisting machinery, steel cars and car irons, boilers and tanks, stone crushers, engines, mining skips and buckets, manufactured by this firm. Marsh & Henthorn, Limited, require no introduction to contracting interests, for their name is recognized as a standard in their various lines of manufacture. Their business has increased to such proportions that the erection of an up-to-date new factory will be commenced at an early date. Mussens Limited, Montreal, have been appointed exclusive Canadian sales agents for the company's hoisting engines.

Facts concerning the steam road rollers manufactured by the Erie Machine Shops, Erie, Pa., are set forth attractively in an illustrated catalogue just to hand. Erie rollers are in extensive use among large paving and contracting companies. They are built for service and are claimed to have given good satisfaction in almost all parts of the world. Every roller is built by templates so that every part may be duplicated. A thorough test of each roller is made before it leaves the company's works and all parts are inspected before shipment. This enables the company to guarantee with confidence every machine bearing their name. It is of interest to note that the first roller built by the company in 1889 is still in active service. It has been subjected to hard wear and tear but is still good for several years' work.

To the Robert Mitchell Company, Limited, of Montreal, belongs the distinction of possessing the largest brass factory in the Dominion. Established in 1851, the firm in 1904 rebuilt and re-equipped its works, and it now has one of the most complete factories in Canada, employing about 300 skilled men. The building stands on a very large area, is excellently lighted, and is well arranged with a view to economical working. The company makes a specialty of artistic productions in brass, bronze and iron, and



Artistic 2-light bracket manufactured by The Robert Mitchell Company, Limited.

a staff of designers and artists is engaged in getting up original designs. Some of the lighting fixtures are very beautiful, a feature being made of electric fixtures for large buildings. The company is competing successfully with the United States in this class of work and in bank and office railing and grilles in brass and bronze, and has completed some exceedingly artistic work in this department. The company also does a big business in grates, fenders, railway and electric car trimmings, tablets and name plates, and plumbers' supplies. Much work is done for railway and tramway companies.

A New Cube Mixer with Heating Attachment

An entirely new combination which will undoubtedly facilitate contracting operations is a cube mixer equipped with heating attachment, as illustrated in the accompanying cut. The device is a plain cube mixer mounted on trucks with an ordinary charging elevator, boiler and engine. Under the charging hopper is a small steel box, which is a combustion chamber, lined with special fire brick. On the frame next to the boiler there is a small air compressor, belted directly to the engine. The air is compressed into the tank shown at the left. Crude oil



Cube Mixer with Hot Mixing Attachment

is also placed in the tank and forced by compressed air to the oil burner, or atomizer, that projects directly into the combustion chamber. Intense heat is generated in the chamber and the pressure of air drives it into the cube.

The machine has been thoroughly tested, the material used being 9 ft. of crushed rock and 10 gallons of liquid asphalt to a batch. It was found that when this stone was thoroughly dry, i.e., before delivering it into the machine, a batch could be turned out in about three minutes, and with very wet stone, in five minutes. The stone was thoroughly heated through and through, and was too hot to handle with the hands. The machine has been pronounced a decided success and the Municipal Engineering & Contracting Company, 607-611 Railway Exchange, Chicago, who are handling it, will doubtless receive many enquiries from the Canadian field.

The John S. Metcalf Co., Ltd., Montreal and Chicago, are drawing plans for additional machinery installation for the Globe Elevator Company, Calgary, to consist of a 10,000-bushel shipping leg, 2,000-bushel scale, shipping spout and appurtenances. This machinery is to go in the 250,000-bushel elevator built for the Globe Elevator Co., two years ago by the John S. Metcalf Co., Ltd., the business having already outgrown the elevator.

"The Making of a Great Canadian Railway"

Enquiry has been made for the name of the publishers of the above work, which was reviewed in our last issue. We regret the inadvertent omission. The firm is Messrs. Seeley, Service & Company, Limited, 38 Great Russell street, London, Eng.

Contracts Department

News of Special Interest to Contractors, Engineers, Manufacturers and Dealers in Building Supplies.

Information for insertion in these columns is invited from Architects, Contractors, Engineers, etc.

Waterworks, Sewerage and Roadways

Battleford, Sask.

A by-law will be submitted to provide \$10,000 for waterworks system and sewers.

Byng Inlet, Ont.

Tenders are called until Nov. 27 for dredging. Department of Public Wks., Ottawa; secretary, R. C. Desrochers.

Brockville, Ont.

The Water Commissioners have decided to purchase an engine large enough to pump all the water consumed by city, the present pump to be used as an auxiliary.

Clarence Creek, Ont.

Tenders are called until Dec. 15th for construction of the Cobb's Lake drain including 4 reinforced concrete bridge piers and one reinforced concrete culvert. Plans, etc., at office of Reeve and of engineers. Total length, 45,965, excavation, earth, 178,613 cu. yards, hardpan, 350 cu. yds., reinforced concrete, 186½ cu. yds. Clarence township; reeve, O. Guibord; engineers, Magwood & Walker, Cornwall, Ont.

Hamilton, Ont.

City Engineer, A. F. Macallum is projecting the work of laying of water mains on Dunsmuir road; Magnolia avenue, Spadina avenue and four other streets. Total estimated cost, \$4,994.25; also 15-in. sewer on Burton street, \$4,387. Specifications at office of city engineer.

Moose Jaw, Sask.

Tenders are called until Dec. 4th for one pumping engine, capacity of 800-850 gals. per min.; also motor driven pumping engines or horse drawn steam pumping engine.

Newbury, Ont.

By-laws have been passed by which the townships of Mosa and Euphemia will jointly construct drains. Tenders will be called shortly. John S. Walker, clerk, Newbury; C. C. McNaughton will supervise the work.

North Battleford, Sask.

Town council intend spending over \$100,000 in extending sewer and water mains, also \$40,000 in cement sidewalks and crossings.

Ottawa, Ont.

City Engineer, N. J. Ker. Provision has been made for asphalt pavement, covering 70,000 sq. yds. for 1912. Plans and specifications being prepared.

Scott, Sask.

A by-law will be submitted to the ratepayers to raise \$26,000 for waterworks and \$10,000 to complete the sewerage system.

Toronto, Ont.

City Engineer C. H. Rust has recommended local improvements on Initiative

Principle, concrete pavements, \$6,372; brick block pavement, \$12,863; cedar block pavement, \$2,162; asphalt macadam, \$9,294; also the construction of 12-in. tile sewers, \$6,520.

Tenders are called for annual civic supply. Asphalt; asp. blocks, cement; crushed stone, cedar posts, field tile, granite paving blocks, rubble stone, sand, street drains, treated wood blocks, brass and brass castings, brass work for house services; C. I. pipe, hardware, hydrants, iron valves and stop cock boxes, iron ctg., manhole top, iron and steel, lumber for bridges, docks and piles, lubricating oils, lead pipe, rubber valves, stop valves, special castings, sewer-pipe, sewer brick. Received by chairman of Board until Dec. 5th.

Vancouver, B. C.

Tenders are called until Dec. 27th for new watermain. Clerk, W. McQueen; W. Works consulting engineer, Mr. Burwell; 24,000 cu. ft. of 24-in. steel pipe, valves for same, excavating and back filling of trench capable of accommodating a 36-in. rivetted pipe.

Negotiations are in progress regarding the drainage of 30,000 acres around Sumas Lake. It is said that L. M. Rice & Co., 445 Granville street, have contracted to do the work, at a cost of \$1,000,000, in three years' time. Messrs. Cook & Craig, 908 Dominion Trust Bldg., made the arrangements.

Victoria, B.C.

Council considering extension on Courtney street from Douglas to Quadra; Government street from Belleville to Michigan, and Broughton street from Douglas to Quadra.

Tenders will be called shortly for water system. Work includes dams, shortage reservoirs, conduits and pressure pipe necessary for delivery of 16,000,000 imp. gals. of water to be brought from Sooke Lake, 30 miles distant and 550 ft. above sea level.

CONTRACTS AWARDED

Coquitlam, B. C.

Roadways (about C.P.R. property); successful contractor, M. P. Cotton & Co., Ltd., Carter-Cotton Bldg., Vancouver. Work will start at once; contract amounts to about \$1,500,000.

St. Vital, Man.

Highway road. Contractor, Bitulithic & Contracting Co., \$124,051.20; other tenders were: Westrumite, Limited, \$11,105.92; Canadian Mineral Rubber Company, \$123,891.20; and National Paving and Contracting Co., \$124,090.88.

Railroads, Bridges and Wharves

Exeter, Ont.

The Grand Trunk will commence work on a new station to replace the

one recently destroyed by fire. The new building will be a replica of the old one, as the same plans will be used.

Esquimaux, B. C.

Plans are being prepared for dry dock (Lang's Cove) for B. C. Marine Railways Co., 2214 Pandora street, Vancouver, 1000 x 100, depth 36 feet, width 120 ft., reinforced concrete with granite facings, electric capstans, pumps, driven by oil burning machinery; travelling cranes, machine, boiler, copper and pipe shops. Construction will probably start early in the year.

Glace Bay, N. S.

A petition has been signed to have the Dominion Coal Company erect a station and freight shed at New Aberdeen.

Goderich, Ont.

Tenders are called until Dec. 11th for construction of wharf. Plans, etc., at Department; at offices of district engineers at Toronto, Windsor and on application to local postmaster. Department of Public Works; secretary, R. C. Desrochers.

Halifax, N. S.

Resolution passed by council that the Federal Government authorize construction of bridge at Pier No. 8.

London, Ont.

Plans are being prepared for erection of a new bridge, for county of Middlesex; engineer, C. E. Talbot, London. Plans call for a 300-ft. steel and concrete structure; cost \$50,000.

A project is under way to erect a dam in Rock Glen, West Williams, to develop power for operating radial road that has been surveyed between London and Sarnia. Middlesex county council is taking up matter of removal of bridges. Engineer, Chas. Talbot, London; company's representative, D. A. Stewart, London.

Moose Jaw, Sask.

Application will be made for permission to extend the C.P.R. Moose Jaw line into Saskatoon. Provision will be made for line from a point at or near Hawarden to one near Floral or Cheviot on its Pheasant Hills branch.

Ottawa, Ont.

Tenders are called until Nov. 28th for supply of copper and brass sheets, bars, tubes and copper wire for electrical circuits; supply of wire rope. Naval Service Department; Deputy Minister, C. J. Desbarats.

St. John, N. B.

It is understood that a syndicate are endeavoring to obtain control of a large block of property at the junction of Duke, Broad, Queen and Meckleburg

street and Pitt street. The amount of property in this parcel is large, and is all in the vicinity of Courtenay Bay, where larger harbor works are understood to be contemplated.

St. Vallier, Que.

Tenders are called for construction of landing pier. Plans, etc., with district engineer, Montreal, Que. Received by secretary until 4 p.m. Dec. 12th. Public Works Department.

South Vancouver, B. C.

The improvement of the harbor by dredging and the disposition of the silt is under consideration by Greater Vancouver Harbor Commission, composed of Ald: Cameron, City Engineer Fellows and Professor Odium.

Toronto, Ont.

Tunnel, \$8,000, Elizabeth street, brick passage way between buildings. Owner, Toronto General Hospital, College st.; architects, Darling & Pearson, 2 Leader Lane, Toronto.

Vancouver, B. C.

Mr. Edward Cruttwell, of London, Eng., representing Sir John Wolfe Barry has arrived and is preparing plans for general traffic and railway bridge over Second Narrows in conjunction with the engineers of the Burrard Inlet Tunnel and Bridge Company.

Victoria, B. C.

The C. P. R. will apply to Dominion Government for power to construct the E. & N. Railway to Hardy Bay. W. F. Salsburp, secretary, E. & N. Railway.

Walkerton, Ont.

Tenders are called for construction of steel bridge over Saugeen River. Counted engineer, Jas. Warren; two spans 125 ft. each and one span 90 ft.; also 2 concrete abutments and 2 piers for same bridge. Received until Dec. 5th. Accepted cheque for \$100 must accompany each tender.

Winnipeg, Man.

New plans for the new Osborne bridge have been sent to Ottawa for approval with a request for immediate action so that work can start in early spring.

CONTRACTS AWARDED

Bassano, Alta.

Electric railway; contractor, Gorman, Clancy & Grindley, Calgary; line 5 miles in length between Bassano and the C. P. R. irrigation dam. Contract calls for supply of material, erection of electric railway in 90 days.

Kamloops, B. C.

Railway (Kamloops to Yellow Head Pass); general contractor, The Northern Construction Co., 406 Union Bank Bldg., Winnipeg, Man., and The Cowan Construction Co., Scott Bldg., Winnipeg; sub-contractor, Twohy Bros., Portland, Ore., \$5,000,000. Sub-contract includes 50 miles west of Kamloops for about 100 miles in the N. Thompson valley, for Canadian Northern Railway.

Thornbury, Ont.

Dock to cost \$25,000; Department of Public Works, Ottawa; engineer, J. G. Sing, Confederation Life Bldg., Toronto; contractor, Gowan & Whitney, Brockville. Concrete superstructure on timber crib.

Public Buildings, Churches, Schools, etc.

Compton, Que.

The School Commissioners have purchased sites for an Academy which it is expected to erect in the near future.

Cranbrook, B.C.

The purchase of six lots has been decided upon and a Parochial Hall will be erected at once. The special committee will report in May next when a start will be made on the church, to cost \$8,000. Owner, Roman Catholic Church. Vicar-General, Diocese of Vancouver. Rev. Father Althoff.

Goderich, Ont.

The electors will vote on a by-law to spend \$15,000 in remodelling the Cameron home and fitting it up as a hospital, as present building is too small.

Tenders are called until Nov. 28th for interior fittings for post office. Plans etc. on application to Geo. Bisset, caretaker, Goderich; clerk of Wks., Postal Station "F" and at Department. Department of Public Works, Ottawa; secretary, R. C. Desrochers.

Guelph, Ont.

Tenders will be called shortly for the erection of a 4-room addition to St. Patrick Ward school. Heating apparatus and furnishings to be purchased later. Board of Education; chairman, Dr. Stewart; architect, W. A. Mahoney.

Granby, Que.

Tenders are called until Nov. 28th for erection of Boys' College to cost \$60,000, for Catholic School Commissioners; architect, Dalbe Viau, 76 St. Gabriel st., Montreal; 5 storeys, 14 x 53, 3 extensions, 32 x 30, pressed brick, stone foundation, steam heating, electric lighting, gravel roof, hardwood floors, 2 fire escapes, ventilation system specified by Canadian Domestic Engraving Co., Ltd, 5 Beaver Hall Sq., Montreal.

Joliette, Que.

Plans are being prepared for alterations and additions to the Roman Catholic Cathedral. Architect, G. A. Monette, St. James street, Montreal.

Kingston, Ont.

Tenders are called until Nov. 29th for construction of lodge keeper's quarters at Royal Military College. Specifications at offices of the Commandant, Royal Military College, offices of the Engineer in Command, and with the Director of Engineers' Services, Ottawa. Department of Militia & Defence. Ottawa; Deputy Minister, Eugene Fiset.

Laprairie, Que.

Work is in progress for school for Catholic School Commissioners. Laprairie, Que; chairman, L. C. Pelletier; architect, G. A. Monette, 97 St. James street; 3 storeys, 40 x 45, pressed brick; walls up nearly ready for roofing. Above architect is appointed to supervise completion of St. Joseph Academy.

Lindsay, Ont.

Sites are being considered for the new armory. The site where the old central school now stands is considered a favorable one.

Little Bras D' Or, C. B.

Tenders called for installation of steam heating system in Roman Catholic church. Plans with architect or at the Glebe House, Little Bras d'Or. Received by J. W. MacIsaac, Parish Priest, until Nov. 21st. Architect, Ronald Gilles, Sydney, N. S.

ceived by J. W. MacIsaac, Parish Priest, until Nov. 21st. Architect, Ronald Gilles, Sydney, N. S.

London, Ont.

The Baptists are contemplating the erection of two new churches.

Mildmay, Ont.

Tenders are called until Dec. 12th for the erection of a church for Congregation of Sacred Heart, Mildmay; Parish Priest, Rev. R. C. Lehmann; architect, A. W. Holmes, 10 Bloor street, East, Toronto; all trades except heating and lighting in erection of church. Plans, etc., at the Presbytery and at office of architect.

Montreal, Que.

Contemplated, two picture theatres. Men interested, Messrs. Brock & McLeish. They are said to have secured control of the Canadian Kinemacolor pictures. Estimated cost, \$500,000. Address Mr. Brock, Windsor Hotel, Montreal.

The Montreal Board of Control will shortly call for tenders for a new fire station on St. Dominique street and a combined fire and police station on St. Herbert street.

Plans the being prepared for Fraternal Chambers on Sherbrooke street, for Knights of Columbus; architect, Mr. G. A. Monette, St. James street, Montreal, 5 str. building. Work will commence in spring.

The Protestant Board of School Commissioners are planning a new school in Laurier Ward; architect, Prof. Percy Nobbs, McGill University. No estimates made. The Lansdowne school in east end will be improved at a cost of about \$50,000.

Niagara Falls, Ont.

Tenders are called until Nov. 29th for interior fittings for post office. Plans with caretaker, Public Building, Niagara Falls; Clerk of Works, Postal Station "F," Toronto, and at Department of Public Works, Ottawa; secretary, R. C. Desrochers.

North Battleford, Sask.

Contemplated, Church, to cost \$15,000, for Presbyterian Church of Canada; architect, Stephenson & Evans, North Battleford, have plans for a brick building.

Nelson, B. C.

Tenders are called until Nov. 22 for alterations and additions to post office fittings. Plans with caretaker public building and with Wm. Henderson, res. architect, Victoria and at the Department, Dept. of Public Works, Ottawa Secretary, R. C. Desrochers.

Ottawa, Ont.

Contemplated home for incurables to cost \$15,000; Prov. Committee in charge. Father M. J. Whelan, Dr. White, M. J. Gorman, K.C., Carlton Chambers. E. J. Daly, pres. Council of Management of St. Patrick's Asylum and others. Arrangements will be made to obtain a charter for erection independently of asylum, then work will be started.

Port Hope, Ont.

Directors of Port Hope Hospital Trust will have plans prepared for a hospital, cost \$15,000; secretary, Chas. Mann; architect, Mr. Curry, 10 Yonge street, Toronto, will prepare plans for the new hospital.

Strathroy, Ont.

R. Trench, Teeswater, is in the town looking for a site on which to build a large modern skating and curling rink. He is building new rinks at Brussels and Mitchell.

Saskatoon, Sask.

The Synod of the Presbyterian Church of Canada in session at Yorkton passed a resolution in favor of erection of wing to be used at present for dormitory and to be the nucleus of a Presbyterian Theological College in affiliation with University. Committee of Management, Hon. W. R. Motherwell, Regina, Walter Murray, President of University, Saskatoon; Hon. A. P. McNabe, Saskatoon.

Sherbrooke, Que.

Tenders are called until Nov. 20 for electric wiring &c., public building, for Department of Public Works, Ottawa; secretary, R. C. Desrochers. Plans, etc. on application to caretaker, O. Deserve, Sherbrooke, and at the Department.

Selkirk, Man.

Tenders are called for re-wiring hospital for Provincial Government, Winnipeg; Minister of Public Works, Colin H. Campbell, Winnipeg; re-wiring of old portion of hospital for insane. Plans, etc., at offices of Prov. architect. Received by Minister of Public Works, until noon, November 20th.

Toronto, Ont.

The city is contemplating a garbage reduction plant to be located about ten miles east of the city.

Tenders are called until Nov. 29th for fittings for post office. Plans, etc., on application to Clerk of Works, Postal Station "F," Toronto, and at the Department of Public Works, Ottawa; secretary, R. C. Desrochers.

The report of Superintendent Bishop recommends the following new schools: Morley avenue, 23 rooms, to cost, approximately, \$115,000; Brock avenue, 15 rooms, \$75,000; St. Clair avenue, 11 rooms, \$55,000; Clinton street, 15 rooms, \$75,000; Howard, 12 rooms, \$60,000; Pyne, 12 rooms, \$60,000; total \$440,000. The enlargements and alterations are: Lansdowne, supply room, \$10,000; Jesse Ketchum, workshop and storeroom, \$30,000; Malvern ave. High School, six new classrooms and assembly hall, \$60,000; Brant street old school, now used as a workshop, renovation, \$15,000; total, \$115,000; purchase of sites, \$45,000; total, \$600,000.

Vancouver, B. C.

Fire Chief Carlisle recommends a by-law to be submitted for \$17,000, for site and hall in Hastings townsite; one for \$14,500 for one in D. L. 301; one for \$10,000 for fire hall in West Kitsilano.

Victoria, B. C.

Work has started on grading for the new legislative block. F. M. Rattenbury, prov. architect.

Tenders are called for erection of a brick and stone church; architect, R. P. S. Twissell, 1019 Metropolitan Building, Vancouver. Received by architect for general contract until Dec. 5th.

Westmount, Que.

Officers of Victoria Rifles Regiment, Montreal, have made an offer to City of Westmount for 30,000 sq. ft. of land, corner of St. Catherine street and Elgin avenue. They ask for exemption from taxes, and if satisfactory arrange-

ments can be made an armorv will be erected.

Winnipeg, Man.

The following by-laws will be submitted at municipal elections: exhibition site, \$500,000; schools, \$600,000; subway, under C. P. R. tracks at Princess street, \$300,000; annex to City Hall, M. Peterson, secretary, Bd. of Control.

Parliament Buildings to cost \$2,000,000 (Broadway, Kennedy, Osborne and Assiniboine), for Department of Public Works, Winnipeg; Minister of Public Works, Colin H. Campbell. A preliminary competition calling for sketch designs only will be called first from which a selection of five will be made and the originators of these authorized to prepare detailed plans. The final choice will be made from these. Five prizes will be awarded.

CONTRACTS AWARDED**Calgary, Alta.**

Church to cost \$400,000, 6th avenue west, for Trustees Knox Presbyterian Church; architect, J. T. Lawson, Norman Block, Calgary; contractor for basement, Walker Fysche Co., Calgary; 134 x 130, stone, gothic architecture, concrete foundation, steam heating, electric lighting, metal roofing, hardwood finish. Excavation started. Tenders received by architect.

Theatre to cost \$200,000, for Hon. J. A. Loughheed, Calgary; general contractor, McNeil & Trainer, Box 14; 2 stories, 100 x 130, fireproof throughout, concrete foundation, Planand system heating, electric light, concrete interior finish, fire escapes. Building roofed in. Arrangements for heating being made. Enquiries as to theatre fixtures should be made to W. Sherman, Lyric Theatre, Calgary. Date not fixed for calling of tenders.

Kemptville, Ont.

Library, cost \$3,000; architect, A. Stuart Allaster, Brockville; general contractor, B. H. McCarley, Kemptville, Ont. 1-sty., 21 x 42, concrete fndn., hot air htg., metal shingle rfg., southern pine interior finish.

Montreal, Que.

New contract awarded for school to cost \$25,000 for Montreal Protestant School Board, Peel street, Montreal; architect, MacVicar & Heriot, 104 Union street, Montreal; ventilation, plumbing and heating contractor, Staton & Bowell, 2554 Mance street, Montreal; engineers, Canadian Domestic Engineering Co., 5 Beaver Hall Square, Montreal.

School, cost \$36,000, for Catholic School Commissioners, St. Laurent, Que. Architect, Dalbe Viau, 76 St. Gabriel street, Montreal; gen. contr., Jas. Dorais, St. Laurent, Que.; heating and plumbing, Camille Legault, Cartierville; 3-sty., brick and stone, hot water heating, concrete basement, first floor stone, second and third stys. brick. Other contracts not yet awarded. General contractor looking after sub-contracts.

Normal school, to cost \$200,000 on Sherbrooke street, for Sisters, Congregation of Notre Dame; general contractor, Martineau & Prenoveau, 643 Berri street, Montreal; painting and glazing, L. A. Poirier, 432 St. Hubert street, Montreal; plumbing, steam heating, roofing and ventilation, T. Latourelle, 6 Craig street west, Montreal; steel work,

Dominion Bridge Co., Ltd., Lachine; elevator, Otis-Fensom, St. James street, Montreal; electric wiring, Geo. E. Dequire, 391 Bleury street; plastering not awarded; contract to be completed Sept. 1912.

Church to cost \$105,000, Laurier ave., for St. Denis Roman Catholic Church; Parish Priest, Rev. J. A. St. Jean, 360 Laurier avenue, Montreal; general contractor, Martineau & Prenoveau, 643 Berri street; plumbing and glazing, Chas. Laurier, Montreal; plumbing, heating, roofing and electric lighting, E. Lesperance, 242 St. Chas. Borromee; contractor for steel, Dominion Bridge Co., Ltd., Lachine; plastering, W. Larose, 237 Christophe Colomb street, steam heating, slate roofing; seating capacity, 1500. To be completed Oct. 1912; foundation made 10 years ago.

Recreation rooms and hall, stone construction, stone foundation, hot water heating, electric lighting, gravel roofing; owner, Seminary of St. Sulpice, Montreal College; architect, A. H. Lapiere, 30 James street, Montreal. Contracts as follows: Concrete foundation, M. Huberdeau, 633 Demontigny street; brick work, Laurent & Frere, 2174 Hutchinson street; painting and glazing, T. A. Gauthier, 128 Elizabeth street; plastering, Joseph Fabien, Lower Lachine Rd.; ornamental iron, Nap. Desantels, 48 Demontigny street east; carpentry, and joinery, A. Marcue, 419 Labrecque street; electric lighting, N. Simoneau, 583 Notre Dame street west; marble and tile, Robert Reid, 125 St. Alexander street; plumbing and roofing, heating and ventilation, T. Latourelle, 6 Craig street west; fireproof windows, Geo. W. Reid & Co., Ltd., 37 St. Antoine street; architectural iron work, the National Bridge Co. of Canada, Ltd., Longue Pointe, Que.

Outremont, Que.

Church to cost \$200,000, for St. Viateur Catholic Congregation; Priest, Rev. Father Charbonneau, 300 Outremont avenue; architect, Gauthier & Daoust, 180 St. James street, Montreal; general contractor, Jos. Fauteux, De l'Eppe st., Montreal; stone, stone foundation, electric light, metal roofing; seating capacity, 1,500.

Work is in progress for convent, on Mount Royal avenue, for Sisters of Marie Reparatrice, Outremont; architect, Geo. A. Monette, 97 St. James st., Montreal; brick exc. and foundations, Marson & Frere; plastering, F. R. S. Beaudoin; carpentry, Joseph Marcotte; painting and glazing, T. Gauthier; plg., heating, roofing, and ventilating, Alex. Mackay; concrete foundation, hot water heating, electric and gas lighting, gravel roofing, fireproof construction, terra cotta partition; shawnee brick, grey canyon sandstone trimmings; elevators, fire escapes and tile not awarded.

Toronto, Ont.

Graphic Arts Building to cost \$100,000, Sheppard and Richmond, for Toronto Saturday Night; architect, F. S. Baker, Traders Bank Bldg., Toronto; builders, H. M. Dancy, 220 Howland avenue, Toronto; steel work, Dominion Building Co., Toronto; carpentry, H. Shervin, 88 Sherbourne street, Toronto.

W. C. T. U. Building, on Gerrard street; architect, Burke, Horwood & White, 28 Toronto street, Toronto; carpentry, S. R. Hughes; masonry, J.

Woods; 3 storeys, and basement, steel and brick, elevators, interior decoration, iron railings, hardwood trimming, ornamental plaster, metal cornice and roofing, tile coping.

Vancouver, B. C.

Frame addition to St. Mark's Church, Kitsilano; architect, C. P. Jones, 429 Pender street west; general contractor, A. B. Whittingham; cost \$5,000.

Isolation hospital to cost \$50,000; city clerk, W. McQueen; architect, S. M. Eveleigh, c/o Dalton & Eveleigh, 615 Hastings west, Vancouver; general contractor, Campbell & Wilkie, 615 Pender street west, Vancouver. Heating apparatus, coal and oil, to be installed, also laundry (fixtures only); disinfecting apparatus; architect receives tenders, work is in progress.

Residences

Calgary, Alta.

Frank Fitchet, 14 Avenue east is contemplating the erection of an apartment block, 3 storey, 40 x 130, brick, tile division walls; cost \$40,000.

Permit granted for residence to cost \$3,000, 2 storey, 28 x 50, concrete foundation, brick, hot air heating, electric lighting, shingle roof, hardwood interior finish; owner, F. H. Peters, 917 20th avenue west.

Hamilton, Ont.

The Dunham Real Estate and Building Co., 18 Albion, will build five brick dwellings on Somerset avenue, \$7,500.

A permit has been granted for erection of sixteen residences to cost \$24,000 for Naylor & Robshaw, 38 Fraser street, Hamilton; 2 storeys, 25 x 35, brick, stone foundation, hot air heating, gas and electric lighting, hardwood interior finish, shingle roofing. Electric supplies, furnaces, plumbing supplies required.

Maisonneuve, Que.

Foundations started for three flats to cost \$4,000, 3 storeys, 23 x 33, pressed brick and wood, concrete foundation, stove heating, electric lighting, gravel roofing; owner, L. O. Jalbert, 50 Desery street.

Montreal, Que.

Foundations started for six flats, Esplanade avenue, \$8,000, 3 storey, 50 x 30, with 20 ft. extensions, stone construction, gravel roofing, electric lighting.

Six flats to cost \$6,000, 3 storeys, 36 x 48, brick encased, cement foundation, gas and electric lighting, gravel roofing; owner, Israel Robitaille, 1956 Hutchinson street.

Excavation completed for four tenements, \$4,000. First ave, Emard Ward, 2 storeys, 50 x 40, wood and brick, concrete foundation, gas lighting, gravel roofing; owner, Sabatino Utello, First venue, Emard Ward.

Foundations are in for two residences, cost \$10,000 on Regent avenue, for Richard Ryan, 341 Guy street, Montreal; 2 storeys, 40 x 40, brick veneer, concrete foundation, hot water heating, electric light and gravel roof.

Foundations are in for a residence to cost \$6,000, for Bonnell Bros., 341 Guy street, Montreal; 2 storeys, 27 x 32, stn. and concrete foundation, solid brick, steam heating, electric light, gravel roofing, hardwood interior finish. Owners supervising work.

Outremont, Que.

Excavation is started on six dwellings to cost \$30,000, for Arthur Cloutier, 374 Gilford; 3 storeys, 50 x 66, pressed brick, stone foundation, hot air heating, electric light, gravel roofing, furnace heating.

Prince Rupert

Tenders will be called shortly for the erection of a residence to cost \$4,000, on Fifth avenue, for Supt. G. McNicholl, G. T. P. Railway; architects, W. L. Barker, Third avenue; 2 storeys, frame construction, cement foundation, hot water heating, electric light, shingle roof. Electric light fixtures, art glass, fancy brick and wood mantels, specified.

Toronto, Ont.

Excavation completed for pair dwellings to cost \$4,000, two and one-half storeys, brick front, roughcast sides, shingle roofing; owner, E. Benner, 155 Booth avenue.

Tenders called for residence to cost \$3,000, Summerhill avenue, brick wall, shingle roofing, rear frame construction. Owner, Wm. Oakley, Rosedale, Toronto. Architect, G. M. Sutherland, 105 St. Vincent street.

Work is in progress for pair dwellings to cost \$4,000, 91 Essex avenue, semi-detached, brick, tar and gravel roofing, owner, A. Dalley & Cooper.

Tenders are called until Nov. 20th for building a residence to cost \$20,000 on Forest Hill road, for Wm. Caldwell, Toronto; architect, F. S. Baker, Traders Bank Bldg., Toronto; 2½ storeys, stone construction, slate roofing, hardwood finish, tiling, mantels, electric light, hot water heating.

C. E. Walton, 100 Gerrard street E., has commenced excavating for nine dwellings to cost \$18,000; architect, E. R. Conlan, 1552 Queen street west, Toronto; 2 storeys, brick.

J. E. Peterkin, 415 Lansdowne avenue, will build three pair dwellings, 2 storey, semi detached, on Gillespie avenue; cost, \$10,800.

Excavation is completed for pair dwellings to cost \$4,000 on Woodbine avenue, for P. Wyatt, 83 Dunbar avenue, Toronto; architect, P. H. Finney, 43 Victoria street, Toronto; 2½ storeys, semi-detached, brick veneer, brick foundation.

Excavation is started for three dwellings to cost \$6,000 on Mulock avenue, for John Watkins, 2355 St. Clair avenue, Toronto; 3 attached, solid brick, 2 storeys.

Tenders will be called shortly for two residences to cost \$4,000 on Roncesvalles avenue, for A. B. Doner, 3 Garnet avenue, Toronto; 2 storeys and attic, semi-detached, brick, stone foundation, tar and gravel roofing, hot air heating.

Excavation has started for 3 pair dwellings, to cost \$10,200 on Gillespie avenue, for J. E. Peterkin, 415 Lansdowne avenue, Toronto; semi-detached, solid brick, stone foundation.

Excavation is under way for two dwellings to cost \$7,700, on Alwin avenue, for Dr. W. J. Laker, 213 Dundas street, Toronto; 2 storeys and attached, brick, tar and gravel roofing, cut stone.

Tenders will be called shortly for erection of a residence, cost \$6,000, Roxboro street; architect, W. F. Rutley, 36 Toronto street, Toronto. 2½-sty., solid brick, stone fndn., cut stone, broken

ashler, metallic lath, plate glass, shingle roof, pebbled glass, hot water htg., elec. light, burlap, cement stucco, hardwood interior finish.

Willard C. Stevens, 187 Wright ave., will build a new residence on Glendale ave.; architect, L. E. Price, 874 Dovercourt road, Toronto. 2½-sty., brick and stone, shingle roof, elec. lgt., stone foundation. Cost \$4,200.

Tenders are called until Nov. 28th for residence, north side Russel Hill Drive, for F. G. Russell; architect, F. S. Baker, Traders Bank, Toronto; 2½-sty., brick, stone fndn., shingle roof, hardwood finish, mantels, tiles, elec. lgt., hot water heating.

Two dwellings, cost \$3,500, Waverley road, e.s., for Alex. Gemmell, King st. west, Toronto; architect, Smith & Gemmell, 23 Jordan street, Toronto; builder, John Ford & Son, Eglinton, 2-sty. and attic, frame clapboard, brick fndn., shingle roof, hot water htg., elec. light, cut stone, mantels, elec. work, brick, metallic ceiling. Excavation done.

Vancouver, B. C.

Savainar Bros., 138 Cordova street w. will have new plans prepared by Architects Townsend & Townsend, 520 Granville street, for the erection of an apartment house.

Westmount, Que.

Foundation is in for residence to cost \$20,000 on Grosvenor avenue, for T. S. Hudson & Co., B 12 Board of Trade Bldg., Montreal; plumber and heating, J. A. Gordon, 301 St. Antoine street, Montreal; 2 storeys, solid brick, concrete foundation, hot water heating, electric light, gravel roof, hardwood finish. Roofing and plastering not yet awarded.

Foundations are under way for two residences to cost \$13,500 each for T. S. Hudson & Co., basement 12, Bd. of Trade Bldg., Montreal; 2 storeys, 30 x 50, solid plastic brick, concrete foundation, Honeywell system of hot water heating, electric light, gravel roof, hardwood finish, two baths in each and shower bath in one, tile floors. Roofing, plaster and plumbing not yet awarded.

CONTRACTS AWARDED

Calgary, Alta.

Permit granted for residence to cost \$3,500, 2 storeys, 22 x 38, frame construction, concrete foundation, hot air heating, electric lighting, shingle roofing, hardwood finish; owner, F. Fraughton, Calgary; general contractor, Clark & Costin, 503 Grain Exchange, Calgary.

Hamilton, Ont.

Residence, Mapleside avenue, \$3,500, 2½ storeys, 40 x 35, brick and stone, stone foundation, hot air heating, electric and gas lighting, shingle roofing, hardwood finish; owner, W. C. Morton, 129 East avenue S.; architect, Henry New, 38 James street S.; general contractor, Trowbridge & Sullivan, 222 Charlton W.; carpentry, Miller & Yonge, Erie avenue; painting and glazing, Stamp Bros., 145 King William avenue, plumbing and heating, Fitzsimmons Bros., 275 King west; plastering, A. Clapman, 14 Main street east.

Montreal, Que.

Six flats to cost \$16,000, for J. Montette, 1001 St. Andre street, Montreal; architect, J. A. Oulette, 360 St. Catharine east, Montreal; general contract-

(Continued on page 63)

Tenders and For Sale Department

To Engineers

Every man who puts in a tender on your jobs has got to see your plans and specifications first. If you are in Montreal and he is in Vancouver the inspection of your plans is a problem. Let us solve that for you. Place on file copies of your plans and specifications in any or all of the "Contract Record" offices.

More contractors and manufacturers read the "Contract Record" than any other Canadian publication. It is the logical place to look for tenders called, and where all important works are advertised.

Send along your plans for your next job and put a line in your ad. to that effect.

Contract Record

Montreal—B34 Board of Trade.
Toronto—220 King Street West.
Winnipeg—Commercial Travellers' Bldg.
Vancouver—441 Seymour Street.

To Architects

The Toronto Stock Exchange will receive competitive plans on January 2nd, 1912, for a new building for the Exchange to be erected at Nos. 86 and 88 Bay street, Toronto.

The conditions of competition will be mailed to those applying to

W. H. BROUSE, President
Toronto Stock Exchange,
Toronto.

45-47

Sewer Excavator

For sale for immediate use, a Vulcan "Little Giant" Steam Shovel with extra long dipper handle for excavating to 16 feet below surface, mounted on traction wheels, dipper 1½ yd. capacity. Machine just overhauled; new chain, and extra large new boiler; weighs 32 tons; low price. Address

WILLIS SHAW MACHINERY Co.,
39 South LaSalle Street,
Chicago, Ill.

42-t.f.

Tenders Wanted

Tenders will be received by the Rev. R. C. Lehmann, Mildmay, Ont., until 5 o'clock Tuesday, December 12, for all trades, except heating and lighting, required in the erection and completion of the Church of the Sacred Heart, Mildmay, Ont.

Plans and specifications may be seen at the Presbytery, Mildmay, Ont., and also at the office of the undersigned. Satisfactory security will be required for the faithful performance of the work.

The lowest or any tender not necessarily accepted.

ARTHUR W. HOLMES, Architect,
10 Bloor Street, East, Toronto.

46-47

Tenders for Bridge

Tenders will be received till December 5th for the erection of a steel bridge over the Sauguen River, 10th concession of Township of Brant. Bridge to consist of two spans of 125 feet and one span of 90 feet; with concrete floor; also for two abutments and two piers for the same.

An accepted cheque for \$100 must accompany each separate tender.

The lowest or any tender not necessarily accepted.

JAMES WARREN,
Walkerton, Ont., Nov. 11, 1911.

46-40F

Debentures for Sale

Tenders will be received by the undersigned up to noon on December 7th next, for the following County of Waterloo Debentures:—
\$12,000 for 20 years at 4½ per cent.
\$3,000 for five years at 4½ per cent.
For further information apply to

H. J. BOWMAN,
County Clerk.
47-47

Berlin, Nov. 18, 1911.

Town of Virden

Electric Light Plant

The Mayor and Council of the Town of Virden are open to receive propositions for the installation and operation of an Electric Light and Power Plant within the limits of the town; any information that may be required can be obtained from the undersigned.

J. F. C. MENLOVE,
Sec.-Treas., Town of Virden.

47-47

City of Moose Jaw Saskatchewan

The Moose Jaw Public Library Board invite competitive plans for a Public Library Building. The cost of the building is to be \$50,000, and plans are to be submitted by December 20th, 1911. A premium of \$100 will be paid for second choice and \$50 for third choice.

For further information apply to the undersigned.

W. F. HEAL, City Clerk.

47-49

CITY OF VANCOUVER

Re Tenders for Seymour Creek Extension

Tenders will be received by the undersigned up to Wednesday, December 27, 1911, at 4 p.m., for the following connection with Seymour Creek Extensions:

1. For the supply of 24,000 feet of 24-inch steel pipe for the Seymour pipe line extensions.
2. For the supply of valves for the new Seymour Creek pipe line extension.
3. For the excavation and back filling of a pipe trench along Seymour Creek, suitable for the construction of a 36-inch steel riveted pipe.

Plans and specifications may be seen at the office of Messrs. Hermon & Bhrwell, Room 12 Inns of Court Building, and at the office of the City Engineer, City Hall.

A deposit of an amount equal to five per cent. of the contract price must be made with each tender, by marked cheque, payable to the City Treasurer.

The lowest or any tender not necessarily accepted.

WM. McQUEEN, City Clerk.
City Hall, Vancouver, B.C.
November 8, 1911.

47-49

Sealed Tenders

Marked "Tenders for Drainage" will be received by me at my office in the Village of Clarence Creek, until one o'clock in the afternoon of Friday, December 15th, 1911, for the construction of

THE COBB'S LAKE DRAIN

in the Townships of Clarence, North and South Plantaganet, including four reinforced concrete bridge piers and one reinforced concrete culvert. Plans and specifications may be examined and forms of tender procured at my office, or at the office of Magwood & Walker, Civil Engineers, Cornwall, Ont.

Total length of drain, ft. 45,965
Estimated Excavation, earth, cu. yds. . . . 178,013
hard-pan, cu. yds. 350

Reinforced concrete, cu. yds. 186½
The Municipal Council of the Township of Clarence reserves the right to accept the lowest or any tender, to reject any or all tenders or to extend the time for the consideration of the tenders received on or before the above mentioned date.

A cash deposit or accepted cheque on a chartered bank equal to five per cent. of the tendered price must accompany each tender.

O. GUIBORD,
Reeve of Clarence Tp.

Dated at Clarence Creek, Ont.,
this 14th day of November, 1911.

47-50



Tenders for Annual Supplies

Tenders will be received by registered post only, addressed to the Chairman of the Board of Control, City Hall, Toronto, up to noon on Tuesday, December 5th, 1911, for annual supplies for the year ending December 31st, 1912.

Asphalt,	Brass work for House
Asphalt Blocks.	Services,
Cement.	Cast Iron Pipes,
Crushed Stone,	Hardware, Etc.,
Cedar Posts,	Hydrants,
Field Tile,	Iron Valves and Stop
Granite Paving Blocks	Cock Boxes,
Granite Boulders,	Iron Castings, Manhole
House Numbers,	Tops, etc.
Limestone Dust,	Iron and Steel,
Paving Bricks,	Lumber,
Pit Gravel	Lumber for Bridges
(Screened and Un-	and Docks,
screened),	Piles,
Rubble Stone,	Lubricating Oils,
Sand,	Lead Pipe,
Sand for Asphalt	Rubber Valves, etc.
Purposes,	Stop Valves,
Street Signs,	Special Castings,
Treated Wood Blocks,	Sewer Pipe,
Brass and Bronze	Sewer Brick.
Castings,	

Envelopes containing tenders must be plainly marked on the outside as to contents.

Specifications may be seen and forms of tender obtained at the office of the City Engineer, Toronto.

The tenderers shall submit with their tender the names of two sureties (approved of by the City Treasurer), or in lieu of said sureties, the bond of a guarantee company, approved of as aforesaid.

The usual conditions relating to tendering, as prescribed by the City By-law, must be strictly complied with.

The lowest or any tender not necessarily accepted.

G. R. GEARY, Mayor,
Chairman Board of Control.
City Hall, Toronto, Nov. 10, 1911.

47-47F

To Manufacturers of Machinery

A firm wishing to take up the manufacture and marketing of the most complete and up-to-date concrete machinery in the United States or Canada. A proposition will be considered for just the manufacturer. Please address Box 348, Contract Record, Toronto, Ont. 44 49

CITY OF MOOSE JAW SASKATCHEWAN

TENDERS

Sealed tenders addressed to the undersigned will be received up to the hour of 8.30 p.m. on Monday, December 4th, 1911, in the Council Chamber, Moose Jaw, Saskatchewan, for supplying the Fire Department of the City with one Pumping Engine, with a capacity of 800-850 gallons per minute. Tenders are invited for motor driven pumping engines, motor propelled steam pumping engines, or horse drawn steam pumping engines.

Tenders must specify the time in which delivery can be guaranteed, and complete specifications must be furnished for the apparatus proposed to be supplied. Tenders for steam pumping engine must comply with the provisions of the "Steam Boilers Act" of Saskatchewan, particulars of which may be obtained from the office of the Chief Steam Boiler Inspector, Department of Public Works, Regina.

All tenders to quote price f.o.b. Moose Jaw. The right to reject any or all bids expressly reserved.

W. F. HEAL,
City Clerk

44 48

Extension of Time

CITY OF EDMONTON ENGINEERING DEPARTMENT

1912 PAVING

Sealed tenders, addressed to the undersigned, and endorsed "Tender for 1912 Paving," will be received at the office of the City Commissioners, Edmonton, Alberta, until twelve o'clock noon (12.00 M.) on Friday, December 15th, 1911, for approximately 100,000 square yards of street grading and paving with curb.

Preliminary plans, and specifications, and all information may be obtained at the office of the City Engineer; plans and specifications are on file also at the office of the Canadian Engineer, 62 Church street, Toronto, and the Contract Record, 220 King street west, Toronto. A deposit fee of Five (\$5.00) Dollars is required. This fee will be refunded when plans are returned.

Tenders are invited for Wood Block, Asphalt Block, Sheet Asphalt, Bitulithic, or other kinds of pavement.

Proprietors of patented pavements are required to furnish their special specifications.

Tenders are required to submit bids as follows:-

- Tender No. 1 - Unit prices, for whole work.
- Tender No. 2 - Unit prices, for 75,000 sq. yds.
- Tender No. 3 - Unit prices, for 50,000 sq. yds.
- Tender No. 4 - Unit prices, for 25,000 sq. yds.

An accepted cheque for five per cent. (5 p.c.) of the amount of tender must accompany each bid.

The lowest or any tender not necessarily accepted.

CITY COMMISSIONERS

Office of the City Commissioners,
Edmonton, Alta., Oct. 19, 1911. 43 49

Note - Time for submitting tenders has been extended from Dec. 1st to Dec. 15th, 1911.

Tenders for Bridge

Tenders will be received till December 5th, 1911, for the erection of a steel bridge over the Sangren River, 10th Concession of the Township of Brant. Bridge to consist of two spans of 125 feet, and one span of 90 feet, 16 ft. roadway with concrete floor. Or for two spans of 165 feet with concrete floor.

Also for two abutments and piers for same. Specifications may be seen with the undersigned.

An accepted cheque for \$100, payable to the Treasurer, County of Bruce, must accompany each tender.

The lowest or any tender not necessarily accepted.

JAMES WARREN,
Engineer.
47 47

Wainwright, Nov. 11th, 1911.

Miscellaneous

Advertisements under this heading two cents a word per insertion. Minimum charge 50 cents

One of the largest firms on the continent making a complete line of clay-working machinery, industrial cars and track, concrete mixers and buckets, desires to secure Canadian representatives. Apply Box 371, Contract Record, Toronto, Ont.

Positions Wanted

Advertisements under this heading one cent a word per insertion. Box No. ten cents extra. Minimum charge 25 cents

Either as salesman for wholesale or manufacturing lumber establishment or as office manager for woodworking plant, by young man with practical selling and office experience. Box 372, Contract Record, Toronto, Ont.

Residences

(Continued from page 61)

or, A. Fillon & Frere, 865 Huntley st., Montreal; 3 storeys, 50 x 90, stone construction, gas and electric light, gravel roofing, hot water heating.

Outremont, Que.

Apartment house for Lucien Bernier, 180 St. James, Montreal; architect, Gauthier & Daoust, 180 St. James street, Montreal; contractor for iron work, Dominion Bridge Co., Lachine; 2 storeys, and basement, 36 x 60, solid brick and Indiana stone, trimmings, masonry foundation, hot water heating, electric and gas lighting, gravel roofing, hardwood finish, gymnasium, 3 bath rooms and 2 shower baths, terra cotta walls, double floors, tile floors and walls in baths, plate and leaded glass, imported brick, patent plaster walls.

Renfrew, Ont.

Three cottages to cost \$6,000 on Centre street, for W. Bolam; contractor for stone, W. A. Moore; 2½ storeys, brick veneer, rough stone foundation, shingle roof, hot air heating, plumbing. Work has started on one.

Toronto, Ont.

Detached residence to cost \$3,000, on West side Kingswood road, for W. H. Cunningham, Toronto; builder, C. J. Poole, 150 Kingswood road, Toronto; 2 storeys, brick tiling.

Two flats on west side Macdonnell avenue, for C. E. L. Metherell, 86 Empress Crescent, Toronto; builder, Wm. Tedford, Toronto. 2 storeys, concrete foundation, electric wiring, hot water heating.

Detached residence to cost \$3,000 on East side of Carlaw avenue, for Mrs.

W. C. Bernard, 74 Howard avenue, Toronto; architect, P. H. Finney, 43 Victoria street, Toronto; contractor, J. J. Ward, 27 Globe avenue, Toronto; 2 storeys, brick, shingle, tar and gravel roofing.

Excavation is in progress for pair dwellings, to cost \$4,000, 109-11 Alcona avenue; builder, J. W. Tibbs, 18 King street west, Toronto; brick front and rough cast sides, tar, gravel and shingle roofing, hot water heating.

Vancouver, B. C.

Two-storey apartments to cost \$10,000, Davie street; owner, W. C. Splan, 1155 Pacific street; contractor, A. Grant, Eburne.

Business Building and Industrial Plants

Arnprior, Ont.

Thos. A. Low, Renfrew, contemplates the purchase of the old McLaughlin Bros. grist mill, in the town of Arnprior, and using it until new one is built, towards which \$50,000 worth of stock will be put on the market at once, the new mill to have a capacity of 250 bbls. per day; work to commence early next spring.

Brampton, Ont.

A by-law will be submitted to grant a loan of \$43,000 to the Pease Foundry Co. to aid in establishing their works here.

Brockville, Ont.

Alterations and additions are under way for a factory for Walthausen Hae Corporation, Brockville; architect, A. Stuart Allaster, Brockville, and a sprinkler system will be installed at once.

Campbell's Bay, Que.

Frank Cahill contemplates erection of flour and grist mill here to replace the one burned at Bryson, Que.

Calgary, Alta.

Mr. Goorley, 8th avenue east, is contemplating the erection of 4 stores and offices, 25 x 130, probable cost \$30,000.

The Marshall Wells Hardware Co., Duluth, Minn., have purchased a site for warehouse, 50 x 70, on 11th avenue, and 14th street east; foundations to be of sufficient strength to carry 6 storeys.

It is rumored that Commissioner J. C. Clarke of this city intends to build a block on his property on 2nd street east. No dimensions are given but in all probability it will be 100 x 130, and for business purposes. Store below and offices above.

Brewery to cost \$100,000 will be erected on Sixth avenue east; Publicity Commissioner, Andrew Miller. Those interested, Hon. H. A. Short, Mayor; and Conrad Knapp, both of Sault Ste. Marie, Mich. Question of granting site under consideration by New Industries Committee. The site is that occupied by city incinerator which will be moved.

Furnishings required for offices and sample room to cost \$200,000 for Hon. J. A. Loughheed; 6 storey, brick and steel concrete interior finish, steam, Plenan system, tar and gravel roof, electric lighting, fire escapes. Steel is being erected on concrete foundation; elevators; store front and office fixtures still required. McNeil & Trainer, Box 14, Calgary, are looking after this.

Plans are being prepared for a 10-storey building for the Calgary Herald

offices on Seventh avenue and First st. west. Tenders will be called in winter months so that work will start in early spring. Architects, Brown & Vallance, 1006 McArthur Bldg., Winnipeg, Man.

Galt, Ont.

Work will start next week on a big carriage stable, 2 storey, 50 x 80, on Cooper street, for A. E. Buchanan, liverman. New carriages, etc., and equipment for a modern carriage stable will be bought.

Granby, Que.

A by-law will be submitted to the ratepayers to grant a loan of \$5,000 to W. E. Buller, of Granby Hardware Company for erection of a factory.

Guelph, Ont.

Negotiations are in progress between city council and the Guelph Stove Co. as to the enlargement of factory.

Stewart Shaf Loader Co., Union ave., Winnipeg, have purchased a building site of fifty acres on York road. The intention is to build a factory to be completed next year, cost \$100,000. President, A. Summers, Winnipeg; vice-president, J. W. Lyons, Guelph.

Hamilton, Ont.

A company has been formed to manufacture steel here. Prov. President, D. A. McIlroy, 663 King street east, and a site of 5 acres on Lottride street has been secured. Plant costing about \$60,000 will be built.

The Canadian Hart Emery Wheel Co. are contemplating a new factory, Barton street east, Hamilton; manager, George Harvey; machinery for manufacturing carborundum and emory wheel, belts, dynamos, etc.

Lethbridge, Alta.

The Eastern Townships Bank has purchased two lots on which a new building to cost \$50,000 will be built.

Martin Head, N. B.

The work of establishing a plant for the Penobscot Lumber Co. at Martin Head, St. John county, is progressing rapidly. On December 1 the new booms will be in position. The erection of a new mill will be commenced in March. Robert Connelly, Great Salmon River, N. B., manager.

Montreal, Que.

R. & W. Kerr, hardware merchants, 326 St. Catherine street west, are contemplating the erection of a factory on Cathcart street; architect, The House of Browne, Ltd., Montreal; reinforced concrete building. Plans are now being prepared by architects. It is not decided whether work will start now or in the spring.

New plans are being prepared for a business building on St. Catherine street for Laude Bros., house furnishers; architect, C. Dufort, La Presse Bldg., Montreal; 10 storeys, 60 ft. frontage of glazed terra cotta, with elevators and all modern store and office appointments. Work will not be started until spring. Original plans called for a 5-storey building.

Moose Jaw, Sask.

Tenders are called for business building on Main street, for Canadian City & Town Properties Ltd.; architect, J. D. Atchison, Bank of Toronto Bldg. Winnipeg & H. E. Lloyd, owner, company's architect; 107 x 125, fireproof construction, five stores on ground floor; offices

above. Tenders called for basement only. It is intended to put in basement ready for early start on superstructure in the spring.

Napanee, Ont.

Dominion Rock Drill Co., Ltd., are planning the erection of a new factory; three storey; buildings each 150 x 45, of cement and brick.

New Westminster, B. C.

The Royal Bank of Canada has acquired a site, 66 x 132 ft., on Columbia near Sixth street, for erection of a bank building.

Niagara Falls, Ont.

John Robinson & Sons, River Road, are planning to purchase a steam heating plant for garage, 50 x 100 ft., hollow brick walls, 15-ft. ceiling, concrete roof, felt covered, large window area.

North Battleford, Sask.

Architects Stephenson & Evans are preparing plans for the erection of a brick machine shop to cost \$10,000.

Point Grey, B. C.

Reeve Bowser is erecting a 2-storey store and apartment block, corner of Wilson road and West Boulevard, 2 storey, 125 x 50, containing 8 stores, and 26 rooms, 3 bathrooms.

Prince Albert, Sask.

Excavation has started for store and offices, to cost \$200,000 on 15th Avenue west, for W. J. Christie, Union Bank, Winnipeg, Man.; architect, Pratt & Ross, 289 Garry street, Winnipeg; 5 storey, 90 x 132, reinforced concrete, fireproof, elevator.

Ottawa, Ont.

Tenders are called for a workshop on Victoria Island; Dept. of Public Wks. Ottawa; secretary, R. C. Desrochers; Erection of workshop; plans, etc., at Department. Received by secretary until 4 p.m. Nov. 23rd.

Renfrew, Ont.

Logan Bros. Ltd. are about to install a larger equipment of machinery in their woollen factory for making blankets and are sending over M. A. Dietz, of their staff, to visit factories where such machinery is made, and to place an order for same.

St. Catharines, Ont.

Work is in progress for erection of a factory for Steel and Radiation, Ltd., 78 Adelaide east, Toronto. Work has been held up on account of railway switching. Cement foundation and steel framework now in place and building will be rushed to completion.

St. John, N. B.

Mayor Frink has stated on good authority that the proposition of F. C. Durant to erect a sugar refinery is still alive. Plans call for expenditure of \$3,000,000.

Messrs. Waterbury & Rising, Ltd., have purchased property in Union street now occupied by them, and by James Collins, and property fronting on Sydney street, occupied by R. J. Cox, harness maker. It is presumed that they will utilize this property for extending their large business.

Simcoe, Ont.

Equipment required for a branch building for the Molsons Bank; interior fittings; lighting, heating and plumbing required.

Thorold, Ont.

General Board Pulp Co., Thorold, will make extensive addition to their factory if satisfactory arrangements can be made with the town.

Jas. Battle, Esq., announces that he has sold a factory site to a corporation that will erect a plant costing about \$100,000.

Tilbury, Ont.

The ratepayers will vote on a proposition to lend Harry H. Hallett \$3,000 on condition that he starts a brick and tile plant here and puts in \$9,000 worth of machinery.

Toronto, Ont.

Alterations will be made to building, King and Spadina, \$18,000, 3 storeys and basement, mill construction. Architect, E. H. Herbert, 65 Adelaide street.

Tenders are called for plumbing and hot water heating of warehouse on Church street, for Sloan & Co.; architect, J. Francis Brown, Yonge street, Toronto. Received by architect until Nov. 18th.

Equipment required for factory and supplies to cost \$75,000, on Madison avenue, for Standard Silver Co., 35 Hayter street, Toronto; steel lockers, furniture, vaults and factory equipment; 200,000 ft. Georgia pine.

The Wm. Davies Co., Front street, are excavating for the erection of a brick addition to their factory at 521 Front street east; owners are supervising building. Work will be done by day labor. Cost \$20,000.

Tenders are to be called for erection of a factory, \$8,800, Lot 5, plan 1256, C.P.R. tracks, for Dominion Carbonic Gas Co.; architects, Bond & Smith, 19 Wellington street west, Toronto; 1-sty., 120 x 50, stone, brick, metal cornice, tar and gravel roof.

Tenders are called until Nov. 25th for erection of factory to cost \$18,000 for Cooper Cap Co., Spadina avenue, Toronto; architect, I. Feldman, 199 Yonge st., Toronto; 5 storeys and basement, elevators, tar and gravel roofing, metal cornice, vacuum steam heating, tiling, vaults, structural steel.

Tenders were called for erection of a warehouse on Richmond street east, near Victoria, for Scotland Woollen Mills, Yonge street, Toronto; architect, L. S. Yolles, 244 Simcoe street, Toronto; brick, steel, tar and gravel roofing, metal cornice, art stone. Excavation is in progress.

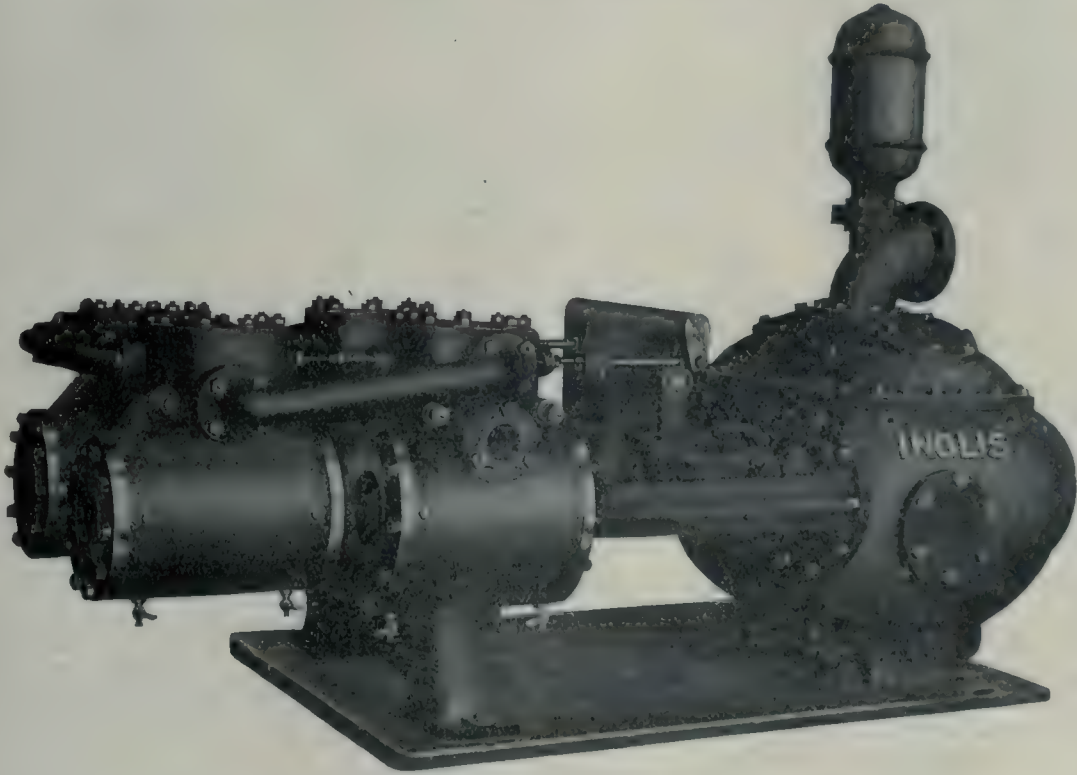
Tenders are called for garage and stable to cost \$5,000, on Sterling road, for The Cowan Co., Ltd., Sterling road, Toronto; architect, Langley & Howland, Confederation Life Building, Toronto; 2 storey, brick and concrete, galvanized iron cornice, skylights. No date specified for receiving tenders.

Tenders are called for erection of a warehouse on Yonge street for Sellers Gough Fur Co.; architect, H. Simpson, 82 King east, Toronto; 5 storeys, 50 x 122 ft., brick, mill construction, gravel foundation, terra cotta front, c. i. columns, steel beams, felt and gravel roofing, plate and prism glass, electric lighting, steam heating. Received week of Nov. 20th.

Excavation is done for warehouse to cost \$60,000 for Cooper Cap Co.; archi-

Water-Works Plants

for Towns and Cities



"Inglis" 1,000,000 gall. Pumping Engine.

Our long and successful experience in the building and installation of Pumping Engines and Water Works Machinery should be a strong argument in favour of "Inglis" products. During the fifty-two years (52) our plant has been in operation, we have built many Pumping Engines, all of which have given entire satisfaction.

Capacities from one to thirty million gallons per 24 hours.

Send us your inquiries.

The **John Inglis Company**

Engineers and Boilermakers

Limited

14 Strachan Ave., TORONTO, Canada

tect, I. Feldman, 199 Yonge street, Toronto; 5 storeys and basement, 50 x 182, concrete steel and brick, tar and gravel roof, structural steel, art stone, hardwood finish, reinforced concrete and steel, vacuum Durham steam heating, metal cornice, burlap, plate glass, elevators, passenger and freight, marble mosaic, vaults.

Vancouver, B. C.

Plans are being prepared for an office and bank to cost \$75,000 on Main street, for Acadie Trust Co.; architect, J. B. Dutour, 319 Pender street west, Vancouver; 5 storey, reinforced concrete, 25 x 122, steam heating, tile, special flooring specified.

Geo. Kirby is contemplating the erection of a store and apartment house, Hawkes and Keefer streets; architect, Otto W. Moberg, 36 Flack Building, Vancouver. Work not to start till spring. In the meantime some sub-contracts may be let.

Plans are being prepared for erection of a warehouse between Helmcken and Davie streets; architect, Geo. P. Bowie, 705 Bank of Ottawa Bldg., Vancouver; 6 storey, 75 x 120, heavy mill construction. Kennedy Bros., Pacific Building, Vancouver, have excavation contract.

Work has started on the Fairview branch of the Canadian Bank of Commerce at 6th avenue, and will be supervised by R. Alfred, care Dominion Realty Co. Tenders are being asked on plumbing, carpentry, heating, roofing and sheet metal work. The counters will be of quarter-cut oak.

Plans are completed for store and apartment house to cost \$29,000 on Richards street, for J. A. Montgomery, 403 4th avenue, New Westminster; architect, G. P. Bowie, 705 Bank of Ottawa bldg., Vancouver; 4 storey, 125 x 120, concrete and brick, metal window, sash, wire glass, vacuum cleaners, deadening felt, steam heating, tiling.

Wallaceburg, Ont.

By-law will be prepared to grant a loan of \$20,000 for erection of window glass factory. D. A. Gordon is interested. Mayor, Mr. Sauvey.

Welland, Ont.

Stores to cost \$6,000 will be erected on Cross street, 2 storeys, brick, cement foundation, gas lighting, gas heating; for Fred Gourlay, Welland; architect, T. L. Nichols, Welland.

West Lorne, Ont.

The big hotel of Wm. McIntyre was wiped out by fire and the library building was torn down to stop the blaze. Both will probably be rebuilt.

Windsor, Ont.

It is reported that the Canadian Sirocco Co., Ltd., is about to build an extensive plant, concrete, steel, metal rfg., steam heating, electric lighting. Address the American Blower Co., Detroit, Mich. Tenders to be called in near future.

Winnipeg, Man.

Plans are prepared for store and office building, Main street, 12 storey, steel and brick; for Peter Lyall, jr., 377 Wardlaw avenue.

Plans are being prepared for erection of an office building for Builders' Exchange; secretary, J. H. Buxton; 12-sty., brick and steel with terra cotta front.

Carson Creamery Co., Ltd., Maryland street, are excavating for a creamery to cost \$25,000; 3 storey, 128 x 100, con-

crete foundation, reinforced concrete and brick, electric lighting, steam heating, tar and gravel roofing, interior finish, white tile and marble, machinery already purchased. A shed for 150 horses will be built also.

CONTRACTS AWARDED

Aylmer, Ont.

Canning factory, cost \$45,000, for Aylmer Canning Co., Aylmer; architect, Thos. Woosley, Aylmer; gen. contractor, Jos. Davis, Aylmer. Two-sty., cement block, cement fndn., steam heating.

Calgary, Alta.

C. P. R. Hotel; architect, E. & W. S. Maxwell; general contractor, P. Lyall & Sons, both of Montreal. Only eight storeys to be erected at present, containing 400 rooms, and to be ready early in 1913.

Warehouse to cost \$50,000 on 11th avenue west, for Canadian Equipment & Supply Co.; general contractor, Walker Fysche Co., Calgary; 4 storeys, 50 x 130, brick, concrete foundation, steam heating, electric lighting, tar and gravel roof.

Hotel to cost \$1,500,000, for Canadian Pacific Railway, Winnipeg; architect, E. & W. S. Maxwell, Beaver Hall Sq., Montreal. Foundation and excavation contractor, P. Lyall & Sons, Montreal; 13 storeys, 228 x 164, stone, brick, steel and terra cotta, concrete foundation, steam heating, electric and gas lighting, slate and tile roofing, hardwood, tile, enamel and marble finish, steel frame, reinforced concrete floors, terra cotta, partitions enamelled walls. Only eight storeys to be finished at present.

Montreal, Que.

Store and eight flats, \$10,500, 3-storey, 70 x 48, pressed brick, stone foundation, gas and electric lighting, gravel roofing; owner, Mrs. P. Chaput, 135a Berri; contractor, D. Morel, 1020 Parthenais.

Stable to cost \$10,000 for Mrs. Hector MacKenzie, 289 Stanley street, Montreal; architect, Robert Findlay, Phillips Pl., Montreal; general contractor, Gray & Wighton, 244 Pine avenue, Montreal; 2 storeys, 40 x 40, brick, concrete foundation, electric lighting, gravel roofing.

Bank to cost \$19,000 on Fairmont ave. for Bank of Ottawa; architect, H. C. Stone, 84 St. Francois Xavier street, Montreal; general contractor, E. G. W. Cape, Beardmore Building, Montreal; roofing, Hickey & Aubut, 93 Dominion street, Montreal; steel work, Dominion Bridge Co., Ltd., Lachine.

Carriage warehouse and office, Selby, for Wm. Gray & Son Co., 586 St. Paul street, Montreal; contractor, Byers & Anglin, 65 Victoria street, Montreal; 2-sty., 198 x 80, concrete and solid brick, hot air htg., elec. lgt., tar and gravel roof. Freight elevator required.

Hotel to cost \$1,500,000 on Sherbrooke street, for The Fitz-Carlton Hotel Co. (Hon. Lionel Guest); architect, Warren & Wetmore, East 33rd street, New York, U.S.A.; 10 storeys, 187 x 142, reinforced concrete, stone and brick, concrete foundation, steam heating, electric lighting, hardwood finish, cement, marble, etc., stairs, elevators, roof garden, tiled floors, etc. Contract for supply of granite awarded to Norcross Bros., Irberville, Quebec.

Ottawa, Ont.

Commercial building to cost \$60,000, for Hiram Robinson, 150 MacLaren st., Ottawa; architect, Jas. Mather, Wellington street, Ottawa; heating and plumb-

ing contractor, McKinley & Northwood, 56-58 Rideau street, Ottawa; 6 storeys. Tenders closed Nov. 18th.

Addition to warehouse on Nicholas street, for Dominion Warehousing Co., Ottawa; architect, Jas. Mather, Wellington street, Ottawa; general contractor, Holbrook & Sutherland, Ottawa; steel work contractor, Dominion Steel Co.; 3 storeys, steel and brick. Tenders close Nov. 18th.

Quebec, Que.

Bank, \$25,000. Crown street, stone and brick, masonry foundation, hot water heating, electric lighting; owner, Bank of Hochelaga, Montreal; architect, A. H. Lapierre, 30 St. James street, Montreal. Contractors as follows: stone, brick, carpentry, joinery, plaster and interior furnishings, Louis Boivin, 202 Richilieu street, Que.; plumbing, gas fixtures, heating and electric lighting, B. Paradis & Frere, 51 Dorchester street, St. Rochs, Que.; marble and tile, Arthur Frenette, 2 Hourlamaque, Montcalm, Que. Architectural steel, Bosse & Banks, 39 St. Paul street, Quebec; roofing, Nap. Barbeau, 31 Bridge street, Quebec; painting and glazing, Marier & Tremblay, corner Desfosses and Bridge st., Quebec.

St. Andrew's, N. B.

The contract for the erection of the new concrete kitchen annex to the Algonquin Hotel, owned by the C. P. R., has been awarded to P. Lyall & Sons, of Montreal. It will provide a large kitchen and fifty-six sleeping rooms.

Toronto, Ont.

Two-storey brick addition to warehouse, 53 Adelaide street west; owner, W. Harland Smith; architect, W. R. Gregg, 23 Jordan street; builders, H. N. Dancy & Sons, 220 Howland avenue.

Addition to hotel to cost \$5,000 on Qing and Queen streets, for Jno. Laxton, King and Queen streets; architect, F. H. Herbert, 65 Adelaide street east, Toronto; contractor, M. Manley, 1058 College street, Toronto.

Shop, cost \$9,000, Adelaide street w., for Gurney Foundry, King street west; architect, Dennison & Stephenson, 20 King street west, Toronto; builder, A. Webb, 13 Shirley street, Toronto. Solid brick, brick fndn., tar and gravel roof, structural steel.

Stable, cost \$60,000, for Don Storage Company; architect, Chadwick & Beckett, 20 Toronto street, Toronto; masonry, Teagle & Son, 55 Boswell ave.; carpentry, Cooley Bros., 89 Tiverton ave.; roofing, A. B. Ormsby, Queen and George streets; painting, G. H. Shackelton, 43 College street; plumbing, Gentle & Travis, 23 St. Enoch's street; 2-sty. and basement. Accommodation for 60 horses.

Office building to cost \$900,000, cor. King and Yonge streets, for Canadian Pacific Railway, Montreal; architects, Darling & Pearson, Leader Lane, Toronto; general contractor, George Fuller & Co., 298-14 King street east, Toronto, or Jacobs Bldg., Montreal; steel, Dominion Bridge Company; terra cotta, North Western Terra Cotta Co.; cut stone foundation, brick and art stone front; mezzapine floor; 2 felt and gravel roofing, skylights, copper coping, steel sash, sand stucco, marble, burlap interior finish.

Victoria, B. C.

Hotel to cost \$100,000, for Challoner & Mitchell; architect, Thos. Hooper,

TURBINE PUMPS

for Water Works Purposes

In Water Works practice it is necessary to provide for two pressures, one domestic and the other higher for fire service. For this purpose we offer our

Patented Double Suction

By an ingenious application of the double suction it is practicable to operate the same pump at either fire or domestic pressure and yet maintain a constant speed. The recent addition to the waterworks at Lachine shows how this end is attained.

The unit consists of a 14-inch 2-stage turbine pump of capacity of 5,000,000 Imperial gallons per 24 hours driven by either a 400 horse power motor or a 400 horse power steam turbine at 1,800 r.p.m. For ordinary domestic purposes a pressure of 80 lbs. is sufficient and this is obtained by closing one valve and therefore operating one stage of the pump, changing it in fact to a single stage pump. For fire service both stages are used and a pressure of 110 lbs. can be maintained. The speed, however, remains the same for both services. The exclusive rights to this double suction for Canada are owned by



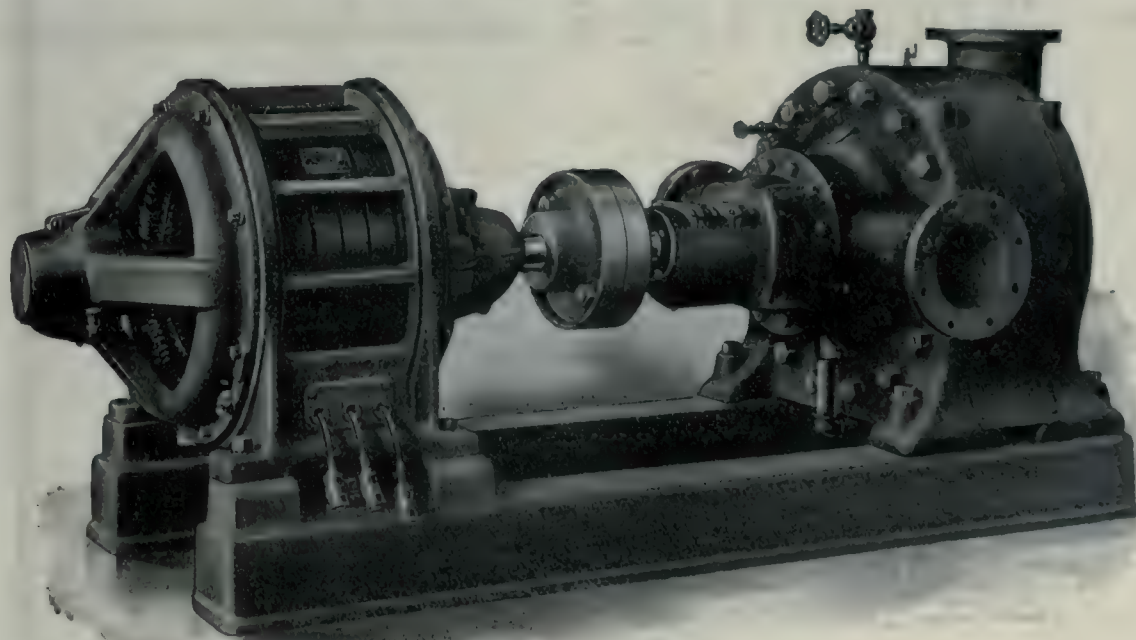
Patented Double Suction

THE JOHN McDOUGALL CALEDONIAN IRON WORKS CO. LIMITED

WORKS: 512 WILLIAM STREET, MONTREAL

Sales Offices: MONTREAL TORONTO COBALT WINNIPEG CALGARY VANCOUVER

Electrically Operated Turbine Pumps for All Duties



CANADA FOUNDRY COMPANY, Limited
TORONTO MONTREAL HALIFAX OTTAWA COBALT WINNIPEG CALGARY VANCOUVER NELSON

Royal Bank Chambers, Victoria; general contractor, Luney Bros., 10 Lee Bldg., Broad street, Victoria. The architect is preparing plans for a sixth storey.

Welland, Ont.

Ice cream factory to cost \$3,000, for the Royal Ice Cream Co., Welland; contractor, The Builders Lumber & Supply Co., Welland; concrete factory. Company will require motor, boiler and freezing machine.

Woodstock, N. B.

Stores to cost \$8,000 for A. E. Jones, Woodstock, N. B.; architect, A. W. Gay, St. John, N.B.; general contractor, Henry Post, Woodstock, N.B.; roofing, H. Smalley, Hartland, N.B.; contractor for iron work, J. E. Wilson, St. John, N.B.; 3-storey, 52 x 52, electric lighting, hot air heating, hardwood interior pine trimmings, interior finish; two galvanized iron vents on roof. Ground floor completed, 2nd storey plastered.

Power Plants, Electricity and Telephones

Dunwich, Ont.

Petition was circulated in Dunwich and Southwold to estimate number who would take hydro power, when line is ready, met with an almost unanimous response, and a great deal of new equipment will be needed.

Drummondville, Que.

New tenders to be called for power machinery; sec.-treas, W. A. Moisan; 250 h.p. water wheel and 150 k.w. Gen-

erator. Previously called tenders not yet accepted, and others will be called in a week or two.

Forest, Ont.

The council is considering the purchase of the electric light plant in the town, and it is likely that a by-law will be submitted to the electors shortly regarding the matter.

Vancouver, B.C.

Estimates are prepared for street lighting on Hastings, Main, Pender and Cordova streets; Ross Howard will supply 300 street standards, sufficient for 4 streets. Northern Electric Co. will supply the conduits, which will be galvanized conduits instead of fibre as previously used. City Clerk, W. MacQueen.

Watertown, Ont.

A by-law will be submitted to the ratepayers on Nov. 22 to raise \$5,000 for an electric distribution plant.

Miscellaneous

Moose Jaw, Sask.

The by-law to expend \$17,000 on fire alarm extension was carried and includes in addition to extension of the fire alarm, the purchase of a steam pumping engine, the estimated cost of which is from \$8,000 to \$10,000.

Ottawa, Ont.

Tenders are called for supply of B. C. fir and white oak timber for dredging branch at Victoria Island. Received by

secretary until Nov. 29th. Department of Public Works, Ottawa; secretary, R. C. Desrochers.

Winnipeg, Man.

Tenders are called by N. J. Black, 308 Grain Exchange, until Nov. 31st for 3 large barges, one large tug, one ship barge and sand dredge and three quarry derricks to lift from three to six tons, and one stone crusher with boilers and engines complete to be built on Red River or on Lake Winnipeg. Particulars from Mr. Bruce, 222 McDermot ave., Winnipeg.

Business Notes

Belleville, Ont.

The brick building belonging to Kelly Estate was destroyed by fire. Those who suffered loss were: Chester, dry goods; Smith Billiard room, and Reno restaurant. Total loss, \$20,000.

Golden, B. C.

Drug store, owned by J. A. Buckingham, Kootenay Hotel, and other buildings, were destroyed by fire. Total estimated loss, \$27,000.

MacLean Daily Reports

The only systematic method yet devised for reporting BUILDING AND ENGINEERING projects from their inception to completion. Ask us for Rates and Specimen Reports.

220 King Street West

TORONTO

Industrial Gas Fuel Appliances

FOR USE IN TORONTO INDUSTRIES

To The Business Men of Toronto:

With the present low price of Toronto gas, the Gas Appliances mentioned in the accompanying list will now be more extensively adopted in the industries of Toronto. There is not a trade, factory, mill, machine shop, laundry, hotel, restaurant or establishment of any kind in the city that cannot save labor, turn out better work and better goods and have a more efficient illumination by adopting these modern aids to business convenience and economy. While it would be impossible to carry in stock all the appliances that the Consumers' Gas Company is prepared to recommend and instal, still, we are ready to supply any appliance on short notice. The Company's expert mechanics are always at your service. Let us know your requirements. The attached list only gives a few names of the different appliances now in use.

SEND US YOUR NAME

and address and we will send you free information about any of the following gas appliances. Mark X opposite the article you are most interested in; cut out and return to us.



The Consumers' Gas Company

Commercial Department

19 Toronto Street, Toronto

Gas Engines	Welding Furnaces
Gas Boilers	Japanning Ovens
Gas Furnaces	Vulcanizers
Bakers' Ovens	Annealing Furnaces
Babbitt Melters	Cauldrons
Bar Annealers	Stereotype Melters
Bench Forges	China Kiln
Brazing Furnaces	Tank Heaters
Crucible Furnaces	Factory Arc Lights
Rivet Heaters	Pressure Blowers
St'l Hardn'g Furnace	Gas Water Heaters
Tool Forges	Candy Boilers
Blow Pipes	Outdoor Lights
Glue Pot Heaters	Gas Lights

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November 29, 1911

No. 48

The Moving Finger writes; and, having writ,
Moves on: nor all thy piety nor wit
Shall lure it back to cancel half a line,
Nor all thy tears wash out a word of it.
—Omar Khayyam.

Loyalty in Letting Contracts

Writing to one of the Toronto papers "A Disgusted Tory" offers a scathing comment on the professions of loyalty, imperialism and British preference which abounded in Toronto previous to September the 21st. These considerations, our Tory friend observes, are conveniently put in the background when such a question as that of the Toronto subway contract is brought up for settlement. The writer asks pointedly why British contractors were "not allowed to tender" and touching upon the request made by Messrs. Perry & Company, Limited, for an extension of time, he observes that no reasonable guarantee can be given that this firm would not have put in a lower bid than Messrs. Haney & Company. The figures submitted by the latter firm were probably low enough, but it is principle that is at stake, not the value of the work. "The whole thing," the writer concludes, "is not only most unfair from an imperial point of view, but looked at from the dollars and cents end of it is absolutely unbusinesslike and shows a woeful lack of care in looking after the ratepayers' interests."

This matter was discussed at considerable length in our issue of November 15th. The editorial published in that number was based on careful investigations. We have nothing to add or to retract, and we do not wish to belabor the point further than to say that the claim made by the Toronto dailies that the sending out of preliminary notices to British firms constituted a reasonable defence for the civic authorities, is ridiculous. How can they account for the

fact that Messrs. Perry & Company, the only firm who showed any practical interest in the work, received no such intimation and that the news was conveyed to them by means of a small paragraph in a weekly newspaper? Is this adequate publicity? And once more, but finally, what was the good of advertising in London papers of October 20 tenders which closed in Toronto at noon, November the first?

Not a Fish Story

The other day we received a communication from a firm in the United States. They had been thinking of entering the Canadian field and, anticipating the passage of reciprocity, had hired a French stenographer so that they would have a stand-in with the natives of the newly-annexed territory when the time came. The time did not come however, and with the unexpected turn of events on September 21st, the French girl lost her job. This enterprising U. S. firm is sore on Canada now, and "Frenchmen" are likely to fare badly for a time in their section of the country. Spanish or Hebrew stenographers of a speculative turn of mind might be well advised to get in an application.

This is no fish story; we have the letter on file.

Municipal Administration

It has been with no little satisfaction that we have noted a widely diffused interest in the article "Municipal Administration at Victoria, B. C.," published in the November issue of the Contract Record.

In our last number we reproduced letters from prominent members of the engineering profession written in support of the arguments adduced in our article. The Manitoba Free Press made our observations the text of a leading editorial in which it was conceded that a strong case had been made out for the adoption of the commission system of civic government employed in certain European countries. The Victoria Times commented at considerable length. That journal was disposed to blame itself for having refrained so long from criticism of the council's erratic course and left the inevitable denunciation to an outsider like the Contract Record, the effect of which, to quote the Times, "will be more adverse to the interests of the city than any local discussion could possibly be." The Times has the good sense to deplore deeply the circumstances which gave rise to such criticism and concludes as follows:

"The problem of capable and qualified engineering is ever with all our Western cities. It is the people who have to pay, no matter who is in the wrong. What the city must guard against is a slump from the unsatisfactory to the possibly worse."

We have expressed satisfaction at the public interest manifested in our article not from a personal standpoint, but because we regard with peculiar apprehension such happenings as have taken place at Victoria and because of their insidious bearing upon the responsibility and general status of the municipal engineer. It seems, however, that a great deal of missionary work yet remains to be done. The Victoria Times realizes that the problem of obtaining and keeping capable and qualified engineers is an important one for the West, but there seems to be anything but a general recognition of this point in that section of the country. Indeed, the worthy aldermen (we beg their pardon) of the city of Victoria seem to have

their prototypes in a number of western cities: Moose Jaw for instance.

Ignorance and prejudice have asserted themselves in the city councils of Toronto and Montreal, but assuredly the West has the East faded into insignificance so far as aldermanic density is concerned. In the East there is always a certain amount of skirmishing going on between the City Engineers' department and certain interests represented in council, but at least the fight is characterized by an observance of British fair play. The assassin-like procedure adopted at Victoria and, in more recent history, at Moose Jaw, is at present unknown in the comparatively virtuous chambers of the city councils of Toronto and Montreal.

Moose Jaw in the Limelight

We have alluded to Moose Jaw. This city has been courting publicity. It has endeavored—with a measure of success—to attract attention to itself by diffusing information concerning its population, growth and progress. Moose Jaw has grown, but the growth has only been along certain lines; Moose Jaw is still in the class of prairie towns, and it is something of a retrograde in spite of its proud boasts.

At Moose Jaw, as at Victoria, an under-current of bad feeling against the city engineer developed among certain members of the council. Eventually this became so strong that the official was obliged to take some means to stem its progress. The city engineer strove to find reasons for the opposition he was called upon to encounter and invited a detailed investigation of his department. The council, however, preferred to discuss the matter at an informal and probably unrepresentative meeting. The engineer's resignation (effective at the end of the year, in conformity with general practice) followed in short order, for the official discovered that unscrupulous methods were being employed to undermine his position. Not only was the resignation accepted but it was held to go into effect immediately, the object being, evidently, to leave a stigma upon the reputation of the official.

At Moose Jaw, as at Victoria, the council continually busy themselves with technicalities which they can only partially understand and an explanation of which, in consequence, is only partially satisfactory to them. They labor under the mistaken and hopeless conviction that because they pay the salary of the engineer they have a right to usurp his professional functions. They are running the city and they wish to show their authority, even to having a voice in such details as the grade of a street, the size of a drain, or maybe the proportioning of concrete.

An Opening for the C. S. C. E.

Now we have no desire to open up a breach between the municipal engineering profession and city councils but we would certainly like to see the engineering department of Moose Jaw left to the resources of its own enlightened aldermen until an investigation has been made by the Canadian Society of Civil Engineers. To us it seems monstrous for a qualified official to be ousted from his position upon charges of incompetency without having these charges carefully sifted. To say the least it is grossly unfair; and to say the most, its discouraging effect upon the bright young men who are thinking of enter-

ing the profession is a serious consideration. It is not that we care a button whether the City Engineer's chair at Moose Jaw is vacant or otherwise—no doubt the loss of the appointment will redound ultimately to the benefit of the former occupant—but we resent the individual injustice, and, in its wider application, the stigma upon the profession.

The ventilation of such troubles as these is not and should not be our peculiar province. It seems to us that these matters are of sufficient importance to warrant an investigation by the Canadian Society of Civil Engineers. In a lower plane the unions protect the interests of the humblest worker and any violation of established principles would be attended by grave consequences. This is generally conceded to be just. Why then, in the higher sphere, should not a professional body such as the C. S. C. E. concern itself with the interests of its members? The main object in view in the organization of the Society,—the promotion of engineering knowledge, is a somewhat different matter from the arbitration of private disputes, but times are changing and the Society must also change—the scope of its usefulness must be widened—if the profession is to maintain its place above the sordidness of competition, graft, and the influence of city councils such as those of Moose Jaw and Victoria.

All things considered we are inclined to congratulate the man who has just vacated the office of City Engineer of Moose Jaw; and we wish his successor "Bon voyage." We are beginning to think that the West is something more than progressive.

A Westminster Engineer's Impression of Municipal Work in Canada

In dealing with the difficulties which beset the City Engineers of Victoria, B.C., Moose Jaw, Saskatchewan, Toronto, Montreal, etc., we have not infrequently touched upon the adverse influence exerted upon the profession by aldermen and councillors. Everybody, however, seems to come from Missouri now-a-days, and generalities are useless: one must provide specific evidence. Here we have it. A prominent engineer of London, Eng., a member of the Institution of Mechanical Engineers, and a Fellow of the Surveyors' Institute, was interviewed recently upon his return from a three months' tour in Canada and the United States. Asked as to his impressions of municipal administration on this side of the Atlantic, he expressed disappointment at finding it so indifferent. He spoke enthusiastically of Canada's growth, but handed out a few remarks which should provide us with food for reflection.

"Municipal Engineers," said Mr. Ault, "in the old country are looked upon as fair game to be shot at by some cantankerous members of the public, but in Canada they need a skin much thicker than that of the rhinoceros. The newspapers often make violently bitter, and scandalous attacks on the professional and personal character of the Municipal Engineer out there. And all he can do is to ignore it, for the law of libel is worthless."

"And what is your opinion, Mr. Ault, as to the prospects of employment for young engineers who might contemplate going out to Canada?"

"Candidly," he replied, "I do not consider them encouraging. This, however, I would say to young men who have an idea of trying their luck out there. If

they are prepared to rough it, and to turn their hand to any job of any kind which comes along, they will find a good berth after a little waiting. But I should advise them to go right out west to the Pacific side, for that part of Canada and of the States is booming, and after the Panama Canal is opened it will boom, in my opinion, in an unprecedented manner."

This is what the enlightened members of our city councils are doing for Canada. They are weakening the very foundations of municipal engineering and they are discouraging the most desirable class of people from entering the country. If such impressions as those received by Mr. Ault are shared by the majority of the members of such organizations as the Institute of Civil Engineers, the Institute of Mechanical Engineers, and the Surveyors' Institute, which number in their membership nearly ninety per cent. of the engineering profession, there is small prospect of inducing bright men to come to this country. The British engineer has made a reputation second to none and we cannot afford to let such impressions as Mr. Ault formed become general.

Here is another aspect of the case for the Canadian Society of Civil Engineers.

Advertising Locally

Talking about the bad habits of Western cities—Victoria, B. C., for instance—one of the worst of these is copied from the East, from which wisdom is traditionally but perhaps erroneously supposed to emanate. We refer to the matter of calling for tenders. The city of Victoria advertised recently for an automobile required by the Corporation for fire department purposes. In reply to our inquiry they inform us that advertisements for such articles are only placed locally.

If local firms are to have the monopoly of such sales, why advertise at all? Why not send the city clerk out to buy an automobile? It would save the cost of the advertisement and it would be just as expensive in the long run.

The ineconomy of local advertising, to say nothing of the injustice to the ratepayers and numerous other attendant evils, should have made itself apparent long since to the city of Victoria. It would be interesting to obtain from the city clerk the exact figure at which this automobile was contracted for, so that a comparison might be made with figures obtained in the East.

Furnishing Materials for Construction

Our Chicago contemporary, *The Contractor*, comments editorially upon the economy and general advantages in construction, of having the contractor furnish the material. For years, says that journal, it has been the custom for contractors to purchase all the necessary materials needed in their construction work. To-day there is a growing tendency to stop this and have the owner furnish some or all of the materials, the contractor simply furnishing the labor and putting the materials in place. At first thought this seems to be an improvement and to some extent the logical way. Naturally a contractor figures a profit on all materials, varying from a few per cent. to fifty, according to the character and amount.

Many owners believe that this profit is saved to them by buying the materials themselves, and in a few cases it is, but only when the owner, as in the case

of a large corporation, is continually buying materials of all kinds in large quantities. However, in most cases, when contractors are accustomed to buying construction materials and enjoy good credit, or are able to discount their bills, they can purchase so much more cheaply than the owner, who is only an occasional buyer, that the difference in price may net the contractor a handsome profit.

Then, too, if the contractor purchases the materials, it is to his interest to see that they are properly cared for and not wasted in actual construction. It is but natural that any one should be more careful of things purchased with his own money than when other people's money is at stake. On large jobs the waste in regard to such things can be enormous—much more than the per cent. of profit figured by the contractor.

Besides, it is difficult for the owner to keep a check on the materials, which must be done at his own cost, either directly or indirectly.

Inspection, Handling and Storing

Another important consideration is that the inspection of materials is always different when the owner does the buying. If the condemned material cannot be thrown back onto the seller, it is more than likely to be used, unless it is in extremely bad condition. On the other hand, when the contractor furnishes the material the inspection is rigid, and frequently some of his profit goes in condemned materials.

Another important consideration is the handling and storing of construction materials. In many cases the cost is considerable. Large storage yards must be secured and sheds of various kinds constructed. At times the materials must be rehandled oftener than planned for, which is an additional cost. When the contractor furnishes the materials, there cannot be any doubt as to who is to handle and store these things, but when they are furnished by the owner, unless the contract sets forth who is to bear this expense, serious questions can be involved and even at the best, disputes and lawsuits result.

A variation in the method of supplying material has been adopted in some sections by paying the contractor a stipulated price for the material as it is furnished or used instead of paying for it in the completed structure. This is done more especially with cement. The idea is that it prevents the contractor and his men from holding out a part of the cement required. It does not overcome this difficulty, as if there is a profit in the price bid, the contractor is more than anxious to use all the cement possible so as to make extra money, with the result that the work costs the owners more than it should. The writer made a careful investigation, during the past year, of two contracts where cement was furnished in this way and found that there was a waste of about five per cent. of cement on one job and nearly ten per cent. on another. Of course the cement went into the completed structure and made the concrete stronger, but where many thousands of yards of concrete are used the extra cost is considerable, and it is waste, as this extra cement is not needed.

Taking everything into consideration, the best method of handling materials for construction work is to have the contractor buy them. Upon receiving all materials on the job, pay for them as materials furnished, and then, when in place, receive payment for them in the completed structure.

There is one serious objection to bidding a price

for material furnished, as a contractor can bid a high price for the material and a very low one for placing it, thus unbalancing his bid, making it possible for a dishonest man to furnish all material and upon being paid for it, give up the work. For this reason it is better to arrange a schedule of prices, after the work has been awarded, for materials to be furnished and insert it in the contract. This is seldom done, but when an allowance is made it is generally fifty per cent. of the price bid in place. This is not enough, as a rule, to cover the purchase price, which sometimes prevents the contractor from furnishing materials promptly. Paying a price to cover the cost of the material allows the engineer in charge of the work to order materials as he deems expedient.

Municipal Engineering at the School of Mining, Kingston, Ont.

Kingston, Ont., Nov. 20, 1911.

Editor, Contract Record:

The undersigned noticed in your issue of November 15th a statement that the rudiments of road building, etc., should be covered in engineering courses. Your words were as follows: "A course of lectures covering accumulated experience respecting all forms of pavement and roads, and details of construction; together with a laboratory for the testing of materials, would render valuable service to the Province."

The School of Mining, Kingston, has for the last seven years given lectures in Municipal Engineering, of which the curriculum is enclosed. This course of lectures and draughting-room work takes three hours a week in lectures and three hours in the draughting-room, and is compulsory for all students proceeding to a degree in Civil Engineering. A municipal laboratory is under process of formation at the present time and we hope within the next year not only to give lectures that are being given now, but to do specialized laboratory work along the line suggested.

Not only do we agree with your opinion in regard to roadmaking, but we think this same opinion will apply as well to the water and sewage problems, and street railway and highway bridge work. It has been the aim of the Civil Engineering Department of this University to develop the Municipal course as fully as any other given in the Department, because of the great demand there will be for municipal engineers within the next few years, and the necessity for special knowledge required by these men. Evidence of this is given in the following curriculum.

Yours very truly,

L. Malcolm.

Assistant Professor of Civil Engineering
Curriculum

MUNICIPAL ENGINEERING

Water Supply

Lectures comprise: Municipal water supply. Rainfall. Source of supply. Quantity, quality and purification of water. Distribution, designing, and details of construction. Domestic systems.

Lecture hour—Thursday, 10 a.m. 2nd Term.

MUNICIPAL ENGINEERING

The Collection and Disposal of Sewage and Refuse

Lectures comprise: The various systems of collection and removal of sewage. Design. Consideration of rainfall.

run off, and water consumption. Proportioning of size. Grades and flow in sewers. Methods of construction and materials used. Plumbing. Maintenance of sewer systems, including ventilation, flushing, and inspection. Assessments.

Sewage disposal: Methods employed. Design, construction, and maintenance of the various systems, including bacterial treatment. Refuse disposal. Kinds of refuse. Methods of collection and disposal and economic value of same. Incinerators.

Lecture hour—Tuesday, 10 a.m.

MUNICIPAL ENGINEERING

Roads and Streets

Lectures comprise: Country and city roads and pavements. Lay out, grades, and roadbeds. Various kinds of pavements and methods of construction. Cost and durability. Gutters, curbs, and gullies. Various kinds of walks, methods of construction, materials used. Methods of dust prevention. Construction of street railway track. Methods of assessment.

Lecture hour—Wednesday, 10 a.m.

Municipal engineering I, II and III include field work. three hours per week, Saturday, 9 to 12. Projects in water works, sewer designs and paving are set and completed during these hours. As far as possible each student will be given separate problems. A time limit is set with each problem.

MUNICIPAL ENGINEERING IV.

City and Highway Bridges and Electric Railways

Aesthetic design of bridges of different types; details of construction. Determination of loads and analysis of stresses taken under General Engineering 'II. Electric Railways—Subgrade, rails, ties, curves, switches, pavements, power, grades, and bridges.

Lecture hour—Thursday, 10 a.m. 1st Term.

An Interesting Talk on Foundation Work

"Modern Methods in Foundation Work" was the subject of a paper read by Mr. Alexander Allaire, M. E., manager of the Foundation Company, Limited, before the members of the Province of Quebec Association of Architects, Montreal, on November 21. Mr. Allaire dealt in detail with the various forms of constructing foundations and gave specific instances to illustrate the methods he described. Some recent foundations in Montreal and New York were referred to and the difficulties explained, together with the precautions taken to insure stability and protect adjoining buildings. Mr. Allaire spoke of the changes in practice as compared with a few years ago, by which in sinking piles and in other ways the cost had been reduced and the work executed more expeditiously. The paper was illustrated by a number of slides of plans and photos. Several questions were asked, particularly in relation to local conditions. Arising out of a brief discussion opened by Prof. Nobbs, Mr. Hugh Vallance suggested that it would be an excellent plan if architects and engineers would send to some central body, say their own institute, data as to the nature of the soil in Montreal. This varied very considerably, even within a short distance—Mr. Hugh Vallance stated 100 feet—and it was important that architects and engineers should be able to readily place their hands on information as to the soil. Mr. Allaire stated that his company had compiled such data in New York and Montreal and had found it to be of great convenience.

Improper Fireproofing in Large Buildings

Practices Which Endanger the Safety of the Structure—Flimsy Protection of Columns, Roof Trusses, Doors and Windows

Some interesting observations on the subject of fireproofing were made by Mr. Richard L. Humphrey, of Philadelphia, president of the National Association of Cement Users, at a general meeting of the Concrete Institute, held last month in London, Eng. In a number of cities public attention has been directed of late to the evils of inadequate fireproofing, and the following extract may be of particular interest in Toronto at this time. We would recommend the Building Committee of the Y. M. C. A. to peruse certain points carefully:

It frequently happens that the walls of a structure are standing after a fire, and people point to those walls as an evidence of the fact that the building has satisfactorily passed the conflagration. It often happens that the walls are of concrete, and after the fire are in good shape, and only require a renewal of the floors, doors and windows and roof to make a habitable dwelling.

It frequently happens that the floors and columns are fireproof, but the front walls are cast iron, which are destroyed, or the walls of brick all fall down. One of the best examples in America of the behaviour of reinforced concrete in a serious conflagration was the building of the Guarantors' Trust Company of Baltimore, and load tests were made on those floors after the fire by the building department, and they were found to be amply safe under the ordinary building laws. In the destruction of the adjoining building opportunity was afforded for the construction of a modern building, and it became necessary to tear down the rebuilt structure because it did not fit in with the new structure, otherwise it was in very good condition.

Stone is very largely used not only in this country and America, but all over the world, as an ornamental material, and it is evident, I think, from the study of buildings where there have been fires of intense heat that the stone is almost entirely destroyed. It is almost impossible to replace the ornamental character without rebuilding the structure entirely, and the behaviour of granite and hard sandstone in fire, which splinter and split, is ample evidence that the subject of natural building stones should be studied with a view to determining their resistance to fire. The United States Government have undertaken some studies of this kind, and they have found that it makes a material difference as to how the stone is quarried in its fire resistance. They found that granite can be quarried so as to offer almost 100 per cent. greater resistance to fire in one direction than it does in the other direction; so that in the matter of ornamental building stones there is much to be learned in the manner in which the stone is quarried from the point of view of its fire resistance. Of course, in a building of this kind the destruction cannot be estimated. The mere fact that the skeleton remains is not very much consolation, and when ornamental parts are also structural parts carrying the walls, then, of course, the construction seriously endangers the safety of the structure, and when granite columns form the interior columns of the construction, their destruction is a

matter of serious concern. If stone is to be used as a structural member of a building, it must be fireproof just the same as a steel member.

Steel Fails at High Temperature

In nearly all the great conflagrations which I have visited—and I have visited most of them in America—it is a frequent sight to see buildings of steel which have not been properly fireproofed entirely destroyed, and it is evident, I think, that something must be done to protect that material, for while steel may have great strength at normal temperatures, it has little or no strength at high temperatures. Then, again, it frequently happens that the floor of a structure may be reasonably fireproof and constructed properly, but the supports of the floor are cast iron, or some equally bad material, and the failure of the column to support the floor causes a collapse.

It often happens that in the construction of columns an attempt has been made to fireproof them by binding around the column perhaps a metal fabric and then plastering it. In the Fairmont Hotel about 100 columns fell as a result of this kind of fireproofing. It frequently happened that the floor settled as much as a foot. Now, you must bear in mind that there was no great fire in that building. The hotel had not been completed, and the only material there was the lumber that was used in the construction of the building, which was not a great amount, but the burning of this lumber was sufficient to develop enough heat to buckle the flimsily constructed columns, and in the destruction of such buildings one frequently sees the folly of those flimsy evasions of the law.

The floor, of course, is an important structure. If the column is reasonably fireproof it is necessary that the floor shall be fireproof. The suspended ceiling was found in the San Francisco and Baltimore fires to act as an excellent shield and greatly increased the fire resistance of the floor. Unfortunately in carrying out this idea it frequently happens that ordinary gypsum or plaster is used, and with a very flimsy anchor the gypsum loses its life at a very low temperature and the anchor is destroyed in heat and the ceiling falls.

It generally happens that the roof trusses of a building are never protected. The upper ceiling is rendered reasonably fireproof, but the steel trusses of the roof are not protected, and as a result it frequently happens that the roof becomes the entry for a fire from the outside. It is just as necessary to protect the steel work of the roof as it is any other part of the structure.

In most cities we find that there are buildings of large size that are reasonably fireproof. They are monumental in their construction, but they are surrounded by fire traps, and this is particularly true in our large cities, where we have buildings that are extremely high, and which, if they were properly protected, with metallic window frames and door frames and fire-glass windows, would probably act as a barrier, but with unprotected plain glass, and perhaps wooden frames, the destruction of the tinder boxes

that surround them brings about the destruction of the contents of the buildings themselves.

It is not only necessary that the floors and columns of a building shall be properly protected against fire; it is also necessary that not only the interior, but the outside shall be protected. It frequently happens that the windows are perhaps metal frames, improperly protected, and the destruction of those windows lead to an easy access for the flames to spread from floor to floor, and lead to the entire destruction of the building.

In some cases where metal doors and windows were used, and plain glass used in the window, the glass simply softened and fell down, and so, of course, the barrier was of little value. On the other hand, when the window is constructed with metal frames and wire glass windows of approved type, the glass often softens, but still stays in place and prevents the fire from gaining access to the building.

Montreal Fire Record

Fire Commissioner Latulippe, of Montreal, has forwarded to the Board of Control a communication in which he makes the following suggestions for the reduction of Montreal's abnormal fire loss:

"That the authorities of the City of Montreal ask the Legislature of the Province of Quebec to include in the law regulating the office of the Fire Commissioner the following amendments:

"(A) That the Fire Commissioners be authorized to inquire not only into the origin of fires, but also into the causes of their spread, such as the installation of electric wiring or gas pipes, the nature of the construction of buildings where fire breaks out, and also the nature of the buildings to which it spreads; the water pressure and the work of the firemen—in order to determine the responsibility.

"A—(2) To impose a fine on persons who by negligence have been the cause of a fire.

"A—(3) To impose a fine on persons whose property has been burned if the amount of insurance largely exceeds the value of the property destroyed, when it is shown in the inquiry that the policy holder was in bad faith at the time of presenting the report of his assets to the insurance company.

"A—(4) To oblige all persons whose property has been burned to make a report within twenty-four hours following such fire to the office of the Fire Commissioner, and also to impose a fine on all persons who fail to observe this regulation.

"The money collected as a result of these fines (the maximum and minimum of which would be fixed by the Legislature) could be applied to the firemen's benefit fund.

"B—(1) I would also suggest that the city should appoint an officer for each fire district whose duty would consist in reaching the scene of a fire before the firemen, of examining the place carefully, and making an immediate report of his examination to the office of the Fire Commissioners. Also the appointment of an officer skilled in matters concerning fires, who would act under the instruction of the office of the Fire Commissioners."

At a meeting held recently in Vancouver, the British Columbia Society of Architects was organized. A committee composed of Messrs. N. A. Leech, chairman; C. P. Jones, Putnam, R. T. Perry, and W. N. Dodd, was appointed to draft by-laws.

Noteworthy Congress at Montreal

Canadian Public Health Association, December 13-15—
An Interesting Programme for Municipal Engineers

The First Annual Congress of the Canadian Public Health Association will be held in the new Medical Building at McGill University, Montreal, December 13-15. The inaugural ceremony will be performed by His Royal Highness the Duke of Connaught, patron of the society. Her Royal Highness, the Duchess of Connaught, will also be present at the opening session on December 13th.

Considerable interest is being taken in the arrangements for this meeting. This is due in no small measure to the fact that the engineer will be well represented. Hitherto there has not been the desired co-operation in this field. Engineers, doctors and chemists have been working along their own lines—for the reason that they had no common meeting-ground. This need for co-operation resulted in the formation of the Public Health Association. The progress already made by this body may be gauged from the elaborate arrangements that have been made for the forthcoming convention.

The oldest public health association is the American, which is continental, and which has held some of its meetings in Canada. The first public health congress held in Canada was that of this association, which took place in 1886. This created tremendous interest at the time and laid the foundation for what was ultimately to be a national association for Canada.

Mr. T. Aird Murray, C.E., Convener of the Engineering Section of the Congress, has drawn up a programme which cannot fail to be of outstanding interest to municipal engineers throughout Canada. The papers scheduled for presentation include the following:

"Chlorination of North Toronto Water Supply," E. A. James, Town Engineer, North Toronto.

"Gravity Mechanical Filtration at Saskatoon," Geo. Clarke, City Engineer, Saskatoon.

"Garbage Removal and Destruction," R. H. Knight, City Water Department, Toronto.

"Water Supply by Air Tank Pressure for Small Towns," F. McArthur, Town Engineer, Yorkton, Sask.

"Mistakes to be Guarded Against in Water and Sewerage Systems for Towns," A. C. D. Blanchard, City Engineer, Lethbridge, Alta.

"Lantern Views of Lethbridge Sewage Disposal System," T. Aird Murray, C.E., Toronto.

"Natural Ventilation as Applied to Private Houses," T. W. Ludlow, B.Sc., M.A., Professor of Architecture, McGill University.

"Town Planning from a Sanitary Standpoint," J. Rawson Gardiner, architect, Montreal.

The general meeting will also include a symposium on sewage disposal, in connection with which leading chemists, bacteriologists and engineers will take part.

Members proposing to attend, and sanitary authorities and other organizations sending delegates, are requested to kindly intimate their intention at as early a date as possible to the secretary of the Com-



Mr. T. Aird Murray, Consulting Engineer, Toronto; Consulting Engineer to the Saskatchewan Bureau of Public Health; Convener of the Engineering Section of the Canadian Public Health Association Congress (Montreal, December 13-15).

mittee on Local Arrangements, F. C. Douglas, Esq., M.D., D.P.H., 51 Park Avenue, Montreal.

In order that members and delegates may get the advantage of reduced railway rates on their return trip, they are requested to obtain standard certificates from their local passenger agents on purchasing their tickets to the Convention.

Water Disinfection by Hypochlorite Treatment in the Province of Quebec

By James O. Meadows*

Two water-disinfecting plants have been in operation at Montreal for over a year and a half and the results secured have been, on the whole, very satisfactory. The typhoid fever mortality rate has been considerably reduced, and the city passed through last winter without having typhoid in epidemic form, an experience rather novel and unlooked for in Montreal. Both plants are only temporary, but as an additional factor of safety it is planned to continue the disinfection after the installation of the filtration plants.

The city disinfection plant is under the direction of a skilled attendant, while the Montreal Water & Power Company's plant is operated by unskilled attendants under the direction of the Provincial Board of Health. The bacteria in the untreated water at the two Montreal plants are shown by the diagrams, Figs. 1 and 2. Table 1 shows the typhoid deaths for Montreal for five years past.

Hypochlorite plants have also been installed at Beauharnois, Pointe aux Trembles, Shawinigan Falls, Grand Mere and Levis.

The Beauharnois water-supply is secured from the St. Lawrence River, and is polluted by sewage from the municipal sewers. Eddies exist in the river at this point, which carry the sewage over the water intake during certain times in the year. The consumption is 360,000 U. S. gals. per day and the water is treated with .6 parts of available chlorine per million. Good results (Fig. 3) have been secured with this plant, due to efficient operation, and healthy appreciation by the citizens of the merits of a purified water-supply. The plant has not been operated long enough to make comparative results as regards diminution of typhoid fever, but the reports so far tend to show a decided decrease. This plant, like all other hypochlorite plants installed in the Province of Quebec, is only temporary, the intention being to later filter the supply or substitute a new supply.

Pointe aux Trembles is located five miles below

*Sanitary Engineer, Provincial Board of Health, Montreal

TABLE I.—DEATHS FROM TYPHOID FEVER AT MONTREAL, MARCH, 1906, TO MARCH, 1911.

Months.	1906-07	1907-08	1908-09	1909-10	1910-11
March	13	7	6	12	6
April	4	10	7	7	4
May	5	11	8	6	9
June	4	5	0	7	5
July	4	7	5	7	8
August	11	12	5	9	14
September	5	12	14	14	13
October	19	12	16	24	8
November	15	12	22	22	11
December	18	9	19	52	7
January	19	12	43	78	5
February	6	12	9	29	6
Total	123	121	154	267	96
Estimated population	350,538	366,900	380,000	395,000	456,000
Typhoid death rate per 100,000	35.1	32.9	40.5	67.6	21.0

TABLE II.—BACTERIAL COUNTS OF RAW AND DISINFECTED WATER AT POINTE AUX TREMBLES, QUEBEC

Date.	Raw.	Bacteria per c.c. 20° C.		Bacteria per c.c. 37° C.		B. Coll.*			
		Treat- ed.	Raw.	Treat- ed.	Raw.	Raw		Treated	
						10 c.c.	1 c.c.	10 c.c.	1 c.c.
1911.									
June 24...	2,000	26	1,600	25	3/3	2/2	2/3	2/2	
June 28...	9,500	5	2,500	6	3/3	2/2	0/3	0/2	
July 5...	5,500	5,000	2,400	2,500	3/3	2/2	3/3	2/2	
July 12...	5,500	110	3,000	75	3/3	2/2	3/3	2/2	
July 19...	60,000	23	9,800	15	3/3	2/2	1/3	2/2	
July 26...	29,000	5	2,600	4	3/3	2/2	0/3	2/2	
Aug. 3...	6,500	6,000	5,000	5,000	3/3	2/2	3/3	2/2	
Aug. 9...	4,500	2	2,500	5	3/3	2/2	0/3	0/2	
Aug. 17...	34,000	140	7,000	15	3/3	2/2	3/3	2/3	
Aug. 24...	29,000	25,000	4,500	4,000	3/3	2/2	3/3	2/2	
Aug. 31...	5,000	850	2,000	500	3/3	2/2	3/3	2/2	

*Examinations for three 1 c.c. and two 10 c.c. portions of raw and of treated water were examined. The numbers in each column at the left of the inclined line indicate the number of samples in which coli. were found; those at the right show the number of samples examined.

Montreal, on the St. Lawrence river, and its water-supply is grossly polluted by the sewage from Montreal. The sterilization plant at this place has not been a success, due to irregular operation (see Table II). The consumption is 90,000 U. S. gals. per day, and the water is treated with .55 parts per million of available chlorine. It is hard to properly regulate the feed of the hypochlorite solution for such a small quantity of water.

The sterilization plant at Shawinigan Falls was installed in April, 1911, but scant data is available as regards its operation because of the indifference of the municipal authorities to co-operate with the Provincial Board of Health. The water-supply is taken from the St. Maurice river, ten miles below the city of Grand Mere, and is badly polluted by sewage during the low stages of the river. This consumption

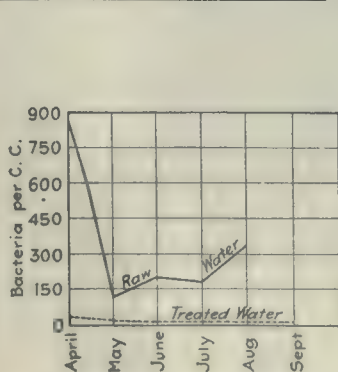


Fig. 1. Municipal Plant at Montreal.

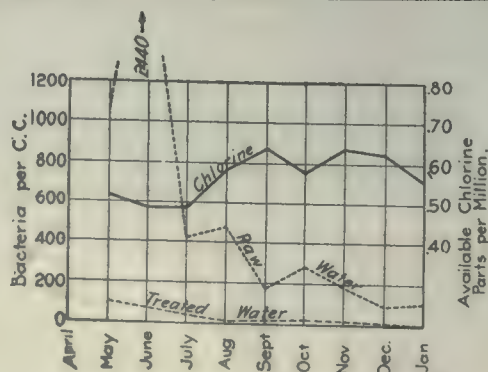


Fig. 2. Plant of Montreal Water & Power Co.

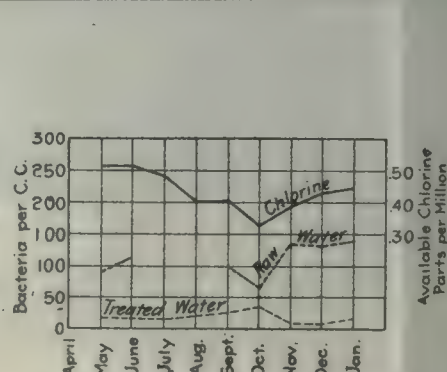


Fig. 3. Water-Supply of Beauharnois.

Figs. 1 to 3.—Average monthly results of water disinfection with hypochlorite at three plants in the province of Quebec

is 60,000 U. S. gals. per day and the water is treated with .75 parts per million of available chlorine.

A sterilization plant was installed at Grand Mere last spring to treat a temporary water-supply of a dangerous character. The sterilization of this supply greatly reduced an epidemic of diarrhoea which broke out when this supply was first used in its raw state.

At Levis, located across the St. Lawrence river from Quebec, a hypochlorite plant has recently been installed. At this point the river is affected by tides, and the sewage from the city is carried upstream over the municipal intake. The consumption at Levis is 840,000 U. S. gals. per day and the water is being treated with .7 parts per million of available chlorine. Fair results have been secured from this plant so far.—Engineering News.

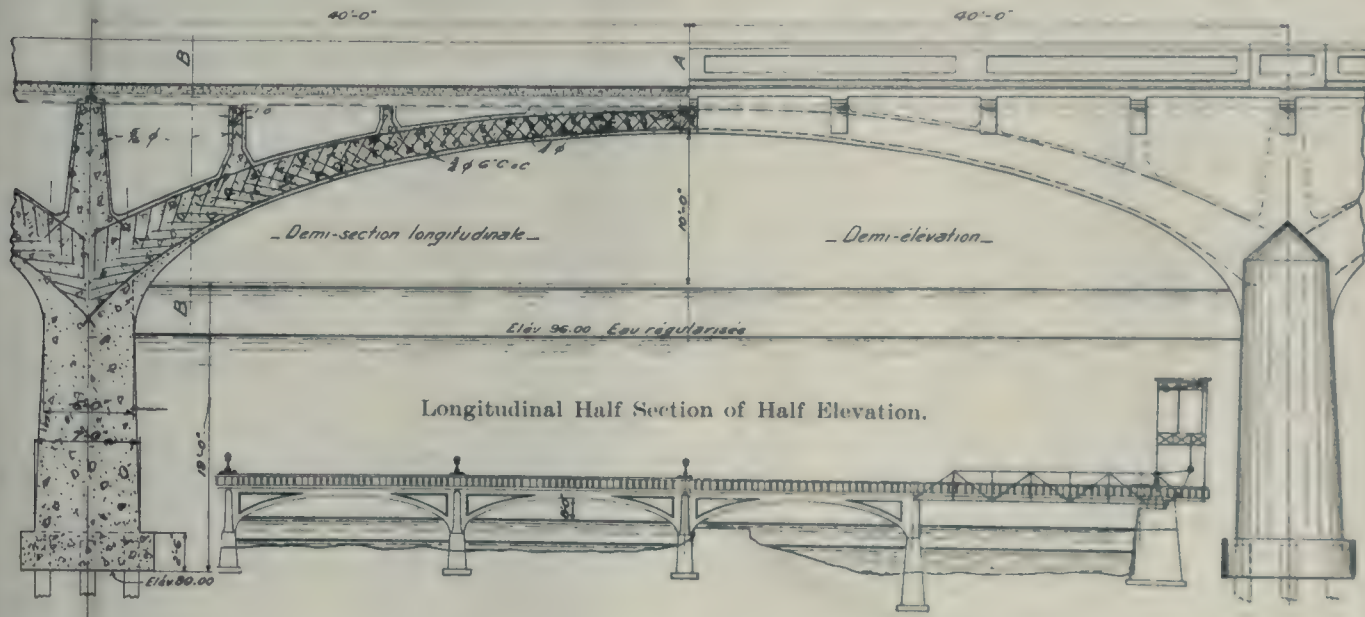
Bascule Bridge at St. John's, Que.

The bascule bridge at St. John's, Que., is designed to replace an old toll bridge now existing across the Richelieu River, and known as the Jones bridge. The new structure, which is being built on the order of

combined cutting, breaking, and rolling-on machine. Compound rails have been known hitherto, but the new method of affixing the two sections has been made possible by the advent of the Romapac machine, which is a substantial piece of mechanism and appears to do its work well. Two portions of track so laid in Leeds are apparently giving satisfaction in wear.

Asphalt Paving Repairs

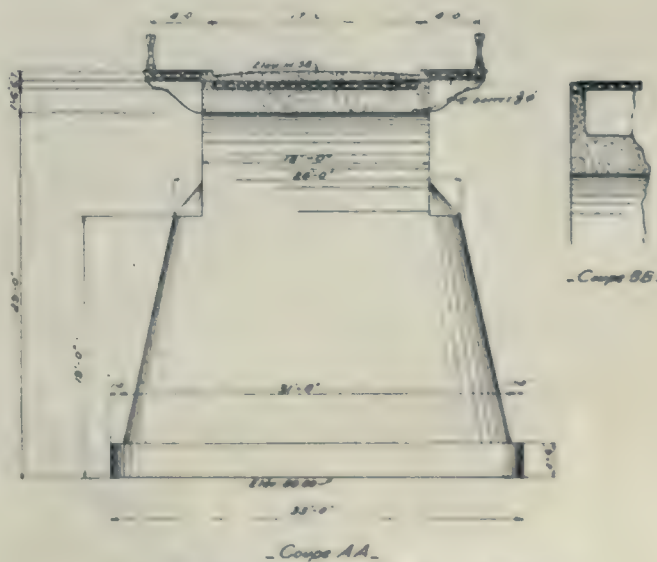
Asphalt paving repairs form the subject of a recent valuable report by the Chicago Bureau of Public Efficiency. It is certainly time for the taxpayers of Chicago and other cities where large areas of such pavement exist to give some attention to the subject. The money invested in these pavements reaches a very large total and the utmost value ought to be secured from it. But pavements, like everything else that is trodden under foot, are neglected by the public unless their condition is an annoyance, and it is this neglect which is responsible for a large waste of money. A pavement cannot be neglected without serious loss resulting and the



Details of St. John's, Que., Bascul Bridge.

the cities of St. John's and Iberville, will be situated about 500 feet above the toll bridge, connecting St. James street on the St. John's side with Market street on the Iberville side. It will be 1,525 feet between the abutments, constructed of reinforced concrete, and composed of 18 arches, 80 feet centre to centre of piers, resting on piles. The floor is to be of reinforced concrete, with paving of asphalt blocks. Over the Richelieu canal, it is proposed to construct a Strauss trunnion lift bridge. The work will include 7,000 cubic yards of concrete and about 100 tons of reinforced material. The engineers are Bauline & Mercier, Montreal, consulting engineers to the cities of St. Johns and Iberville, and the contractors are Laurin, Leitch & Lemoine, of Montreal. The cost is estimated at \$154,000.

A new system of tramway track is being exploited in England. This Romapac system embraces a compound rail from which the worn section can be taken and a new section laid without disturbing the permanent girder bed of the rail, by means of a special



Cross Section of Pier, St. John's Bridge.

maintenance of it similarly cannot be neglected without a like loss. Laying such pavements is too often regarded as something of an esoteric rite of contracting, and the repairing of them as a still deeper mystery. It is perfectly true that the manipulation of asphalt mixtures requires technical skill and trained labor, but there are certain essential features of the work which anybody can understand and all should demand. For instance, the bureau has discovered that a large amount of good pavement is torn up around the places where patches are needed. This is unnecessary, but the old material can be used over again by the contractor, so the practice continues. It is manifestly ridiculous to allow a contractor to take material from the city and sell it back again at a large profit. Again, the bureau has discovered that the binder course is often put down so cold that it cannot be consolidated properly. The binder course is a vital part of most types of asphalt pavement, forming the support for the more expensive and dense wearing course above it and binding the bituminous materials to the concrete base which is the real load-carrying part of the pavement. If this binder is not rolled thoroughly while it is in the right condition for consolidation, it shifts about or remains so open that the wearing surface sinks into it at places, forming depressions where deterioration takes place rapidly. It was furthermore discovered that an excessive amount of the relatively cheap binder was employed and an inadequate amount of the expensive wearing surface. The result of such conditions and others of a more technical character is excessive cost for poor work on one of the most expensive investments a city makes. American pavements have a hard enough life at the best, owing to the free and easy way in which every plumber and public service corporation tears them to pieces, and the way in which these people are allowed to wreck them and then to botch their repair is one of the reasons why our municipal housekeeping is deeply affected by the high cost of living.—Engineering Record.

"Going Down?"—Cement

That the Canada Cement Company are working upon the idea of increasing consumption by lowering prices, rather than by curtailing production and obtaining higher prices, is clearly shown by the president's report to the shareholders at the last annual meeting, when he stated: "It is confidently expected that the increased demand and increased output will result in further savings in the cost of manufacture and distribution, and it is the policy of your directors to give your customers the benefit of these reductions." This is further evidenced by the announcement, which was made on November 1st, 1911, of a still further reduction in the price of cement. The reduction in some districts is ten cents a barrel, and in others five cents. On the whole it will probably average seven cents a barrel. This reduction—with the reduction made last year—means a very large saving to the cement consumers of Canada.

The Polished Surfaces of London's Streets

After a spell of dry weather the streets of London, paved with wood and asphalt, become polished to a very high degree. The sheen upon Victoria street, Piccadilly and some other roads is so remarkable that at night they shine almost like ice in the glare of the lamps, writes Lord Montague in *London Car*.

If an unused section be observed over which motors do not run, no polish will be seen, but in the middle of the street, the surface, though curiously enough not slippery in its dry state, is polished like the floor of a ball-room, the natural effect, when one comes to think of it, of rubber and steel in juxtaposition, and the slight but continual slipping of wheels over a surface of hardwood.

The centre of the streets has become marvellously clean, and all the horse refuse is blown into the gutters near the pavement, which, being often flushed with a trickle of water, collects most of this light and dangerous detritus which would otherwise be blown farther afield. I have often written of the *Ebony Way* down the Champs, Elysees in Paris. We have now in London many ebony ways, but not being given as a nation to so much over-lubrication as our Gallic neighbors, our roads are not so black, owing to dripping oil on the surface. The surface of our streets is becoming more like polished ivory than polished ebony. The effect of the Road Board and its grants is already to be seen all over England, in regard to the making of main roads dustless.

The Rail-wear Problem

Open-hearth rails with high carbon content and low phosphorous offer one of the most favorable possibilities for the solution of the rail-wear problem, according to the belief of Mr. J. T. Richards, chief engineer of maintenance of way of the Pennsylvania Railroad, expressed in submitting information on the results of some tests to the committee on rails of the American Railway Engineering Association. A test of open-hearth, nickel and Bessemer rails was made on a 6-deg. curve on the eastbound main-line track near Union Furnace, Pa., carrying both freight and passenger trains. The comparison was between open-hearth rail with 0.79 per cent. carbon and 0.024 per cent. phosphorous; open-hearth, 0.896 per cent. carbon and 0.009 phosphorous; nickel rail and ordinary Bessemer rail. Observations covered a period of 818 days, the wear on the first three classes of rail being very nearly alike throughout the test, the nickel showing slightly better at the end of the test and the open-hearth standing in the order of their carbon content, the high carbon being about midway between the nickel and the lower carbon rails. The Bessemer rail was removed from the track, worn out, at the end of 405 days. The high carbon rail did not fail nor break during the test and was not nearly as much worn at the end of 818 days as the Bessemer rail after 405 days.

Concrete Affected by Freezing Weather Repaired

Considerable trouble has been experienced in repairing concrete which has been exposed to freezing weather before acquiring final set. The following method has been used quite successfully:

Chip off with a pick and bull point the concrete which has been affected by frost, and then thoroughly wash the exposed surface with water, using stiff scrubbing brush, until entirely clean. A 1:3 solution of muriatic acid is then applied with a brush, and the surface is again washed. As soon as possible after this is done a very wet mixture of new concrete is applied.

Is the Quebec Bridge Design a Failure?

**Prominent U. S. Engineer's Exhaustive and Sweeping Criticism—
A Great Opportunity but a "Disappointing and Lamentable" Result**

The modus operandi of the Dominion Government in the whole project of the Quebec bridge, as well as the adopted plans, are the subject of an exhaustive criticism by Gustav Lindenthal in a recent issue of the Engineering News. This article includes an instructive comparison of the Forth Bridge and Quebec Bridge designs. Owing to pressure of space however, we are unable to extract more than the generalities expressed; but these are of outstanding interest.

Mr. Lindenthal criticizes the procedure of the Board in no measured terms. It is one thing, he says, to lay down general rules and specifications for a large structure and an entirely different thing to work out a design. The first can be done by a Board or Commission quite well; but the second cannot be done that way satisfactorily. If a bona fide competition was desired, then it should have been invited from a number of firms or designers to whom at least the actual expense of making the plans for such an unusual structure should have been paid. This is a just and recognized practice in architectural competitions.

Invitation of Competitive Designs; Remarkable Conditions of This Invitation

The Board after much labor and time brought forth minute specifications and an official design called the Board's Design (with several variations of trivial importance), on which tenders were invited from bridge construction companies. With feigned impartiality these companies were also invited to submit designs of their own, if they desired to do so, also with tenders thereon. The Board's Design was for a cantilever structure, carrying a double-track railroad and two wagon roads and trolley lines, the same as for the collapsed bridge but for a greater live-load.

The preparation of that design cost the Canadian Government about \$500,000 and 2½ years' time. But the bridge companies were expected to make their competitive designs without compensation and in four months' time. If five or more of the world's bridge firms had been invited to prepare competitive designs, on a proper general specification, in six months' time, and for a compensation to cover expenses, then at 20 per cent. of the cost of the official design (which afterwards was ignored) and in less than one-quarter of the time there would have been a choice from a number of superior plans with tenders thereon, which would have represented the best practice and advance in the art.

Fairness required that all designs invited by this Board, including its own, should, if need be, on its own motion, be subject to scrutiny and decision by a special and unbiased commission of engineers. The impression prevailed, not unnaturally, that the Board would be prejudiced against other designs but its own. In fact the specifications were pointed to as proof of bias. But as it was, the same Board responsible for the official design (with only one member out of three changed) was and presumed to be

also the judge of the designs competing with it. How much or how little confidence that Board or its majority, which had prepared and adopted the official plan, had in its own qualification may be gaged by the fact that it required its own design, which presumably represented its best collective wisdom, to be guaranteed by the contractor, who had to assume under Par. 5 of the specifications "the entire responsibility not only for the materials and construction of the bridge, but also for the design, calculations, plans, and specifications and for the sufficiency of the bridge for the loads thereon specified."

One may wonder why under such conditions the Board should consist of engineers at all. What confidence could a body deserve or command, which having been under no limitations for engineering expenses or for time in making plans, was still so doubtful about them as to avoid responsibility, which it placed wholly upon the bidders, who had not been consulted about the plans, who had no share in making them or a voice in selecting the engineers that made them?

The psychology of that provision, of course, is not hard to understand. The old bridge fell down; it was the fault of the engineers. Engineers are irresponsible; they have no wealth. They cannot respond in damages, but the contractor can, so if he is anxious enough for the contract and the profit from it, put the whole thing on him. What a conception of professional duty, honor and dignity for engineers!

It is quite true that the contractor has and should have the sole responsibility for the erection of the structure, as the erection, once its method is decided on and approved by the engineer, depends largely on the management and organization of his own forces and appliances. But this responsibility is sharply distinguished from that for the design and for the strength and safety of the bridge and for its erectability. This should be wholly the responsibility of the engineer.

While thus the contractor has a responsibility placed upon him under the specifications and contract which should not be his, there are some strange provisions in them which put power into the contractor's hands which he should not have. Under Par. 113, certain "plans, submitted or approved by the Minister, shall be subject to the joint approval of the Board and Contractor." If under that clause, the Board and contractor should not agree, or even if they did agree, in overruling the Minister, (who, by the way, appoints the Board), what then? It would seem that even greater confusion of authority is here evident than existed for the bridge which collapsed. Directions may be variously issued under these specifications by the Board, by a Chief Engineer, who may or may not be a member of that Board, and by the Minister of Railways and Canals, for whom other things is reserved the determination, presumably as befitting his rank, of the last two coats of paint (\$295). Engineers who draft such specifications, or

countenance them, make the engineering profession ridiculous, and lay it open to reproach, not infrequently heard in the press and from public men, that they lack in executive and administrative ability. It would be painful in this connection to contrast the engineering conduct of this work with the very able management of the construction of the Forth Bridge by its engineers, who upheld the best traditions of the profession and richly deserved the honors bestowed on them.

Of other provisions of the specifications it could have been foreseen that they would greatly increase the cost of the work, without any corresponding benefit. Such was the provision of a deposit of \$500,000 in cash with any tender, as a guarantee that the bidder will accept the contract if awarded to him. A deposit of a certified check with tender on public work is usual and necessary to exclude irresponsible bidders, but that the deposit with the tender should be so large and in cash, withdrawn from bankable funds, is an onerous and unwise provision, because it has the effect of reducing the number of responsible bidders and greatly increasing the cost of the work.

So also is the provision of an additional deposit in cash of 10 per cent. of the contract, with only 3 per cent. annual interest on it. A large bond for large work is justifiable and should have been provided, but to insist that the security be also in cash, the two together exceeding the capital of some large banks, must result in another needless increase of cost. Judging from the exceedingly high unit-prices in the tenders, there is no doubt that the cost was increased many hundred-thousand dollars for a hypothetical surety. For if the bridge should fall again, the cash deposits would be entirely insufficient to pay for the loss and damage.

Notwithstanding the unfair conditions under which the competitive plans were invited, several plans were submitted with tenders from Canadian, English, American and German firms, such is the keen rivalry for large contracts.

Excellence of the Forth Bridge Design

The more the Forth Bridge design is studied, the more evident it appears that the engineers of that structure used with masterly skill every device that would promote economy, stability and reserve of strength. They had no precedents to go by, and had to solve the problems on original studies. The enormous difficulties arising from the extremely large riveted connections, and in providing for them the necessary large contact surfaces, all of which enhance weight, were ingeniously met. In this respect the American pin connections offer the great advantage of simplicity, cheaper fabrication and easier erection, which were not available to the English engineers.

Its architectural appearance is imposing, but not slightly. A different treatment of the towers and a slight bend in the top chord of the high trusses would have esthetically enhanced the character of the cantilever type. But this would have produced greater complexity in the angles and conditions of web members, lying in warped surfaces, which may have been the reason for not doing it.

The writer did not, at one time, favor the insertion of the stiff diagonal members (subject to tension and compression) in the side towers, regarding them as redundant members, which made that part of the system statically indeterminate. That was before the completion of the bridge. But the official tests later

on showed remarkably small deflections, maximum only 5 ins. for the Queensferry cantilever ends, 1/4, 100 of the span, and this result may be due in large part to the stiffening effect of those diagonals, which also help to reduce the secondary stresses in the trusses. A comparison with the double-track railway bridge of 470 feet span over the Niagara River will in part confirm this view. The trusses here have no diagonal in the towers. The bridge was tested in 1883 and showed a maximum deflection of $7\frac{3}{4}$ ins., or 1/730 of the span.

It appears that the Forth Bridge, although designed for a live-load of only 4,500 lbs. per lin. ft., can safely carry much heavier train loads, as indicated above.

Possibilities of the Cantilever for Quebec

If the competitive designers for the Quebec Bridge could have been at liberty

First, to use in the trusses unit-stresses averaging one-fourth of the ultimate strength of steels as in the Forth Bridge, which are more than ample;

Second, to choose greater height in trusses as in the Forth Bridge, thus reducing the chord stresses;

Third, to use curved bottom chords, thus carrying a large part of the web loads directly to the piers and reducing the web stresses (the bottom chords in the Phoenix Design are too sharply curved and are liable to produce reversible web stresses, which must be avoided in long members); and

Fourth, to use double or multiple-system webs, thus with small ambiguity obtaining the great advantage in a heavy bridge of diffusing the web stresses and reducing the column lengths and the bulkiness of connections;

Then the competition would have proven that a cantilever bridge with the same large margin of strength as the Forth Bridge could have been produced for a live-load of 12,000 lbs. (retaining the heavy floor-system of the Board's Design) with about 112,000,000 lbs. of steel, as indicated above. The saving over the official design, which contained 147,000,000 lbs. in the cantilever portion, would have been (at the lowest unit-prices bid) about \$2,700,000.

But every feature which would tend towards economy was inhibited by the specifications, without any apparently good reason. The height of trusses was arbitrarily limited to 200 feet. The chords of the cantilever and anchor arms had to be straight; but the top chord of the suspended span, curiously enough, could be curved.

The trusses of the official design contained enough steel to carry, in better designed trusses, with a large margin of safety, the floor and train loads of four heavy railroad tracks, besides the wagon roads and trolleys; while the floor was dimensioned for only just two railroad tracks, two roadways and two trolley lines. It was not in any respect a well balanced design.

The Accepted Plan

About 24 tenders and eight or nine competitive plans were submitted by four bidders. The only variations in the cantilever bridge of the Board's design offered by bidders related to erection, web details, and length of anchor arms. The tenders on the Board's design varied from \$11,000,000 to the extravagant price of \$16,000,000, and from 7.6 cents to 11 cents a pound for all steel (carbon and nickel).

Among the competitive plans there were indeed several (all from one firm) which were much lighter

and cheaper than the Board's design, but these were, every one, in contravention of the official specifications. Dire consequences were apprehended by the tenderers, the least of which was the throwing out of their plans if they did not comply in every respect with the Board's specifications. One firm, understanding probably better than the others the home-atmosphere, dared to ignore the rules of the game, and in that way it happened that cheaper designs were submitted. One design had only 96,000,000 lbs. of steel in it, including approaches, and cost \$9,000,000; it was just the plan chosen and accepted by the Canadian Government.

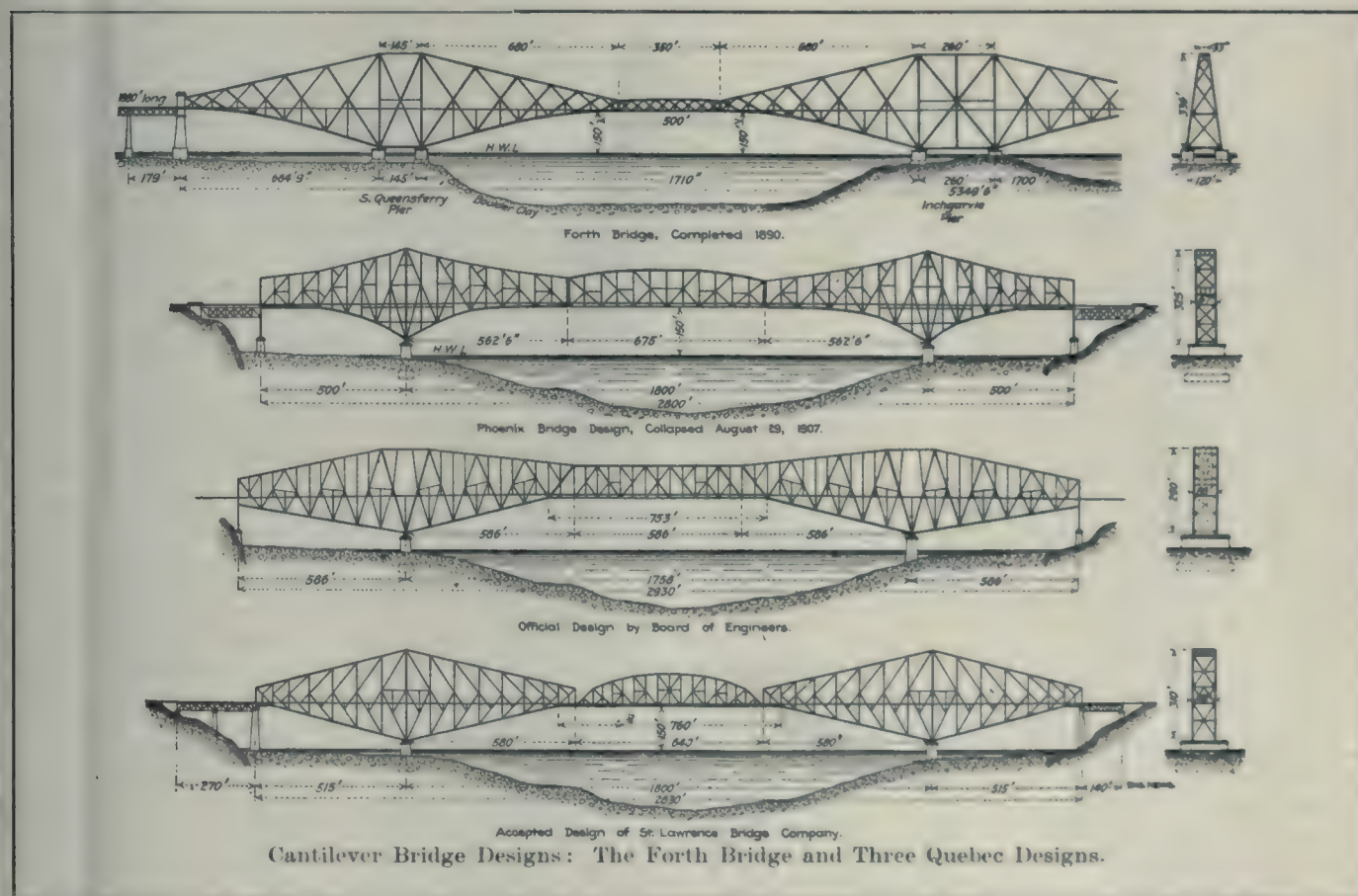
The Government's Attitude

The action of the Government in this respect was not fair to the other competitors, who had acted honestly and in their designs had strictly adhered to the

bridge structure could be built for a sum much below the cost of that official design. One can understand how under these circumstances he may have had the desire to lose no more time, and that probably from motives of expediency he adopted, although in violation of good faith to all the other tenderers, the lightest and cheapest design (but not the cheapest in unit-price) submitted to him.

That the rules of ethics which govern honorable men in their private affairs may thus be ignored by officials in public affairs, seems to be viewed by the public in this age not as the immorality which it is, but as a matter of indifference. So the "injustice" had to be accepted with complacency by those directly concerned—there was no help for it.

The public interest would have been better pro-



conditions laid down. There is no doubt whatever that, had they taken similar liberties with the specifications, the nine-million-dollar design would not have been the cheapest.

But what was an ill-advised, perplexed Minister of Railways and Canals to do?

The Canadian Government has already expended (or obligated itself for) over \$7,000,000, including the cost of the collapsed structure, engineering and contracts for new piers, and had lost three years' time in commencing the new bridge, with the interest account running on. From the fact that the very costly Board's design was not adopted by the Canadian Government it can hardly be claimed that in the end it valued highly the ability and the expensive surveys of its own technical advisers.

The responsible Minister had to find out in that way, almost by accident, that a strong and serviceable

tected if all the plans had been rejected and new plans and tenders invited. With the preparation which all the bidders had, new plans and bids could have been submitted by them in two months' time. But to order and do these things would have required some competent head, which did not exist.

Nor does any really responsible technical head seem to exist now. Since the conclusion of the contract there have been other changes in the personnel of the Board, only one of the original members remaining. There are good reasons for the belief that quite different and better results would have been produced by the present Board; but it is too late. The contract is made and the hands of the Board are now tied. Under the contract the entire responsibility for design, execution, etc., had to be assumed by the contractor, as above mentioned, so that the present Board, it appears, has no discretion, no power and no respons-

ibility, except that of seeing that the work is executed as per contract.

No detailed information about the adopted design has been published. The proportions of nickel and carbon steel have not been stated. Those who have studied the Quebec problem will at once concede that a good cantilever bridge and its approaches can be built within 96,000,000 lbs. and within the contract price of \$9,000,000. But it is also a fact that within the same weight and price the bridge could have been made sufficient to carry two heavy railroad tracks, two wagon roads and trolley lines, since the live-load of 10,000 lbs. per lin. ft. is ample for these on an 1,800-ft. span; and this fact the Canadian Government could ascertain for itself, if it chose seriously to do so. If, as reported, the adopted design does not provide for wagon roads and trolley lines, then the choice is a stupid blunder, not by any means excusable by an apparent saving in cost over the other plans submitted, which had complied with wasteful specifications.

It is also stated that riveted connections are to be used throughout and that the tension members are to consist of nickel-steel shapes with riveted splices in place of the well-tested forged nickel-steel eyebars, so much lighter in useful weight. If this be the fact, it would be a retrogression in bridge construction for which no good reason can possibly be furnished. In that respect, at least, the Board's design was much better.

As already mentioned, it was a distinct loss to the Government that the special knowledge and experience gained by the able engineers of the Royal Commission, which had investigated the collapse of the first structure, was not availed of in the plans of the new structure. They were particularly well qualified and cautioned by their investigations to draft specifications for and to sit in impartial judgment on new designs, which should have complied with the high standards which can be set for such work. Several million dollars and at least two years' time would have been saved in that way.

The desire of the Canadian Government to have the bridge built in Canadian shops and with Canadian steel as far as practicable was perfectly legitimate, and should have been frankly stated in the invitation to bidders, instead of veiling its intentions by the pretense of an international competition, which was a farce and which put English, German and American bridge firms to large and unnecessary expense.

The Aesthetic Phase of the Quebec Bridge Problem

The aesthetic considerations which present-day civilization has a right to expect in a work of this magnitude and importance were entirely neglected. Not a word on that feature was contained in the specifications; not the slightest effort was made in that regard. There are several cantilever structures, in this country and abroad, which prove that they can be made architecturally sightly.

The bridge which collapsed had some grace of outline; so has also the Forth Bridge, so much derided for its bulky appearance. But none can be claimed for the new cantilever designs for the Quebec Bridge, which are ugliness itself. It would seem that as in no other monumental work, benighted amateurishness found true expression (we believe, quite involuntarily), not only in the coarse outlines of the structure, but even in such small features as the short approaches consisting of little, miserably weak-appearing girders on the slopes between the abutments and the an-

chor piers, instead of solid concrete masonry arches, which cost hardly more at present cement prices.

As is well known, the cantilever bridge is one of the oldest types. Some ancient examples still exist, built by savages of tree trunks and bamboo sticks, anchored down with boulders. Made almost without tools and with scanty resources, the vernacular architecture of these crude structures, set into a wild landscape, has a certain charm of its own which is a delight to the lover of simple comeliness and should be a lesson to the educated engineer.

To give a pleasing form to its creations seems to be an instinct of the human race as far back as history can trace it. The higher the culture, the more refined that instinct, in all races and in all ages, as proven by thousands of structures for thousands of years. This fact makes architecture an accepted standard and measure of civilization. It remained for the modern metal bridge engineer to change that notion and to create in conspicuous locations unsightly structures and even to feel proud of them. Every large bridge destined to last many centuries should be designed on pleasing lines. This need not add anything to its cost but requires a little more work and study. Posterity, more enlightened in science and art, may well ask whether the wits of the designers of the Quebec Bridge were all used up by details and strain sheets so that none were left for artistic form and character.

As long as engineers as a class are indifferent in this regard, or satisfied to be mere utilitarians (and sometimes mere tyro utilitarians at that, ranking in this respect below their unlettered forbears and in our day not above the mere mechanic), so long will they experience and merit the low esteem which cultivated taste and minds accord to them in aesthetic matters.

Here in the case of the Quebec Bridge, destined to last centuries, was an unhampered opportunity for engineers to prove, if they could, that an aesthetically pleasing form can be given to a large bridge, whatever its type. The result is disappointing and lamentable; it will not represent, as it should, the good work that can be done in the twentieth century.

A syndicate of British capitalists will erect an immense cement works on Saanich arm, opposite Todd Inlet, Vancouver Island. The syndicate has already acquired about 100 acres of land, including a mile and a half of water frontage. The purpose of the company is to install a plant having a daily capacity of 2,000 barrels, the machinery for which is already ordered. Three hundred thousand barrels of cement have been imported into the province during the year. The syndicate, therefore, considers that there is an immense field for that business.

The old Pembina highway, running southward out of Winnipeg, is in a fair way to become the most important road in North America. A chain of six of the United States have signified their willingness to join forces and funds in constructing a great transcontinental highway from Winnipeg to the town of Galveston, Texas, situated on the Gulf of Mexico.

According to the recent census, Montreal ranks ninth and Toronto thirteenth in population among the large cities of the North American continent. The first three places are occupied, of course, by New York, Chicago and Philadelphia.

The Financing of Engineering Projects

When it Pays and When it Does Not Pay the Contractor to Take a Venture—Sometimes an Introduction to Good Contracts*

Much construction work that is done in this country is for existing corporations, either public or private, that are on a sound basis. That is, in case of public corporations, the work is done for towns or cities, or for the various state governments or the national government. Their ability to pay for construction work cannot be questioned. In the case of private corporations that are already operating, their financial standing is readily ascertained, and a contractor runs but little risk that he will not be paid for the work he does.

A large amount of work, however, is done for new corporations, and not only is their financial standing in doubt, but in many cases the chances may be against the new project ever being a paying one.

Such projects are generally the schemes of promoters, and in the past many men engaged in this business have not had very savory reputations. As a class they have been men who are anxious to get rich quick. Many of them have achieved great success and made large fortunes, and their names and achievements have attracted others to the promotion business, for failures are quickly forgotten. Many contractors have had dealings with promoters, so that it is small wonder that engineers and contractors, who are likewise interested in construction work, should be drawn into the business of promoting engineering projects.

It is a perfectly legitimate business and if done along proper lines is honest, and is work that no one need be ashamed of doing. There is no reason why contractors should not engage in such enterprises provided they understand the details and realize what it may mean to them. We could name a number of prominent contractors who have been successful promoters.

Pointers for the Contractor

Besides mining promotions, the most common schemes that call for construction are, steam and electric roads, power developments, irrigation and drainage projects, and water supply and sewer systems for towns and cities. Many good projects that show prospective profits in operations can have money raised for them without great trouble; but large enterprises that may antagonize companies that already exist, even when there can be little question of their paying in operation, are very difficult to finance.

This is especially so of railroad projects that compete with existing systems. The financial interests of the country are closely allied and are very jealous of newcomers, making it a very hazardous undertaking to promote and build a railroad that they may oppose. It has been stated that when the financial interests object to the building of a new line they can prevent the necessary money from being secured, or failing in that, they can attack the promoters through other interests that they have and so weaken them that the control of the new road will pass from the owner's hands. In other words, the building of the road is either defeated or the road passes into other hands. It is true that there have been exceptions

to this, but they are rare indeed. We hear much these days of trusts, but there is no greater trust or combination than the "money trust," although such a trust does not exist through any organization, nor has it any legal status. One cannot even tell of those who form this combine; but that it exists is a fact, and the ordinary promoter will find it useless to attempt to fight these interests. Their influence is not only great in this country, but it plays an important part in the money marts of Europe in reference to American projects.

Many small lines or systems can be built without raising any opposition from the money trust, but when these roads become paying propositions, pressure is brought to bear to compel the owners to sell, and frequently the sale price is much below the real value. All of these facts and many more should be kept in mind by contractors who contemplate promoting steam and electric roads, especially the former.

One of the first things a promoter must learn, if he wishes to continue in business and achieve success, is not to use his own money, especially if he is a contractor. To do so means to spend his capital without any quick return, so that soon all he has is in his scheme and he has no means of raising additional funds. Almost at the outset others become interested in the scheme, and as they enter it to make money it is but right that they should furnish money to pay the necessary expenses of surveys, prospectuses, traveling and similar features. Much information must be gathered and formulated and reports must be gotten up, and in many cases more money must be spent than is anticipated. Many good projects are never put through owing to the fact that promoters believe only a few thousand dollars are necessary to promote the scheme, when really many thousands are needed.

The enthusiasm of the promoters often causes them to make mistakes or leads them to believe success will be achieved quickly. Those who are asked to invest money will not have this enthusiasm, but will consider the matter from a purely business standpoint, without sentiment. A story illustrates this:

A Ton of Rails for a Ton of Bonds

Two southern contractors who were promoting a road three or four hundred miles long organized a company, had the necessary surveys made, and had reports and data showing the probable income of the road. They believed it would be an easy matter, with the showing they could make, to secure ample money to build and equip the road, and as a starter they proposed to go to Pittsburg to secure the rails. Money for their expenses was appropriated and they started off. On the way, one contractor said to the other, "Now Bill, you let me handle this steel king, as I know how to work such men, and you chip in when I ask you. I will show you how to work such a man." Arriving at Pittsburg, they waited upon the steel king and made an engagement with him. At the proper time they laid before him their reports, profiles, maps and plans with estimates of cost; also the character of the country through which the road was to go, together with statistics as to towns, business, prob-

* By Daniel J. Hauer in "The Contractor" (Chicago)

able income and similar details. The steel king listened with much interest until they had finished, when he asked, "Gentlemen, what is your proposition to me?" Up spoke the diplomatic contractor and said, "It was our idea that your company, realizing the great value of the bonds we are to issue on this road, would be willing to furnish us with the rail we need in exchange for bonds." "Yes," said the steel man, "we have done that at times and we would be willing to do it for you upon a fair basis. Let me see, I think we could furnish you a ton of rails in exchange for a ton of bonds."

"Come on, Bill, let's go," said the diplomat. When they got outside Bill said, "Mike, you sure know how to handle these steel kings. Let's go back to South Carolina." This happened more than ten years ago and the road is not yet built.

Contractor-Promoters Get the Business

Large construction projects cannot be built with one man's money, nor with the capital of one or two. They may start it, but it is necessary to secure funds through some banker or syndicate of bankers, otherwise the burden will be too great. A fair amount of stock can often be sold locally, but most of the bonds must be disposed of elsewhere, and in many cases bankers insist on a bonus of stock with the bonds they take over.

Even with small projects, if the promoters use their own capital, then, if they are contractors, their working capital is tied up and they are thus prevented from undertaking other work that might prove profitable.

One attractive feature of contractors promoting engineering projects is that not only can they make money on the promotion of the scheme, but they thus furnish themselves with a good job at good prices.

Contractors, when they do not promote jobs themselves, must deal with promoters, and often through their own banking and brokerage connections they assist the promoters in raising the necessary funds for construction and operation. When contractors become the actual partners of the promoter and know every move that is being made, they can act with confidence that they will receive payment for the work they do; but when the promoters act independent of the contractors, but with their assistance, then, at times, there is grave danger of the contractors being deceived and losing money either directly or indirectly.

Familiarity with Details Essential

Under the last named conditions the contractor should insist on knowing all the details of the promoter's business, especially the contracts that have been made for stock selling and underwriting of bonds. If this information is refused him he had better withdraw from the whole deal before it is too late and he has lost his own capital. That a contract exists for underwriting bonds or raising funds is not enough. The terms of that contract must be known, and it is even necessary to know the parties to the contract and if they have such a standing as will allow them to secure the money needed. The writer wishes to be emphatic on this subject as he feels keenly on it, having been caught himself by the fact that in one project, in which he was interested a contract for underwriting had been made, and knowing this he went ahead with his work without knowing the conditions and terms of the contract. If he had seen the "fool contract" he would never have started the

work, and many thousands of dollars would have been saved to him and others. If a copy of the contract cannot be obtained from the promoter, then one should be gotten from the public records, as in most cases these contracts must be recorded. In other words, know every detail of what you are doing so that you can safeguard yourself in every manner.

A contractor can assist a promoter in several ways. If the contractor has large capital he can furnish funds directly himself. He can, through his own banking connections, place the promoter in a position to obtain money, or he can accept bonds either in part payment or for the entire work to be done.

Mention has already been made of using up a contractor's own capital by furnishing funds direct. The best plan is to put the promoter in the way of securing money for his stock and bonds through bankers and brokers, and thus put all of the construction work on a cash basis. When bankers and brokers take over the securities direct they are enabled to handle them in large quantities much better and to keep them on a much higher plane, and actual cash is secured much more easily and quickly, although a large margin on the securities may be demanded; but it is better to pay larger margins and be sure of the money rather than to wreck the whole scheme in trying to save a few dollars.

Bonds in Payment for Work

A third way of contractors assisting a promoter is to accept, in payment for work done, bonds of the corporation building the project. In the contract between the corporation and the contractor there should be a clause setting forth how many bonds shall be given the contractor at each payment, when part payment is taken in bonds, and at what price.

Bonds will not pay labor and material bills, so the contractor must use up his own capital, borrow money on the bonds, or sell them at once. It is seldom good policy for a contractor to hold such bonds. Their value for some years may be in question and the same amount of money invested in gilt edge securities would in all probability net a large income in a given term of years.

To borrow money on such bonds may be only a temporary relief, for if the project fails, the securities become worthless and the contractor will have to furnish the banks other securities. Of course, there may be a chance of the bonds increasing in value, which would be a benefit to the contractor, but, as previously stated, the best plan is to sell them.

When bonds are to be sold arrangements should be made before the making of the contract with some bank or bond-broker to handle and sell these bonds. If this is not done the contractor will be compelled to make arrangements monthly for the sale of his bonds, with the result that many delays will occur and the contractor will frequently find himself in straits for money.

Also, the bonds will be offered at all kinds of prices in order to raise money on them, thus injuring the future sale. These conditions quickly arise and each month they grow worse. All kinds of trading has to be resorted to, to obtain money on the bonds. This shows the necessity of arranging for a market before beginning work. A contractor seldom has either the experience or facilities for disposing of stock and bonds and should always turn such matters over to a competent banker or bond broker.

These and many others are the considerations that

should be given to this kind of enterprise. Those who have never engaged in them should go into such projects with great caution and after careful deliberation. Much money can be made in such schemes, and some contracting firms or corporations only take work for which they furnish the funds or through banking connections provide the money. Others carry on such work, at the same time accepting cash contracts from which money is earned to enter other promotion projects.

The prices obtained for such work are always high, as the contractor can dictate his own terms and the form of contract and specifications can be made favorable to the contractor.

There are engineering companies that do nothing else but promote construction work, depending upon contractors to associate themselves with them in carrying out the jobs they obtain. Such a connection is a good one for a contractor, but the contractor should never let his enthusiasm warp his judgment in such matters.

Detail in Concrete Work

There is far more wisdom in doing a simple thing well than in trying to accomplish the impossible with continued failures. The aptness of this truth should force itself upon every operator in concrete, says Cement Era. He should be able to do whatever he assumes to do, in a way that will be just a trifle better than his competitor has done. If he is simply building concrete sidewalks let him do this in such a way that it will bear critical inspection, and he will not have worked in vain.

One man makes a specialty of concrete brick. He works at this single idea with such earnestness that his results are wonderful. Not only does he make a moisture proof and fire resisting brick, but one that has beautiful and attractive faces. He prides himself on the latter feature of his work, and justly can he do so, because there has never been such artistic specimens of brick seen in the past. His brick have stood the most severe tests for tensile strength. They have commanded the highest price, and are today in demand in many sections of the country at high prices. How to do this has been the study of years, but it has proven the wisdom of his endeavors.

He makes a feature of moisture proof and fire proof brick. How can this be done unless there is study given the matter? He has studied the component parts of cement, the varying grades of sand, and what will prove to be the best aggregates. He has found the secret of careful mixing and more careful molding and curing to be factors of such importance that they are vital to his operation.

He who desires it can develop in an artistic way the greatest results in concrete. Some operators are devoting their time to this idea with a marked success. They have studied the subject with more than ordinary vigor, and the fruits of their endeavors have been achievements of notable labor. How can this be done unless there is concentration of your endeavors. See to the minute details, to the intricate points that at first seem to be trivial. These are the ideas that must be cultivated by the successful operator.

If you will seek out the varying kinds of concrete construction and note the variation in the work you will be surprised at the wide difference in one from another. Some operators will never consider a job complete until they have noted that every detail is

above reproach. Others will be as content to pass a job if it has the least appearance of finish. They will gladly call it completed and collect their money, ready to begin on another with the eagerness that is the best mark of their carelessness.

Blocks are one kind of concrete that have been slighted over in so many instances that many people are now averse to their use at all. There is reason for this aversion, and just reason, in very many cases. What has been the result of the average manufacturer in concrete blocks? He has contented himself with a meager knowledge of the intricate details of concrete work. He has purchased a machine, often a poor specimen of this type of equipment, and with a slight insight into the details of block work, has essayed to manufacture blocks and compete with competitors who have devoted years to earnest labor to their work.

The results of this haphazard business method have been to instill in the minds of the many that concrete, considered as a whole, or as a special feature, is a failure. Seeing only the evil effects of this poor work, and overlooking the best jobs that are in evidence in almost every locality that possesses concrete work, they have condemned all alike. It is hard to blame men for this action, when there is at least justice in some of their censures. The blameable party is the concrete operator who has seen fit to content himself with the cheapest work possible.

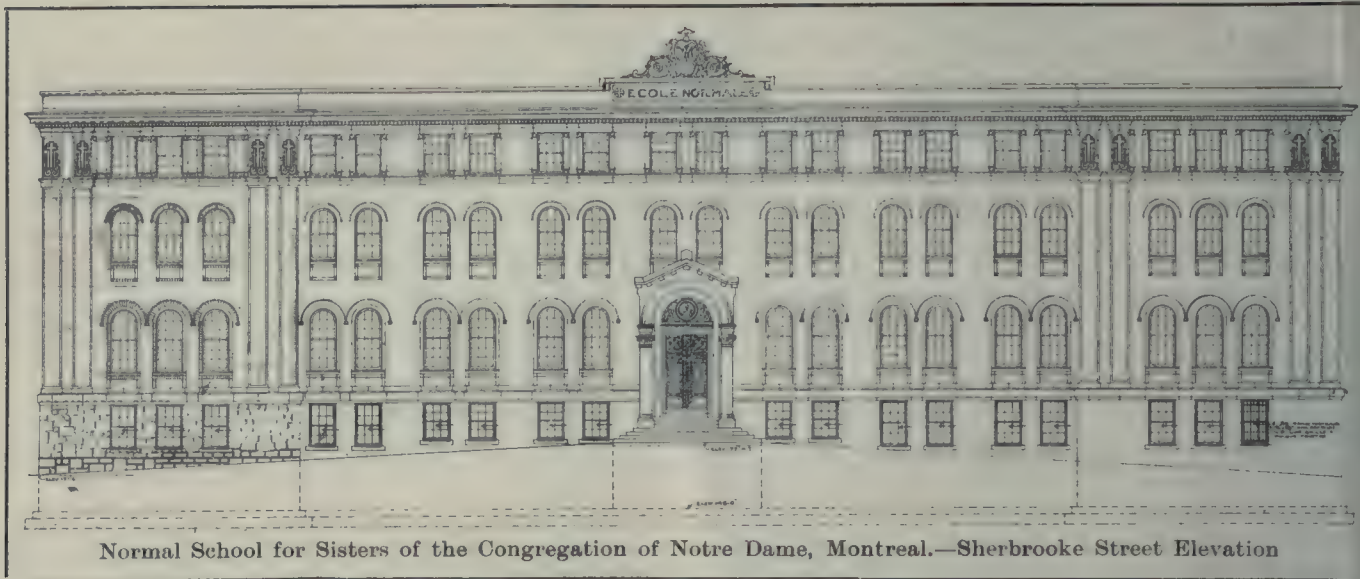
If anything is worth doing at all it is worth doing well. There is an unlimited field for the successful operator in concrete. It is simply a matter of careful construction; of studied detail; of the best equipment and materials. Without these adjuncts, it is not possible to hope for concrete that will be meritorious. You cannot blame the public for their aversion to poor concrete. You, yourself, will not be content to live in house that is poorly constructed. You could not be induced to purchase a home thus erected. How can one hope to impress favorably upon the people the importance and desirability of concrete unless he can prove his ability to manufacture such as will be above reproach?

Devote yourself to an earnest study of concrete in its smallest details, so that you can make of it an industry that will be such as to prove to you a success, and not a boomerang that will cause your own failure, and that will strike you in the face with its very inferiority.

Slate and Marble Deposits of Newfoundland

The Slate deposits of Newfoundland for roofing and other purposes are at Trinity Bay, about 120 miles by rail and steamer north of St. John's. They are 600 to 800 feet in width, and extend for miles; 75 per cent. of the slate is a bright purple, and the remainder of an attractive grayish green. They belong to the same geological formation (Cambrian) as those of north Wales. The geographical position of these deposits, being so near the Atlantic steamship routes, commands an exceptionally favorable position for export.

A large deposit of marble occurs within a few miles of one of the arms of Bay of Islands, on the west coast of Newfoundland. The deposit is 250 feet or more in width, and extends at least 2 miles in length. The marble is of a beautiful cream color when polished and has been pronounced by competent marble workers to be equal to the best Italian.



Normal School for Sisters of the Congregation of Notre Dame, Montreal.—Sherbrooke Street Elevation

Normal School, Montreal

The Normal School, designed by Messrs. Marchand & Haskell, architects, of Montreal, is being constructed by Martineau & Prenoveau for the Sisters of the Congregation of Notre Dame, Montreal. The floor and column construction is of steel, supplied by



Entrance to Normal School, Montreal

the Dominion Bridge Company, Limited, Lachine, with reinforced concrete floors and roof, the exterior being of white pressed brick and sandstone. The building will have a frontage of 190 feet on Sherbrooke street and 130 feet on Atwater avenue. There will be four storeys, the upper one being utilized for dormitories. The plans show ten class rooms and a chapel, the latter 36 feet by 69 feet. The interior decorations are of a plain character. At the rear there will be galleries for outdoor exercise in bad weather and with fire escapes from all storeys to the ground. The elevator is to be of the Otis-Fensom type. Electric lighting will be provided and hot water heating installed. The estimated cost is \$200,000.

Artificial limestone blocks for the new reinforced concrete hospital at Coney Island, N. Y., were made at the contractor's plant near by and taken to the site in cars. In the manufacture of the stone, clear white pine patterns were first made to correspond in detail to the full-size drawings. These patterns were then impressed in a wet sand mold and, when removed, a matrix of grout was poured. This grout consisted of one part Potrland cement to two parts of aggregate, consisting of one part of marble dust and the remainder limestone, graded from $\frac{1}{8}$ to $\frac{1}{2}$ in. The stones were left for four days, then were hoisted from the molds and cured in the open air, covered by a layer of canvas, which was kept well wet. They were then cleaned and finally finished on a rubbing bed. All the walls are of interlocking hollow-tile blocks.

Concrete poles are made in Germany of a hollow reinforcement of wire, filled with a composition of cement, sand and asbestos, which is dried by being rotated from 8 to 10 minutes at 1000 to 1500 r.p.m. The centrifugal force exerted during this operation is said to impart density and strength to the concrete. The maximum dimensions of these poles, of which over 5000 have been used in Dresden, Prague and Leipzig, are 46 ft. in length by 16 in. diameter.

Iron imbedded in concrete of a gasometer at Hamburg, Germany, was found to have no signs of rust when the structure was demolished 48 years after its erection.

Street Paving Work in American Cities

Influence of Public Opinion Not Conducive to Best Practice—Progress Less Apparent Than in Any Other Branch of Municipal Work

Street paving has not kept pace with the other departments of municipal public work, says Mr. Samuel Whinery, consulting engineer of New York City, writing in the *Engineering Record*. This is principally due to the fact that the theory and practice of paving city streets has not been developed along scientific lines, and this condition is, in turn, largely attributable to the fact that the work has not been sufficiently under the control of competent engineers.

Street paving is regarded by the public and by civic authorities as a comparatively simple business matter, where technical guidance is unnecessary and where any expenditure for expert advice is an unjustifiable extravagance. As a rule, city councils assume to decide the kind of pavement to be used, they often dictate or modify the specifications under which the work shall be done, and frequently exercise the right to pass upon the quality of the materials and workmanship. The city engineer is regarded as little more than an agent to carry out instructions given him.

Engineer a Figure-Head—Public Carry on the Work

The fundamental trouble with the present methods of conducting this branch of work is that the public does not understand or appreciate that street paving is a branch of municipal work requiring for its proper conduct the knowledge and experience of the able engineer.

In other branches of important municipal public work the situation is very different. Contrast, for instance, the practice in water supply and sewerage. In these it has long been realized that no important enterprise is to be undertaken and carried out without the advice and aid of competent experts. The result is that these departments have been studied and developed along scientific lines; the engineering and economic problems have been carefully worked out and the data necessary to deal with them intelligently have been accumulated and classified. We can determine with close approximation the safe quantity and quality of a source of water supply, compute the storage capacity necessary, can determine the cost of pumping, the size of pipes needed, the quantity of water likely to be used, the cost of construction and operation and the most economical project to adopt. We are able to do all this because the theory and practice of municipal water supply has been developed by able and expert engineers, who have been given the opportunity, means and authority to pursue investigations and exercise their judgment.

This has not been the case in the equally important department of street paving, largely because in this branch of work the province of the engineer has been ignored and unappreciated and his function has been assumed by other civic authorities. Too often he is reduced to the position of a mere figurehead.

The results, painfully obvious in most of our cities, are what might be expected. The conditions are not too strongly expressed by the word chaotic. More money is spent—and enormous sums mis-spent—in this department of city work than in any other, and

yet our streets are the most discreditable feature of municipal work.

We have not even accumulated the data necessary to deal with the subject intelligently. The great majority of our city governments treat with contumely any attempt at scientific investigation of street paving, and refuse to grant the necessary facilities or to supply the money required. The making of systematic observations, the recording and digesting of results, and the carrying out of technical experimental work on a sufficient scale to be useful, are regarded as unnecessary and a waste of money not to be countenanced. There are, of course, a few cities that are exceptions to the rule, where the value of systematic investigation is beginning to be appreciated and provided for, but seldom on an adequate scale.

Sound Economics

Good engineering embraces sound economics as well as adequate technics. In practice the problem before the engineer is to accomplish the desired result with the smallest expenditure of money; in other words, it is to obtain the largest return upon every dollar invested. This involves the careful adoption of means to ends; the design of every individual structure in the cheapest and simplest manner that will fully serve the purpose. These principles should control as well in street pavements as in any other municipal work. Their proper application in this department is peculiarly the work of the engineer, and no man or body of men, whatever may be their natural abilities, can, without the engineer's special training and experience, take his place. The ablest doctor can not successfully or properly prepare and conduct an important lawsuit, nor is the lawyer competent to treat a case of typhoid fever.

To secure proper results the engineer must have a free hand, and must possess the necessary data, the tools with which he must work. The city engineer is usually denied the first, and at present the second practically do not exist; he has not been permitted to create them. The values of the fundamental factors in a paving problem, technical and economic, are largely unknown quantities. How little, for instance, do we know of the life or endurance of the various kinds of pavement, measured by a rational unit? We know in a general way, that, disregarding the element of natural decay, the quantity of work done (travel carried) under stated conditions is the obvious and proper measure of endurance, but we have practically no data reduced to such units; and since endurance is a fundamental factor in computing the economic value of any pavement the problem can not be intelligently solved. We are forced to substitute guessed-at values where we should have definite information.

Cut-and-Dry Paving Methods in Use

Briefly, street paving and road making may be said to be in the alchemistic stage, where we are seek-

ing certain results by random or cut-and-dry methods rather than by systematic scientific investigation.

Doubtless this picture of the present condition of the art and science of paving streets will seem to many to be overdrawn and pessimistic. The writer admits that it does not apply in full force to all cities, but it is substantially true of the country at large. The important question is, how may these conditions be remedied?

It may be confidently asserted that the first and most important step in any successful attempt at reform in street-paving practice must be the recognition that it is a branch of municipal work which requires the services of the high-class engineer, whose advice and authority must be accepted and allowed to control. In other words, street paving must be put upon the same plane, so far as the function of the engineer is concerned, as other special departments of municipal work, like water supply, sewerage and city transportation. With this first step taken the others necessary will follow automatically. The engineer will take care of them. The engineer has been unjustly blamed for the unsatisfactory condition of street paving. When he shall be given the proper latitude and authority, he will willingly accept responsibility for results in this, as he has in other fields, and will achieve the same high measure of success. He will apply to this work the same sound principles and practice that he has developed in other departments. Our pavements will be selected, designed and constructed with strict regard to the work required of them, and to securing the desired results in the most truly economical way. The kind of pavement used for any given street will not then be determined by popular clamor, or by the hasty impressions or influenced opinions of city councils, who, however earnest and honest, are not competent to deal intelligently with such technical problems. Construction and maintenance will be systemized, and intelligent specifications will be enforced. In short, our streets will not only be better paved, but enormous sums of money will be saved.

To accomplish these results will, of course, require, as in the other important branches of municipal work, the active interest, judgment and advice of the best engineering talent the profession affords in this line of work, in the capacity of consulting engineers or specialists.

City Engineer Not An All-round Specialist

It can not be expected that the average city engineer will be a specialist in all branches of municipal work, nor, in fact, that he will be a man of very high natural ability or great acquirements in the profession. The compensation offered now, or likely to be paid in the future for the services of city engineers, is not sufficient to attract men who have attained eminence in any branch of municipal engineering. But the great majority of them are quite competent to discharge the diverse duties of the position under the direction or advice of the specialist in the several departments of work.

The services of the consulting engineer can be as profitably utilized in street paving as in other municipal work. It would doubtless be regarded by the present average city official as a rank innovation, although if a new water supply were required, or an existing one needed to be improved, he would insist on the employment of a specialist in that branch of work. Those who have had, from observation and

experience, the best opportunities to know the facts will almost unanimously assert that the services of the specialist are as necessary, and as likely to be at least as beneficial, in street paving as in any other branch of public work.

The profession owes a duty to the public in this matter which it should not hesitate to discharge, even at the cost of being charged with selfish motives. The engineer cannot, if he be a good citizen, refrain from pointing out the malpractice that prevails in the present system, or lack of system, of conducting the street paving departments of our cities, resulting in the absolute waste of hundreds of thousands of dollars every year. He, of all other citizens, is best able to expose the facts and to point out the remedy. In no small measure does his position parallel that of the physician who must acquaint his patient of disagreeable facts and urge the necessary treatment.

Walter J. Francis & Company

The firm name of W. J. Francis, C.E., of Montreal, has just been changed into that of Walter J. Francis & Company, consulting engineers. The members of the firm are now Mr. W. J. Francis, C. E., and Mr. Frederick B. Brown, M.Sc. The former, who is a graduate of Toronto of twenty years ago, is a member of the Canadian Society of Civil Engineers, the American Society of Civil Engineers and the American Institute of Consulting Engineers. Mr. Francis was the engineer for the hydraulic lift locks on the Trent Canal, and he has also been identified with other important work in the Dominion. Mr. Brown, before entering into partnership with Mr. Francis, was for six years one of the principal members of the engineering staff of Messrs. Ross & Holgate. He is a graduate of McGill University, some ten years ago, holding three degrees; he is special lecturer on engineering economics at his university, and is an Associate Member of the Canadian Society of Civil Engineers and of the American Institute of Electrical Engineers.

Nonpariel Agency Opened at Montreal

The firm of David E. Kennedy, of 2 West 45th street, New York, distributor for Nonpariel cork tiling, has opened an office at 43 St. Sacrament street, Montreal, under the management of Mr. F. Wells. The tiling is already known in Montreal, it being fitted in the Royal Victoria Hospital, the Lake of the Woods building, and the Bank of Commerce (where between three and four thousand feet have been supplied for the whole working space), and it is also specified for the extension of the Windsor station of the C. P. R. The material is made by granulated cork of a fine quality being compressed to a small fraction of its original bulk enclosed in moulds by hydraulic pressure, and without the addition of any cementing materials heated to a high temperature. This method liquifies the gum of the cork, which acts as an actual binder and confines the particles into a dense homogeneous mass, which is practically a block of natural cork, as no artificial cement is used. Each block is laid individually. The tiling can be used for libraries, churches, banks, court houses, billiard rooms, dining rooms, restaurants, kitchens, laundries, pantries, bath rooms, offices, stores, halls, stair treads, and elevators. It is claimed that the entire surface being hermetically sealed water cannot seep through to stagnate or to rot a wood under-floor. It can be laid on any smooth backing—concrete, wood, metal, stone or tile. The cork tiles are one inch thick and are made in standard sizes and various shades. The special features of the flooring are durability, noiselessness, comfort, non-absorbency, non-inflammability, and distinctive appearance.

New Links in the C. N. R. System

The railway system of the Canadian Northern Railway Company comprises two distinct and widely separated groups of lines in the eastern and western provinces of Canada respectively, but the company for a long time has had in view the work of connecting and extending these two groups so as to form a through route from the Atlantic coast to the Northwest and eventually a complete transcontinental line. The general situation is shown on the accompanying map.

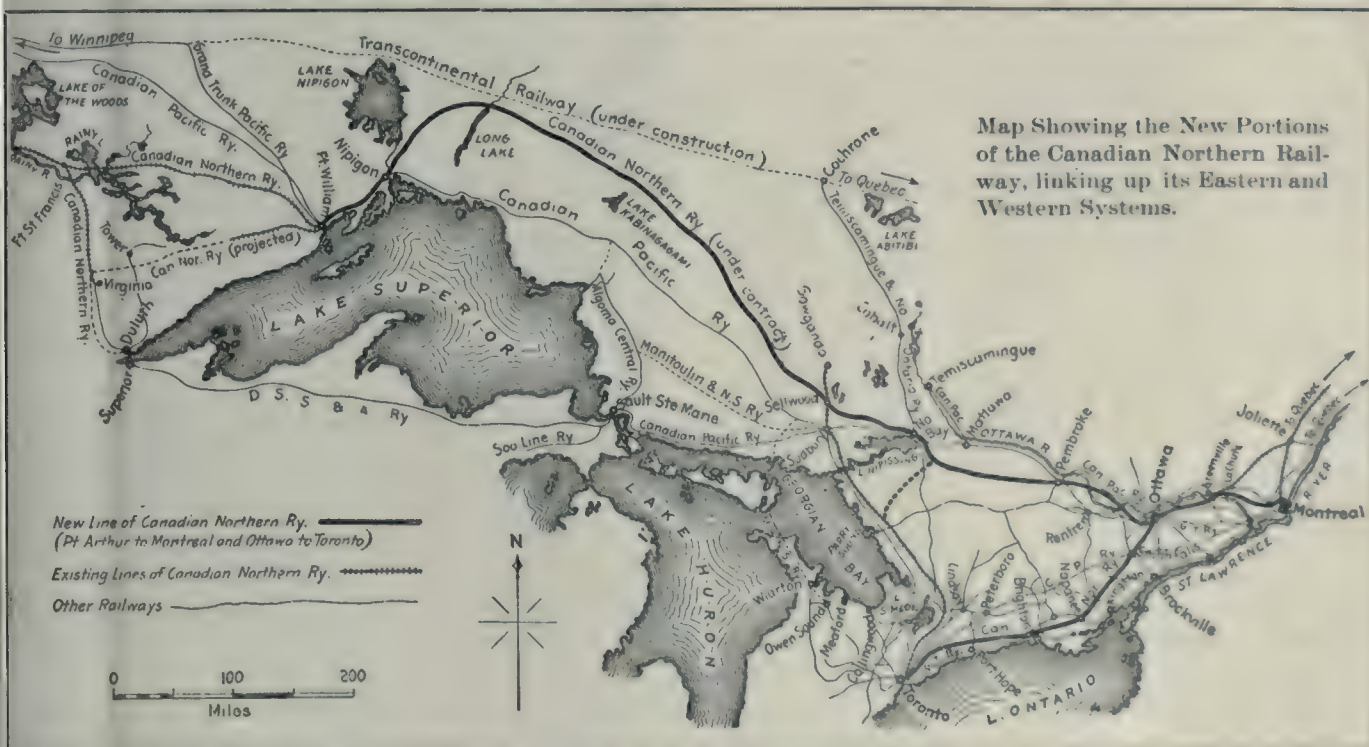
The eastern system extends from Quebec to Montreal and Ottawa, and includes a separate or isolated line extending 300 miles from Toronto north to Sellwood, which is about 30 miles north of Sudbury on the Canadian Pacific railway. The western system comprises a network of lines in the great agricultural districts of northwest Canada. Its main line, however, extends from Port Arthur (on Lake Superior) to Winnipeg and thence to Edmonton (Alberta); beyond this latter point it is headed across the Rocky Mountains to a Pacific coast terminal and port.

An important step has been taken recently towards linking up the eastern and western systems by the award of a contract for the construction of a line 540 miles long

The construction work on the new 540-mile line between Sellwood and Port Arthur will be, for the most part, of a very ordinary character. The most difficult and interesting section will be the 120 miles into Port Arthur. This includes some heavy side-hill work in rock excavation along the shore of Lake Nipigon, with a tunnel 1,100 ft. long; also an extensive bridge over the Nipigon river, a diversion of the river and a viaduct, 2,200 ft. long and 130 ft. high, across the Blonde river valley.

The other more important river crossings (from east to west) are the Ground-Hog, Trout, Kapuskasing, Missinabie, Kabinakagami, Morrison, Kenogami, Sturgeon and Black Sturgeon rivers. The ruling grades are 0.6 per cent. against westbound trains and 0.5 per cent. against eastbound grades, all compensated. These have nowhere been exceeded for the entire distance between Montreal and Port Arthur, and have been used, in fact, only in a few instances. The ordinary standard is 0.4 per cent. in either direction. The standard of curvature is 6°, which has been exceeded at only half a dozen points; for some hundreds of miles on the interior plateau curves of 4° are the rule.

Sellwood and Montreal Line.—The main transcontinental business is to and from Montreal, and arrangements are being made to complete a through line from Sellwood



from Port Arthur, Ont. (the present terminal of the western system), eastward to Sellwood, connecting with the line to Toronto. A further gap of 300 miles remains to be closed on the line from Sellwood to Ottawa and Montreal, and this section is now under survey. In the negotiations with the government, Sudbury figured very largely as a point on the new line, and the mileage on the original location started from Sudbury Junction, the nearest point. As now located the line runs from Sellwood, which is 23 miles north and on a completed line which now reaches Gowganda, 53 miles from Sudbury Junction. The junction of the Montreal line will probably be at a point about 11 miles north of Sudbury (and 310 miles west of Montreal). The completion of the new lines shown on the map will have a marked influence on the railway system of Canada as well as upon the Canadian Northern railway.

to this point. The main portion of this will be a new line eastward from near Sellwood to Ottawa. The company already has a line running eastward from Ottawa along the west bank of the Ottawa River, and crossing the river at Hawkesbury, beyond which point it runs eastward to Quebec. To complete the connection between Ottawa and Montreal, the old Carillon & Grenville Ry. (broad gage 5 ft. 6 ins.) has been purchased; this will be rebuilt to standard gage and extended to Montreal. It is said that this extension may include a long tunnel, giving an entrance to Montreal from the north. The building of this line will affect the completion of a direct through route between tidewater and the great interior territory of the Northwest which is being so rapidly settled and developed.

The standards of grades on this Montreal-Sellwood line are the same as on the Sellwood and Port Arthur line,

except that there is at one point a grade of 0.5 per cent. (compensated for curvature) against the eastbound traffic. To reduce this to 0.4 per cent. would involve much additional distance and curvature as well as heavy rock work. For this reason it was considered better to face the distant possibility of having to work this as a "pusher grade," than to increase the mileage for the passenger trains.

Duluth and Virginia Line.—The Canadian Northern railway has a branch (known as the Duluth, Winnipeg & Pacific Railway) from its Winnipeg and Port Arthur line westward from Fort Frances through the Rainy Lake district to Virginia, Minn., where connection is made with the Duluth, Missabe & Northern Railway so as to form a route between Duluth and Winnipeg. A new line is under construction from Virginia to Duluth, so as to give the company its own line throughout. The terminal points being the same as those of the Duluth, Missabe & Northern Railway, the route unavoidably lay through pretty much the same country, but there is no paralleling. The distance is about 75 miles. A line is to be built also from Duluth eastward to connect with a branch line from Port Arthur, which is owned by this company.

The D., M. & N. Ry. is an iron-ore road with an enormous business, which it carries over grades of 0.6 per cent. against the ore traffic and 2 per cent. in the opposite direction. It was felt that the last was too low a standard to be accepted on the new line of the Canadian Northern Railway, and after an exhaustive examination, a route was adopted giving a grade of 1.15 per cent. out of Duluth for some 10 miles, and then for the remaining 65 miles flattening off to a standard of 0.3 per cent. against southbound and 0.6 per cent. against northbound traffic. This portion is all on the elevated tableland north of Lake Superior and there is nothing in the construction out of the ordinary. The grading alternates between clay and gravel, cuttings and muskegs, and two or three moderately bad sink holes are the only interesting features.

The 500-ft. lift from Lake Superior to the plateau is nearly all on a steep and very broken rock side-hill. It includes a 500-ft. tunnel and some very heavy rock work aggregating 150,000 cu. yds. in a distance of about eight miles; also two or three permanent trestles. The entry to Duluth is all elevated, and grade crossings of streets have been practically eliminated. The Canadian Northern Railway owns its own yard and water terminals in West Duluth, but it is proposed to run over the tracks of the Northern Pacific Railway into Duluth proper and also by way of the Grassy Point bridge into Superior, Wis.

Ottawa and Toronto Line.—To complete an eastern system connecting the principal cities of eastern Canada, a line is to be built across Ontario from Ottawa to Toronto. This also is shown on the map.

The surveys and locations of the lines above described have been in charge of Mr. Henry F. Wicksteed, Chief Engineer of Surveys, Canadian Northern Railway. The construction of the two lines from Sodwood to Port Arthur and from Virginia to Duluth is under the direction of Mr. H. T. Hazen, as Chief Engineer, with offices at Duluth, Minn.—Engineering News.

The work of improving the roads of York township will be continued aggressively. At a meeting of the Good Roads Commission held last week, plans for further improvement were adopted. Ten miles of good roads have already been laid down. The Commission has ten road rollers in operation; these it is expected will be increased to fifteen by the spring. A thousand tons of stone will be laid in York township this winter. Mr. E. A. James, York County Engineer, will submit a report covering the work done to date.

Personal News and Notes

Mr. Alex. Milne, City Engineer of St. Catharines, Ont., has resigned.

City Engineer Smith, of Victoria, B.C., has appointed Mr. Harry Worswick Superintendent of Construction, at a salary of \$250 a month.

The ratepayers of Vancouver will probably be called upon to vote on a by-law to raise upwards of \$2,000,000 for street improvements.

For the first time in its history, Brandon, Man., has passed the million-dollar mark in building. Next year promises to witness exceptional activity in the city.

The total cost of the Toronto subway, as estimated by City Engineer Rust, and including Messrs. Haney & Company's tender for the construction, is \$5,171,395.

At the noonday talk of the Builders' Exchange, Montreal, on November 29th, Mr. W. K. Grafftey, of the Montreal Lumber Company, and president of the Montreal Lumber Association, will address the members on the subject of "Lumber."

As the outcome of a recent address before the Montreal Builders' Exchange, Professor E. Brown, of McGill University, issued an invitation to members of the Exchange, to see tests of concrete beams in the laboratory. This invitation was accepted, and the demonstration was announced to take place in the Engineering Building on the evening of Monday, November 27th.

A complete set of standard tube mills for the Edmonton Portland Cement Company's plant on their property west of Edson, Alta., has been purchased from the Chalmers & Williams Company, of Chicago, manufacturers of mining and cement manufacturing machinery. J. W. Young, vice-president of the Chicago company, was in Edmonton last week closing the deal for the sale of the machinery. It will be shipped to Edmonton and then to the property for installation at an early date.

There is a determined fight going on for the control of the Laprairie Brick Company, in which Mr. T. A. Trenholme, on the one side, and the National Brick Company on the other, are the principal contestants. It is stated that the National Brick people, who are building a big plant near Laprairie, have obtained control, paying \$350 cash and a bonus for blocks of Laprairie stock. Mr. Trenholme objects to a merger of the two concerns and is putting up a strong fight.

Mr. N. W. Rowell, the liberal leader in Ontario, is so much impressed with the importance of the good roads question that he is making it his main platform. At a recent meeting in Bowmanville, Mr. Rowell urged the necessity of Provincial aid in municipalities by special expenditure in the initial construction of main roads as is done in France, Germany, Switzerland and other road-making countries. He advocated special training for highway engineers, declaring that the Liberals, if in power, would establish such a course in connection with the engineering school.

The Canadian Highway Association was organized for the purpose of establishing a road from coast to coast through the Dominion of Canada, at a recent meeting held at New Westminster, B. C. Hon. Thomas Taylor was elected honorary president; W. J. Kerr, first vice president of the New Westminster Automobile Association, was made active president. A system of sectional vice-presidents was adopted similar to that in force in other organizations of a like nature.

Vancouver's Great Building Progress

Facts and Figures about 1911—Present Prospects Indicate an Expenditure of nearly Twenty-five Millions during 1912 — Active Preparations being made

Vancouver, Nov. 22, 1911.

Great strides have been made by the building industry of Vancouver during 1911 and contractors and others find themselves far in advance of 1910 and previous years. One of the notable features of the season has been the great demand for house accommodation, this being attributable to the weekly arrival of hundreds of the better class of immigrants and also to the fact that many new business firms and agencies have been established from time to time. Vancouver's building record is a great one, and it would have been better still had it not been for the general strike in June last, which tied up building operations for more than six weeks.

The records of any civic department may be regarded as a self-registering barometer of a city's progress. If this is true, Vancouver's growth and progress have been phenomenal. A few days ago your correspondent asked Building Inspector Jarrett for an estimate of the total value of building for 1911. In reply the official said that the work emanating from his department would represent at least eight million dollars and possibly more. Such a figure will mark an extraordinary advance over the banner total of last year. As a matter of fact last year's total was surpassed during the January-September period of 1911.

Next year gives every promise of witnessing remarkable activity in building circles. Most of the architects are busy working on plans for large offices, warehouses, apartment houses or residences to be started early in 1912. Things are far livelier than they were at the corresponding date last year.

Vancouver's growth is continuous. The fifteen-million-dollar mark has been passed and your correspondent feels sanguine that the record of eighteen million dollars will be made.

Following is a comparative statement of building permits from 1902 to 1910 inclusive:

Year	Number of Permits	Value of Buildings
1902	417	\$ 833,607
1903	580	1,426,148
1904	836	1,968,591
1905	940	2,653,000
1906	1,006	4,308,410
1907	1,773	5,632,744
1908	1,697	5,950,893
1909	2,054	7,258,565
1910	2,260	13,150,365

The above statement is a significant one. It shows that from 1902 to 1909 Vancouver's building increased in about the same ratio from year to year. The awakening came last year and things are now happening so quickly that it is reasonable to assume that next year the city will attract universal attention. The comparatively slight increase around 1907 is due of course to the financial stringency of that period.

If Vancouver's progress during the last few years were described graphically and the curve produced, the building total for 1912 would be nearly twenty-five million dollars. It is not beyond the realm of possibility that this figure will be approximately correct. The phenomenal leap from the 1909 total to that of 1910 may be said to mark the

commencement of the era of Vancouver's second growth. Following is a comparative monthly statement of building for the last four years:

	1908	1909	1910	1911
January	355,685	565,630	631,311	1,412,442
February	368,225	409,655	880,795	1,011,090
March	485,555	880,250	1,808,760	2,147,798
April	1,171,260	783,490	1,460,503	1,206,320
May	439,925	477,140	941,510	2,388,050
June	333,400	657,020	1,162,940	909,156
July	636,120	549,107	639,530	995,585
August	538,930	841,020	745,250	1,525,918
September	324,505	744,530	740,715	1,736,568
October	436,080	507,615	1,285,395	1,506,375
November	346,800	610,189	1,897,885	
December	354,408	576,709	955,771	
Totals	5,950,893	7,258,565	13,150,365	14,839,302

The business area of Vancouver is expanding very rapidly. Business blocks and modern construction are changing the character of the down-town streets. Where formerly stood frame and brick buildings of two and three storeys may now be seen eight and ten-storied structures of steel and concrete with marble interior finish. The Dominion Trust Building, with its fourteen storeys, is the tallest in the city. But the building for the Investors Guarantee Corporation when finished will be fifteen storeys and 160 feet in height. Last year, however, a city ordinance was passed regulating the height of buildings at ten storeys, or 120 feet. The total assessable property for 1911 is \$136,597,705. In 1887 it was \$2,639,077. The average annual increase for the first twenty years was \$800,000, while that for the last four years has been \$5,000,000. The value of building permits issued in Point Grey, a suburb, for the month of July was greater than any city in British Columbia, apart from Vancouver.

The marvellous growth of the business of the building operations in the city has compelled the civic department to increase its permanent staff to meet the demands upon it. Last year a stop was put to "jerry" work and the enforcement of the building regulations was rapidly carried out. Building Inspector Jarrett's assistants are kept constantly in the field inspecting foundations, structural material, heating pipes, etc. The outcome of this work has been to generally raise the standard in the city. A couple of years ago some contractors and speculators succeeded in selling "scamped" houses to unsuspecting newcomers who did not examine the structures very carefully. This resulted in the appointment of a committee of the council which succeeded in bringing about the necessary amendment to the by-laws.

A review of the ten months' permits issued this year shows that there were some fifty-five for buildings costing \$50,000 and over. Among these are the following:

Peter Agren, 6-storey apartment house, \$125,000; D. Burns, reinforced concrete steel brick offices and stores, \$400,000; B. C. Electric Railway & Light Co., steel and brick office building, \$350,000; F. D. Boucher, brick and steel stores and apartment house, \$300,000; C. P. R. Hotel, Vancouver,—Annex, \$190,000; Geo. Dawson, steel and concrete stores and offices, \$180,000; Dominion Government, examin-

ing warehouse, \$335,000; Investors Guarantee Corporation Co., Ltd. (J. W. Weart, Pres.), office building, 15 storeys, \$500,000; Kelroy & Morgan, 6-storey steel and brick office building, \$100,000; Lees & Maskell, 5-storey, stores and apartments, brick building, \$60,000; H. O. Lee, stores and apartments, \$200,000; National Finance Company, 7-storey brick and steel office block, \$100,000; A. J. Patterson & Co., brick block for dancing academy and apartments, \$125,000; Alderman Rogers, office building, \$550,000.

At this writing it is expected that application will be made at any time by the Hotel Vancouver management for a permit to effect improvements at a cost of half a million dollars.

Trade Notes and Items of Interest

The building of an hotel, which, it is claimed, will be the most up-to-date of its kind on the entire Pacific Coast, and the cost of which will be \$500,000, will be started at the corner of Burrard and Mellville streets, Vancouver, as soon as the necessary excavations are finished. The owner is Mr. W. S. Ramsay, of Pender street, and it is possible that the new hotel may bear his name.

A new gypsum plant, with a capacity of 200 tons a day, has just been completed at Winnipeg by a newly-organized firm, called the Dominion Gypsum Company, Limited. The construction work on this plant has been rushed to such an extent during the summer that the company was able to make its first shipment last week, which consisted of twenty-five tons. The plant is driven by seven large motors, which are driven with 730 horse power, supplied by the Winnipeg civic power plant.

Building operations are in active progress at Brandon, Man. The new depot of the C. N. R. is now finished. The new six-storey hotel at the side is well on the way to completion and it is expected that it will be open early in the New Year. The five-storey building of the International Harvester Company was completed recently and taken over by the management. The building has been completed most expeditiously, for the first sod was turned on May 31st last, there being five floors, 85 ft. x 140 ft., giving a total of 60,000 square feet.

The United States will lend the Dominion of Canada the assistance of American Government experts and mechanical appliances in building the new bridge across the St. Lawrence River at Quebec. As a precaution against a repetition of the disaster of a few years ago, when the bridge collapsed, Canada asked the U. S. Department of Commerce and Labor for the loan of a device possessed by the Bureau of Standards by which the security of a bridge can be tested during the stages of its construction. Secretary Nagel has compiled with the request and has authorized experts to go along with the apparatus.

An interesting booklet received from the Elite Manufacturing Company, Ashland, Ohio, sets forth the merits of the Low-Down Forced Feed Concrete Mixer. This machine is claimed to embody all the best points of manufacture. The makers claim that it can be operated day after day with a minimum of care and expense. The strength and durability of the mixer are ensured by the very best grade of malleable iron and steel used throughout in the construction. The Low-Down Mixer is small, compact, and simple in its construction. It is said to contain about one-third less pieces than others and it can be operated by any ordinary day laborer.

C. J. Wills & Sons, Victoria street, London, England, have obtained a contract for constructing a line, 350 miles in length, from Montreal to Midland, Ont., on the Georgian Bay. Surveys are now being made for the section from Montreal to Ottawa, 110 miles, and the construction of this

portion of the line is estimated to cost \$600,000. The surveys will be carried on during the winter and a start made with the construction in the early spring. Mr. D. Lyell, of the Lake of the Woods building, Montreal, is the contractors' representative. English capital is largely represented in the company, which is known as the Central Railway of Canada.

The science of mixing concrete is the topic of a pamphlet distributed by the Austin Cube Mixer Company, of Chicago. The fundamentals involved in scientific concrete mixing are stated as follows: (1) the application of positive force; (2) a method of applying positive force which accomplishes mixing in the shortest time; (3) a method of applying positive force which not only quickly intermingles but intimately incorporates the materials. These principles are discussed in detail, and the booklet contains many hints which will be seized with avidity by the practical man, the contractor and the engineer. Some excellent illustrations are given of the products of the Austin Cube Mixer Company, whose cube mixers are rapidly becoming a password among concrete workers.

Notice is given of the consolidation of the Universal Concrete Machinery Company, formerly of Waterloo, Ia., and the Iowa Foundry and Manufacturing Company, of Fort Dodge. Hereafter business will be transacted under the name and charter of the Iowa Foundry and Manufacturing Company, Fort Dodge, Iowa. The new concern will have A1 facilities and will build their machines complete from the crude material to the finished product. The lines manufactured include, besides concrete machinery, the Elk gasoline engine, claimed to be the simplest and best ever built. This engine is equipped with the Ballard governor, an entirely new device which controls the engine so perfectly that should the transmission be disconnected from any cause, the engine would retain exactly the same speed, regardless of the load. A new catalogue is now being prepared and will be mailed upon application.

The controllers of Montreal have issued their report for 1910, in which they deal at length with the civic administration. During the year the roads department spent \$858,162, for which 71,081 square yards of asphalt, 49,527 square yards of granite blocks and 135,940 square yards of scoria blocks were laid in the streets. The total cost was split up into \$615,974 by contract and \$242,187 by day labor. To this amount should be added the sum of \$272,947 for sidewalks, of which \$204,116 was by contract and \$68,839 by day work. The sum of \$81,206 was spent for curb stones. Sewer construction cost \$348,175, and the report adds that the board has under consideration a more efficient sewer system. In the water department \$328,839 was spent, and of this \$128,398 went on day labor. The controllers refer with satisfaction to the great increase in building in the city, the cost of which rose from \$7,785,621 in 1909 to \$15,715,859 in 1910. At the same time the opinion is expressed that the building by-laws need attention. The good work of the department of public works, with Mr. G. Janin as chief engineer, is also commented upon.

The Algoma Brick & Tile Company, Sault Ste. Marie, Ont., has just obtained articles of incorporation with a capital of \$40,000. Those behind the new concern are Messrs. F. Denman, D. Jannison, Geo. Woolrich, W. Jannison and Alfred Elliott.

The brickyard is close to the Steelton boundary and to four other brickyards, which would indicate that this will be the centre of the brickmaking industry in Algoma. Operations have been commenced and by fall several kilns of brick will have been made. The yard will commence to operate in full blast next year when the daily production

Contracts Department

News of Special Interest to Contractors, Engineers, Manufacturers and Dealers in Building Supplies.

Information for insertion in these columns is invited from Architects, Contractors, Engineers, etc.

Waterworks, Sewerage and Roadways

Assiniboia, Man.

Tenders will be called shortly for paving on Portage avenue in Ward 5, from city limits to west side of Deer Lodge Road, 24 ft. wide. Secretary-treasurer, F. Ness.

Burlington, Ont.

Tenders are called until Dec. 8 for construction of steel plate pump well for water supply. Plans, etc., at office of commissioners, Burlington, or at office of engineer. Contractor to furnish all labor and material. Work to be finished May, 1912. Board of Commissioners, Burlington; chairman, M. C. Smith; superintendent, Percy Dawson; engineer, Chipman & Power. Mail Bldg., Toronto. See advertisement in "Tenders and for Sale Department" of this issue.

Halifax, N.S.

Plans will be prepared by F. W. W. Doane, city engineer, for reservoir, etc., cost \$85,000. Stand and pipe changes in distribution.

Hamilton, Ont.

The Board of Control have recommended the submission of by-law for \$650,000 for waterworks improvements and extensions. This includes \$120,000 for new reservoir.

Montcalm, Que.

Tenders were called until Nov. 24th for laying of 6, 9 and 12-in. c.i. pipe. Plans at office of secretary-treasurer—A. Lockquell.

Time of receiving of tenders has been extended until Dec. 1 for 12,000,000-gal. steam pump with gate and check valves, independent air pump, etc. Engineer, Geo. Janin, Montreal.

Moose Jaw, Sask.

Tenders are called until December 12 for about 100,000 lin. ft. of steel water pipe, 18 in. in diameter. Specifications at office of consulting engineer, Clerk, W. F. Heal; city engineer, J. M. Wilson; consulting engineer, W. J. Francis, 24 Commercial Union Bldg., Montreal.

Quebec, Que.

Tenders are called until Dec. 20th for new water supply scheme. Consulting engineer, T. A. Jardine Forester, Quebec. A 44 and 40-in. dia. c.i. pipes, special, valves, etc. B, 44 and 40-in. dia. steel pipes, specials, etc. C, loading and transportation. D, trenching, filling, laying and jointing. Specifications at City Hall.

Strathcona, Alta.

Specifications are being prepared for extension of pumping plant. City engineer, A. J. MacLean; superintendent, power plant, Engineer J. Watson. Another unit is contemplated; pump to be for high pressure work and of turbine type either engine or motor driven. Cost estimated at \$20,000. Specifications being prepared by Mr. Watson.

Stratford, Ont.

It has been recommended that several thousand dollars worth of cement sidewalks and pavements be laid next year and water commissioners will lay new pipe on Ontario street.

Toronto, Ont.

Tenders are called for storm overflow sewers (Carlaw avenue, Connaught, Queen, Ossington, E. Toronto). City engineer, C. H. Rust. Section No. 1—150 ft. 3 ft. 7 $\frac{3}{4}$ in. x 5 ft. 3 $\frac{1}{2}$ in. twin concrete culvert, supported; 1131 ft. 3 ft. 7 $\frac{3}{4}$ in. x 5 ft. 3 $\frac{1}{2}$ in. twin concrete culvert on piling; 1017 ft. 5 ft. 5 in. x 4 ft. 6 in. concrete culvert; 540 ft. 4 ft. 5 in. x 4 ft. 3 in. concrete culverts; 380 ft. 3 ft. 6 in. x 4 ft. 3 in. concrete culverts; 475 ft. 3 ft. 0 in. x 3 ft. 0 in. concrete culverts; 842 ft. 4 ft. 10 $\frac{1}{2}$ in. x 3 ft. 6 in. concrete culverts. With all necessary bellmouths connection chambers and manholes. See advt. in "Tenders and For Sale Dept." of this issue.

Victoria, B. C.

Following local improvement works are planned: Grade drain and pave with asphaltic pavement, Davie street; Leighton road, Amphion street, Oswego st., Menzies street; also Russell street, Griffiths street, Garbally road, Empress ave., Hamilton street, Arnold avenue, Chester avenue, Bopd street, Sylvia street; also grade, drain and rock surface. Wilson street, and permanent sidewalk on Vining street. Municipal Clerk, Wellington, J. Dowler.

Railways, Bridges and Wharves

Campbellton, N. B.

Tenders were called until Nov. 25th for labor and material necessary for construction of a crib wharf east of power house. Plans at office of town engineer. Separate tenders on labor and material. Town clerk, John T. Reid.

Hamilton, Ont.

South Ontario Pacific Ry. will apply for authority to construct and operate a railway from a point at or near Hamilton in a southerly or southeasterly direction to a point on Niagara river. H. C. Oswald, secretary; Pringle, Thompson & Burgess, Ottawa, agents. No Hamilton people are concerned.

Lethbridge, Alta.

The plans of the Canadian Pacific Railway embrace a new station and two freight sheds. This will probably be done next summer.

London, Ont.

The ratepayers will vote on a by-law to bonus the North Midland Railway to the extent of \$25,000, providing that it runs into London and a station and power house, etc., are built here. A. E. Welch, London, is the promoter.

Tenders are called until Dec. 7th for construction of a new steel bridge between the two townships of Delaware and Caradoc, over Thames. 2 150-ft

steel spans, concrete approaches. Cost \$20,000. City engineer, Chas. Talbot.

Montreal, Que.

Plans are being prepared by the Canadian Pacific Railway architects for changing Place Viger station into an hotel only as a new station has been erected in that vicinity. The company plans to spend \$5,000,000 on its hotel.

Ottawa, Ont.

Plans are being prepared by city for erection of a steel bridge over G. T. P. tracks on Bronson avenue. City engineer, N. J. Ker.

An agreement was signed by the Government Nov. 17 for construction of a bridge to cost \$115,000 on Bank street, over Rideau Canal. Concrete work to be started at once by city; day labor. Plans etc. at office of city engineer, N. J. Ker.

Plans are being prepared by the city engineer's department for steel and concrete bridge across Rideau Canal at Pretoria avenue. City engineer, N. J. Ker.

There is a suggestion to move the present Bank street canal bridge (swing) to a new location over the canal at Mutchmor street after the new Bank street bridge has been completed.

Ridgeway, Ont.

The Board of Trade propose building electric railway to Welland unless N. St. C. & T. Ry. Co. agree to do so. \$14,000 has been subscribed. Matter to be laid before railway officials shortly. Line will be about eight miles long. Chairman, Board of Trade Committee, E. W. Near.

St. Valier, Que.

Tenders are called until Dec. 12 for construction of extension to pier. Plans etc. at department and at offices of district engineers at Montreal, Quebec and on application to local postmaster. Department of Public Works. Ottawa; secretary, R. C. Desrochers.

Selkirk, Man.

Plans are being prepared for a bridge across Red River here. It is believed that the Government will favor the project. The board of trade has been active in the matter.

South Vancouver, B. C.

Tenders will be called shortly for street railway over main street, for British Columbia Electrical Railroad, Vancouver. The grading of Main street from terminus of B.C.E.R. to meet Flurne line will start as soon as possible.

Toronto, Ont.

The council have under consideration the following by-laws, recommended by Board of Control for presentation to people; tube railway, \$5,171,000; Hydro-electric extensions, \$2,200,000; Bloor st. viaduct, \$1,412,000.

The Richelieu & Ontario Navigation Co., head office, Montreal; gen. manager

C. J. Smith, will build a new dock at foot of Bay street.

Application will be made to the Dominion Board of Railway Commissioners by the C. P. R. for authority to build a branch line to connect the Toronto-London line with the Owen Sound line. Spur to be $4\frac{1}{2}$ miles long.

Vancouver, B.C.

The Dominion Pacific Railway will shortly apply to Parliament for a charter for a railway from the international boundary, northward to Fort St. John. B.C. The proposed line will touch the C. P. R. and the C. N. R. at several points.

Victoria, B. C.

R. P. Rithet & Co., 117 Wharf street, Victoria, are preparing plans for erection of a new pier to west of old dock, 100 ft. in width.

Walkerton, Ont.

New tenders are called for steel bridge over Saugeen river; two spans, 125 ft. each and one span 90 ft.; 16 ft. roadway with concrete floor; or two spans of 165 ft. with concrete floor; also 2 abutments and piers for same. Specifications with engineer, Jas. Warren, Walkerton. Received until Dec. 5th.

CONTRACTS AWARDED

Montreal, Que.

Surveys are being made for railroad for Central Railway of Canada (Messrs. C. J. Wills & Sons, London, Eng.) Contractors, D. Lyell, C. E. Lake of the Woods Bldg., Montreal; sec. of 110 miles between Montreal and Ottawa; construction is expected to start early in the spring.

Newcastle, B. C.

Wharf and bunkers to cost \$50,000, near Nanaimo, for Vancouver-Nanaimo Collieries Co.; contractors, Rannie, Ironsides & Campbell, Inns of Court Bldg., Vancouver. Wharf 100 x 100, long approach to wharf—gravity train to convey coal from bunkers inland to shore bunkers.

Port Arthur, Ont.

The Thunder Bay Contracting Co. have been awarded the contract for freight sheds at Port Arthur.

St. John, N.B.

Michael Connolly has been awarded the contract for wharf construction at Sand Point, West St. John. 300 foot extension on the C. P. R. wharf (so called), and an 880 berth running inward from the end of the extended C. P. R. wharf with a head piece of birch of concrete superstructure and will be the first construction in St. John along these new lines.

Vancouver, B. C.

Dry dock to cost \$500,000; dock 550 x 80 ft. lifting capacity of 15,000 tons; owner, Port of Vancouver Drydock & Shipbuilding Co.; contractor, Harrison & Co., Manchester and London, Eng.; steel and machinery to Wm. Hamilton, Port Glasgow, Scotland. It is reported that work will start at once.

Public Buildings, Churches, Schools, etc.

Brantford, Ont.

The Independent Labor League are contemplating a Labor Hall. Financial agent, W. M. Hicks, Pres. Labor League,

Brantford. \$15,000 already on hand; \$30,000 to be raised.

Bridgeburg, Ont.

Capt. N. G. File, 44th Regiment, Bridgeburg, has asked council to secure options on site for an armory, \$15,000 is now on hand.

Burlington, Ont.

Plans are being prepared for erection of a school, cost \$35,000, for Burlington School Board; chairman, E. H. Cleaver; architects, Mills & Hutton, Bank of Hamilton Bldg., Hamilton. Two stys., 80 x 80, brick and stone, stone fundn., elec. ltg., tar and gravel roof, steam htg., elec. work. lavatories, ventilating system, elec. bells, hardwood interior finish. By-law to be submitted in January.

Calgary, Alta.

The School Board have bought property on Crescent Heights as a building site for an 8-room school.

Eastview, Carleton Co., Ont.

The R. C. School Board will raise \$20,000 for securing sites and erecting buildings.

Edmonton, Alta.

Tenders will be called after the New Year for schools and additions to cost \$100,000. Board of Education; school architect, G. E. Turner. Two new schools and two additions; 8-rooms each, brick with stone trimmings, steam heated, fan ventilation.

Wesley Methodist Church are planning a church on Seventh and Athabasca streets, cost \$24,000. This building will later be used a Sunday school and a new church will be erected. Work to commence early next year.

Galt, Ont.

Addition to hospital. Architect, W. Grayson Brown, Chancery Chambers, Hamilton; masonry, James Webster; carpentry, Wm. Hallman; painting and glazing, E. Rhodes; plumbing and heating, Scott & Bennett, all of Galt. Elec. ltg., hot water htg., shingle or slate rfg., hardwood int. finish, operating room to have glass floor and modern equipment. Board of Governors. Sec., W. H. Lutz.

Hamilton, Ont.

A shelter to cost \$20,000 is contemplated for Children's Aid Society and City. Chairman, Committee in Charge, Controller Gardner. \$10,000 voted for it. No plans ordered yet. Building to provide for both girls and boys.

Hartland, N. B.

Tenders are called until Nov. 29 for interior fittings for post office. Plans etc., on application to L. E. McFarland, clerk of works. Pub. Bldg., Hartland; D. H. Waterbury, St. John, N.B., and at Department. Department of Public Works, Ottawa; secretary, R. C. Desrochers.

Hespeler, Ont.

A company has been organized to build a new skating and curling rink at a cost of \$6,000.

Manilla, Ont.

The Public Library Board have secured a site and the intention is to build a brick library next summer, shelving capacity, 4,000 vols.

Montreal, Que.

Tenders are called until Nov. 29 for alterations to property on Sussex ave. to be used as church. Owner, Church of

the Redeemer (Lutheran); architects, Peden & McLaren, 20 St. Alexis street, Montreal.

Tenders are called for fire station to cost \$40,000 on St. Dominique; architect, L. R. Montbriant, 230 Andre, Montreal; 2-storey, 40 x 96, brick and stone fireproof; masonry foundation, hot water heating, electric lighting, Sparham cement roof, interior finish, fireproof, steel frame. Received by architect until Dec. 15th.

The Board of Control have reported in favor of purchasing land in Longue Pointe Ward on which to erect a combined fire and police station.

Tenders are called for erection of a police and fire station on St. Hubert st. Architect, Z. Trudel, 238 St. Andre St., Montreal; 2 storey, 70 x 110, brick with stone trimmings, masonry foundation, hot water heating, electric lighting. Received by architect until Dec. 15th and call for prices for both fireproof and mill construction. Work not started.

Moose Jaw, Sask.

Competitive plans are called for public library, to be submitted by Dec. 20th. For second choice a premium of \$100 will be paid; for third, \$50. For further information apply to city clerk. Estimated cost \$50,000. City clerk, W. F. Heal.

North Toronto, Ont.

A by-law will be submitted at the January elections to authorize the purchase of a new site for High School.

North Vancouver, B.C.

The Presbyterian Church has been granted permission to borrow \$12,000 for new building. Steps will be taken at once for its erection.

Port Hope, Ont.

Tenders are called for public school. Secretary, J. W. Sanders; architects, Ellis & Connerly, Manning Chambers, Toronto. Whole contract; also separate trades required in erection of 11-room bldg.; re-modelling of Central school. Plans, etc., at office of secretary; also at office of architect. Received until December 11th by secretary.

Regina, Sask.

The City Council passed the by-law to grant \$15,000 bonus towards the erection of building for educational purposes in Diocese of Qu'Appelle.

The Saskatchewan Anti-Tuberculosis League have considered favorably two sites in Qu'Appelle Valley for the new public sanatorium proposed. Joseph Campbell, president.

Strathroy, Ont.

The town is planning a new hospital. A special committee has the matter in hand and will report. Address chairman Special Hospital Committee, Strathroy.

Vancouver, B.C.

The directors will request council to submit a by-law in January for \$125,000, for erection of new exhibition buildings, construction of roads, etc.

Victoria, B. C.

No tenders having been received by the Department of Public Works for the general contracts on schools at Nob Hill and Headquarters, new tenders will probably be called.

Victoria, B. C.

Plans are being prepared for erection of a theatre to cost \$100,000 in Broughton

and Blanchard streets. Architect, W. D. O. Rochfort, Pemberton Bldg., Victoria. It is expected that the contract will be let this winter.

Welland, Ont.

The Salvation Army will build a two-storey barracks, cor. of Cross and Division streets, in the spring of 1912; Captain Crawford, S.A., Welland, Ont., in charge.

Winnipeg, Man.

Tenders are called for lighting, alarm system, elevators, etc., for the new Isolation hospital. Received by secretary, Board of Control, until Dec. 1st. Sec., Board of Control, M. Peterson; architects, H. B. Rugh. 927 Union Bank.

CONTRACTS AWARDED

Montreal, Que.

School to, cost \$25,000 for Montreal Protestant School Board, Peel street, Montreal; architects, MacVicar & Heriot, 104 Union street; general contractor, Gray & Wighton, 244 Pine avenue, W., Montreal; reinforced concrete. Church, Ross & Co., 40 Hospital street, Montreal; electric wiring, Electric Repair & Contracting Co., 119 Lagauchere, Montreal; fire escape, Fred A. McKay, 18 St. George street, Montreal; ventilation and heating, Staton A. Bowell, 2554 Mance, Montreal; roofing and plumbing, Hickey & Aubut, 93 Dominion Montreal; contractor for steel work, Dominion Bridge Co., Ltd.

Sunday school, cost \$5,000, Dearie avenue, for Plateau Presbyterian Church (Mr. Muir, Presbyterian College); architects, Hutchinson, Wood & Miller, 53 Royal Ins. Bldg.; gen. contr., Murray & Gray, 4427 St. Catherine street, Montreal. 33 ft. high, 46 x 40, brick, conc. fndn., hot air htg., elec. ltg., gravel rfg., steel beams.

Port Stanley, Ont.

New Church for Roman Catholic Ch.; contractor, Henry A. Kay, Windsor, Ont. Contracts for seating, lighting, heating, glazing and furnishings let later.

Quebec, Que.

Immigration Building; owner, Dominion Government; contractor, C. E. Deakin, 11 St. Sacrament street, Montreal; approximate cost, \$425,000.

Weston, Ont.

Hospital for National Sanitorium Association, 374 King west, Toronto; architects, A. R. Denison & Stephenson, 20 King west, Toronto; carpentry, R. G. Kirby, 539 Yonge street, Toronto, \$5,000; 2 storeys, brick, stone and concrete.

Residences

Calgary, Alta.

Permit has been granted for two residences to cost \$6,000 on Mount Royal for R. G. Colgrove, 123 8th avenue E., Calgary; 2 storey, 24 x 52, frame, concrete foundation, hot air heating, electric light, shingle roof.

Montreal, Que.

Work will be started shortly on dwellings and stable, cost \$18,000, for Colonial Real Estate Co., Beaver Hall Hill, Montreal. Architect, McDowell & Henderson, Bank of Toronto Bldg., Guy st., Montreal. Three storeys, 88 x 95, brick, concrete foundation.

Mr. Rudolphe Forget, 83 Notre Dame street west, has purchased block for \$48,000 on Ontario ave., as a prospective site for residence.

Ottawa, Ont.

Owner Wm. Bonson, 252 Florence St., Ottawa, is planning the erection of 3 houses, 2 storey, 34 x 38, 17 x 38, brick veneer, hot air heating, gravel roof. Cost \$4,000.

A. E. Shaver, 199 Patterson avenue, is having plans prepared by architect C. J. Burritt, Sparks Chambers, Ottawa, for erection of brick veneer apartments to cost \$15,000.

A permit has been granted for residence, cost \$3,000, for A. Levinon, 443 Bank street; 30 x 49, double brick veneer, concrete foundation, electric light.

Permit has been granted for residence, cost \$3,800, St. Francis street, for R. D. Trepannia, 35 Spadina ave., Ottawa, 40 x 40, double brick veneer, concrete foundation, electric light.

Outremont, Que.

O. Lamoureux, 96 St. George Cartier Square, is excavating for residence on St. Joseph Boulevard; 2-sty. and basement, 30 x 40, solid brick, conc. fndn., hot water htg., elec. ltg., slate rfg., cost \$12,000.

Senneville, Que.

Dr. J. L. Todd, 261 Peel street, is excavating for residence, near Montreal; architects, Nobbs & Hyde, Beaver Hall Hill, Montreal; 2½-sty., 30 x 40, stone and fireproof material; masonry fndn., hot water htg., elec. ltg., roof of fireproofing material. Tenders closed Nov. 27th.

Toronto, Ont.

A permit applied for apartments, \$4,000, Belmont street, 2½ storey, brick, tar and gravel roofing, hot water heating, electric lighting, cut stone, mantels, electrical work, brick, galv. cornice; for J. A. Steele, 43 Victoria street; architect, P. H. Finney, 43 Victoria street.

Tenders are invited for det. residence, to cost \$3,000, E. S. Pacific avenue, for Chas. Jolliffe, 437 Gladstone avenue, Toronto; brick, stone foundation, shingle roofing, hot air heating, electric lighting.

Tenders are wanted in lesser trades for dwelling to cost \$5,000, north-east corner Edna and Barrett avenue, for Mrs. L. Weller, 7 Sinclair street; architect, J. H. Stanford, 34 Yonge street, Toronto; builder, J. Weller; 2 storey and attic, brick and stone, stone foundation, shingle roof, hot water heating, electric lighting.

W. E. MacKay, 469 Bathurst street, will build a pair 2½-storey semi-detached dwellings on Constance street. Cost \$6,000.

C. Coulter, 385 Palmerston Blvd., will build one pair dwellings, 2½-sty., semi-det. brick and stone, stone foundation, on east side of Grace street, to cost \$6,000.

Work is in progress for 3 detached residences to cost \$9,000, 501-3-5 Carlaw avenue, for Hayes & Caldwell, 234 Withrow, Toronto; 2½ storey, brick, tar and gravel roof.

W. Caldwell, Pauline avenue, has plans prepared by J. H. Stanford, 34 Yonge street arcade, for erection of 4 residences, solid brick, stone foundation, cut stone, tile, plate and art glass, mantles, hot water heating, in Pauline ave. Cost \$12,000.

Tenders are called for erection of a residence on Rowanwood avenue, for G. W. Defoe, 47 Simcoe street, Toronto; architect, S. B. Coon, 1106 Temple Bldg.

Toronto; 2½ storeys, stone and brick, stone foundation, shingle roofing; gas & electric light, hot water heating, 580 in. radiation, (Doneshue heater), hardwood flooring, speaking tubes, galv. cornice, plate glass, hardwood floors, shingle roofing. Tenders received by architect until Nov. 27th.

V. K. Bryce, 215 St. Clair avenue, is having plans prepared by architect J. H. Stanford, 34 Yonge street arcade, for erection of three detached dwellings to cost \$12,000.

W. E. Markey, 469 Bathurst street, has completed excavating for two houses, 2½ storeys, stone foundation, tar and gravel roofing, hot air heating—electric light, on Constance street; cost \$6,000.

Excavation is completed for pair residences to cost \$4,600, Rusholme Park Crescent, for Wood & Roberts, 623 Gladstone avenue, Toronto; 2½ storey, brick, slate, tar and gravel roof, hot air heating, electric light.

Excavation is done for pair dwellings, to cost \$5,000, for A. H. Cassanway, 200 Howard Park avenue, Toronto; architect, J. M. Cowan, 65 Adelaide east, Toronto; 2½ storey, semi-detached, brick, brick foundation, tar and gravel roof, electric lighting.

Sub-contracts are invited for two residences to cost \$6,000, on Mulock avenue for Jno. Watkins, 2335 St. Clair avenue, Toronto; 2 storey, brick, mantles, electric work, hot air heating, tar and gravel roof, electric lighting.

Sub-contracts are invited for residence to cost \$6,000 on Castle Frank Crescent for Mr. Smith, 1220 Wellington West, Toronto; architect, Bond & Smith, 1920 Wellington west, Toronto; 2 storey, attached, brick and stone, cut stone, stone foundation, hot water heating, electric lighting, electric work, mantles, plate glass.

Work is in progress for residence to cost \$6,000, for H. J. Hill, 9 Thornwood street, Toronto, 2 storey and attic, solid brick, brick foundation, shingle roofing, hot water heating, hardwood finish, structural steel, cut stone, marble, tile mantles, electrical work, brick metallic lath, plate and art glass, galvanized cornice, plaster stucco.

Tenders are invited for erection of a residence to cost \$4,300 on Conduit st. for Henderson & Weir, 1723½ Dundas street, Toronto; architect, W. J. Sanderson, 42 Pacific avenue, Toronto; 2 storey and attic, stone and brick, tar and gravel roofing.

Tenders are invited for erection of a residence to cost \$7,000 on Walmer rd. N., for M. L. Kent, 9 Wells street; architect, Designing & Draughting Co., Toronto street, Toronto; builder, S. Walker; 2½ storey, brick, hot air heating, electric lighting, tar and gravel roof.

Excavation is done for residence, \$4,500, St. Andrew Gardens, for Rea Lynch & Co., St. Andrews Gardens; architect, E. R. Conlan, 1552 Queen street west, Toronto; 2-sty. and attic, stucco and brick, stone fndn., cut stone, stone fireplace, mantels, hot water htg., gas ltg.

Excavation is completed for one pair and one det. res., \$6,000, 38-42 Dagmar ave., for Wm. A. Bully, 458 Pape ave., Toronto. Two-sty., solid brick, shingle rfg., hot air htg., elec. ltg.

Excavation is done for residence, cost \$8,500, S. High Park Blvd., for F. Court-

(Continued on page 61)

Tenders and For Sale Department

To Engineers

Every man who puts in a tender on your jobs has got to see your plans and specifications first. If you are in Montreal and he is in Vancouver the inspection of your plans is a problem. Let us solve that for you. Place on file copies of your plans and specifications in any or all of the "Contract Record" offices.

More contractors and manufacturers read the "Contract Record" than any other Canadian publication. It is the logical place to look for tenders called, and where all important works are advertised.

Send along your plans for your next job and put a line in your ad. to that effect.

Contract Record

Montreal—B34 Board of Trade.
Toronto—220 King Street West.
Winnipeg—Commercial Travellers' Bldg.
Vancouver—441 Seymour Street.

To Manufacturers of Machinery

A firm wishing to take up the manufacture and marketing of the most complete and up-to-date concrete machinery in the United States or Canada. A proposition will be considered for just the manufacturer. Please address Box 348, Contract Record, Toronto, Ont. 44-49

Sewer Excavator

For sale for immediate use, a Vulcan "Little Giant" Steam Shovel with extra long dipper handle for excavating to 16 feet below surface, mounted on traction wheels, dipper 1½ yd. capacity. Machine just overhauled; new chain, and extra large new boiler; weighs 32 tons; low price. Address

WILLIS SHAW MACHINERY Co.,
39 South LaSalle Street,
Chicago, Ill.
42-t.f.

CITY OF VANCOUVER

Re Tenders for Seymour Creek Extension

Tenders will be received by the undersigned up to Wednesday, December 27, 1911, at 4 p.m., for the following connection with Seymour Creek Extensions:

1. For the supply of 24,000 feet of 24-inch steel pipe for the Seymour pipe line extensions.
2. For the supply of valves for the new Seymour Creek pipe line extension.
3. For the excavation and back filling of a pipe trench along Seymour Creek, suitable for the construction of a 36-inch steel riveted pipe.

Plans and specifications may be seen at the office of Messrs. Hermon & Bhrwell, Room 12 Inns of Court Building, and at the office of the City Engineer, City Hall.

A deposit of an amount equal to five per cent. of the contract price must be made with each tender, by marked cheque, payable to the City Treasurer.

The lowest or any tender not necessarily accepted.

WM. McQUEEN, City Clerk.
City Hall, Vancouver, B.C.
November 8, 1911. 47-49

City of Moose Jaw Saskatchewan

The Moose Jaw Public Library Board invite competitive plans for a Public Library Building. The cost of the building is to be \$50,000, and plans are to be submitted by December 20th, 1911. A premium of \$100 will be paid for second choice and \$50 for third choice.

For further information apply to the undersigned.

W. F. HEAL, City Clerk.

Tenders for Bridge

Tenders will be received till December 5th, 1911, for the erection of a steel bridge over the Saugeen River, 10th Concession of the Township of Brant. Bridge to consist of two spans of 125 feet, and one span of 90 feet, 16-ft. roadway with concrete floor. Or for two spans of 165 feet with concrete floor.

Also for two abutments and piers for same. Specifications may be seen with the undersigned.

An accepted cheque for \$100, payable to the Treasurer, County of Bruce, must accompany each tender.

The lowest or any tender not necessarily accepted.

JAMES WARREN,
Engineer.
47-47

Walkerton, Nov. 11th, 1911.

Extension of Time CITY OF EDMONTON ENGINEERING DEPARTMENT

1912 PAVING

Sealed tenders, addressed to the undersigned, and endorsed "Tender for 1912 Paving," will be received at the office of the City Commissioners, Edmonton, Alberta, until twelve o'clock noon (12.00 M.) on Friday, December 15th, 1911, for approximately 100,000 square yards of street grading and paving with curb.

Preliminary plans, and specifications, and all information may be obtained at the office of the City Engineer; plans and specifications are on file also at the office of the Canadian Engineer, 62 Church street, Toronto, and the Contract Record, 220 King street west, Toronto. A deposit fee of Five (\$5.00) Dollars is required. This fee will be refunded when plans are returned.

Tenders are invited for Wood Block, Asphalt Block, Sheet Asphalt, Bitulithic, or other kinds of pavement.

Proprietors of patented pavements are required to furnish their special specifications.

Tenders are required to submit bids as follows:—

- Tender No. 1—Unit prices, for whole work.
- Tender No. 2—Unit prices, for 75,000 sq. yds.
- Tender No. 3—Unit prices, for 50,000 sq. yds.
- Tender No. 4—Unit prices, for 25,000 sq. yds.

An accepted cheque for five per cent. (5 p.c.) of the amount of tender must accompany each bid.

The lowest or any tender not necessarily accepted.

CITY COMMISSIONERS

Office of the City Commissioners,
Edmonton, Alta., Oct. 19, 1911. 43-49

Note—Time for submitting tenders has been extended from Dec. 1st to Dec. 15th, 1911.

Sealed Tenders

Marked "Tenders for Drainage" will be received by me at my office in the Village of Clarence Creek, until one o'clock in the afternoon of Friday, December 15th, 1911, for the construction of

THE COBB'S LAKE DRAIN

in the Townships of Clarence, North and South Plantagenet, including four reinforced concrete bridge piers and one reinforced concrete culvert. Plans and specifications may be examined and forms of tender procured at my office, or at the office of Magwood & Walker, Civil Engineers, Cornwall, Ont.

Total length of drain, ft. 45,900
Estimated Excavation, earth, cu. yds. 178,013
hard-pan, cu. yds. 350

Reinforced concrete, cu. yds. 180½

The Municipal Council of the Township of Clarence reserves the right to accept the lowest or any tender, to reject any or all tenders or to extend the time for the consideration of the tenders received on or before the above mentioned date.

A cash deposit or accepted cheque on a chartered bank equal to five per cent. of the tendered price must accompany each tender.

O. GUIBORD,
Reeve of Clarence Tp.

Dated at Clarence Creek, Ont.,
this 14th day of November, 1911. 47-50



Tenders for Annual Supplies

Tenders will be received by registered post only, addressed to the Chairman of the Board of Control, City Hall, Toronto, up to noon on Tuesday, December 5th, 1911, for annual supplies for the year ending December 31st, 1912.

Asphalt,	Brass work for House
Asphalt Blocks.	Services,
Cement,	Cast Iron Pipes,
Crushed Stone,	Hardware, Etc.,
Cedar Posts,	Hydrants,
Field Tile,	Iron Valves and Stop
Granite Paving Blocks	Cock Boxes,
Granite Boulders,	Iron Castings, Manhole
House Numbers,	Tops, etc.
Limestone Dust,	Iron and Steel,
Paving Bricks,	Lumber,
Pit Gravel	Lumber for Bridges
(Screened and Un-	and Docks,
screened),	Piles,
Rubble Stone,	Lubricating Oils,
Sand,	Lead Pipe,
Sand for Asphalt	Rubber Valves, etc.
Purposes,	Stop Valves,
Street Signs,	Special Castings,
Treated Wood Blocks,	Sewer Pipe,
Brass and Bronze	Sewer Brick.
Castings,	

Envelopes containing tenders must be plainly marked on the outside as to contents.

Specifications may be seen and forms of tender obtained at the office of the City Engineer, Toronto.

The tenderers shall submit with their tenders the names of two sureties (approved of by the City Treasurer), or in lieu of said sureties, the bond of a guarantee company, approved of aforesaid.

The usual conditions relating to tendering, as prescribed by the City By-law, must be strictly complied with.

The lowest or any tender not necessarily accepted.

G. R. GEARY, Mayor,
Chairman Board of Control
City Hall, Toronto, Nov. 10, 1911. 47-47

TOWN OF BURLINGTON

Province of Ontario

Notice to Contractors

Sealed tenders will be received by the Water-Works Superintendent until 8 p.m. on Friday, December 8th, 1911, for the construction of a Steel Plate Pump Well for Water Supply.

The contractor is to furnish all labor and materials for this work, which is to be prosecuted during the winter months, and completed in May, 1912.

Plans and Specifications may be seen at the office of the Board of Commissioners, Burlington, or at the Engineers' office, Toronto.

M. C. SMITH, Esq., Chairman.

PERCY DAWSON, Esq., Superintend't.

CHIPMAN & POWER, Engineers,
Toronto, Ont.

48-48

TOWN OF OSHAWA**Asphalt
Block Pavement**

Sealed tenders will be received up to five o'clock p.m. of the 9th day of December, 1911, for the construction of an Asphalt Block Pavement on a Concrete Base, together with a Cement Concrete Curb and Gutter, approximately 11,000 square yards.

The part to be paved will include that portion of the road occupied by the track of the Oshawa Street Railway Company.

Plans may be seen and Specifications obtained from the Town Engineer's Office, Town Hall, Oshawa.

A certified cheque for ten per cent. of the contract price must accompany each tender.

The lowest or any tender not necessarily accepted.

W. E. N. SINCLAIR, B.A., LL.B., Mayor.

FRANK CHAPPELL, Town Engineer.

Oshawa, Nov. 22, 1911.

48-48

CITY OF MOOSE JAW

SASKATCHEWAN

TENDERS

Sealed tenders addressed to the undersigned will be received up to the hour of 8.30 p.m. on Monday, December 4th, 1911, in the Council Chamber, Moose Jaw, Saskatchewan, for supplying the Fire Department of the City with one Pumping Engine, with a capacity of 800-850 gallons per minute. Tenders are invited for motor driven pumping engines, motor propelled steam pumping engines, or horse drawn steam pumping engines.

Tenders must specify the time in which delivery can be guaranteed, and complete specifications must be furnished for the apparatus proposed to be supplied. Tenders for steam pumping engine must comply with the provisions of the "Steam Boilers Act" of Saskatchewan, particulars of which may be obtained from the office of the Chief Steam Boiler Inspector, Department of Public Works, Regina.

All tenders to quote price f.o.b. Moose Jaw. The right to reject any or all bids expressly reserved.

W. F. HEAL,
City Clerk.

44-48

Tenders Wanted

Tenders will be received by the undersigned City Engineer of Lethbridge, Alta., to December 27th, 1911, for street paving and sewerage disposal plant. Plans and specifications of disposal plant on file at city engineer's office, Lethbridge, or T. Aird Murray, consulting engineer, Toronto. Preliminary plans and specifications of paving at city engineer's office.

A. C. D. BLANCHARD,

City Engineer.

Lethbridge, Alta.

48-48

Tenders Wanted

Tenders will be received by the undersigned until twelve o'clock noon on Thursday, the 21st day of December, 1911, for the purchase of the land known as the Starkey lots, being lot seven in concession D, lot seven in concession C, and lot 42 in concession 12 of the Township of Carling, in the District of Parry Sound. These lands are well timbered with all kinds of valuable merchantable timber.

Dated at Parry Sound this 21st day of Nov., 1911.

J. P. WEEKS,

Solicitor for Arthur Starkey, Esq.,

23-24

Parry Sound, Ont.

Positions Vacant

Advertisements under this heading one cent a word per insertion. Box No. ten cents extra. Minimum charge 25 cents

Architectural Draughtsman

WANTED—Thoroughly competent architectural draughtsman. Apply Allen Keefe, Architect, 229 Sparks Street, Ottawa, Ont., stating age, experience and salary expected. 48-51

Positions Wanted

Either as salesman for wholesale or manufacturing lumber establishment or as office manager for woodworking plant, by young man with practical selling and office experience. Box 372, Contract Record, Toronto, Ont. 47-48

Miscellaneous

Advertisements under this heading two cents a word per insertion. Minimum charge 50 cents

One of the largest firms on the continent making a complete line of clay-working machinery, industrial cars and track, concrete mixers and buckets, desires to secure Canadian representatives. Apply Box 371, Contract Record, Toronto, Ont. 47-48

Residences

(Continued from page 59)

emanche, 78 Howard Park ave.; architects, J. M. Cowan, 65 Adelaide street east, Toronto; 2½-sty., brick, stone fndn., cut stone, slate rfg., hot water htg., mantels, plate glass.

244 Pine ave., Westmount; carpentry, Beckham & Scott, 17 Concord street.

Tenders will be called shortly for two attached residences, cost \$7,000, for A. O. Scott, 80 Emerson ave., Toronto; 2-sty., brick, stone fndn., tar and gravel roof, hot air htg., elec. lgt.

Solomon & Joss, 48 Russett avenue, have applied for permit to erect attach-

ed residences, \$6,000, 90-92 Russell ave., 2-sty., brick, stone fndn., cut stone sills, mantels, hot air htg., elec. light.

Vancouver, B.C.

Plans are being prepared for apartment block, 4th ave. and Yew street, for J. P. Matheson & Son, 532 Granville st., Vancouver; 3-sty., 125 x 105; eight stores, hot water or steam htg., vacuum system under consideration. Tapestry face brick will be used on both street sides. Tenders have not been called.

Plans have been prepared for apartment block, Broadway and Yukon, for D. MacCallum, 24 7th ave. west; architects, Townsend & Townsend, 520 Granville street, Vancouver; 4-sty., 50 x 100, hot water htg. Work may be done by day labor, in which case owner will let all minor contracts.

Verdun, Que.

Foundations are started for 3 flats to cost \$3,200 for C. Allard, 1163 Wellington street, Verdun, 3 storey, 25 x 40, brick, electric lighting, gravel roofing, hardwood finish.

Woodstock, Ont.

The Congregation of Knox Church are contemplating the erection of a new manse on Light and Hunter streets to cost \$10,000.

CONTRACTS AWARDED**Brantford, Ont.**

Residence, \$10,000, 3-sty., 32 x 52, brk. const., brick fndn., hot water htg., elec. lgt., slate rfg., hardwood finish; owner, W. B. Preston, Brantford; architect, L. D. Barber, Brantford; general contractor, Noble & Sons, Brantford. Heating and plumbing contracts awarded to T. J. Mines & Co., Brantford.

Calgary, Alta.

Three residences, cost \$12,000, for Wilfrid Chambers, Y. M. C. A.; general contractor, H. Sykes, 240 11½ St. W.; 2-sty., 40 x 24, frame, concrete fndn., hot air htg., elec. light, shingle roof, hardwood int. finish.

Hamilton, Ont.

Residence, \$4,500, Main street west; 2 storey, 28 x 45, brick and stone, electric and gas lighting, hot air heating, shingle roofing, hardwood interior finish, art glass, electric bells; owner, Mrs. H. C. Simonds, 271 Main street west; architect, Hysert & Hildredth, 188 Gibson avenue; gen. contractor, Hysert & Hildredth, 188 Gibson avenue; excavation, Hysert & Hildredth, 188 Gibson avenue; masonry, C. Kidd, 398 Barton street east; plastering, Hannaford Bros., 232 Robinson; carpentry, ptg., glazing, plbg., and heating, let to general contractor. Permit issued. Tenders let privately.

Montreal, Que.

Sixteen flats, cost \$14,000, for H. J. Ross, 180 St. James street, Montreal; general contractor, Jackson & Co., 335 Hibernia street; 2-sty., 154 x 96 with extensions, brick and plank, conc. fndn., stove htg., gas lgt., tar and gravel rfg. Work starts at once.

Apartment house, Dorchester street; owner, Tlex. MacKay, St. Antoine and St. Martin street. Contractors as follows: Excavation, masonry, brick and stone, J. C. Hague, Azilda street; carpentry, Charles Frost, 129 De l'Enfer st.; roofing, Sibley & Hout, 77 Duke street; steel work, Eastern Canada Steel Works, Quebec; architectural iron, Dominion Architectural Iron Works, Ltd., 63 Dal-

housie street; concrete beams, The Seigswart Co., Three Rivers; plastering, Joseph Fabien. Lower Lachine road.

Apartment house to cost \$200,000 on Bishop street, for O. L. Henault, 4545 Sherbrooke street west, Montreal; architect, C. A. Mitchell, 58 Beaver Hall Hill, Montreal; piling contractor, J. H. Wood & Son, 27 St. Edward street, Montreal; 10 storeys, 50 x 120, steel frame, terra cotta facings, concrete foundation, steam heating, gas and electric lighting, roof garden, interior finish, marble, mosaic and hardwood, refrigerating plant, mail chutes, gas stoves for each apartment, telephone system, electric bells, plate glass throughout.

Residence to cost \$8,000 for Hon. Chas. Marcl, Sherbrooke street west; architects, T. Ogilby Harris, 180 St. James street, Montreal; general contractor, J. H. Lebeuf & Co., town of St. Pierre; 2 storey, 38 x 33, Scotch fire brick, concrete foundation, hot water heating, electric and gas lighting, tar and gravel roofing, hardwood interior finish, asbestos plaster, wood beam ceilings, veranda roof of asbestos shingles, main roof gravel; automatic gas heaters.

Toronto, Ont.

Residence to cost \$7,000, Summerhill Gardens, for T. Knight, 108 Summerhill avenue, Toronto; architect, J. H. Sanford 34 Yonge street, Toronto; builder, E. Farris, 345 Huron street, Toronto; masonry, Chas. Bulley, 18 Withrow avenue, Toronto; 2 storey, 42 x 26, solid brick, stone foundation, hot water heating electric lighting, hardwood finish, cut stone, tile, mantles, brick.

Residence to cost \$3,600, west side Kingston road, for W. H. Cunningham, 32 Kingswood road, Toronto; builder, C. J. Poole; 2 storey, solid brick.

Two dwellings, north Yonge street, 2-storey, semi-detached, brick; owner, Dr. Laker, 213 Dundas street; architect, E. G. Wilson, 77 Victoria street; contractors as follows: Paint and glass, Leonard Gibson, 37 Alcorn avenue; plumbing, Thos. Peacock, 381 Margueretta st., electrical, W. E. Shepard, Dundas st.

Residence, to cost \$6,200 for J. Patterson, King west and Market streets; architect, Chadwick & Beckett, 18 Toronto street, Toronto; builder, Edwin White, 15 Bleecker street, Toronto; 2½ storey, solid brick, stone foundation, hot water heating. No. 6 Daisy Boiler—20 Rads. 976 ft., stucco, slate roof.

Residence to cost \$4,000, Moss Park, for L. Price, 1887 Queen street, Toronto; architect, Bond & Smith, 19 Wellington west, Toronto; builder, L. Price, 1887 Queen west, Toronto; 2 storeys, solid brick, cut stone, shingle roof, hot water heating, electric lighting, mantles, electric work, hardwood trimming.

Hughes & Caldwell, 234 Withrow avenue, are excavating for 3 detached residences to cost \$9,000; 2½ storeys, brick, shingle roof, electric light, hot air heating.

Westmount, Que.

Residence to cost \$20,00, on Montrose avenue, for Mr. T. Bienvenue, 32 Sherbrooke street west, Montreal; architect, R. Findlay, 10 Phillip Sq., Montreal; masonry, Robertson Bros., Chestnut st., west, Montreal; carpentry, Favreau & Corbeau, 12 Erie street, Montreal; painting and glazing, Valentine & Guilbault, 38 Parc L'afontaine, Montreal; roofing,

T. Latourelle, 6 Craig west, Montreal; plaster, Henry Morgan & Co., Beaver Hall Hill; 3 storey, 45 x 56, brick, hot water heating, electric light, slate roof, interior, ash, electric work, telephone system, electric bells, ornamental columns, plate and art glass. Electrical work and ornamental iron not awarded.

Residence, Mountain ave., \$11,000, 3-sty., 25 x 40, stone and brick, stone fndn., hot water hgt.; owner, Mrs. Howard, 212 Melbourne st.; archs., Hogle & Davis, 80 St. Francois Xavier street, Montreal; gen. contr., Gray & Wighton,

Business Buildings and Industrial Plants

Aylmer, Ont.

The Aylmer Pump and Scale Works will enlarge its offices and make extensive improvements in them. Modern equipment will be required.

Brantford, Ont.

The Cockshutt Plow Co. is said to have acquired a controlling interest in the Brantford Carriage Works and the Adams Wagon Works Co. Both plants will extend. H. Cockshutt, general manager.

It is expected that the Barber-Ellis Co will build a factory on Marlboro street, to employ 250 hands.

Calgary, Alta.

G. A. Kerr, 1115 7th avenue, west, is contemplating erection of a block, 50 x 60, brick veneer, 2-storey, for stores and rooms, \$8,000.

Mr. Gusmet of Mliwaukee appeared before the council Nov. 13th asking for permission to build a brewery on city property in the Manchester sub-division.

W. H. Cushing, sash and door manufacturer, Calgary, is contemplating the erection of a plant for the manufacture of street car bodies.

The Western Machine & Supply Co. have made application to the city for a site in the Manchester sub-division for erection of a factory. The company wishes to engage in the manufacture of iron products.

Industrial Commissioner Mr. Miller, Craig and Rose, Edinburgh, Scotland, are contemplating the erection in the city of a plant to manufacture paints and varnishes.

Fraser & Seablow are excavating for business block, cost \$30,000, in East Calgary; architect, L. Dowler, Alexander Block, Calgary; 4-sty., 33 x 80, brick, concrete fndn., steam hgt. (steam boiler), elec. light, tar and gravel roof, hardwood int. finish. Remainder of work in spring. No general contract let. It is probable owner will supervise.

Galt, Ont.

Tenders will be called in the spring for machine shop in River View Park for Katie Foundry Co., Ltd; president, J. K. Ferguson; 2 storey, 70 x 29, brick, cement foundation, electric lighting, hardwood floor on second floor; grinders, tubing barrels, etc; also lavatory equipment. Hall for employees above.

Tenders will be called shortly for a foundry (moulding shop) River View Park, for The Katie Foundry Co., Ltd.; president, J. K. Ferguson; secretary, L. J. Radigan; 1 storey, 70 x 70, brick and concrete, electric light, two 5-ton electric cranes. Building to be erected next spring. Firm manufactures grey iron castings.

Hamilton, Ont.

Tenders will be called shortly for extension to plant to cost \$2,000,000, on Sherman avenue, of Steel Company of Canada, Ltd.; general manager, Robert Hobson, Hamilton; engineers, Morgan & Co., Worcester, Mass., U. S. are preparing plans. Rod mill, blooming mill, billet mill, two 60-ton continuous open hearth furnaces.

Maisonneuve, Que.

Excavation is under way for store and two flats, \$4,000, Adam street, 3-storey, 24 x 38, brick, concrete foundation, electric lighting, gravel roofing; owner, Andre Bernier, 198 Jean d'Arc.

Merritt, B.C.

Plans are being prepared for erection of a bank, cost \$50,000, for Bank of Montreal; 2-sty., brick and stone. It is not expected that construction will begin until spring.

Montreal, Que.

Messrs. Glickman & Glickman, 124 St. Lawrence Blvd., are having plans made for converting a store on that street into a moving picture theatre in the vicinity of Pine avenue. C. Duport, La Presse Bldg., architect.

The Board of Control have ordered plans prepared for a refrigeration plant for Bonsecours market. No estimate has yet been mentioned.

2,300 square feet of land at 12-14 St. John street, with warehouse, has been purchased for \$40,000 from Henry Joseph and others by J. W. Molson, 451 Sherbrooke street west, as a building site for and office building.

Nanaimo, B. C.

Brick plant will be established on Gabriola Island, \$30,000. Machinery supplied from Berg. Machine Co., Toronto; Thos. Dobeson & Sons, Nanaimo, supply the engine; owner, The Dominion Shale, Rock. Brick and Sewer Pipe Co., Ltd., Vancouver; manager, L. D. Morris. The plant is expected to be in operation by March 1st.

Newmarket, Ont.

Factory. Owner, Harding Motor Car Co., 351 Globe street, London; F. C. Harding, manager. By-law to grant \$25,000 as loan to above company carried. A site has been secured and it is hoped to have the building in operation by January.

Prince Rupert, B. C.

Hotel for Grand Trunk Pacific Railway; supt. of Hotel System, F. W. Bergman, manager of Chateau Laurier, Ottawa; prov. architect, F. M. Rattenburg. The hotel proposed here to accommodate 250 guests is one of six under consideration. Three points have been selected: Edmonton, Victoria and Prince Rupert. Another will be located in the Sulphur district in the Rockies, and two others between Prince Rupert and Winnipeg.

St. Catharines, Ont.

Tenders are called for erection of a brick block to cost \$7,000, for S. P. Gourlay, King street; architects Nichols, Welland; 2 storey and basement, 37 x 56, two large stores and 2 flats.

Strathroy, Ont.

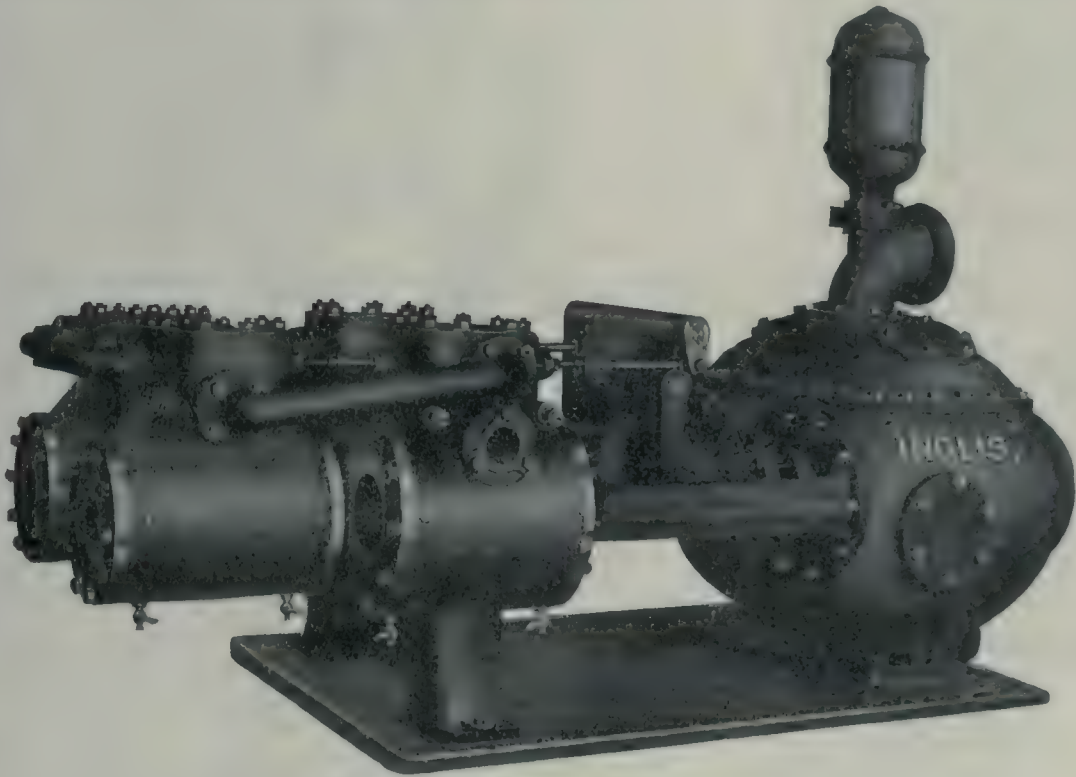
The Dymond Colonial Furniture Co is planning to double its plant next spring. Plans will be prepared later.

Toronto, Ont.

Application has been made for the Selmet-Solway Co., Syracuse, N.Y., by

Water-Works Plants

for Towns and Cities



"Inglis" 1,000,000 gall. Pumping Engine.

Our long and successful experience in the building and installation of Pumping Engines and Water Works Machinery should be a strong argument in favour of "Inglis" products. During the fifty-two years (52) our plant has been in operation, we have built many Pumping Engines, all of which have given entire satisfaction.

Capacities from one to thirty million gallons per 24 hours.

Send us your inquiries.

The John Inglis Company

Engineers and Boilermakers

Limited

14 Strachan Ave., TORONTO, Canada

Corley, Price & Garvey, Toronto, for a site for a coke manufacturing plant. From 75 to 100 acres would be required. Cost \$2,500,000. It is their intention to begin building operations at once.

Permit applied for alterations to store and dwellings to cost \$6,000, 3 storey and basement, solid brick, stone foundation, tar and gravel roofing, electric lighting, metal cornice, reinforced concrete vaults; owner, Mr. Gangel.

Excavation has started on store and dwelling to cost \$4,000, Roncesvalles and Garden avenue, brick; owner, T. J. Sharpe, 330 Sunnyside avenue; architect, P. H. Finney, 43 Victoria street.

Tenders are open for 1 pair stores and dwellings, for C. Coulter, Palmerston Blvd., Toronto; architect, P. H. Finney, 43 Victoria street, Toronto; 2 storey, semi-detached, stone foundation, tar and gravel roofing.

Work will start shortly on erection of a brewery to cost \$50,000 on King and Ontario streets, for Copland Brewing Co., King street east; architect, Mr. Schultz; 6-storey, solid brick, tar and gravel roofing, steam heating, electric light, freight elevators, machinery, structural steel, brick, reinforced concrete.

Sub-contracts are invited for two stores and residences, \$6,000, on Parkway and Dundas, for M. Stonehouse, 107 Lippincott street, Toronto; architect, J. Gladwin Hedges, 86 Clinton street, Toronto; 2½ storeys and 3 storeys, brick, slate and felt roofing.

Work is in progress for alterations to store and residence to cost \$5,000, College and Shaw streets, for Mr. Gangel, College and Shaw streets, Toronto; 3 storey and basement, brick, stone foundation, tar and gravel roofing, reinforced concrete, electric lighting, metal cornice, vaults, tile.

Tenders are open for warehouse to cost \$28,000 on Richmond street, for Scotland Woollen Mills, 139 Yonge st., Toronto; architect, L. S. Yolles, 244 Simcoe street, Toronto; 5 storey, brick and stone, stone foundation, structural steel, Indiana cut stone, tile, steel, sash fire escapes, electric work, machinery, brick, concrete, fireproof doors, wire glass, cornice, elevators, steam heating, electric light.

Plans are being prepared for erection of a tanning factory to cost \$13,000 for W. B. Levack, 1189 Bathurst street, Toronto; 2 storeys, brick and concrete, concrete foundation, tar and gravel roof, steam heating, electric lighting, fire escapes, tanning machinery, brick, concrete vats, etc.; sprinkler system, pumps, engines, boilers, and beam house equipment.

Tenders are invited for erection of a warehouse to cost \$25,000, on Bathurst street, for F. C. Burroughs, cor. Bathurst and Queen street, Toronto; architect, Herb. C. Paull, 395 College st., Toronto; 6 storeys; brick, concrete foundation, tar and gravel roofing, structural steel and iron, skylights, cut stone, fire escapes, electrical work, brick, reinforced concrete, fireproofing, plate glass, folding and fireproof doors, cornice, ornamental iron, elevators.

Sub-contracts invited for alterations to warehouse, cost \$8,000, at 80 Wellington street west, for Sterling Lace & Novelty Co., 70 Wellington street west, Toronto. Architects, Curry & Sparling,

Yonge street, Toronto. Structural steel, cut stone, brick, mill construction, elec. light, tar and gravel roof.

Plans are being prepared for a garage, cost \$25,000, on Huntley street W. for G. S. Boone, 142 Crescent road; architect, Chadwick & Beckett, 20 Toronto street, Toronto. Two-sty. and basement, brick, stone fndn., struc. steel, Longford cut stone, art stone, weeping tile, conc. footings and floor, galv. cornice, ornamental iron, mantels.

Tenders are called until Dec. 4th for the erection of a garage on Avenue road, for Wolseley Tool Motor Car Company, Vickers Ltd., proprietors; brick garage and show room.

Truro, N. S.

Plans are being prepared for erection of extensions to plant for Stanfields, Ltd. The building will be about 125 ft. long.

Vancouver, B. C.

Plans are filed for store and apartments, 2676 Granville st., \$14,000; 3-sty., frame and brick veneer, W. C. F. Gillman, Hutchison Bldg., architect; no general contract will be awarded.

A permit is issued for store and apartment house, Cordova street, \$50,000, 3 storey, brick, steam heating; owner, F. McElroy, 1763 Nelson street; architect, Hugh Braunton, 80 Exchange Bldg.

Plans are being prepared for erection of an office building by architects Heath Gove & Nuese, Metropolitan Bldg., Vancouver; 12 storey, 120 x 120, steel and reinforced concrete.

It is announced that Bloedel, Stewart & Welch of Bellingham, Wash., are planning to build a large saw mill near here; J. H. Bloedel, president.

Sketches are being prepared for erection of an office building to cost \$230,000, for Dominion Trust Co., 207 Hastings west, Vancouver. It is stated that no architect has as yet been selected.

Welland, Ont.

Tenders are called until Nov. 30 for erection of stores to cost \$7,000, for S. P. Gourley, Welland, Ont.; 2 storey, 40 x 50, brick, concrete foundation, electric light.

Tenders are to be invited for hotel extension to cost \$15,000 for J. Cooper, proprietor Dexter House; 3 storey, brk., concrete foundation, steam heating, electric light.

Windsor, Ont.

Plans are being prepared for addition to plant to cost \$30,000, of British American Brewing Co.; architect, Milner & Eisen, 1018 Hammon Bldg., Detroit, Mich. The new building to be 4 storeys, 56 x 60 ft.

CONTRACTS AWARDED

Calgary, Alta.

Warehouse for General Supplies, Ltd. (E. A. Dunbar, 5 Crown Block); general contractor, Fysche, Martin & Co., 7 Crown Block, Calgary; 3 storey, 50 x 110, brick, concrete foundation, steam heating, electric lighting, tar and gravel roofing, mill construction, freight elevator to carry 4,000 lbs., iron fire escapes.

Business block to cost \$100,000 for Independent Order of Oddfellows; architect, D. S. McIlroy, 118a 8th avenue west, Calgary; general contractor, R. A. Brocklebank; 4 storey, 110 x 70, reinforced concrete, steam heating, electric

lighting, tar and gravel roofing, elevators, boilers, fire escapes and vaults. Contractor is making preparations to continue work during winter.

Calgary, Alta.

Stores and offices, cost \$80,000, for G. J. Johnson; architect, A. Pirie; general contractor, McDougall & Foster, Board of Trade Bldg., Calgary; 6-sty., 50 x 130, steel, brick walls, conc. fndn., steam htg., elec. ltg., tar and gravel rfg., slow burning floors, passenger elevator, fire escapes.

Business block, cost \$120,000, for A. McDougall, McDougall Block, Calgary; architect, A. A. Rose, Lineham Block, Calgary; general contractor, Rose Bros., Lineham Block, Calgary; 5-sty., 75 x 130, brick and mill construction, conc. fndn., steam htg., elec. ltg., tar and gravel rfg., fireproofing.

Business block, cost \$50,000, 8th ave. east, for P. Burns & Co., Ltd., E. Calgary; architects, Hodgson, Bates & Butler, Grand Exchange, Calgary; general contractor, Norton Griffiths Construction Co., Vancouver. B.C. Two-sty., 50 x 130, steel constr., reinf. conc., conc. fndn., steam htg., elec. light, tar and gravel roof. The work has been closed down for the winter. It is possible that the block will be carried up 8-storeys, for which foundation is laid.

Business block, cost \$25,000, for J. Dimorr, Harrow, England; architect, Leo. Dowler, Alexander Block, Calgary; general contractor, L. R. Burn, Centre st., Calgary; 3-sty., 50 x 40, brick, conc. fndn., steam htg., elec. light, gravel roof. Elevators will be required.

London, Ont.

Store on Dundas street, for T. F. Kingsmill, dry goods merchant; architect, W. G. Murray, London; general contractor, John Dodd; 3 storey and basement, brick building to replace one destroyed in recent fire. Store fittings, elevators, heating equipment, etc., will be let later.

John Hayman & Sons have been awarded the contract for a new store for Wilfrid L. Mara on Dundas street, \$20,000, 3 storey, in front and 2 in rear. W. G. Murray, architect. All shelving, store fixtures and heating and lighting equipment to be bought later.

Montreal, Que.

Cigar factory, \$15,000. St. Charles Borromeo, 3 storey, 47 x 70, brick, stn. foundation, hot water heating, electric lighting, gravel roofing; owner, Rattray & Co., Ltd., 84 Peter street; contractors as follows: gen. contractor, Simpson & Peel, 10 Benoit street; brick and masonry, James Morrison, 5 Dominion Sq. Apartments; painting and glazing, W. E. Potter & Co., 46 Benoit street; plumbing and heating, W. A. Bradford, 42 Jurors street; roofing, Richardson, Simard & Co., 129 Elgin street; freight elevators, Otis-Fensom Company.

Store, \$15,000. St. James street, 2 storey, 30 x 60, brick, cement foundation, hot water heating, electric lighting, gravel roofing; owner, The Holden Co., Ltd., 354 St. James street; architect, H. C. Stone, 84 St. Francois Xavier street, contractors, as follows: general contractor, Reid, MacGregor & Reid, 668 St. Catherine street; carpentry, D. M. Long, 39 Windsor street; painting and glazing, Alex. Craig, 41 Jurors street; plumbing and heating, W. J. McGuire & Co., Ltd., 232 Craig street; roofing, Richardson, Simard & Co., 129 Elgin

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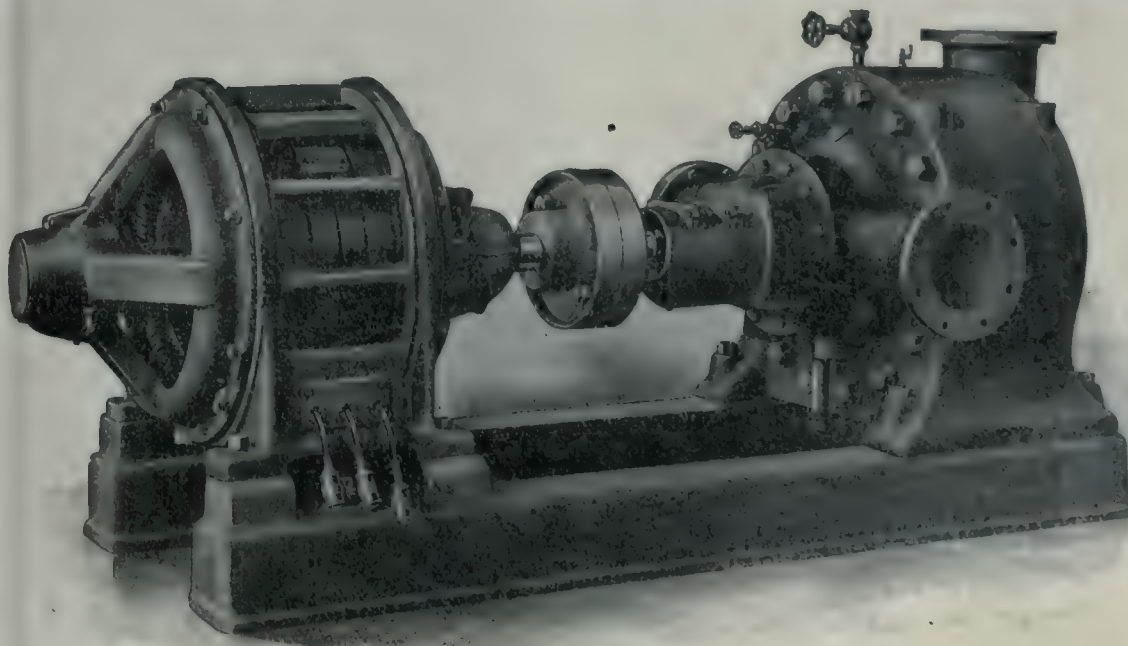
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avenue; ornamental iron, F. A. McKany 18 St. George street; plastering, Geo. H. Knott & Co., Chestnut avenue; elec. wiring, the Sayer Electric Co., Bleury st. street.

Ottawa, Ont.

Garage to cost \$9,000 for L. Duhamel, Ltd., 107 Murray street; architect, J. P. McLaren, 104 Sparks street, Ottawa; general contractor, A. O. Garvock, Lewis street, Ottawa.

Toronto, Ont.

Garage to cost \$5,000. Highland ave., 1½ storey, 24 x 30; owner, H. C. Schofield; architect, Geo. W. Gouinlock, 1104 Temple Bldg.; masonry, J. W. Gratton, 488 Clinton street.

Store and apartment to cost \$26,000, Roncesvalles and Bosted avenues, for R. C. Bustard, 1538 Yonge street, Toronto; masonry contractor, Samuel Walker, 196 Gladstone avenue, Toronto; 3 storey and basement, brick, cut stone, tar and gravel roofing, hot water heating, electric lighting, tiles, mantles, plate glass, speaking tubes, hardwood floors.

Office and warehouse to cost \$28,000; (382 Wallace street) for Glidden Varnish Co., 382 Wallace avenue; architect, Prach & Perrine, Hamilton; builder, Wickett Bros., 431 Sumach street, Toronto; 2 storey, 105 x 60, brick, mill construction, reinforced concrete, steel sash, plate glass, tar and gravel roof, electric elevators, tanks and machinery.

Addition to factory to cost \$18,000, Don Railway, for Conduits Ltd., Don Railway, Toronto; architect, Bond & Smith, 19 Wellington west, Toronto; contractor, Trussed Concrete Steel Co., 23 Jordan street west, Toronto; 1 storey, brick and concrete, tar and gravel roof, structural iron, skylights, reinforced concrete and iron.

Factory to cost \$53,000, for Russell Motor Car Co.; architect, E. J. Lennox, 164 Bay street; masonry, Page & Co., Charles west, Toronto; carpentry, T. V. Gearing, 102 Carleton street, Toronto; both on percentage basis. 2-storey, 158 x 124, brick, steel construction, steel, art stone, freight elevators, hardwood flooring, steam heating, felt and gravel roof, electric lighting, machinery.

Cooler Building to cost \$60,000 for Swift Canadian Company; boilers, Bishop Construction Co., Traders Bank Bldg., Toronto; 4 storey, brick, electric lighting, structural steel, iron, electric work, machinery, brick, reinforced concrete, freight elevators.

Stables, cost \$50,000, for Don Storage Co., 137 River street, Toronto; architects, Chadwick & Becket, Toronto st., Toronto; masonry, Teagle & Son, 55 Boswell ave.; carpentry, Schooley Bros., 193 Ontario street; roofing, A. B. Ormsby, Queen and George streets; painting and glazing, G. A. Shackleton; plumbing, heating and ventilating, Gentle & Travis, 23 St. Enoch's Square.

Vancouver, B. C.

Warehouse to cost \$60,000, C. P. R. Reserve, for Kelly, Douglas & Co., 367 Water street, Vancouver; contractor, Jno. McLuckie, 815 Pender street w., Vancouver. Firm are wholesale grocers; general contractor will handle all minor contracts.

Dairy building for Almond Ice Co., Pender and Dumbevy streets; architect, E. E. Blackmore, Loo Bldg.; gen. contr., Jas. Layfield, 1024 Broadway west; 2-story, reinforced concrete bldg., \$20,000.

Power Plants, Electricity and Telephones

Byron, Ont.

The residents have asked for hydro power, and Superintendent Glaubitz, London, has promised to take up the extension of the line for them at once.

Hamilton, Ont.

Tenders are called for erection of a sub-station for Hamilton Hydro-electric Department; consulting engineer, E. I. Sifton; Mayor, G. G. Lees; 20 ft. x 30 ft., brick. Plans, etc., at office of engineer. Received by Mayor, care city clerk. until December 5th.

Conduit, cost \$20,000, for Hamilton Hydro-electric Department; consulting engineer, E. I. Sifton, City Hall; contractor, Vermont Conduit Co., Buffalo, N.Y.

Outremont, Que.

Council approved of plan of electric wire conduits approved by Prof. Herdt of McGill University. The intention is to put all telephone and electric light wire under ground as soon as possible. Ornamental street lamps will be required; also trolley poles.

Quebec, Que.

Tenders are called for electric lighting system. City engineer, W. D. Paillette; 520 arc lights (choice of 3 systems) 226 more or less, incandescent lights to contain 90 Tungsten 80 watt lamps; also 136 Tungsten 60 watt; "Park Lights," lighting of municipal building, etc. Received by engineer until Dec. 6th and call for erection and maintenance of system.

Thorndale, Ont.

The East Middlesex Telephone Co. will make important extensions to its system, including a line to Evelyn. T. Berger, manager, Thorndale.

Vancouver, B. C.

Water power plant to cost \$500,000, Puntledge river, for The Canadian Collieries of Dunsmuir; contractors, Grant, Smith & Co., Pacific Bldg., Vancouver. Plant will develop 12,000 h.p. hydraulically; power for mines and railway will be furnished. The company will expend \$1,600,000 in new equipment and extensions next year in the coal fields on Vancouver Island.

Virden, Man.

The mayor and council are open to receive proposition for installation and operation of light and power plant within the town limits. Information from sec.-treas. J. F. G. Menlove.

Waterford, Ont.

The by-law to install an electric lighting system carried by a vote of 176 to 46, and tenders will be called at once.

Welland, Ont.

Mr. George Annas will petition the council to have business part of town lighted by clusters of tungsten lamps on iron posts. J. Black, town engineer.

Miscellaneous

Edmonton, Alta.

Tenders are called until Jan. 1 for machinery for Edmonton Portland Cement Co., Hoser, Ryder Block, Edmonton; coal crushers and pulverizers; also clinker crushers. Specifications on application to office.

South Vancouver, B. C.

Fire Chief Jordan is preparing plans for a fire alarm system for the municipi-

ality. Estimates etc. will be considered at the next meeting of the board of works.

Business Notes

Arrow Lakes, B. C.

On Thursday, Nov. 9th, 1911, a fire which started in the refuse burner spread to the slab pile and completely wiped out the Canadian Pacific Lumber Company's mill and yards at Kingston Creek. Damage estimated at \$75,000; Rand Gibbons, manager.

Calgary, Alta.

Among the businesses represented in the list of those desiring to locate here are the following: automobile manufacturers in Wisconsin and Detroit; also an automobile supply house interested, New York; shoe manufacturers in Toronto, Three Rivers and Quebec; farm pump engine manufacturers in United States; furniture manufacturers, Vancouver; powder manufacturers, Pennsylvania; wholesale druggist, Halifax; manufacturer of paints, varnishes, Oakland, Cal.; brick manufacturer, Winnipeg; manufacturers of women's clothing, Toronto; manufacturers of concrete mixers, Milwaukee, and others.

Fenelon Falls, Ont.

The Standard Chemical Works building completely destroyed; contents badly damaged. It is probable they may rebuild. Manager, Wm. Shane.

Montreal, Que.

Eadie-Douglas Limited, 12 University street, Montreal, Que., have been awarded the contract for TerraNo flooring for the Roman Catholic Church at Haileybury for the Infectious Diseases Hospital in Guelph for three new Y.M.C.A. buildings in Montreal and for the Isolation Hospital in Toronto.

Ottawa, Ont.

The garage of Pink & McVeity, Sparks street, was destroyed. Loss on automobiles stored, \$50,000; on building, \$15,000. The gasoline in tanks did not explode.

Victoria, B. C.

T. N. Hibben & Co., stationers, 112 Government street, Victoria. 4-storey building completely destroyed. Loss, \$140,000. Insurance, \$35,000.

New Companies

Neelys Limited, Toronto, Ont., have been incorporated, with a capital of \$100,000, to deal in building materials, etc. Provisional directors, Thos. A. Neely, Hugh Alex. Reid and Fred Neely, all of Meaford, Ont.

Western Dominion Investment Company, Ltd., Winnipeg, Man., incorporated, with a capital of \$500,000, to deal in timber lands, mining rights, etc. Incorporators, Roland Shelton, Herbert W. Hollis and Chas. S. Tupper, all of Winnipeg.

Canadian Summer Resorts, Limited, Toronto, Ont., has been incorporated, with a capital of \$40,000, to erect buildings and deal in building materials. Provisional directors, John Richmond Jackson, Edward Willis Drake and Floyd A. Lawson, all of Toronto.

Century Land Co., Ltd., Toronto, Ont., incorporated, with a capital of \$40,000, to carry on a general land and building business. Provisional directors, Jas. Edward Day, Edward V. O'Sullivan, and John M. Ferguson, all of Toronto.

Contract Record

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Contracting and Progress of Promoters

The part of the contractor as a company promoter was taken up by Mr. Daniel J. Haner in an interesting article printed in the last issue of the Contract Record. In the main the author's contentions were based on good ground and in any case they were expressed conservatively, but if we were asked to state a distinction between promoters and contractors we should say the former take all the plunder without risk, while the latter toss up for the odd cents and take all the risk. There is hardly a concern which has been floated upon shareholders but is heavily handicapped by excess of capital—the excess caused by the grasping greed for plunder of promoters.

A singular feature of promoting is that the real promoters scarcely or never stick to the company when floated, and so when the almost inevitable inquiry takes place they do not figure in the proceedings. This is true as regards the great mass of promoters, but, fortunately for them, there are a few honest men who of necessity have to promote in that they have something new to introduce and something that will advance the progress of the world.

The mere fact that there is a small percentage of honorable promoters unfortunately enables the larger number to victimize the public. One of the professions particularly open to be victimized is that of the contractor. A new scheme is afoot; the promoter asks the contractor to tender for so and so. The tender is made out and sent in according to the information provided by the promoter and given to the contractor. A flaming prospectus, among other clauses, has one that such and such a contractor—always, mind you, one with a good reputation—has offered to do the necessary work at a stated price. Assume that the concern floats, how often is the real work needed—the same as indicated by the promoter

when getting a tender from the contractor? Usually it is found necessary to alter in all directions, and in the end the work is far different, as is the bill for it, than was estimated for the purpose of the prospectus.

Again and again remarks are made about the mistakes in tendering, but we desire to emphasize the fact that the contractor is far less to be blamed than the men who supply him with information.

There is a third state when neither promoter nor contractor can be blamed. Nature often provides unforeseen surprises to upset the best and wisest calculations. In fact, hardly any work of great magnitude or in a new direction is ever carried out without the cropping up of the unforeseen, for which the contractor provides, as does the engineer, in the name of contingencies.

Our point, however, at the moment is that promoting and contracting do not always go hand in hand, in that the information given on account of the latter is often too meagre, even if not intentionally misleading; and that it is to the benefit of the former that the cost of estimated work should be as low as possible.

Three Weeks to Tender on Millions

Elsewhere in this issue we publish the terms of contract in connection with the Sooke Lake development work for the city of Victoria. This project has been on the tapis at Victoria the whole year and the expenditure involved is \$1,500,000, but when it comes to calling for tenders, three weeks is considered sufficient for obtaining bids. The reason for this inadequate time allowance, it would appear, is the same as was given in the case of the subway proposition at Toronto, namely, the need for obtaining figures prior to submitting a by-law to the ratepayers. It would seem as if the system—or lack of system—adopted by the Toronto City Council had become fashionable in municipal councils, but in reality this kind of thing has been going on from the very beginning. We have urged time and time again that the preliminaries for such important projects should be settled well in advance of the time for taking tenders, so that not only the ratepayers would get a fair deal, but that the contractor would be enabled to look carefully into every phase of the work and submit the best figures consistent with careful judgment and the best workmanship.

We hear of failures and rumors of failures in municipal contracts throughout the country. The blame for this is placed with the contractors, but in reality it should be assigned largely to the inexperience and inefficiency of those who arrange the details of such work. The "hurry-up administration" of these people is a farce. If the ratepayers knew enough to consider these things they would reject the Toronto Subway and Sooke Lake proposals.

An Opportunity for the Government

It is of interest to record that a deputation from the Royal Architectural Institute of Canada has waited upon Premier Borden and preferred certain requests. These are: that the Government provide the Institute with an annual scholarship of \$3,000; that a properly constituted commission be appointed to prepare a comprehensive plan of improvement for

the City of Ottawa; and that the designing of large public buildings be entrusted to private architects so as to insure individual and modern treatment.

From all accounts Mr. Borden was interested in the representations of the delegates, but it is significant that nothing further than the conventional "careful attention" was promised.

The new Government will be well advised to support the aims of The Royal Architectural Institute. The architectural profession in Canada is worthy of encouragement; indeed it is almost a vital thing in

the interests of the country that it should be raised to a higher plane than it now occupies. Canada is a country in the building, and it will be a far-sighted policy if the Government do all in their power to elevate the whole standard of construction, whether in building or engineering; it will be a near-sighted blunder if they relegate to the obscurity of the future the modest requests that have just been made by the Institute. It is in matters of this kind that the authorities are enabled to show their discernment or otherwise.

Continental Enthusiasm in Good Roads

Widespread Interest Disclosed at Recent Sessions of First American Road Congress — Synopses of Papers by Prominent Engineers

The first American Road Congress held recently in Richmond, Va., was attended by prominent engineers and contractors from all parts of the United States and from several Canadian cities. Mr. Logan Waller Page, Director of the Office of Public Roads, acted as president of the congress. In his opening remarks he pointed out that no good roads discussions were complete which failed to recognize that maintenance is the most important topic in the whole subject of road improvement.

Macadam and Gravel Roads

The morning of the second day of the convention was opened with a paper on macadam and gravel roads presented by Mr. W. A. McLean, Provincial Highways Engineer for Ontario. The great length of the roads under his charge has made it necessary to keep unit costs down to a minimum and in doing this machinery has been found invaluable. Indeed, he was inclined to term road rollers the most popular things in the province; while the value of grading machines and portable rock crushers was stated to be everywhere acknowledged.

Brick Paving Methods

A paper on this subject was delivered by W. P. Blair, Secretary of the National Paving Brick Manufacturers' Association, who described the methods of construction the Association recommends for suburban and main country roads, such as the several hundred miles of brick roads radiating from Cleveland. The preparation of the sub-grade and the cushion, and the laying and jointing of the brick was explained. The Association strongly advises filling the joints with a grout made of equal parts of Portland cement and sand, kept constantly agitated so it will remain of uniform consistency. This is recommended because it does not wear away more rapidly than the brick; soft fillers, Mr. Blair said, eventually permitted the edges of the bricks to become chipped and when this occurred deterioration took place rapidly. The cement filler, when properly made and used, added greatly to the life of such a pavement. Expansion can be taken care of by joints along the curb. The curb on country roads is best kept flush with the pavement and the shoulder should be firm and level with it so that teams can turn out of the roadway without difficulty.

Relation of the Engineer and Contractor

Interesting papers upon the above subject were presented by Mr. Bates, Past-President of the Ameri-

can Society of Civil Engineers, and Capt. D. L. Hough, President of the United Engineering & Contracting Company.

Mr. Bates pointed out that road work could only be successful when executed under an engineer's direction, because it was necessary, in order to have the greatest efficiency, that the quantity and quality of the work and the method of doing it should be definitely controlled, and only an expert was qualified to exercise that control. In order for him to be successful he must have full authority over everything entrusted to him, and hence care should be taken that nobody who is not competent to exercise such authority properly is put at the head of the work, no matter how influential his backing. It is also advisable to have the work done by contract, because actual construction is a business and the best results in business are only attained when men are induced to enter it as they enter other lines of business. Furthermore it is desirable to encourage road contracting for in this way men will invest in plant and maintain organizations which will bring about the best efficiency, but the only provided when there is sufficient business to warrant this expense.

Mr. Bates pointed out that as engineers and contractors must pull together or the people will be the losers, their relations should be defined carefully in the contract; but as a contractor he felt that engineers were sometimes inclined to use their power of final decision on subjects under dispute in an unfair manner. Hence contractors bidding on work to be executed under some engineers raised tenders so much that in such cases they apparently attach more attention to the personality of the engineer than to the terms of the contract. Such a condition was wrong, for a contract which enables one party to work an injustice on another is contrary to public policy, no matter whether it is legal or not. Another great cause of trouble, Mr. Bates said, is found in clauses so unintelligible that both engineer and contractor find it difficult to decide what are their respective obligations.

A great deal of help can be furnished to the contractor in some cases by the engineer and the cost of the work can be reduced if it is so arranged that it may be prosecuted continuously, so that the requirements for plant and organization are understood at the outset. As a rule, moreover, if the work is planned so that local contractors can undertake it, better prices can be secured, Mr. Bates said, because

they wish to retain experienced men and keep their plant employed, while outside parties must build up a fresh organization.

A source of unnecessary expense in many cases where a good engineer is employed is a requirement that the contractor shall guarantee his work for a certain time. Competent engineering will require and secure good work, Mr. Bates pointed out; when a contract is completed the engineer should know that the contractor has given the full measure of work named in the contract and he should be in a position to pay that value in full. This means that the engineer should be a permanent officer in the organization in charge of the road work, so that he may keep in touch with all the changing requirements of his locality and prepare his plans and specifications to meet them so completely that the contractor need not assume any part of them under the guise of guarantees.

The Engineer's Personality a Factor

Captain Hough pointed out early in his paper that the engineer's personality had no little influence on the cost of work of the same quality. Some men, particularly young men, insisted on the letter more than on the spirit of a contract, and the needless burdens they imposed on the contractor were reflected in the higher bids on work where he was engaged. He never realized these things until he became a contractor himself, but after some experience in the latter capacity he reached the conclusion that few engineers could appreciate every side of their work until they had actual experience in charge of construction on a contracting basis. This would teach them that the vital principle of a contract was mutuality which cannot be violated without one party or the other being injured.

The less a contract has in it, provided absolute clearness is present, the better the results, as a rule. It is impossible to foresee everything that may arise to affect construction operations, and consequently too much detail in the contract is more likely to cause trouble than to work good. Furthermore, engineers will find it desirable in many cases to permit contractors to make suggestions regarding some features of their contracts, so as to enable them to utilize plant and organizations to the best advantage. A rigid contract which gives a contractor no opportunity to employ his resources to the best advantage does nothing but enhance the cost of work.

The character of construction and its scope is constantly growing so that technically educated men are finding the work of the contractor an interesting and profitable field. This is desirable in every way, and particularly in raising the moral of the whole force engaged under a contractor. The knowledge that the contractor intends to give the man or corporation paying for the work just what is called for, and that his engineers insist upon this standard even without inspectors means a great deal in carrying on construction successfully.

Captain Hough then analyzed a large number of road contracts and specifications, pointing out features in them which were a hardship to the contractor without being a help to the parties represented by the engineer. Such things inevitably cause disputes and lead to litigation. Litigation is one of the most costly diversions of a contractor and to avoid this great expense he recommended the establishment of a court of arbitration which would consist of two engineers and a lawyer.

The Carpeting Principle. Sanded Bitumen on Concrete Foundations

An interesting account of the use of a carpet of sanded bitumen on concrete foundations, for residential roads at Ann Arbor, Michigan, is contributed to a recent issue of *Engineering and Contracting* by Mr. E. W. Groves, the city engineer. Mr. Groves first tried this method of providing a wearing surface in order to prolong the life of an asphalt block pavement. After it had been in use for about two years it proved so satisfactory that it was decided to try it for new construction, and about 1,800 square yards were put down in 1909, the carpeting layer being made with coal-tar and sand, and the under crust being of concrete.

Petitions for more of this pavement have been rolling in, and some 61,000 square yards are being laid down this year.

The method is described as follows:—

The concrete is laid in strips one-half the width of the street, and 25 feet long, an expansion joint $\frac{3}{4}$ to 1 inch being left every 25 feet across the street, perpendicular to the axis and at each curb. The surface of the concrete is given a wood float finish, and roughened by brooming and indenting the surface with a tamp arranged for that purpose. After finishing a section as described the form at the centre of the street is removed, and the pavement for the other half of the street is laid, the new concrete being deposited against that which has been previously laid, so that while there is a joint at the crown of the street it is hardly perceptible. This would be objectionable were it not for the bituminous covering which completely covers it.

After the concrete has hardened, and is thoroughly dry and clean, the surface is covered with hot bitumen and No. 4 torpedo sand. The bitumen is applied from a sprinkler wagon designed for that purpose, having a fire-box under the tank for heating the material to a temperature of about 200 deg. Fahr. The bitumen is immediately distributed evenly over the surface of the concrete with an ordinary street sweeper with a well-worn broom, and the surface well covered with torpedo sand. Approximately half a gallon of bitumen is used per square yard of surface, and a cubic yard of sand will cover approximately 250 square yards, making a wearing surface about $\frac{3}{8}$ in. thick.

Various kinds of bitumen have been tried, and there has been no difficulty in obtaining a suitable material. The work is carried out by direct labor, and with cement at \$1.10 to \$1.30 per barrel, gravel at \$1 per load of $1\frac{1}{3}$ cubic yards, and labor at \$2 per day of nine hours, the cost is less than \$1 per square yard.

The article is accompanied by a photogravure showing one of the roads in Ann Arbor in which this pavement has been laid. The road has a fairly wide carriage-way, separated from the two footways by strips of turf in which shade trees are planted in continuous rows. The road is fairly well shaded, though the trees are not yet of full size, apparently. Probably no part of the road receives more than a very few hours of continuous sunshine in the summer. It is not stated in the article whether the pavement has been tried on more exposed roads, and it seems to have been specially successful in the residential roads, possibly with quite light traffic, and probably provided with trees.

Strength of Materials and Notes on Design

Instructive Points in the Presidential Address at the Institution of Civil Engineers—Application of Scientific Data to Practice

In his inaugural address as president of the Institution of Civil Engineers, delivered recently in London, Eng., Dr. W. C. Unwin, F.R.S., dealt with some of the technical principles on which the successful design of engineering structures is based.

After recalling the fact that down to the middle of the last century the only generally used tests of the quality of iron and steel used in construction were bending tests, and in certain cases shock tests, Dr. Unwin observed that it was the introduction of Bessemer steel, and cases of unexpected failure of steel structures, which forced on engineers the necessity of systematic tests of quality. An important series of tests carried out by the late Mr. D. Kirkaldy led to the adoption of a tension test as the usual test of quality. Its special merit was that exact figures could be specified for elastic limit, resistance to fracture and elongation.

With the introduction of definite tests, the importance of accurate and reasonable specifications became urgent. The engineer was responsible for the careful drafting and strict enforcement of his specifications, and in fixing on tests of quality, questions of cost and of the convenience of manufacturers must not be disregarded. Recently the work of the Engineering Standard Committee had done very much to guide the engineer in securing trustworthy material without imposing conditions too irksome or costly on the producer. Hence it had come about that the testing engineer had been created, having functions partly as an investigator of the properties of materials, partly as adviser of manufacturers, and partly as inspector of material.

Application of the Science of Strength of Materials to Practice

The general object of the accumulation of experimental and theoretical knowledge of strength of materials had been to determine the minimum amount of material and the best disposition of it in machines and structures to secure safety. Putting it another way, by theory the stress conditions due to any given straining action could be calculated; then it had to be determined what was the greatest permissible working stress and in what way did it depend on such physical properties of the material as could be ascertained by testing. As to this there were still considerable differences of opinion.

The oldest and still the most common method of proceeding was to reduce the straining actions to simple tension, thrust or shear, by calculations based on the assumption of Hooke's law, and to provide material enough to limit the intensity of these stresses to a fraction of the breaking strength of test-pieces similarly strained. The ratio of the breaking strength to the working strength was termed the factor of safety. In by far the largest number of cases with which an engineer had to deal, the breaking strength of a structure could not be calculated, for Hooke's law ceased to be true for stresses much below the breaking stresses. Hence the engineer sometimes

proceeded one step further. He tested a scale model of a structure to breaking, and from this deduced the breaking load of the full-size structure by the law of similarity. Thus a model of the Conway Bridge was constructed, the linear dimensions being one-sixth those of the complete bridge, and it was assumed that the breaking load of the bridge, including its own weight, would be thirty-six times that of the model, including its own weight. There had been recently some similar tests of large-scale models of some of the members of the Quebec Bridge.

In the case of complex structures, the determination of the exact maximum stresses in which were beyond the resources of mathematical analysis, the value of model experiments was unquestioned. It was easy to show that the ratio of the breaking stress to the working stress, or the breaking load of a girder to the working load, was not a real factor of safety; the point at which danger occurred in different cases was not a fixed fraction of either the real or the calculated breaking load. It had even been contended with some plausibility that the fashion of dividing the breaking stress by a factor to find the working stress was a barbarous method. The factor must be varied for different conditions, and could only be fixed empirically.

The ductile materials chiefly used in construction yielded or suffered a large deformation at about half to two-thirds of the breaking stress. The deformations, if the yield stress was exceeded, would be at least in very many cases far too large to be tolerated in either machines or structures. If the yield stresses were taken as the limits of safety, then the real factor of safety was only about half the ratio of the breaking to the working stress. Further, the ratio of the yield stress to the breaking stress was not a very constant ratio. Should they, then, drop the breaking strength, and adopt the yield-point as the measure of the constructive value of a material? Many constructive materials, such as stone, timber, and cast-iron, had no yield-point. Besides, even for ductile rolled material, such as mild steel, the point ordinarily determined as the yield-point was not a very fixed point for a given material. It depended a little on the rate of loading. Yielding really began at the elastic limit, a point below the yield-point, spreading along the bar and becoming general over the bar at the yield-point.

An Elusive Theory

Some writers assumed that the elastic limit as determined in a tension test was the real measure of the constructive strength of a material, but he was not sure that this was not, when rigidly examined, the most ambiguous and elusive of all the measures proposed. No doubt there were cases where the primitive tensile elastic limit did fix a superior limit to the stress consistent with safety. But it could not be taken generally as an exact measure of constructive value, though it certainly was a valuable indication. Further, the elastic limit in compression was seldom observed, and the elastic limit in shear was experi-

mentally almost unknown. Yet resistance to shear was probably for ductile materials the most important element of constructional value.

The classical research of Wohler showed that, subjected to equal alternate tensions and thrusts, a steel bar would in time fracture, if the stress exceeded about one-third of the statical breaking strength. The ratio was, however, not a constant one, and must be determined independently for different materials or different qualities of the same material. Bauschinger showed that a bar, subjected to equal alternating stresses, gradually increased, would be found to have ultimately equal elastic limits in tension and thrust of about one-third the statical breaking weight, and these he termed natural elastic limits. These limits did appear to define the range of variation of stress a material could sustain, but they did not know much about them except in the case of steel. It was then these limits were exceeded in alternating stress that fatigue ensued and the bar broke. Dr. Stanton's results confirmed this. But for the engineer's purpose the natural elastic limits were not easily found.

Hence, whether they took the breaking stress, the yield stress, or the primitive elastic limit, they had not found a satisfactory, rational basis for measuring the constructive strength of a material. There was not a fixed ratio between the greatest safe working stress and either of these. But he did not wish to be understood as depreciating the value of the determination of breaking stress, yield-point, and elastic limit in testing materials.

A composite factor of safety had sometimes been proposed. For instance, one took a factor of $1\frac{1}{2}$ to 2 for the ratio of the breaking to the yield stress, a factor of 1 to 3, according to the character of loading in accordance with Wohler's law, a factor of 1 to 2, according to the rapidity of loading or as an allowance for shock, and finally a factor of $1\frac{1}{2}$ to 4 to allow for unknown contingencies. Multiplying all these together one obtained a so-called factor of safety by which the breaking stress was to be divided to find the working stress. He did not know that any practical designers proceeded in that way, and the margin of choice in selecting the factor was so wide that the method was not really useful. But there was a more serious objection. The component factors were not independent factors forming sub-multiples of a real factor of safety. It was quite irrational, for instance, to multiply a factor 2 for the ratio of yield to breaking strength by a factor 3 for alternating loading. The product was meaningless. None of these sub-factors was unimportant or to be disregarded, but they did not reach a rational rule or even a safe rule-of-thumb by merely multiplying them together. Valuable as were the idea of breaking strength, yield-point and elastic limit determined in a tension test in influencing the judgment of the engineer, they did not furnish any purely rational rule for fixing the working stress for designers. Experience in similar cases must always be the ultimate appeal.

Comparative Structural Value of Materials

It was only when comparing two different materials that an engineer required to consider relative constructive value, and then he based his judgment on all the properties of the material. Ordinarily, the safe working stress was fixed by experience in similar cases, theory helping mainly in explaining why in different cases different stresses were suitable. The history of engineering design was a history of experi-

ments in construction, in which by trial and error right proportions had been found—and in the settlement the different relative importance of cost and weight entered into the question as well as the considerations of mechanical strength. The fact that scientific data and rational or semi-rational formulae were conveniently used should not be allowed to conceal the fact that an empirical element always entered into the solution. New designing was really a process of comparison, in which the engineer extended experience in known cases to new conditions, and the problem was in what proportion dimensions must be varied to allow for differences of size, of material, of loading, of speed, or of form.

Gypsum in New Brunswick

One of the most stable of the mining industries of New Brunswick is that of gypsum production, the bulk of which comes from the mines of the Albert Manufacturing Company, of Hillsborough, although it has been mined to a certain extent at Plaster Rock on the Tobique. This company employs an average of 350 men and boys throughout the year and during the last year quarried on four of their leases 93,499 tons of crude gypsum. Meanwhile development work is proceeding on their other leased property. Most of their quarrying operations are in open cuts except in cases where there is a considerable depth of clay when tunnelling is resorted to but this is not done to any great extent. Their exports of crude gypsum (shipped just as quarried in lump form principally by steamers) will this year amount to between 55,000 and 60,000 tons, but a considerable portion of the product is reduced at the Hillsborough works and shipped in manufactured form to various points throughout Canada, also to the United States and even to Australia, shipments to the last named being made by direct steamer from St. John and Montreal. The shipment of plaster this year to Canadian points will amount to about 110,000 barrels and to the United States about 18,000 barrels. A barrel usually contains 300 pounds but in a few special shipments the weight is 250 pounds per barrel. The manufactured product is principally plaster of paris and hard wall plaster.

Newfoundland and Nova Scotia Stone Trade

Newfoundland granite, although not quarried to any great extent, appears to be of superior quality. There are several varieties, all of an enduring nature, the most important being gray, green and red. The quantity quarried during 1910 is estimated at 500 tons, of which 430 tons were shipped to Canada.

About 4,000 tons of flint pebbles were gathered during the year, valued at about \$25,000. There is an increasing demand for these pebbles, consequently increased facilities were provided at various points on the beach for collecting and handling them, preparatory to shipment. One noticeable feature was the construction last fall of four large barges to carry these pebbles.

Only 1,400 tons of talc, valued at \$2,800, and a small quantity of slate were exported; the talc going to the United States and the slate to Canada. There is only a local demand for slate, although it is claimed to be of superior quality, suitable for all purposes, and obtainable in three distinct colors—dark purple, red and pea green. Before 1908 considerable quanti-

ties were shipped to the English market. It is said that a mill for grinding talc and manganese is about to be erected on the shores of Conception Bay, and it should develop the talc properties in that neighborhood.

The Atlantic Pebble Company, operating at Manuels, has 180 men employed collecting pebbles. A track has been laid along the beach, and 14 machines are placed there to sort the stones in six different sizes. They are put up in sacks of 141 pounds each, and a steamer is expected about the middle of September to take a cargo to New York. It is the supposition that all the pebbles collected will be marketed in the United States.

It is reported that one of the limestone claims at Port au Port has recently been sold to the Dominion Iron and Steel Company, of Sydney, Nova Scotia. This company has had a large number of men working on these and other limestone properties since last November, and has drilled and sunk over 40 holes in testing the properties, but found only a small area of the required stone, a sufficient supply, however, for the next 25 years. This industry will give employment to at least 350 men all the year. Piers will be built and a shipping port made ready at once. The company will run an 8,000-ton steamboat between this port and its blast furnaces at Sydney, making three trips per week.

Stone Trade Between Canada and U. S.

Canada's Deposits, and Extent of Import—Customs Duties Compared—An Interesting Review by H. W. Read, in "Stone"

The question of reciprocity in natural products between the United States and Canada, which necessitated an extra session of Congress to secure the approval of one party, and which in its rejection by the other was the cause of a general election and the overthrow of the late Liberal Government, was one that was discussed almost solely with reference to agricultural products, lumber and paper pulp. Nevertheless, among the items proposed for a lower tariff was the following:

Freestone, granite, sandstone, limestone and all other monumental or building stone, except marble, breccia and onyx, manufactured, or not dressed, hewn or polished
—Rate of duty, 12½ per cent. ad valorem.

An abbreviated extract of the tariffs of the two countries is given at the end of this article and the present United States tariff as applied to the above clause is 10 per cent. per cubic foot. The Canadian tariff is 15 per cent. ad valorem. If the proposed tariff reduction had taken place the stone trade between the two countries would undoubtedly have increased. The stone from Eastern Canada would have, as in former years, taken advantage of cheap water transportation to reach the market of the Eastern States, and the products of the quarries in the central states would have benefited by an increase in the trade with the provinces of Ontario and Quebec.

Upward Trend of Canadian Tariff

Owing to the complete rejection of the reciprocity agreement by the Canadian people it is reasonable to suppose that the Canadian tariff will not be lowered. Indeed, if there are any changes in the Canadian general tariff an upward movement is to be expected. For the benefit of some readers it might be well to note that Canada now gives Great Britain a preference tariff—a reduction of 33½ per cent. from the general tariff—and that public sentiment is in favor of even a greater preference. So while the question of reciprocity between the United States and Canada may be called a dead one, it might be interesting at this time to take a general view of the Canadian stone trade and its relation to that of the United States.

In the calendar year 1909 (the last for which statistics are available) the production of the better

grades of stone in Canada is given by the Department of Mines as follows:—

Kind—	Building	Ornamental and Paving and		Total
		Monumental	Curb Stone	
Granite	\$159,470	\$73,611	\$106,963	\$340,044
Limestone	666,364	95,457	154,490	916,311
Marble	20,000	135,780	—	155,780
Sandstone	324,716	1,490	17,774	343,980
Totals	\$1,170,550	\$306,338	\$279,227	\$1,756,115

These statistics are obtained from the producers and owing to incompleteness are apt to be slightly less than the actual production.

In the same year Canada's imports were:

Kind—	Great United Other			Total
	Britain	States	Countries	
Building stone, rough (1)	\$2,048	\$99,933	\$489	\$102,470
Building stone, dressed (2)	987	177,100	—	178,087
Granite, sawn only	802	1,578	—	2,380
Granite, mfgs. of	121,983	7,921	14	129,918
Paving blocks	—	58,355	—	58,355
Marble, sawn only	2,275	85,656	30,164	118,095
Marble, rough, not hammered or chiseled	—	8,414	—	8,414
Marble, mfgs. of, N.O.P.	1,393	53,092	1,153	55,638
Mnfrs. of stone, N.O.P.	3,374	24,316	2,754	30,444
Totals	\$132,862	\$516,365	\$34,574	\$683,801

(1) Flag-stones, granite, rough freestone, sandstone and all building stone not hammered or chiseled.

(2) Flag-stone and all other building stone, sawn or dressed.

The exports from Canada for 1909 are classified as Stone and Marble, wrought, \$33,598, Unwrought, \$25,772. Total, \$59,370.

These figures show that Canada purchases from the United States more than one-quarter of the amount of her own production and that imports from the United States are about three-quarters of the total. The Canadian exports of stone are practically negligible and it is probable that a considerable portion of the above amount consists of paving stones shipped to the West Indies.

The reason of this large importation is easily explained. Aside from marble in which individual pre-

ference will always be demanding an imported stone, the bulk of the stone imported from the United States is limestone and sandstone from Indiana and Ohio. These fields are supplying practically all the demand for light colored stone in the province of Ontario and Quebec. It might be noted here that these provinces are the largest brick manufacturing provinces in Canada and that in late years a considerable quantity of artificial stone and terra cotta has been used in important buildings.

The quarries in Ontario—referring to high grade building stone only—are worked on a small scale, and the Quebec limestone, while it is a most desirable stone, and is used most widely in that province, is dark gray in color and crystalline in texture. Moreover, the best plants for the sawing and finishing of stone are located in the cities and the quarries are not in a position to put up the aggressive competition that should be the case.

The Maritime Provinces, which contain good deposits of gray, olive, red and brown sandstone, have supplied only a small proportion of the stone used in upper Canada. In former years large quantities were exported to the United States, but the opening up of the large deposits in the central states, the improvement in the transportation therefrom and the raising of the tariff resulted in the decline of the stone industry of Eastern Canada. This trade has improved in late years and is now in a healthy condition. It is supplying the local demands and is meeting with increased success in the markets of Ontario and Quebec. The benefit of the tariff, however, is more than counterbalanced by the greater cost of production and transportation over the stone from the Ohio and Indiana fields.

The quarries in Western Canada are supplying the greater part of the local demands, and on account of the transportation cost will probably never be able to obtain much of the trade of the east.

Comparison of Customs Duties

The following tables give the present customs duties of the United States and Canada as applied to stone. An exact comparison between the two is not possible because in the former country the duty is fixed generally at a rate per cubic foot, with occasional ad valorem rates, while in Canada it is computed entirely ad valorem. The United States tariff, however, is considerably higher than the Canadian. The highest rate under the latter is 35 per cent., while two classifications under the former are 50 per cent.

United States Tariff as Applied to Stone

	Rate of duty.
Freestone, granite, sandstone, limestone and all other monumental or building stone, except marble, breccia and onyx, not specially provided for in this section, hewn, dressed or polished or otherwise manufactured...	50%
Unmanufactured, or not dressed, hewn or polished	10c.
per cu. ft.	
Marble and onyx, in block, rough or squared only	65c.
per cu. ft.	
Marble and onyx, sawed or dressed, over two inches in thickness	\$1
per cu. ft.	
Marble and onyx, sawed in slabs less than two inches in thickness, and marble and onyx rubbed carry higher rates of duty.	
Marble and onyx wholly or partly manufactured into monuments; benches, vases, etc.	50%
ad valorem	

Canadian Tariff as Applied to Stone

	Rate of duty ad valorem
Flag-stone, granite, rough sandstone and all building stone not hammered, sawn or chiselled	15%
Flag-stone, all other building stone, sawn or dressed	20%
Granite, sawn only	20%
Granite, manufactures of, n. o. p.	35%
Paving blocks	20%
Manufactures of stone m.o.p.	30%
Marble, rough, not hammered or chiselled	15%
Marble, sawn or sand rubbed, not polished	20%
Marble, manufactures of n. o. p.	35%

Referring again to the reciprocity agreement it may be said in conclusion that public sentiment in Canada as voiced at the last general election, expressed the opinion that if the United States really wants reciprocity with Canada it would be a token of her good faith if she first lowered her tariff wall to the level of the Canadian one. The tariff on stone is a fairly accurate index of the difference in tariff between the two countries. It is very reasonable to assume that as Canada increases in national strength she will not remain content with an unequal tariff wall between the two countries which acts to the disadvantage of the producer protected by the lower tariff.

Mention may be made of the fact that in the past the Canadian customs authorities have been rather il-liberal in classification of dressed and undressed stone. Blocks that were merely scabbled in order to save freight charges have been compelled to pay duty as dressed stone. It is equally true that the American customs officers nearly always find an excuse for including a shipment of stone in the higher classification, so that matters may be evened in this regard between the two countries.

A novel method of building up cement piles or supports in quicksand is the subject of a German patent. A pipe of suitable size has at its lower end an auger point and a helical screw blade, several holes being driven through the wall of the pipe just above the blade to permit the discharge of cement grout outward. By water pumped through the pipe, the apparatus is twisted into the sand, jets being used to aid the sinking if necessary. When the required depth has been reached, the grout is pumped into the pipe and the drill turned backward to withdraw it. Flowing out along the face of the blade, the cement becomes mingled with the sand directly above, and the turning screw passes the mixture to the space below. A cylindrical pile is thus built up in the semi-liquid sand. Others may be produced in the same way alongside the first, and these may be readily consolidated into very strong and substantial piers.

Egyptian stone workers 4,000 years ago had a surprising knowledge of what are considered modern tools. These pyramid builders operated with solid and tubular drills and straight and circular saws. In handling the tubular drills, which were of superior quality, the skill of the artisan was so remarkable that the cutting marks in granite show no indication of wear of the tool, while a cut of a tenth of an inch was made in the hardest rock at each revolution. A hole through both hard and soft material was bored perfectly smooth and uniform.

Concrete Construction in Freezing Weather

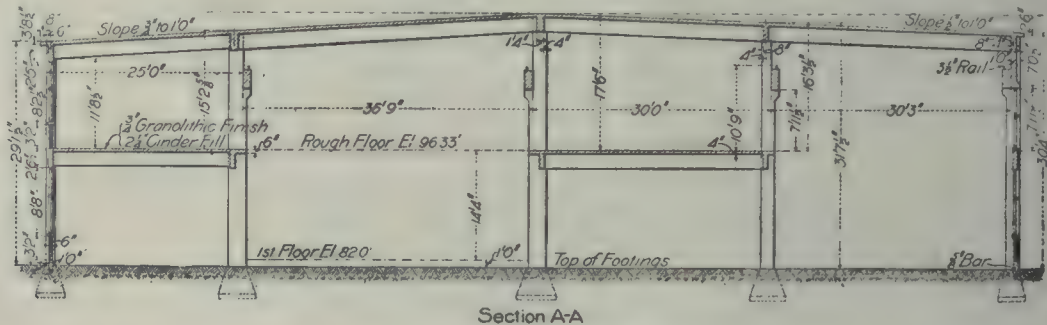
Method of Heating Material—Canvas Sheets for Protecting Concrete—Interesting Type of Gallery Floor Construction and Crane Girders

A reinforced concrete switch shop, for making frogs and crossings for railroads, has recently been completed for the Ramapo Iron Works at their plant in Hillburn, N. Y. Work on this shop was started on Jan. 3, 1910, and was continued during the remainder of the winter without interruption, although most of the concreting was carried on at a temperature ranging from 0 to 20 deg. Fahr. The building was completed April 15, 1911. The structure is two storeys in height and 123 x 150 ft. in dimensions.

It was originally intended to excavate for all footings to a depth of 4 ft. below the average elevation of the ground, which was practically level, and put in concrete without reinforcement. This was specified on the assumption that the bearing capacity of the soil was 4 tons per square foot, but, upon examination, it was found that only one-half of the footings could be so constructed; for the remainder the excavations were widened and reinforced concrete footings de-

tion to be concreted in a day, in order to protect the concrete in place from freezing and to quicken its setting. This curtain, reached from the ground, or lower floor, up to the floor to be poured and fires were started an hour or two before concreting and kept running constantly for three days after the fill was made. One salamander to about 800 sq. ft. of floor area was sufficient to keep the temperature of the inclosed section at about 80 deg. Fahr. The best results were obtained by burning good foundry coke. The upper surface of the gallery floor was protected by spreading canvas 6 in. above it and holding this covering up by timbers or boards in order to form a chamber through which the heat from the stoves below could circulate. Five inch square holes, for allowing the heat to pass up, were left in the floor from 16 to 20 ft. on centers.

The concrete set almost as rapidly as it would in summer and forms were stripped in about five days.



Section A-A
Cross-Section of Switch Shop

signed for a soil of 1 ton capacity put in. All footings were made with hand-mixed mortar. This part of the construction was completed on Feb. 1, on which date the first fill of concrete was made for the middle section of the gallery floor.

The mixing plant was set up inside the building and the hoist shaft, which just cleared the gallery floor, extended up between two roof beams. This plant consisted of a No. 2 Ransome mixer and bucket operated by a Ledgerwood single-drum hoist, driven by a General Electric 35-h.p. motor. A plant runway was built from a gravel bank at the east end of the building to the mixer and wheel-barrows used to feed the machine. After mixing, the concrete was hoisted and dumped into a box attached to the hoist frame above the floor and from there distributed to the various parts of the building in Ransome 6-ft. carts.

An interesting feature of the construction was the method of heating the material. It became necessary to use artificial heat because of the cold weather, and the sand and gravel were warmed by spreading a canvas blanket over the bank and allowing steam to escape and circulate under it for several hours. If the steam was kept on all night it penetrated the bank from 3 to 4 ft. and work could proceed the following day without further heating; thus the escaping steam was avoided while the men were at work.

A canvas curtain was hung around the entire sec-

The forms for gallery floor were used for corresponding sections of the roof, after which they were made over and used for the roof of the other two bays, where no gallery floor is required. All forms were built of dressed lumber and greased with oil before concrete was placed in order to prevent the concrete from adhering to the boards.

A special feature of the design is the use of the gallery in only two of the large bays. This gallery is omitted in two sections to permit the use of two 5-ton traveling cranes; one section 37 ft. wide through the middle and another section 31 ft. wide along the north side. These two bays are entirely unobstructed from the ground floor to the reinforced concrete roof and the galleries constitute a second storey. The two electrically operated cranes travel the full length of these bays and pass, if necessary, through openings to switch tracks of the Erie Railroad at one end of the building, so that the material is placed directly upon the cars.

The general arrangement of the beams and columns is shown by a typical floor plan. The north gallery floor and the roof slab rest directly on the walls and columns. The gallery floor is carried on longitudinal lines of columns extended the full length of the building and is designed to carry the full live load and dead load, including the eccentric load of the crane girders; the columns are reinforced in gen-

eral by four $\frac{7}{8}$ -in. bars with horizontal hoops, of $\frac{1}{4}$ -in. square bars spaced 12 in. on centers. The second-storey columns carry the roof slab and the crane girders and bear directly on the first-storey columns. The gallery floors are designed to carry a live load of 200 lb. per square foot.

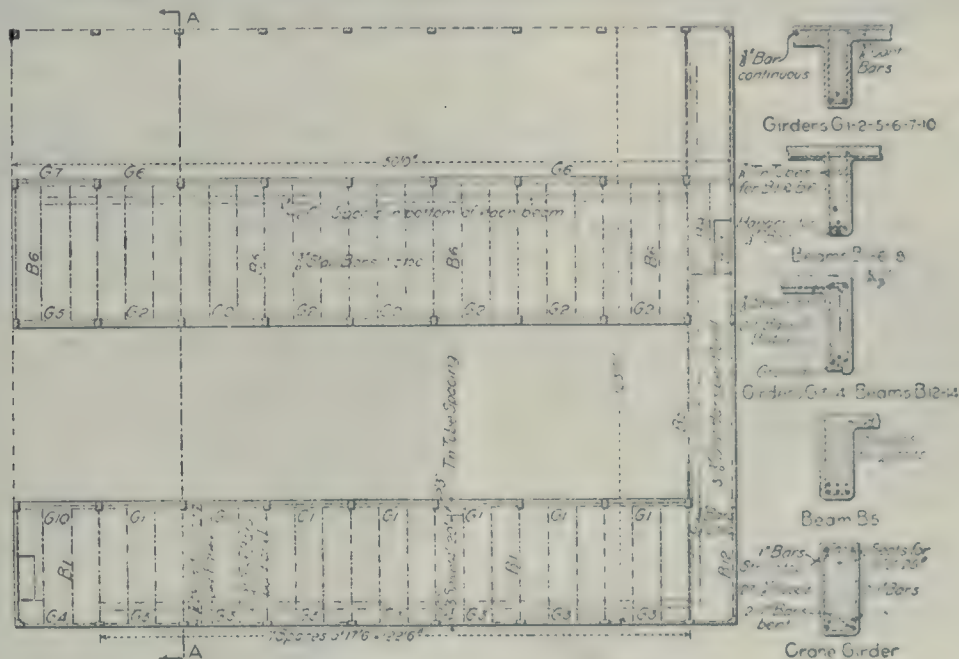
Features of interest in the concrete design are the type of gallery floor construction and the crane girders. The method of reinforcement, number of bars and other features are indicated on the accompanying drawings. The floor beams are of both rectangular and T-section. Square twisted bars were used throughout with hoops and stirrups in beams to take care of shear and diagonal tension and all slab reinforcement was carried in the top over the beams to provide for negative bending moments.

The curtain walls are constructed of 6-in. terracotta blocks laid up in Portland cement mortar. Particular attention was paid to the distribution of reinforcement in the crane girder because of the heavy

slab were poured afterward, followed by the cinder fill and finishing coat. A wet mixture was used for column slabs and beams in order to completely cover all reinforcement. The $\frac{3}{4}$ -in. granolithic floor was composed of one part cement to two parts of clean sand and was laid over $2\frac{1}{4}$ -in. clean cinder fill. The ground floor is of earth, no concrete being used. All reinforcement consisted of coal twisted square bars of mild steel with an elastic limit of 45,000 to 55,000 lb. per square inch and an ultimate strength of 70,000 to 80,000 lb. per square inch.

The building was designed and erected by the Turner Construction Company, of New York City, and Mr. James C. Strong, assistant general manager of the Ramapo Iron Works, was the engineer in charge for the owners.—Engineering Record.

Some rules regarding chimneys are given in a paper which was read before the Franklin Institute in London by Mr. H. C. Brinckerhoff. One rule



Gallery Floor Plan and Details of Girders

duty it had to perform and special rail plates were cast in the concrete for holding the traveling rails. In order to give sufficient headroom and ample clearance no beams were built in the two bays where the cranes ran and the floor beams rested directly on the girders at the side. Special reinforcement was used in these galley-floor girders and the number of columns was increased to form additional supports.

The roof was of the beam and slab type, with a slope of $\frac{3}{4}$ in. to the foot, and is designed to carry a load of 40 lb. per square foot. A roof covering of three-ply slag was laid over the slabs and Barrett specification felt and pitch were used.

The stairs have cement-finished risers and treads and gas-pipe railing on one side and around the openings in the gallery floor.

All concrete was composed of one part Alpha Portland cement to five parts gravel, which was taken from the adjacent bank and the resulting concrete was dense and firm. The building was poured in sections and all columns were cast up to the bottom of the floor beams, or roof beams, and the beams and which he gives is that a chimney 100 ft. high will give a draught at the base of 0.6 in. of water. This

assumes 60 deg. air temperature and 450 stack temperature. This latter is a trifle low for average conditions, and in many cases it would be safe to estimate on 0.7 in., although in designing a new plant it is always wise to have plenty of draught rather than just too little. For any other height of chimney the draught is just in proportion to the height of the chimney, measured, of course, above the grate. These figures assume reasonable cross-sectional area, as otherwise the chimney will absorb a considerable proportion of its own draught. The author suggests from 16 to 20 square feet per 1000 horse-power, although half these areas have frequently proved sufficient. The horse-power is apparently based on 4 lb. of coal per horse-power hour.

The preservation of iron in concrete is again demonstrated in the demolition of an old gasometer in Hamburg, Germany. The structure was built about 1852, and when taken down forty-eight years later, the iron anchor bolts which had been completely encased in a cement concrete were found to be as fresh and bright as new iron, with no traces whatsoever of rust.



Victoria High School

C. Elwood Watkins, Architect

Attractive High School at Victoria, B. C.

Main Features of Design and Construction—Arrangement of Floors—Combination of Materials—Heating and Ventilation—Miscellaneous Equipment

This building will be erected by the Board of School Trustees, Victoria, B.C., according to plans prepared by Mr. C. Elwood Watkins, architect, of that city. Tenders received for the construction of the building amount to approximately \$360,000.

The building is planned in the shape of the letter E, the three wings projecting to the rear.

The gymnasium and assembly hall are located in the centre wing, the side wings being devoted to class rooms. There are four main floors, the basement or ground floor being practically at the ground level.

Below this floor there is the sub-basement which does not cover the entire area of the building. This is devoted entirely to the heating and ventilating plant, with the exception of the portion under the centre wing which is occupied by the gymnasium. Convenient to the gymnasium, on this floor, is the armory for the use of the cadet corps.

The gymnasium, which occupies the height of the basement and sub-basement storeys, is 70 ft. x 85 ft. and is well lighted on the three sides from above the running track level. The floor of the gymnasium will be of wood on top of concrete. The running track will be constructed of wood dished in the regulation manner and supported by steel rods from the girders in the ceiling. The walls of the interior of the gymnasium up to the height of the running track will be faced with white glazed brick. Access to this floor is to be had directly from the outside by two spacious entrances located on either side of the front of the building, one side of the building on each floor being devoted to the girls and the opposite side to the boys.

The main floor of the building may be reached by four stairways from the basement or from the outside by the main front entrance or from entrances located on either end of the building. The approach to the main entrance is by broad granite steps with ornamental granite balustrades. Inside of the main

entrance the approach to the main floor is by broad marble steps, the walls of the entrance vestibule being also panelled in marble.

On one side of the main entrance on this floor is located the principal's office and reception room and on the opposite side, the male and female teachers' rooms with private lavatories attached. Immediately opposite the main entrance is located the assembly hall which will be seated with opera chairs and will be capable of seating, on this floor, 516 people. A balcony with seating capacity for 300 will be entered from the next floor above. A stage 18 ft. x 34 ft., with the necessary ante rooms, is provided in connection with the assembly hall. The floor will have a slope to the front so as to give an unobstructed view of the stage from all points of the room. This hall will be finished in an attractive manner, the walls being broken up into panels by pilasters, with moulded caps and bases, and lighted by large windows glazed with leaded glass. The ceiling will be formed into panels with heavy plaster beams and cornices. A portion of the ceiling panels will be glazed with leaded glass ceiling lights. The walls and ceilings of the assembly hall and also of the class rooms and corridors will be tinted in light colors. On this floor are located ten class rooms each capable of seating 30 pupils. Four wide stairways lead to the second floor on which are located twelve class rooms with locker spaces and lavatories similar in all respects to those on the floor below. The library is located on this floor immediately over the main entrance. On the third floor are located five ordinary class rooms and a commercial room.

The construction of the building will be fireproof throughout with the exception of the wood used for interior finish. The exterior walls and interior carrying walls are built of brick and carry floor slabs of combination clay tile and reinforced concrete, giving flat ceilings without intermediate beams in all of

the rooms. The Kahn System of reinforcement is used throughout. All of the partitions between the class rooms, &c., are constructed of hollow clay tile. The ceiling of the upper floor will be of reinforced concrete. The roof framing will be of wood and will be covered with slate and lead. The floor of the assembly hall, over the gymnasium, will be of concrete carried on built steel beams. All of the stairways in the building will be of reinforced concrete.

As a protection against local outbreaks of fire two stand pipes, with hose attached, are located on each floor. All of the exit doors from the building and from all of the rooms where any considerable number of pupils are liable to congregate will be fitted with the latest pattern of panic-proof locks and bolts.

The floors of all of the corridors and stairways will be covered with Raecolith plastic flooring turned up the wall to form a coved base.

The corridors, lavatories, &c., are to be heated by steam radiators on the vacuum principle. The class rooms will be heated and ventilated on the plenum system. Three fans are located in the sub-basement in connection with this plant and all of the air will be passed through air washers before being admitted to the building. Vents direct to the outside air are provided from each room. Steam is supplied to all of the radiators and coils from two 125 h.p. Babcock & Wilcox water tube boilers arranged for burning either coal or crude oil fuel. The temperature of each of the rooms will be automatically controlled by thermostats operating the dampers by compressed air. A separate exhaust fan is located in the attic to draw the air from the lavatories and locker spaces in the corridors, also a special small exhaust fan to remove all fumes from the chemical laboratory. A stationary vacuum cleaning plant will be located in the basement and the building will be piped with openings on each floor. The building will be wired for electric light, in conduit. Each room will be fitted with a telephone directly connected to the switch board in the principal's office.

In the principal's office will be located a Master clock, with complete programme attachment, which will operate, electrically, secondary clocks in each of the class rooms with programme bell. This system will be arranged to automatically ring for change of classes in each of the rooms and also on gongs located on the outside of the building and in the corridors.

On each floor of the building will be located two fire alarm boxes and two large gongs; also an alarm box will be placed on the front of the building outside. The boxes will be arranged so that an alarm rung from any floor of the building will call the Fire Department and also strike the alarm on all of the gongs in the building and indicate the number of the floor from which the alarm is rung. Drill alarms may also be rung without calling the Department.

The exterior of the first storey will be of granite and the upper storeys of pressed brick. All of the trimmings on the upper storeys will be of cut sand stone.

The building will face the south. All of the class rooms are arranged on the east, south and west so as to receive direct sunlight at some time of the day.

Reinforced concrete motor boats are made by a firm in Holland. The framework is made up of a steel keel, to which are attached steel rods running in

two directions; these rods are bent to the required shape and wired in position, so that the metal framework is self-supporting. On both sides of this framework an inner and an outer covering of wire netting is secured with metal ties and then plastered on both sides. After the hull has thoroughly hardened for several weeks, it is given five coats of waterproofing paint. All the fittings of the boat are put in place prior to the plastering, so that they are solidly imbedded in the concrete.

Alberta Ladies' College, Red Deer, Alta.

The Alberta Ladies' College now being erected at Red Deer at a cost of \$80,000, will provide accommodation for about eighty students in addition to the president, lady principal, matron and staff.

The building has a sub-basement comprising tank room and boiler room; also fuel storage, store rooms, etc. The basement floor is only four feet below the grade level, thus providing ample light and ventilation. It comprises a large dining hall, kitchen, pantries, and cold storage, household science rooms, laundry, gymnasium and caretaker's apartments. On the ground floor are located reception rooms, matron



Alberta Ladies' College, Red Deer, Alta.

and president's apartments, and five large class rooms. The second and third floors are set apart for students' bedrooms and sitting rooms, and library. The fourth floor comprises fourteen music rooms, large music class room, art room, etc. There are two fire escapes the whole height of the building, also large verandahs and balconies on each floor. Externally the building will be finished in pressed brick with shingled roofs.

The architects are Mr. C. A. Julian Sharman, of Red Deer, Alta., and Messrs. Barnes & Gibbs, of Edmonton.

Laboratory Tests on Concrete at McGill University

Following his address on "Reinforced Concrete Design," given to the members of the Montreal Builders' Exchange, on October 18th last, and reported in our issue of November 1st, Professor E. Brown invited the members of the Exchange to visit the McGill University testing laboratory and witness tests on concrete. The visit was arranged for the evening of November 27th, and about twenty members availed themselves

of the opportunity offered. The tests were arranged to show the variations in the rate of yielding of plain concrete in compression, and the behaviour of a reinforced beam when tested to destruction. Short cylindrical columns of plain concrete were loaded to destruction, the increasing deformations produced by successive increments of load being shown by four extensometers placed symmetrically round the column. The test thus demonstrated the decreasing value of the modulus of elasticity in compression as the stress is increased. At the same time, large differences in the rate of yielding were shown as between the four extensometers, indicating that the variations in the modulus of elasticity are by no means definite or constant.

A reinforced beam was then loaded symmetrically at two points, and by means of extensometers placed between the loads along the fibres of the beam on one side at different depths, the deformation of the various layers at any given stage of the loading was determined. These were plotted to show the linear deformation law, and to determine the position of the neutral axis at any given load. The percentage of the total load moment carried by the steel, and the concrete in tension, was thus computed for various loads until the beam began to crack, after which the test was carried to destruction.

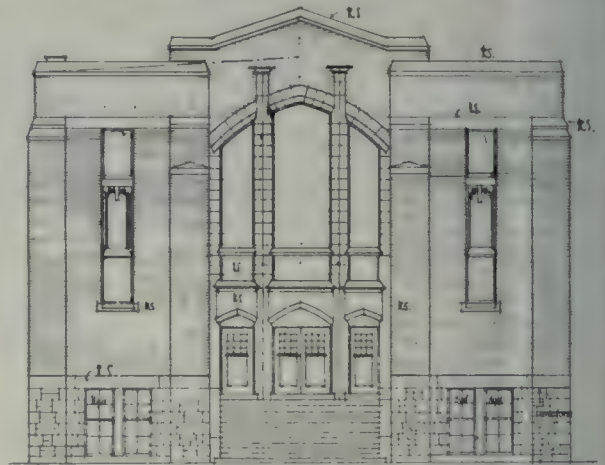
Statistics recently compiled by the American National Fire Protection Association show that of 11,257 fires in buildings equipped with automatic sprinklers the protection was successful in 95.01 per cent., or 10,695 instances. In these cases the sprinklers either extinguished the incipient blaze or held it in check, the operation of a single sprinkler head being sufficient in 3,286 fires. In 6,146 blazes two or three heads put out the fire before a larger number were opened by the heat. Approximately 59 per cent. of the fires occurred during the daytime or between the hours of 6 a.m. and 6 p.m. The fires in buildings equipped with automatic sprinklers, which amounted to 4.99 per cent. of the entire number reported, were for the most part due to preventable causes.

The contract for the first 185 miles of the Hudson Bay Railway which was awarded last August to Mr. J. D. MacArthur, is held up in accordance with the

general instructions issued by the Minister of Railways for the cessation of work on contracts awarded in his department subsequent to the dissolution of parliament. Inasmuch as only the preliminary work of taking in contractors' supplies is now under way this will not seriously delay the construction of the road.

Shaw Memorial Church, Montreal

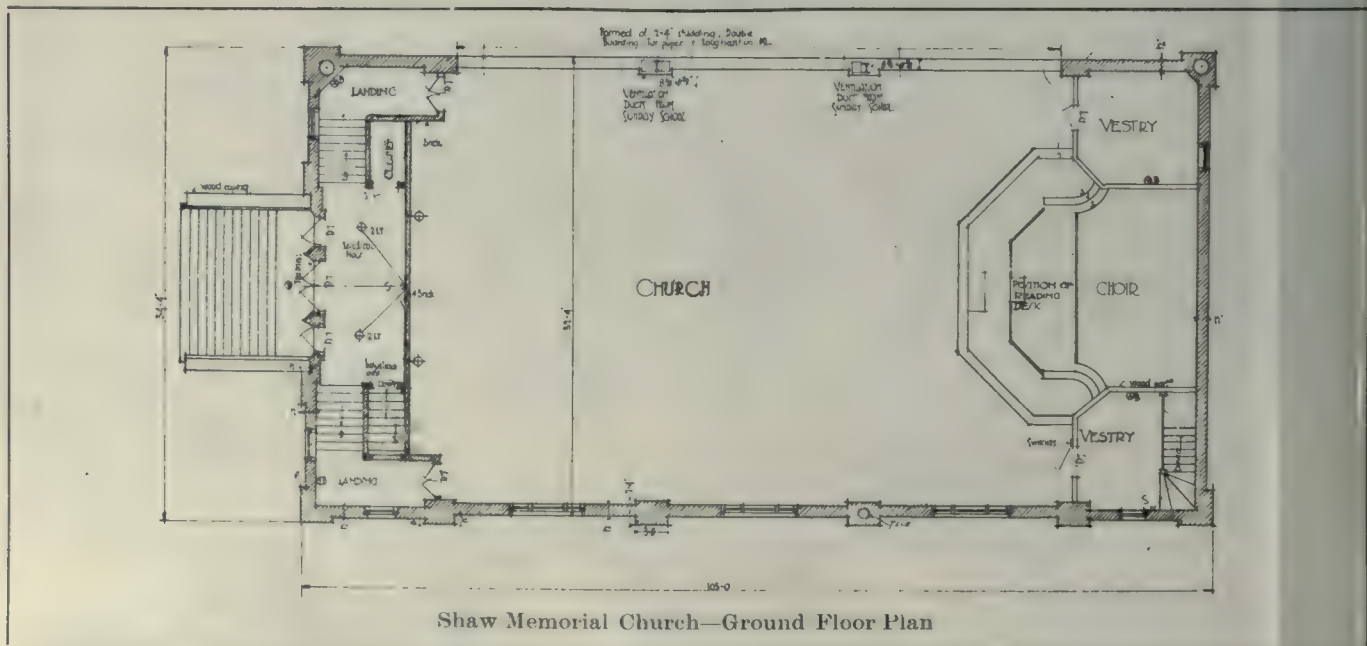
The Shaw Memorial Church, now being erected to the memory of the late Dr. W. I. Shaw, Principal of the Methodist Theological College, is on the corner of St. Christophe Colomb and Beaubien streets,



Shaw Memorial Church—Elevation to Christopher Columbus Avenue

Montreal. The plans show a building 54 x 105 ft., containing in the basement a Sunday School room, with the primary department located so that ingress and exit can be made separately from the main room, and can also be thrown open to be used in conjunction with the principal room. There are several class rooms, separated by folding partitions.

The auditorium upstairs can be entered from the main entrance on St. Christophe Colomb or from Beaubien streets. Provision has been made to erect a gallery should it be required in the future; the yard wall is also being left so that it can be easily removed in the event of its being necessary to extend



Shaw Memorial Church—Ground Floor Plan

the auditorium and the Sunday School. Over the main entrance there is to be a tablet erected to the memory of Dr. Shaw.

The foundation walls are to be of Montreal limestone, with a Roman stone base course; the upper walls are to be of red brick, trimmed with Roman stone. The interior is finished with selected ash. Messrs. Peden & McLaren, of Montreal, are the architects. The masonry and brick work is being done by Reid, MacGregor & Reid, and the carpentry by D. M. Long. The cost is \$25,000.

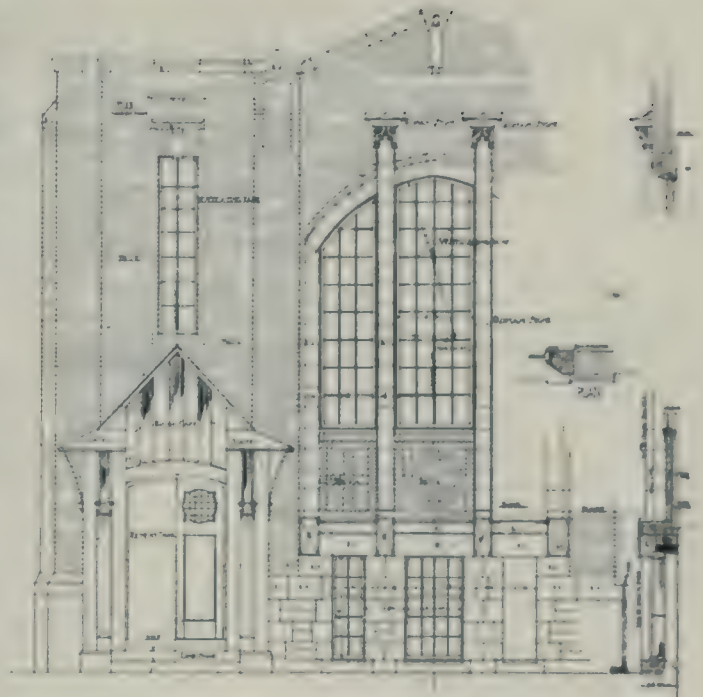
Delorimier Methodist Church, Montreal

This church is being constructed to the design of Peden & McLaren, architects, Montreal. It is situated on Simard street, near St. Joseph's Boulevard, Montreal, and consists of an auditorium, provided with partitions so that class rooms can be utilized at one end. The walls are of Montreal limestone and brick, with Roman stone trimmings on the front. The building will be heated with warm air. The area is 87 ft. frontage by 73 ft. depth.

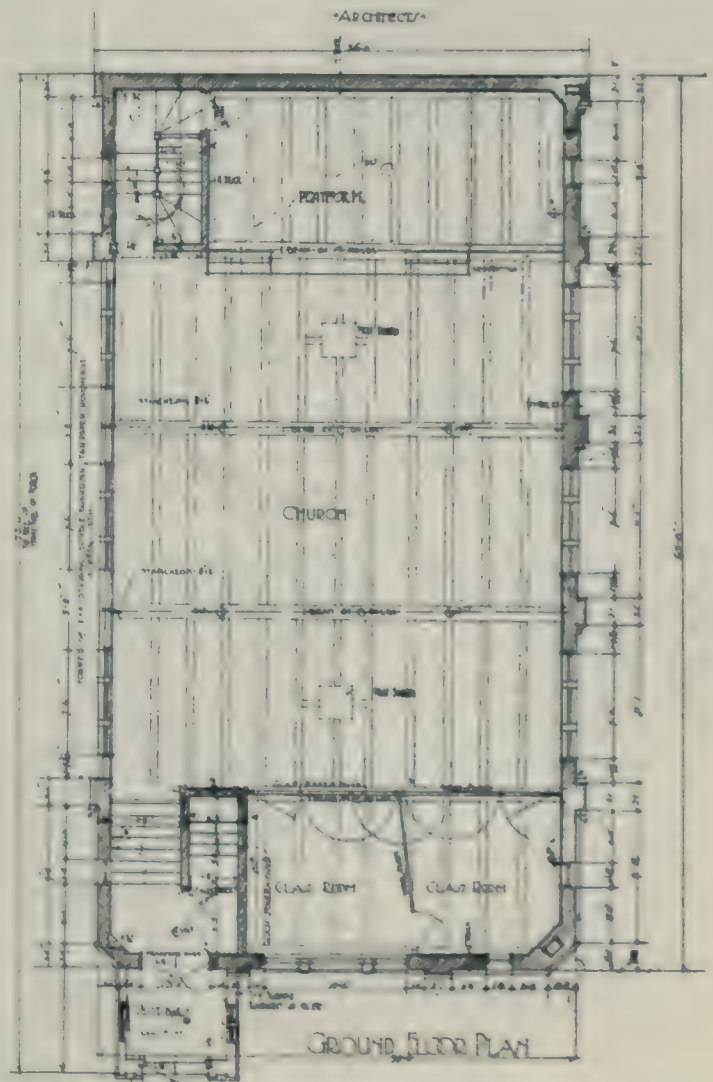
An Unusual Concrete Plant

Charging a concrete mixer from freight cars on a siding is being done on the masonry work for the St. Clair avenue bridge of the Cleveland Short Line Railway by the use of small wooden hoppers supported on the sides of the cars and a narrow-gauge track parallel and close to the sidings. The narrow gauge track is on an incline, continuously past all of the cars and up to a point above the mixer which is located at the end of the siding. A cable from a hoisting engine near the latter point is attached to a small steel charging car of the hopper type, with a dumping gate at one side. Its capacity is equal to one charge for the mixer. The hoppers hung on the sand and stone cars have bottom gates over the narrow-gauge track and are large enough for two men inside the cars to shovel into them continuously. The hopper for cement is supported on a light staging beside the point where a box car loaded with cement is placed. In the operation of the plant freight cars are placed on the siding with the cement car nearest the mixer, then a car of sand and a car of stone. A man in the cement car takes sacks of cement to the staging immediately in front of the door and dumps them in the hopper, one at a charge, while the shovellers in the gondola cars keep the side hoppers filled. The small charging car is allowed to run down by gravity to the stone car on the end, a man riding it to open the car-hopper gates. It is then drawn ahead by the cable, the rider tripping the gate latches as it is stopped at each hopper to receive its charge. It then proceeds to the mixer, where the rider opens the car gate and discharges the load.

There is a new idea in oak flooring. In narrow strips this flooring has made great progress for several years now. The latest idea is to take these small units and fasten them together at the flooring plant, making them into broad boards, to facilitate laying. It is thought that this new idea will make oak flooring appeal more forcibly to the carpenters and builders, as the one objection they have urged against it has been the tediousness of laying and nailing it in small units.



Delorimier Church—Front Elevation



Delorimier Church—Ground Floor Plan

Architects in Charge of Construction

A Discussion of the Trade—Contract Method of Conducting Building Operations—Some General Points in its Favor

By Walter B. Chambers

Of the various ways to go about erecting a building, by far the commonest is to put the work into the hands of a "general contractor." It is usually awarded to him after he has been selected from among several competitors who submit their bids based on the architect's drawings and specifications.

The general contractor is a middle-man. He is rarely a mechanic or a direct employer of skilled labor. He takes the architect's drawings and specifications to his office and calls in his sub-contractors, —firms or individuals carrying on the various building trades,—whom he invites to submit to him their bids for that part of the work which is to be done under their particular trade. In this way he gets his bids for the carpentry, plastering, heating, plumbing, structural iron, ornamental ironwork, etc. To the sum of the most favorable bids he so obtains, and which represent the real cost to him of putting up the building, the general contractor adds his own profit, generally 10 per cent, and then offers the owner this sum as his bid for doing the work. If it compares favorably with estimates similarly made up by other general contractors who have been asked to submit bids, the work is awarded to him.

The Owner's Standpoint

Viewed from the owner's standpoint there are many disadvantages attaching to this way of building. That the owner's viewpoint is the right one for the architect is unquestioned, as he is the owner's agent in the transaction, and while it is his first duty to be fair in all his dealings and rulings, his legal position naturally causes him to look after the owner's interests with special care.

An honest, competent and experienced man acting as the general contractor can be a very effective aid to a building enterprise; there are many such men in the business, and their employment is wise in many cases.

Architects who are more interested in the artistic than in the practical problems connected with their work will welcome the opportunities which the employment of an efficient general contractor affords them, of shifting responsibility to his shoulders. It is comforting and reassuring to feel that one's work is being well and promptly executed through the activities of your contractor—that your client's end of the contract is being honestly lived up to by the "party of the first part." But how many times is such confidence well placed? Builders are, as a rule, no more unselfish than most business men, and at best they are, and naturally so, a little more anxious about their own interests than anyone else's. It is clearly improper to leave in their hands any power to choose or direct or to exercise discretion of any importance. In other words, it is the architect's plain duty to look after his client's interests himself and not delegate any of that duty to the man who has the other end his client's contract.

But many times the employment of a general contractor adds to, rather than lessens, the architect's

difficulties in controlling and directing a building operation, by intervening between him and the sub-contractors. Being responsible legally only to the general contractor, the sub-contractor can evade carrying out instructions received directly from the architect by interposing his employer and claiming that all orders to him must pass through the latter. Technically he is perfectly right in this position; but when, as is often the case, it is made use of to thwart the carrying out of the architect's wishes, the latter looks about for some other system of legal relationships and responsibilities which will be a help to him instead of a hindrance. He can find this in the "trade-contract method."

By the trade-contract method the architect, acting for the owner, makes direct contracts with each of those manufacturers and employers in the different building trades who under the other method are only sub-contractors of the general contractor.

To do this properly, the drawings and specifications must be prepared in considerably greater detail, and a much larger number of copies of each are needed for sending out to the tradesmen to secure estimates; for it is necessary to take at least six estimates in each trade in order to get the benefit of the competition, which is one of the chief purposes of the procedure.

Gives Architect More Direct Control

There are two signal advantages of this contract-by-trades method,—first, the more direct control over the work which it gives to the architect, and second, the reduction in cost, through the greater amount of competitive bidding by the many would-be contractors; and through the elimination of the general contractor's profits.

The importance of the first of these cannot be too greatly emphasized, for it deals with those matters which make the difference between satisfied and dissatisfied clients successful or unsuccessful operations. For that reason it is even more important than the second, since efficiency and energy in carrying out a building are even more to be desired, in most cases, than rock-bottom prices. Still, there is no surer way to obtain for a client one hundred cents' value for every dollar expended, than by this contract-by-trades procedure.

Another advantage is that inspection and superintendence of work in progress, both at the shops and at the building, is made eased for the architect. Under the ordinary system, when the architect or his representative visits the sub-contractor's shops and thinks it necessary to order changes or corrections, he finds his directions accepted by the sub-contractors "subject to the approval of the general contractor." The reason is obvious,—the sub-contractor, being responsible legally only to the general contractor, doesn't propose to let himself be committed to any modification to his contract without the latter's sanction. This puts the architect in an awkward position.

It is as though the colonel of a regiment was told by the lieutenant to whom he had given an order, "I'll carry it out if my captain approves."

The military analogy, though not perhaps a true one, will do to illustrate the awkward state of affairs, —a state of affairs which can't exist under the trade-contract system, where each tradesman has his legal relations direct with the owner.

How many trade-contracts are needed in a building operation? This depends both upon the nature and the location of the building. An office building in a large city requires over fifty;—a city residence a little more than half that number.

The greater the number the greater the advantage to the owner, and also the greater the complications and difficulties in management and direction on the part of the architect. Too much sub-dividing is apt to defeat its own object. Following is a fairly typical list of convenient trade-divisions into which the erection of an ordinary city building may be separated:

Drawings and Specifications

The preparation of the drawings, specifications and contract papers needed for separate trade-contracts is arduous in direct proportion to the number of subdivisions. They have to define clearly not only just what work is to be included in each, but also just how the work of the other trades will affect each one. The contractors must know at the time they put in their bids just what to count on from their associates on the job by way of help or hindrance to their own work. For instance, if the plumbers are not told in their specifications that the cutting of masonry, iron, wood or plaster work necessary to the proper running of their pipes is to be done for them by the masons, ironworkers, carpenters and plasterers, they will include in their bids a sum to cover the cost of such cutting, and the owner would be paying for it twice, since each of those trades will be called upon in their own specifications to "do all cutting," etc.

So the specification-writer's task is proportionately more complicated. So is the draftsman's. And so of course is the bookkeeper's, whose records show the state of each contractor's account, the extras, credits and payments. Then where there are fifty accounts connected with one building operation, in place of one, the clerical labor involved is greatly increased; in fact, the importance of accurate business procedure by the architect is apparent.

The pitfalls and labyrinths of misunderstandings into which we may be led through modifications of written contracts, or discrepancies between drawings and specifications, or other vaguenesses, have to be even more carefully avoided when a "general contractor" is not employed. For one of the functions of the latter is to fill up the holes and bridge over the gaps in his contract. These holes and gaps always exist, though their number and size vary according to the thoroughness with which the architect prepares his drawings and specifications, as well as the contract clauses themselves. Among the latter is usually inserted that one which calls upon the contractor to "do any and all other work not shown on or described in the plans and specifications, but necessary to complete," etc.

The actual value of this clause depends largely on the good nature of the contractor, as its legal worth is nil. If your "general contractor" is making a good profit out of the work, he will not be averse to filling in gaps and holes out of his own pocket, with

a lively sense of favors to come by thus impressing the owner with his liberality. Most contractors figure at the outset on doing this, and their bid for the work is made just so much larger by providing for it.

Facilitates Satisfactory Records

Under the separate contract system, it is possible to keep a much more accurate account of the building's progress and the proper times and amounts for the payments due the contractors. One reason why contractors like it is that their payments are made to them direct, on the certificate of the architect, whereas when a "general contractor" is in charge, his sub-contractor's work is paid for by him out of the payments made him by the owner. An unfair contractor (there are such persons) is thus given the opportunity to be unfair to his "subs" by holding back their money on some pretext. So the trade contractors welcome dealing directly with the owners, for they know that their payments will be prompt, and at the same time the architect's control is the more effective, for the argument of a withheld certificate is always potent in hastening the carrying out of his directions.

The taking of a large number of estimates by trades, which is so important a feature develops a fact of much significance, but to which little attention is usually paid. This is, the wide difference in the amounts submitted, though the bids are of course all based on exactly the same data of drawings and specifications. Those differences are found to be greater in some trades than in others, but the fact that they are found, and almost invariably run a wide gamut of change, is one of the strongest arguments in the trade-contract method's favor.

Various legitimate causes create these differences. One bidder bids low because he is doing other work in the neighborhood of the proposed "job" and counts on consequent economies accruing from the fact. Another counts on certain money-saving methods of which he believes himself master, either in fabricating or erecting material, or both. Still another contractor bids low through a mistake on the part of his estimating clerk in taking off the quantities or adding up the figures. Some contractors are careless enough to entrust this important duty to inexperienced or incompetent hands. A well-known granite firm recently faced, and accepted, a loss of many thousand dollars because it found itself saddled with a contract for stone which the firm's estimating clerk had figured for on the assumption that the architect's drawings were at quarter-inch scale. The drawings were really at eight-inch scale, and were so marked.

Another case is that of the contractor who, when work is slack, is willing to undertake it at little or no profit to himself in order to keep his men employed. But from whatever cause they are traced, the diversity in the estimates received is nearly always surprising, and emphasizes the importance of taking as many bids as possible in each line, as well as in as many lines as practicable. It often happens that of half-a-dozen estimates taken in a certain trade, the lowest is one hundred per cent. less than the highest.

It is hardly necessary to add that a building built under the trade-contract system will be better built than one done under a general contract, for the greater amount of time and attention it demands from the architect is bound to bring this about.—The Brick-builder.

The Preservation of Ironwork

Ironwork enters so largely into the everyday life of municipal engineers, and is used in so many forms in works of construction, says Mr. William Rauson, in a recent issue of *The Surveyor*, that a little consideration given to the methods and need for its preservation may be of service in understanding the principles that are involved.

The oxidation or rusting of iron is not due simply to the combination of iron and oxygen. Iron under ordinary atmospheric conditions will quickly rust, but in the presence of dry oxygen will remain bright for a long time. Rusting appears to require not only air, but moisture and carbonic acid. Lime will prevent iron rusting quickly, because it absorbs the carbonic acid which is always present to some extent in the atmosphere.

During the process of rusting ammonia is formed through the nitrogen of the air combining with the hydrogen of the water. The oxide of iron, or rust, as it forms, sets up a galvanic action with the unaffected metal, and although a very weak current of electricity is produced, it decomposes the water, allowing the hydrogen to combine with the atmospheric nitrogen. This galvanic action causes the corrosion of ironwork to proceed with increasing rapidity, after rusting has once been allowed to commence.

The action of water upon iron depends largely upon the presence of carbonic acid. In the presence of sea-water the iron may be dissolved without the formation of visible rust. Sewage matter has a greater action upon iron than ordinary water, probably due to the presence of sulphides.

One of the principal causes of accelerating rusting is electrolysis. When the iron is brought into contact with another metal in the presence of a solution or atmosphere through which an electric current can pass, one metal will decompose. When iron railings are fixed by means of molten lead, the iron will decompose, especially if moisture be often present. This action can be seen in almost all cases where railings have been thus fixed for any length of time.

It will thus be realized how necessary it is that ironwork which has to do duty for many years should be preserved from rusting. In works of construction, unless precautions were taken, the strength of ironwork would speedily be reduced below the factor of safety.

Ironwork can be protected from rusting by (1) coating with oxide films, (2) coating with paint or varnish, (3) coating with some other metal, and (4) enamelling.

(1) When superheated steam is allowed to pass over red-hot iron the water vapour is decomposed, the oxygen combines with the iron, and the hydrogen is liberated. The oxide which forms on the iron makes a protective coat or film against future oxidation. This has become known as the Bower-Barff process, from the two manufacturers who most successfully applied the process. The oxide which is formed is the magnetic oxide Fe_3O_4 . If the coat or film becomes broken, or is imperfectly formed, galvanic action would cause corrosion, of the iron.

(2) Ordinary paint will form a preservative for ironwork, especially when the base used for the paint is red oxide of iron. Red and white lead are both used, but are likely to be acted upon by carbonic acid gas, &c., and galvanic action may also occur. Paint should be applied to cast-iron as soon as possible after it has left the mould, before rust has had time to

form. The cast-iron should first receive a coat of linseed oil before the iron has become cold. Various patent preparations—such as graphite, etc.—are now on the market for the preservation of iron. These are largely used for the painting of railings and outdoor ironwork, and are found to last longer than ordinary paints.

Bituminous varnishes are most commonly in use for the preservation of iron pipes, &c. They consist of various mixtures of coal-tar, pitch, linseed oil, resin, and the like. Dr. Angus Smith's process is the best known, and consists of first cleaning the iron, heating to 700 degs., and then dipping for fifteen or twenty minutes into his mixture at a temperature of between 300 degs. to 400 degs.

(3) Iron can be coated with another metal—such as zinc or tin. Iron is coated with zinc by the process of galvanizing, which consists of first cleaning the iron by steeping in an acid solution, and then plunging into molten zinc, which forms a protective coat to the iron. If, however, the zinc be worn off, or the coat imperfectly formed, galvanic action is set up, which will corrode the zinc. Zinc is very readily acted upon by acids, and is therefore not suited to manufacturing districts. When iron is coated with tin, if galvanic action is allowed to set up, the iron is corroded.

(4) Enamelling is only of value for iron articles used for domestic purposes, and consists in applying a pottery glaze, which should contain very little lead. Where the enamel becomes chipped the exposed iron will quickly rust and cause further disintegration of the enamel.

The Effect of Electric Currents on Reinforced Concrete

In the "Proceedings" of the American Institute of Electrical Engineers for November, Messrs. Harry Barker and W. L. Upson draw a number of conclusions from experiments carried out under their general supervision at the University of Vermont to ascertain the nature of electrolytic disruption of reinforced concrete. These conclusions, which are stated to be merely tentative, are as follows:

The disruption of reinforced concrete may result from stresses produced by local thermal expansion where the current density is high, with either alternating or direct current and irrespective of the direction of the current in the latter case.

With small current densities and without temperature stresses being developed disruption finally results from the accumulation of iron oxide at and near the imbedded iron where direct current leaves the iron to enter the concrete.

The bursting stresses developed with low current densities are largely caused by the formation of iron oxide, immediately at the anodic surfaces to a slight extent, but largely in the concrete near the anodes, the depth of penetration depending on the porosity of the concrete, the gas pressure, current strength, etc., among other things.

No gradual reduction of the strength of the concrete has been shown to accompany progressive corrosion of the iron. The oxygen for the formation of oxide probably is furnished mostly by the electrolysis of water and only to a slight degree is taken from the cement compounds.

Disruption may result with low-current densities

where iron is not the anode material if other compounds are formed from the anode or from the concrete and expand during the secondary reactions. In all cases pressure of gases developed may slightly assist or hasten disruption.

The general softening of the concrete after rupture is similar to that in specimens crushed mechanically and may be here regarded as largely the result of the bursting stresses.

A single current of small density may cause corrosion and disruption at several points by passing to and leaving a number of pieces of reinforcing steel, each completely imbedded.

With large leakages of either direct or alternating current to reinforced concrete, structural failures may be expected within a few hours of the start of current and as the result of thermal effects.

With small leakages of direct current an insidious undermining of structural strength must be expected.

With alternating currents, when the current density is low enough to eliminate local temperature stresses, repeated tests have shown no danger of structural troubles. This is in accord with the findings reported by Mr. J. L. R. Hayden before the A. I. E. E., March, 1907, but does not mean that there is absolutely no effect from alternating currents. It would indicate rather that the secondary reactions were so slow that the primary reactions were practically reversed each cycle.

Structural trouble is not to be expected with dry concrete unless random high direct-current voltages are noted on the structural members.

Present methods of electrical survey seem sufficient to detect dangerous (to the structure) voltages about reinforced concrete structures, and remedies are available for application as each individual case under consideration seems to demand.

Comparative Merits of Various Roofings

A recent writer on architecture expresses the following opinion about roof covering:

"In reference to duration, slate or clay tile roofs will outlast all the other forms, and if desired, may be removed and used elsewhere, while gravel roofs or some of the best kinds of prepared roofing will be next in durability and will last from ten to twenty years. Any common form of sheet metal roofing will soon be destroyed by rust unless it is frequently painted, and will not generally last longer than from three to five years.

"In comparing the cost of roofings, it appears that some of the various prepared roofings are the cheapest. Other kinds, in order of cost are wood shingles, tar and gravel, corrugated iron, standing seams, sheet steel, metal shingles, slate, tin, corrugated asbestos board and tile.

"Iron or steel are unsuitable for roofing buildings, where destructive fumes or gases accumulate, as the thin metal is quickly destroyed by corrosion, and leaks develop. It is better on such buildings, if sheet metal is preferred, to have it lead coated.

"Metal roofs have the advantage of being lightning proof and, as the roof surface is smooth, they are more easily kept clean by the wind and rain. If it is desired to collect rain water from the roofs, water will be purer when taken from a clean metal roof than if drained from one of tar and gravel. Metal has the disadvantage of transmitting heat and cold, and metal roofed buildings are harder to heat in winter

and in summer are uncomfortably warm. The objection to plank roofing from the standpoint of fire risk has probably been overestimated, for heavy plank supported on purlins 4 to 8 feet apart, will at the worst, burn very slowly, and will not collapse as soon as light steel framing, which warps and bends quickly under heat. Several disastrous fires have been traced directly to this cause.

"Slate has the disadvantage of cracking quickly under heat, should fire sparks get in between the joints and ignite the boards below. It appears, therefore, that the selection of a roof covering will depend upon the necessity for its being fireproof or not, the desired amount of durability, the first cost, pitch of the roof, and the amount of money the owners are willing to spend, either for the sake of appearance or permanence.

"Red slate or some of the many kinds of clay tile, especially red or green, add greatly to the appearance of roofs, though at extra cost, but this additional cost may easily be warranted on such buildings as pumping stations or power houses, located as they often are, in public places and open for the inspection of visitors."

Thin bituminous pavements on a concrete base have been constructed in Ann Arbor during the last two years by day labor under the direction of City Engineer E. W. Groves, at slightly under \$1 per square yard. The surface of the concrete is floated and then small depressions are made in it with a special tool to keep the surfacing from creeping. After experimenting with numerous materials the surfacing finally selected consists of Dolorway, a Barrett product, and torpedo sand. About one-half gallon of the bitumen is used per square yard and it is spread with a street sweeping machine. The sand is then applied on this bitumen in sufficient quantity to give a thickness of three-eighths of an inch, which seems to be enough to protect the concrete from injury by temperature changes and traffic.

Red water trouble at Attleborough, Mass., is commented upon in the annual report of Mr. George H. Snell, superintendent of the Water Department. The Attleborough water, he states, acts upon galvanized or lead pipe, and in order to prevent the formation of rust Mr. Snell urges that the use of galvanized iron pipe or galvanized range boilers be avoided. The Water Department uses cement in tin-lined pipe. The rust is more noticeable during the months of August, September, and October, when the temperature is said to be highest. The hot-water fixtures have given more trouble than those for cold water.

A well-known civil engineer in the U. S. has recently made public his personal experience of the behavior of concrete under attack by lightning. He says that a reinforced concrete water tank at his country residence was struck a short time ago without causing injury, the only effect having been to vitrify the texture of the concrete in places.

An Omission.—The article on Dam Failures published on page 36 of our issue of November 22nd was reproduced from a recent number of *Engineering and Contracting*, Chicago, credit having been inadvertently omitted in our previous number.

Residential Heating and Ventilating

Relative Merits of Direct and Indirect Methods of Heating— Up-to-date Furnace Installation Satisfactory and Economical

By Charles S. Prizer *

There is nothing more valuable to an architect in his profession than to keep up with the latest developments in the construction of buildings provided those developments are along sound, safe and conservative lines. Of course an architect cannot be expected to know everything about all the professions which are involved with his in the designing of buildings and in the construction thereof and in the selection of materials, for he is compelled to rely to quite a considerable extent upon experts in various lines when he attempts to do really good work.

More Attention to Ventilation

I believe that the time has now arrived when there will be increasing attention paid to the ventilation of residences and I believe that the architect who is up to the times will certainly specialize in the future along the line of ventilating the human habitations which he plans and erects for his clients.

There are but two methods of heating that lend themselves to ventilation as a part of the heating proposition—direct heating on the one hand and indirect heating on the other. Indirect heating consists of pouring warm air into the apartments of a building for the sake of warming them. Direct heating means the heating of the apartments by means of radiators—hot surfaces located in the rooms to be heated. Direct radiation heating I am convinced will not be the permanent heating that will be applied in residences or in any other buildings for that matter.

Steam and Water Heating

Steam and hot water heating have their proper place but in their direct form they are unsanitary because they involve a negation of ventilation. It is impossible to heat a building by direct radiation located in the rooms thereof and at the same time ventilate that building. It is impossible to have a healthful winter climate in your home provided that home is heated by any form of direct heating, be it stoves, radiators or any other method of direct heating. Therefore the system of heating that ought to be applied to residences is indirect heating.

There are but two practicable methods of ventilation that can be secured through indirect heating. The one is indirect steam heating where the stacks are located underneath the rooms to be heated, and the air is poured over them into the apartments to be heated and necessarily in heating the apartments you are changing the air in the room constantly.

Warm Air Furnace System of Heating

The other method is that of the warm air heater or the warm air furnace method of heating. These two methods are equally meritorious if they are each one right, with this difference—a modern refinement of heating which will probably grow as people get to a fuller understanding of the hygienic principles involved is the humidification of air in rooms artificially heated. Indirect steam heating does not readily adapt

itself to the artificial humidification of the air. That artificial humidification can be had very much better in connection with furnace heating, but with that eliminated there may be said to be no difference as to the merits of heating a building indirectly by steam or by the warm air furnace method, provided both are well done. However there is this very great difference—a complete indirect system of steam heating is very costly to the installer. Most indirect work that is done in residence heating to-day only applies to some rooms in the building; whereas it is perfectly apparent the sleeping chambers and baths and all of the different apartments in a house should be ventilated.

Steam Indirect Heating

Steam indirect heating is expensive to install and it is proportionately even more expensive to operate, the fuel cost being at least double the fuel cost of operating a warm air furnace heating plan; in fact complete indirect steam residence heating is so expensive as a proposition that it does not apply to a great majority of the houses that are built from year to year, and even well-to-do people when they know what it costs to install and to maintain, are reluctant to put themselves under the burden of that expense, but warm air furnace heating, if it be properly done, fulfills every hygienic and scientific requirement of the perfect heating and ventilating plant. It is reasonable in its first cost, for you can do an absolutely first installation of warm-air furnace heating in connection with formal ventilation at no greater expense to the owner of the building than he would pay for a system of direct steam radiation heating which is unscientific, unhygienic and indefensible. At the same time one has every advantage that he could possibly get from the more expensive methods, provided the installation is correct, the apparatus is what it ought to be and the proportioning of the whole system is right, and that by the way is a very large proviso.

An Advocate of Furnace Heating

I stand here to-night to advocate warm-air furnace heating as the best method practicable and the cheapest method of good heating that there is in existence, but I am compelled at the same time to admit that the warm-air furnace heating apparatus has been discredited and condemned throughout the country by reason of the defective installation and the use of apparatus of too small capacity. The remedy for that of course is to substitute good installation for imperfect installation. I am not here to blame the retail-heating contractors for the state of affairs which exists in the warm-air furnace industry, for I trace back the source of the evil conditions that exist directly to the manufacturer of warm-air furnaces. Whoever builds a machine or an apparatus to perform purposes or functions should say how that machine is installed, and how it is to be used, and just there is where the manufacturers of furnaces have fallen down. Up to this time there have existed no

* Extract of an Address given at the Seventh Annual Conyention National Association of Sheet Metal Contractors.

definite authoritative rules for the installation of warm-air furnaces. Everywhere you go and talk to people who install furnaces you will find that in their own estimation they know all about the method of doing this work in the best possible manner, yet strange to say, all of their competitors do bad work. The fact is a very great deal of poor, defective furnace installation is to be found. The retail furnace dealers have had no definite rules to go by; each one has known, in some mysterious and wonderful manner, without rules just how to do the work—at least he thinks so, but in spite of what he thinks I would take you through any city and examine one warm air furnace installation after another and subject it to any sound rules of heating engineering and condemn it as insufficient, inadequate and wrong in its proportionment and that exists in such a large percentage of cases that it is certainly no wonder that the public regard warm-air furnace heating as a cheap and inferior method of heating. Where it is installed it is generally because the builder of the house or the owner does not wish to incur the expense of putting in a more expensive method.

A Word to the Architect

Now for the architect, there are various considerations in favor of hygienic heating and ventilating as compared to the other kind. If a client comes to you there is in my judgment no better man to promote your own permanent interests as an architect than by making the particular residence under consideration by him a healthful place for that man to live in during the winter time, but this can only be done by ventilating and installing a warm-air furnace system. For example, you are abolishing direct radiators, which are always a nuisance and the abomination of interior decoration for they spoil the effect of your rooms. But you can serve the interests of your client so that he will be your friend and if you identify yourself with a thorough ventilation of the residences you build it will set you up one notch further in your profession and upon a solid foundation. The men who come to it first will enjoy a very decided advantage in house construction over the people who serve their clients with direct radiation systems.

Montreal's New Health By-Law

For three years a special committee of the Montreal Council has been at work on a new health by-law, the final draft of which has just been completed. The by-law is very drastic, especially in the clauses which provide for the control over slums. Hygiene and public health are placed under the Board of Control, the officials of which are given power to enter buildings, yards, and vacant land to ascertain whether the provisions are being complied with. Elaborate instructions are given regarding the plans of stables, their construction, drainage and ventilation.

In the case of dwelling houses and public buildings it is directed that none shall be erected on a lot of land which cannot be made healthy by drainage. No building for a dwelling house is to be erected on land which has been filled up or levelled with refuse or rubbish unless the foundations rest upon concrete and unless the ground in the cellar or basement be covered with a layer of concrete at least six inches thick. In every dwelling each room intended to be occupied is to be provided with a window opening directly into the external air on a free space which shall be sufficient for the lighting and aeration of the room. The glazed surface of the window is to be not less than one-tenth of the floor area. Yards closed in on all sides are

prohibited for dwelling houses which are to have more than one storey.

Every building for public meetings is to be provided with ventilation by thermic devices or by mechanical devices capable of supplying 1800 cubic feet of fresh air per hour and per person during the time such meetings are held. It is forbidden to introduce fresh air into any room of such a building at a speed of more than 200 feet per minute, and at a temperature less than 65 degrees Fahr.

Special clauses provide for the construction, alteration, or repair of educational establishments. In the case of industrial establishments such as abattoirs and rendering plants which are likely to become injurious to the public health or offensive, plans must be approved by the head of the hygiene department. Every industrial establishment is to be provided with ventilation which will supply each employee with 1,800 cubic feet of air per hour. In certain factories, water services and baths must be provided, and every establishment must have rooms in which meals can be taken. Factories already existing at the time of the passage of the by-law are given two years in which to conform to its requirements.

The penalty for breaking any provision is a fine of \$40 or imprisonment for two calendar months.

To Build a Shorter Route To Winnipeg

Noteworthy among recent incorporations is that of the British Canadian Construction Company, Limited. This company has been organized to undertake the construction of the Joliet & Lake Mannan Colonization Railway, which, when completed, from Montreal to a point on the G. T. P. in Northern Quebec, will provide the shortest route to Winnipeg by about 200 miles. The undertaking is one which will be followed with keen interest by eastern manufacturers and contractors. The grading is being proceeded with from Joliet north by the Enterprise Construction Company, and it is expected that the line from Joliet to meet the G. T. P. will be completed in about eighteen months. Among the most prominent incorporators of the company may be mentioned Mr. A. M. Laredo, of London, Eng.; Mr. Howard S. Ross, K.C., of Montreal, representing Montreal interests, and Mr. P. O'Reilly, of Ottawa. The concern is capitalized at \$500,000. Mr. Laredo is largely interested personally and intends to remain in Canada until the line is completed so that he can give the affairs of the company his personal attention.

Sooke Lake Development, Victoria, B. C.

Specifications for the Sooke Lake water project have been submitted to the City Council of Victoria, B.C., by Mr. Wynn Meredith, consulting engineer. Tenders have been called, the closing date being December 15th. Below are details of the specifications:

The southern route will be an all pipe-line presenting no engineering difficulties. Each tenderer will deposit a marked cheque for \$15,000, and each tenderer must prove that he is financially competent to carry out the work. A bond to the amount of ten per cent. of the contract price will be required. The contract requires that the following rate of progress upon the work shall be made, the whole to be completed within 731 days from the time the contract is let: 6 per cent. of the work in two months; 15 per cent. in six months; 45 per cent. in nine months; 55 per cent. in twelve months; 65 per cent. in fifteen months; 80 per cent. in eighteen months; 95 per cent. in twenty-one months, and 100 per cent. in twenty-four months. The work will be divided into five sections and no contract will be received for a portion of any section, and no bid will be considered

which does not cover one entire section. The work will include clearing a portion of the present submerged area, and the area to be flooded at Sooke Lake, construction of a dam at the outlet of the lake, with gate tower and screen house, including gates, screens and all devices and appliances; supplying, grading for, and placing of a conduit and devices for the conveyance of water to the reservoir; cleaning and clearing the area to form the pressure reservoir; construction of dams and structures for receiving water from the conduit line, and conveying to the reservoir, or to the pressure pipe line; construction of gate house, with screens and gates for controlling the water for delivery to the pressure pipe line, the pressure pipe line with valves, meters, and all work and appliances of every kind, and including a connection with the city's main at Fountain Square on Government street.

No compensation will be given to a contractor for delays or hindrances from any cause, though extension of time may be given if approved by the engineer. Forfeiture of the contract and amount of bond required may be ordered where contractor fails to comply with specifications within ten days after notice to do so. Dominion, Provincial and Municipal regulations shall bind the contractor. These cover the regulations relating to alien labor, conciliation, fair wages clause, Sunday labor, etc. Provision is made for the protection of labor, it being stipulated that the contractor shall pay unskilled labor not less than 34½c. per hour, and for skilled labor the standard union rate of wages current in the city at the time of calling for tenders, wages to be paid at least once a fortnight and eight hours to constitute a day's work, overtime to be paid for at the rate of time and one-half. The city, should the contractor fail to pay the proper scale of wages, will pay the difference and charge it up to the contractor. No Oriental labor will be permitted on the work. No spirituous liquors will be permitted upon or about the works. Proper medical attendance for the workmen is also provided for.

Progress on G. T. P. in British Columbia

J. W. Stewart, of Foley, Welch & Stewart, reports splendid progress on the construction of the G. T. P. in British Columbia. He says that of the section of about 750 miles through British Columbia, construction on all but 300 miles has been commenced. With the letting last August of the portion between Aldermere and Tete Jeune Cache, joining up with the 50 mile stretch from the summit of the Rockies to the Cache; all the British Columbia work is now under contract to this large firm. This long section covers over 400 miles. On the portion between the railroad at the canyon and Aldermere, 160 miles, work is in an advanced stage, and it is expected to be opened for traffic next year. Some heavy cuts are involved, and many bridges are necessary. The cantilever bridge crossing the Skeena river is well in hand, and other sections are receiving careful attention. About 4,000 men are employed by sub-contractors in different parts of the province for this company, and advantage has been taken of the excellent season to rush construction as much as possible. The earth work will naturally be tied up by the coming winter, but there will be little delay with the rock cuts. Apart from the sections under contract eastward from Prince Rupert, rails have been laid from the Edson district to the summit of the Rocky mountains, and track laying is now in progress in British Columbian territory across the Great Divide. From Tete Jeune Cache, when this point is reached, the contractors will possess navigable waters to introduce supplies. In addition to the G. T. P. contracts, the firm share with the Northern Construction Company the contract for the section of the Canadian Northern Railway between Hope and Kamloops, and they have two

big contracts for the Mackenzie & Mann interests in the east, from Fort Frances to Duluth, and from Port Arthur to Sudbury. The former of these has almost been completed. The character of the country on the Sudbury line is very rough, and involves some heavy cuts.

Personal News and Notes

Desjardins & Lortie, Montreal, Que., have registered as general contractors.

Mr. K. S. MacDonell, of Collingwood, Ont., has been appointed town engineer of Barrie, Ont., at a salary of \$1,000 a year.

The Carillon Construction & Development Company have been registered with a capital of \$50,000, to do a general contracting business.

The Protestant School Commission have asked the Legislative Committee of the Montreal City Council to secure power to condemn unsanitary houses.

Beique & Charton, Montreal, who have the contract for a gravitation waterworks system at Mont-Laurier, P.Q., have suspended operations for the winter.

A. & P. Steven, Limited, is the name of a company formed in Montreal, with a capital of \$50,000, to carry on a general business in elevators and all kinds of machinery.

Mr. Ford, the sales manager of the Canada Cement Company, Montreal, met with an accident while leaving a friend's house. He slipped on the pavement and broke his leg.

The Dominion Rock Drill & Foundry Company, Limited, manufacturers of hoisting engines, rock drills, etc., have arranged to erect a large factory during the coming winter, to meet the demand of their growing trade.

Mr. David Brown, of Brown & Vallance, architects, has returned to Montreal after several weeks' visit to the West. The immediate cause of his visit was in connection with the erection of the Saskatchewan University buildings in Saskatoon. Five of the buildings have been completed.

The Port of Vancouver Drydock & Shipbuilding Company, capitalized at \$1,500,000, will construct at Vancouver a dry dock 550 feet in length, with a lifting capacity of 15,000 tons. The company has been subsidized by the Dominion Government to the extent of more than \$1,000,000, covering a period of twenty-five years.

An English firm (in the Midlands) manufacturing mosaics, encaustic and plain flooring tiles, and also glazed tiles of various kinds, would like to get into touch with Canadian firms who could handle their specialties. Enquiries should be addressed to the branch office of the High Commissioner for Canada, 73 Basinghall Street, London, E.C.

Plans are being drawn for improvements at the C. P. R. Place Viger Hotel, Montreal. It is proposed to remodel the hotel, the alterations including the building of a very fine rotunda, a large banquet hall, grill room, restaurant and hotel offices. In addition there are to be a promenade, drawing room, a dining room on the American plan, and a private dining room.

Architects, contractors, and supply men were well represented on the committees working for the collection of \$1,500,000 for McGill University, Montreal, many of these gentlemen being also liberal contributors to the fund. Messrs. G. Ross, Hugh Vallance and J. D. Spence, represented the architects; E. M. G. Cape and W. Lyall, the contractors; and H. J. Fuller and James Ballantyne the supply men.

Assuming the passage of the necessary by-law, tenders will be called in a few weeks by the Works Department of

Vancouver for two trunk-sewers which are part of a scheme estimated to cost \$1,000,000. Mr. W. S. Lee, of Montreal, who has been retained by the city to take charge of the Greater Vancouver sewerage system, is now busy on the finishing details of the plans.

The Norton-Griffiths Company, Limited, have the contract for the Belmont House building at Victoria, estimated to cost \$400,000. The building will be devoted to banking purposes, offices and stores. It will be of reinforced concrete construction with the exterior elevations executed in a special grade of terra cotta. The firm behind the project is Belmont Buildings, Limited.

Five years ago the City of Victoria, B.C., engaged Mr. Le Baron, consulting engineer, to report upon the best method of permanently improving the entrance to the river. The recommendations of Mr. Le Baron have just been approved by the authorities and tenders are now being called (closing date December 19) for the construction of a jetty, a mile and a half long, at Stevenson. The estimate cost of the work is \$1,000,000.

At the regular meeting of the Calgary Builders' Exchange a resolution was passed expressing profound sympathy for the family of the late J. A. H. Lake, formerly chairman of the plastering contractors' section of the Exchange. The following new members were elected: Craddock-Sweeney-Dearing Construction Company, Foster Cartage Company, Prevel & Son, Burnett & Weir, Waite-Fullerton Company, Limited, builders' supply dealers.

Mr. A. Chausse, building inspector, of Montreal, proposes an amendment to the building by-law to permit the city to keep a record of the building in Longue Pointe Ward, which was exempt from observing the city's building regulations for five years from the period of annexation. Mr. Chausse also desires the inclusion in the records of the buildings put up by the Harbor Commissioners. Hitherto the Commissioners have been exempt from taking out building permits.

The Grand Trunk Railway System have awarded a contract to John S. Metcalf Company, Limited, Montreal and Chicago, for the substructures of a new bridge to replace their present bridge across the Richelieu River, near Lacolle Junction, Que. The work includes a new pivot pier with protection cribs, two new rest piers and piers for the approaches. Timber caissons filled with concrete will be used. The estimated total cost of the sub-structures is approximately \$140,000.

H. M. Trade Commissioner reports that a Toronto agent is desirous of getting into communication with British manufacturers of specialties for the hardware and building trades. The name and address of the agent in question may be obtained by British manufacturers on application to the Commercial Intelligence Branch of the Board of Trade, 73 Basingshall street, London, E.C. Any further communications regarding the inquiry should be addressed to H. M. Trade Commissioner for Canada, 120 Board of Trade Building, Montreal.

The Montreal Water & Power Company has just turned the water into one of the new steel mains, from Bellingham and St. Catherine Roads, Outremont, to the corner of St. Lawrence Boulevard and Barnard street, Montreal. The mains consist of 1,500 feet of pipe, 4 ft. diameter, 4,200 feet of 3 ft. diameter, and 1,500 feet of 30 in. diameter. The pipe was supplied by the East Jersey Pipe Company, of Patterson, New Jersey. The work is not quite finished, but it is being rushed in the hope that it will be completed in about a month.

Mr. Edward Crutwell, representing Sir John Wolfe

Barry, the eminent London engineer engaged to design the proposed railway bridge across Burrard Inlet at Vancouver, has accumulated the necessary data and returned to England. On his way back he stopped off at Ottawa to confer with the Dominion authorities. He was assisted in his work at Vancouver by Messrs. Cleveland & Cameron, who are associated with the enterprise. It is stated that a number of plans will probably be submitted to the members of the Burrard Bridge & Tunnel Company.

An action brought by Mr. Alphonse Content, architect, against the Corporation of the Petit Seminaire of St. Therese was decided by Judge Demers, Montreal, on November 30. Mr. Content agreed to do certain work in the building of an annex to the college, the fees being according to the tariff of the Province of Quebec Association of Architects, 2½ per cent. to be deducted for the education of his children. There was some extra work, for which plaintiff charged 7½ per cent., but the college contended that only 5 per cent. was payable. The Judge allowed 5 per cent. with 2½ per cent. for the education of the children.

An interesting pamphlet embodying a treatise on economical combustion, with special reference to the Hermansen Recuperator Furnace is published by Wuerz & Company, of Cleveland, Ohio, designers and builders of industrial furnaces and kilns. Canadian firms interested in the subject of fuel economy will be well advised to get in touch with Messrs. Wuerz & Company, who have spent years working out the problems appertaining to this study. The pamphlet to which we have referred above proves conclusively the success of the System Hermansen as applied to muffle furnaces. The company offer expert advice, and their best services are available for consultation.

Mr. George Young, superintendent of construction for the Canadian Bridge Company, Walkerville, Ont., has been in Strathcona making arrangements for the erection of the steel superstructure of the C. P. R. high level bridge between Edmonton and Strathcona. Mr. Young superintended the erection of the Cambie street viaduct over False Creek, Vancouver. The Canadian Bridge Company's contract at Edmonton is a large one. Over eight thousand tons of girders, brace rods, joists, etc., are to be shipped from the manufacturers. Of this material about one hundred and twenty tons is now in the yards at Strathcona. About twenty-five car loads of timber will be used in the false work. Mr. Young estimates that the work will occupy the better part of a year. It is interesting to recall that Mr. Young superintended the construction work of the Clover Bar Bridge on the G. T. P.

The Ceresit Waterproofing Company, 446 Commercial National Bank Building, Chicago, have just issued a new illustrated catalogue which contains remarkable evidence of the efficiency of Ceresit. This material has been used on some of the most important building work in Canada. Of the recent contracts may be mentioned those in connection with the Windsor street station of the Canadian Pacific Railway at Montreal; the McArthur building at Winnipeg; the Library building of the University of Toronto; the Eastern Townships Bank building, Winnipeg; the Technical High Schools, Winnipeg; City Hall, Ottawa. The makers of Ceresit claim that it is not only the most efficient, but the most economical waterproofing on the market. Ceresit is a cream white paste which is simply added to the water used in mixing mortar or concrete. It penetrates with the water to all parts of the concrete or mortar and ensures a permanent water-proof and damp-proof job. The booklet contains detailed directions for using the material. As an extra argument in favor of Ceresit it may be said that these directions are so simple that a child could apply them.

Contracts Department

News of Special Interest to Contractors, Engineers, Manufacturers and Dealers in Building Supplies.

Information for insertion in these columns is invited from Architects, Contractors, Engineers, etc.

Waterworks, Sewerage and Roadways

Berlin, Ont.

A by-law for raising \$10,735 for building a new storm drain will be submitted to the electors shortly.

Chatham, Ont.

The city is contemplating several public improvements and the city engineer is to report on a new roadway on Centre street; also new sewers on Hillyard and Emma streets. Chairman Board of Works, Mr. Baxter.

Exeter, Ont.

A by-law to raise \$5,000 for waterworks extensions will be submitted to the ratepayers at the elections.

Hamilton, Ont.

Tenders will be called shortly for pipe sewers, Ottawa street, Cannon street to Barton, 30-in., \$15,070; Lincoln street, Berlin, Linden and Gordon, \$2,300; Dickson street, \$1,697. Cement walks and curbs will be done by engineer's department. Mayor, G. H. Lees; city engineer, A. F. MacAllum.

Following by-laws will be submitted: \$65,000 for waterworks; \$18,500 for Gore Park convenience; \$65,000 for Central Fire Station, and \$100,000 for parks, all to be submitted to the people. Authority to issue \$70,000 to extend Birch avenue, and \$160,000 for school purposes will be sought from the Railway Commission.

Lethbridge, Alta.

Tenders are called until Dec. 27 for sewage disposal and paving. City engineer, A. C. D. Blanchard; consulting engineer, T. Aird Murray, Lumsden Bldg., Toronto, Ont. (1) Street paving; (2) sewage disposal plant, 1 preliminary plans etc. on file at city engineer's office; 2 specifications on file at city engineer's office and at office of con. engr., Toronto.

Montreal, East, Que.

Mayor, Jos. Versailles; secretary, J. E. Corderre, Notary; engineers, Hurtubise & Hurtubise, 99 St. James street, Montreal. Tenders on permanent sidewalk, macadam roads and sewers will be called after February elections.

North Toronto, Ont.

Following works are planned: 4-ft. concrete sidewalk, Bowood ave., \$924; 6-in. water main under Mount Pleasant ave. to connect with main on Roehampton ave., \$570; cast iron, Bell & Spigot pipe. Clerk, W. C. Norman.

North Vancouver, B. C.

By-laws to provide for the following city improvements are now before the council: \$257,000, additional sewers, and the balance for other city work, including \$175,000 for waterworks, \$50,000 for clearing streets, \$5,000 for clearing and grading lanes, and \$10,000 for the con-

struction of a city dock at the foot of Chesterfield avenue, mainly for storage purposes. The engineer's recommendations concerning sewers are as follows: sanitary sewers on 4th, 5th and 6th sts., \$135,000; on 8th, 10th and 11th streets, \$47,000; on 12th and 13th streets, \$17,000; on 19th avenue, \$17,000; on Mahon avenue, \$8,000, and on Lonsdale avenue, \$6,000. Storm sewers in the following locations: on St. David's avenue, from the water front to Beach road, \$18,000, and extension of the sewer on St. Andrew's ave., from 3rd to Keith road, \$18,000. The fire department requires \$12,827 for maintenance during 1912.

Oshawa, Ont.

Tenders are called until Dec. 9th for construction of asphalt block pavement on a concrete base together with cement concrete curb and gutter, about 11,000 sq. yds. Plans etc. at engineer's office. Mayor, W. E. N. Sinclair, B.A., L.L.B.; town engineer, Frank Chappell.

Sandwich, Ont.

Town is planning extension of waterworks, new mains along Tecumseh Rd., and tenders will be called shortly.

Victoria, B.C.

City Council has approved of specifications and tenders will be received until Dec. 15th for the Sooke Lake water system; estimated cost, \$1,500,000. Water commissioner, J. L. Raymur; consulting engineer, Wynn Meredith.

Warton, Ont.

The council has decided to lay a sewer from McNaughton street to Berford st. Tenders to be called shortly.

Railways, Bridges and Wharves

Guelph, Ont.

The Finance Committee of city council and county council will install, it is understood, a central heating plant in connection with new jail, registry offices and other buildings of interest to both.

London, Ont.

Supt. Glaubitz has about completed plans for the splendid new river drive that is to be constructed from London to Springbank next year, a distance of five miles, and they will be considered at a meeting of the Water Commissioners shortly.

Niagara Falls, Ont.

Negotiations are in progress for an electric road for Welland, Niagara & Lake Erie Railroad. Mr. McLaughlin, Welland, is negotiating with council for franchise to run a line through Bridgeburg from Pt. Colborne to Niagara Falls, 37 miles. He has Dominion charter and necessary backing.

Port Colborne, Ont.

The Niagara, St. Catharines & Toronto Railway, head office, St. Catharines, propose to construct an electric railroad line from Port Colborne to Bridgeburg, 7 miles double tracking, 11 miles single

track, light construction. Cars, transformers, general electric railway equipment. Construction to start in the spring.

Preston, Ont.

The council is considering the question of paving King street and the matter will be gone into thoroughly.

Quebec, Que.

A deputation consisting of Messrs. Forget, Lesperance and others waited upon the Federal Government in regard to a new dry dock.

Stewart, B.C.

Tenders are called until Dec. 21st for extension to wharf, Portland Canal. Plans, etc., at department, and offices of district engineers at New Westminster and Chase, B.C., on application to local postmaster. Department of Public Works, Ottawa; Secretary, R. C. Desrochers.

Steveston, B.C.

Tenders are called for construction of jetty at mouth of Fraser river. Plans, etc., at office of district engineers at New Westminster, Chase and on application to local postmaster. Received by secretary until 4 p.m., Dec. 19th. Secretary, R. C. Desrochers; Dept. of Public Works.

St. John, N.B.

Announcement has been made here officially that A. R. Gould and associates of Bangor, Me., will shortly be awarded the contract for construction of the St. John Valley Railway.

Tillsonburg, Ont.

A by-law will be submitted to raise \$3,000 for building the Borden Bridge. Mayor Thompson has the matter in hand.

Vancouver, B.C.

Application will be made to Federal Government for two more dredges for this vicinity. Supt. of Dredging, Public Works Dept., H. A. Bayfield.

Victoria, B.C.

The by-law to provide \$45,000 for the Dallas Road sea wall passed. Other by-laws to provide for library improvements were defeated.

Winnipeg, Man.

Tenders are called for supply of labor and materials for erection of sub-structure for Osborne street bridge across Assiniboine. Plans, etc., at office of City Engineer, 223 James ave. Received by Chairman, Board of Control, until 11 a.m. December 18th. Secretary, Board of Control, M. Peterson.

CONTRACTS AWARDED

Burk's Falls, Ont.

Work has started on construction of cement and steel bridge to cost \$12,000 for Department of Public Works, Ottawa; general contractor, Mr. Butt, Burk's Falls.

Lacolle Junction, Que.

Bridge, sub-structure to cost \$140,000, across Richilieu river, for the Grand Trunk Railway; contractor, John S. Metcalf Co., Ltd., St. Francois Xavier street, Montreal. New pivot pier with protection cribs; two rest piers, an piers for the approaches. Timber caissons filled with concrete will be used.

Waterloo, Ont.

The Township Council has let a contract for a reinforced concrete bridge to contractor Clemens and granted a request that he be allowed the leave the work over until spring. The bridge will be built at Breslau.

Public Buildings, Churches, Schools, etc.

Aylmer, Ont.

The town has an offer of \$8,000 for a new public library from Andrew Carnegie, and the matter will be taken up by the council at once.

Bethany, Ont.

The council are seriously considering the re-building of the town hall, recently destroyed by fire.

Burtondale, B.C.

Tenders will be received by the Minister of Public Works up to 12 o'clock December 6th, for erection of a small 1-room schoolhouse with concrete basement. Plans, etc., at offices of J. H. McCormack, secretary School Board, Burton, B.C., the Government agents Nelson, Kalo and Revelstoke, and the Department of Public Works, Victoria.

Campbellford, Ont.

Tenders were called until Dec. 5th for public library to cost \$8,000; 2 storey, 40 x 40, brick, stone foundation, hot water heating, slate roof, electric light, interior finish quarter cut oak, electric work. Town clerk, W. E. Carnahan; architect, W. A. Mahoney, Guelph.

French Creek, B.C.

Public Works Department, Victoria, calling for tenders for erection of large 1-room school in Alberni district. J. E. Griffiths will receive tenders until Dec. 6th.

Hamilton, Ont.

The Young Women's Christian Association are planning to construct a natatorium at a cost of \$15,000; secretary, Mrs. Mackenzie, 17 Main street, Hamilton.

Montreal East, Que.

Plans will be prepared shortly for erection of a church for Roman Catholic Denomination; architect, R. A. Brasard, 9 St. James street, Montreal.

Montreal, Que.

Trustees, Fairmount Presbyterian Ch. are planning the erection of a new church in spring on Masson street.

Tenders are called for alterations to post office, 12 St. Henry Sq.; plumbing, plastering, carpentry and papering. Specifications at office of H. N. Lymburner, 103 St. Francois Xavier street, Montreal.

St. Thomas, Ont.

Work is in progress for erection of a theatre to cost \$4,000, for H. G. Borbridge; architect, J. F. Finlay; 1 storey 35 x 80, brick, cement foundation, hot

air heating, electric lighting, corrugated iron roofing, interior finish wood. Seating capacity, 600.

Saskatoon, Sask.

Tenders called for church to cost \$100,000; owner, Knox Church; architects, Brown & Vallance, Winnipeg; L. P. O'Leary, local representative. Received by R. Pretty, secretary, Bldg. Committee, until December 1st.

Stettler, Alta.

Miss Taylor, nurse, of Strathmore, proposes to erect modern equipped hospital, 2-sty., brick, steam heated. The building proposes 12 wards on ground floor and 12 above, operating room, anaesthetic room, bathroom with kitchen as an addition to main building. Cost \$10,000.

Sydney, N.S.

A. N. McLennan, G. A. R. Rowlings. H. Grant and T. W. Publicover are interested in the proposed erection of a new rink 120 x 240, to cost \$15,000. Work will start as soon as possible. Application has been made for a charter.

Toronto, Ont.

Work is in progress for a moving picture theatre to cost \$6,000 on Paul street, for Walter Ely, King and Sherbourne streets; 1 storey, brick, structural steel, cut stone, reinforced concrete fireproof doors, boilers.

The West End Christian Temperance Society are contemplating the erection of a large club house on Bathurst street.

Council will be asked to submit by-law to raise \$60,000 for additional school accommodation.

Competitive plans will be called for new technical school, (Herrick, Borden, Lippincott and Harbord streets; Board of Education, Toronto; supt of buildings, Mr. Bishop. Supt. to outline conditions and suggestions governing the competition. Sites for branch technical schools are to be selected.

Tenders are invited for erection of a brick theaterium to cost \$5,000 for The Suburban Amusement Co., 64 Victoria street.

Westmount, Que.

Under the Liberal Government plans were prepared by Alphonse Pitche for new post office. The citizens are now asking for two offices. Nothing has been done.

Winnipeg, Man.

The Thistle Curling Club propose erecting a curling ring to cost \$50,000. Prov. Directors, Peter Lyall, jr., W. A. Carson and R. J. Mackenzie and others, care rink, 160 Alexander avenue. No site has yet been selected from the ones under consideration.

CONTRACTS AWARDED

Calgary, Alta.

Addition to church. Owner, English Church Trustees; general contractor, J. Hargraves, Crescent Heights; 1 storey, 30 x 40, frame, concrete foundation, hot air heating, electric light, shingle roof, hardwood interior finish.

Montreal, Que.

Foundations are commenced for church to cost \$15,000, St. Joseph Blvd. and Simard street. 31 feet high, 37 x 73, stone and brick, stone and concrete foundation, hot air heating, electric lighting, tar and gravel roofing, owner, Trustees,

Delorimer Methodist Church; architect, Peden & McLaren, 20 St. Alexis street; contractor for excavation, Seobie & Co., Coristine Bldg., plumbing, G. R. Woodburn, 177 Fulford street.

Toronto, Ont.

Orange hall on College and Euclid avenue, for C. Graham, 57 Yonge street; architect, G. H. Miller, Toronto Gen. Trusts Bldg., Toronto; builder, J. T. V. May, 22 Shannon street, Toronto; 2-storey and basement, cut stone, tar and gravel roof, cornice, plate glass, mantles.

Victoria, B.C.

The Ritchie Contracting & Supply Co., Granville street bridge, has secured the contract for all the marble and tile for the Union Club bldg. Architect, L. P. Rixton; general contractor, The Sound Engineering & Construction Co., Seattle. The setting will be done by the Vancouver Marble & Tile Co., Beach ave.

Residences

Calgary, Alta.

A permit has been applied for a residence to cost \$4,000, for Ross & Thompson, 1513 5th street west; 2 storey, 34 x 38, frame, concrete foundation, hot air heating, electric light, shingle roof, hardwood interior finish.

A permit has been granted for two residences to cost \$6,000, Mt. Royal, for R. G. Colgrove, 123 8th avenue east; 2 storeys, 24 x 52, frame, hot air heating, concrete foundation, electric light, shingle roofing. Owner is builder.

Montreal, Que.

Excavation done for two flats, \$3,000, St. Hubert street, 3-sty., 25 x 30, brick and stone, stone fndn., gas and elec. ltg., gravel rfg.; owner, Joseph Gravel, 3354 Letang street.

Jno. T. Clark, 2111 Rosemount Blvd., will build six flats to cost \$7,000; 3 storey, 40 x 42, wood and brick, stone foundation, furnace heating, gas light, gravel roof.

Foundation is started for six flats to cost \$6,000 for V. Harnois, 1213 Huntley street, Montreal; 2 storey, 50 x 44, pressed brick, gas and electric lighting, gravel roofing. Owner is builder.

Montreal West, Que.

Tenders were invited for residence to cost \$5,000 on Percival avenue, for W. E. McLean, Montreal west; architect, Peden & McLaren, 20 St. Alexis street, Montreal; brick veneer, concrete foundation, electric light. Tenders closed Nov. 27th. See advt. in "Tenders and For Sale Dept." of this issue.

Ottawa, Ont.

J. A. Scott, 39 Melgrum ave., has been granted a permit to erect a 2-sty. 37 x 30, brick veneer residence on Powell ave., electric light and concrete fndn. Cost \$3,800.

Toronto, Ont.

Permit applied for, dwelling, \$4,000, 295 Wright ave., 2½-sty., brick, owner, A. Dickens and J. Richardson, 9 Adelaide Place.

Permit applied for, dwelling, \$3,500, e.s. Pacific ave., 2-sty. and attic, brick; owner, Chas. Joliffe, 437 Gladstone ave.

Permit granted for dwelling, \$4,500, n.s. Westminster ave., 2-sty. and attic, brick; owner, E. C. Finch, 143 Sunnyside avenue.

Excavation is done for three attached dwellings, \$4,800, Gerrard street east, 2-sty. and attic, brick veneer front and roughcast sides; owner, J. Brown & Co., Gerrard street east.

W. Dunseath will build two pair semi det. houses on Shaw street. Architect, J. Gladwin Hedges, 86 Clinton street, Toronto. Stone fndn., brick and shingle. Cost \$8,000.

Residence, \$6,000, on Indian Grove, east side, for William Halls & Son, 54 Hewitt ave. Architect, J. W. Siddall, King street. Two sty and attic, shingle roof, also gable shingle, hot water htg.

A. Mills, Traders Bank, has had plans prepared by Architect J. W. Siddall, Janes Bldg., for erection of a residence at 375 Roxboro street east. Builder, Wm. Halls & Son, 54 Hewitt ave. Two sty. and basement, brick. Cost \$9,000.

Permit granted for dwellings, \$6,000, n.s. Roxborough street, 2½ storey, brick, for P. F. Brand, 36 Foxbar road; architect, W. R. Ratley.

Permit has been applied for residence, \$5,000, Rowanwood avenue, brick, 2½ storey; owner, C. W. Defoe, 47 Simcoe street; architect, S. P. Coon, Temple Building.

Excavation is done for dwelling, to cost \$4,200, south side Cains avenue, semi-detached, brick, stone foundation; for John T. Graydon, 527 Brock avenue.

A permit applied for residence to cost \$7,000, Roxboro street east, 2 storey and attic; owner, Jno. McMurren, 319 Roxboro street east; architect, Sharp & Brown, 18 Wellington street east; owner is builder.

Excavation is done for pair dwellings to cost \$7,000 on Edwin avenue, for A. O. Scott, 80 Emerson avenue, Toronto; 2 storey, semi-detached, brick.

Tenders are invited for apartments to cost \$6,000 on Belmont street, for J. A. Steel, Victoria street; 2½ storeys, brick.

Excavation is done for pair dwellings to cost \$4,500 on Beverly street, for R. Lavine, 182 Beverly street; architect, S. A. Waggett, Toronto street; semi-detached, brick.

Work is in progress for residence to cost \$6,000 on Russell Hill Drive, for Robert Mackay, Rosedale; architect, J. Francis Brown.

Work is in progress for a pair residences to cost \$12,000 on Summerhill Gardens, for R. C. Vaughan, 66 Dunvegan road; 2½ storey, brick, shingle roof, hot air heating, electric light.

Tenders are called for residence to cost \$3,100, Heath street west, s.s., for J. J. McKinney, 48 Warren road, Toronto; architect, J. H. Galloway, 23 Toronto street, Toronto; 2 storey and attached brick, shingle roof, hot water heating, electric light, plate glass. No date specified for closing of tenders.

Tenders are called for erection of a residence to cost \$2,800, Heath street west, for J. J. McKinney, 48 Warren road, Toronto; architect, J. H. Galloway, 23 Toronto street, Toronto; 2 storey, brick, stone foundation, shingle (gable) roof, hot water heating, electric light.

Permit has been applied to erect dwelling to cost \$4,000, Roncesvalles and Garden avenue; for T. J. Sharpe, 330 Sunnyside avenue; 3 storey, brick.

Excavation is done for 2 pair dwellings to cost \$7,800 on E.S. Greenwood

avenue for J. E. Wannwright, 18 Beatrice street, Toronto; architect, J. G. Hedges, 86 Clinton street, Toronto; semi-detached, brick.

Tenders are wanted in lesser trades for pair semi-detached residences to cost \$12,000, 30 Logan avenue, for J. H. Champion, 138 Hogarth avenue, Toronto, brick construction.

Tenders are invited for erection of apartments to cost \$5,000 at 31 Winchester street, for J. H. McKnight, 162 Bay street, Toronto; architect, J. L. Havill, Mail Bldg., Toronto; 3 storey, brick construction.

A pair of residences to cost \$4,800 will be erected for Henderson & Weir, 1723½ Dundas street; architect, W. I. Sanderson, 216 Westmoreland avenue; 2 storey and attached semi-detached, brick.

Excavation has been completed for an apartment to cost \$35,000 at 1600 Queen street, for A. R. Coleman, 171 Dowling avenue, Toronto; architect, C. J. Gibson, 75 Yonge street, Toronto; 2 storey, brick.

E. G. Shutzer, 139 Springhurst ave., will build three pair houses, 2 storey, and attached, brick, tar and gravel roofing, electric light etc., on Hewitt avenue to cost \$16,000.

Excavation is completed for 1 pair semi-detached residences to cost \$4,000 on Shanly street, for Jno. Hines, 57 Hallam street; architects, David E. Smith, 77 Victoria street, Toronto; 2 storey, brick.

Jno. and Thos. Bishop, 176 Wright avenue, will build six attached residences to cost \$12,000, on Shuter and George streets; architect, J. G. Hedges, 86 Clinton street; 3 storey, brick, tar and gravel roof.

Tenders will be called for a residence to cost \$8,000 on Russell Hill road; architect, Thomson & Belfry, 43 Victoria; 2½ storey, brick, stone foundation, cut stone, metal cornice, mantles, burlap, hardwood, stucco slate roof, hot water heating.

J. C. Neibergall, 201 Campbell avenue, will build a residence on Campbell ave.; architect, J. H. Stanford, Parkdale; 2 storey and attached, brick, detached. Cost, \$3,000.

Excavation has been completed for a residence to cost \$3,000 at 662 Ossington avenue, for Frank Wager, 688 Ossington avenue; architect, W. G. Hunt, 679 Dovercourt road; 2 storey and att. brick, cut stone, stone foundation, rubble stone, tar and gravel roofing, hot water heating, gas and electric light.

Tenders will be called for erection of an apartment house on Wellesley street, for E. Wickett, 431 Sumach street; architect, H. G. Wilson, 77 Victoria street, Toronto; 2 storey and basement, brick, tar and gravel roofing, hot water heating, electric lighting, hardwood and pine interior finish.

Excavation is done for residence to cost \$4,000 for H. Ransome and T. Carter, 548 St. Clarens avenue; architect, J. Hunt Stanford, 34 Toronto Arcade, Toronto; 2 storey, brick.

Excavation is completed for residence to cost \$4,250 on Westminster avenue, for E. C. Finch, 142 Sunnyside avenue, Toronto; brick and stone, shingle roofing, hot water heating, electric light.

Vancouver, B.C.

Apartment building, 3-sty., frame and brick veneer, 2676 Granville street, \$14,

000. Beaver Board, cement, iron; architect, W. C. F. Gilliam, Hutchinson bldg.

Plans are completed for cottages for B. C. Building Trust Co., 739 Hastings street west, Vancouver; architect, H. B. Watson, 602 Holden Bldg., Vancouver; ten 3-room cottages in Burnaby; eight 5-room cottages in Point Grey. Plans, etc., with architect.

Plans are prepared for an apartment block to cost \$115,000 at Hamilton and Georgia streets, for Herbert Bentley, 632 Hornby street, Vancouver; stores on ground floor; 4 storey, 50 x 120, reinforced concrete, steam heating, marble entrances, elevators.

James Townley, Mainland Glass Co., 643 Broadway east, is having plans prepared by architect G. A. Horel, 25th and Main streets, for the erection of an apartment house, 3 storey, brick, 33 x 100.

Westmount, Que.

Messrs. T. S. Hudson & Co., 12 Basement, Board of Trade Bldg., Montreal, are arranging for the erection of 12 or 12 self-contained or semi-detached residences next spring, on Clark avenue.

Woodstock, Ont.

Lieut.-Col. White was appointed chairman of a committee that will get plans at once for a new \$10,000 manse for Knox church.

Lieut.-Col. White in his report to the Board of Trade on the project of erecting houses to rent to employees of industries induced to locate here, recommended the formation of a syndicate. A deputation will go to Brantford to investigate a similar venture there.

CONTRACTS AWARDED

Calgary, Alta.

Residence to cost \$5,000 in Elbow Park, for J. E. Runions; architect, J. J. Irvine, 221 Underwood Block; contractor, S. J. Ferns, 525 17th avenue west, Calgary; 2 storey, 33 x 39, frame, concrete foundation, steam heating, electric light, shingle roof, interior finish hardwood.

Basement has been completed for apartment house, cost \$7,000, for W. A. Denby, 349 14th ave. west; arch., Holman & Gotch, 349 14th ave. west; contractor, H. D. Aldous, Calgary. Two-sty., brick veneer, 36 x 54.

Residences cost \$20,000, Parkdale, for A. S. McKay, Parkdale; architect, Leo. Dowler, Alexander Corner; contractor, Johnston Bros., 6 McTavish Block, Calgary. Two-sty., 23 ft. by 34 ft. 6 in., brick veneer, conc. fndn., hot air htg., elec. lgt., shingle rfg. This is the first pair of twelve to be erected on same plan.

Montreal, Que.

Residence, \$25,000, Pine ave.; owner, Travers Allan, Bank of Montreal; architect, R. Findlay, 10 Phillips Place. Contractors as follows: Excavation and masonry, J. H. Hutchison, 64 Ambrose st.; carpentry, D. M. Long, 39 Windsor st.; painting and glazing, H. Coutlee & Son, 483 St. Christophe; roofing, plumbing and heating, T. Lessard & Sons, 191 Craig street east; iron work, Dominion Bridge Co., Ltd., Lachine.

Residence to cost \$35,000 on Pine avenue, for A. E. Holt, 56 Pine avenue, Montreal; architect, Hogle & Davis, 80

St. Francois Xavier street; general contractor, Jno. Wighton, 73 Fort street, Montreal; carpentry, Beckham & Scott, 17 Concord street, Montreal; cement, Church, Ross & Co., 40 Hospital street, Montreal; steel work, Dominion Bridge Co., Ltd., Lachine.

Montreal, Que.

Excavating has started for three flats, cost \$9,000, for H. Archambault, Laval street, St. Timothee; architect, Z. Trudel, 238 St. Andre, Montreal; general contractor, Jos. Ethier, 637 LaSalle. Three storeys, 30 x 75, brick veneer, cement fndn., elec. and gas lgtg., gravel rfg.

Foundations are under way for three flats to cost \$10,000 for C. B. Faiver, 1080 St. Lawrence Blvd.; general contractor, D. Lalonde, 1234 St. Lawrence Blvd., Montreal; 3 storey, 32 x 82, cut stone and wood, gas and electric light, gravel roofing.

Work is in progress for block of residences to cost \$100,000 on St. Urbain and Esplanade, for O. Lamoureux, 96 George Cartier Square, Montreal; architect, R. Charbonneau, 52 St. James st.; brick masonry, Deslauriers & Charbonneau, Cote St. Paul, Que.; 3 storey, 210 x 167, Indiana stone facing, solid white stone foundation, hot water heating, supplied to the 86 flats contained, flat gravel roof, Cabot quilt deafening for floors, tile baths, marble halls, oak and chestnut finish.

Ottawa, Ont.

Framework has started for residence, cost \$4,200, for Mrs. J. Bambrick, Crichton street; gen. contr., A. Boehmer, Crichton street. Two storeys, 40 x 25, stone fndn., brick veneer, hot air hgtg., electric light, gravel roofing.

Foundation has been started for residence to cost \$4,600 on Clarence street, for Mrs. Brennan, 49 Clarence street, Ottawa; general contractor, Esdale & Douglas, Lisgar street; 2 storey, 42 x 30, brick, hot air heating, electric lighting, tar and gravel roof.

Toronto, Ont.

Residence to cost \$9,000, 375 Roxboro street east, for A. Mills, Traders Bank; architect, J. W. Siddall, Janes Building, Toronto; builder, W. Halls & Sons, 6 Park Place, Toronto; 2 storey and basement.

Residence to cost \$6,000, Castle Frank Crescent, for Mr. Smith, 19 Wellington west; architect, Bond & Smith, 19 Wellington west, Toronto; masonry, Elgie & Page, 21 Havelock street, Toronto; carpentry, E. A. Bradshaw, 52 Lynwood avenue, Toronto; 2 storey, attached, brick and stone, cut stone, hot water heating, electric work, mantles, plate glass.

Foundations are started for 6 pair residences to cost \$24,000, Humberside, for F. M. Turckett, 53 Indian road Crescent; builder, R. Thompson, 1 Conduit street, Toronto; 2 storey semi-detached, brick.

Residence to cost \$11,000 on St. Clair avenue for A. E. Kirkpatrick; architects, Eden Smith & Son, 199 Yonge street, Toronto; builder, Thomas Bros.; 2 storey, and attached, stone foundation, struc. steel, cut stone, marble, tile, plate glass, galv. cornice, plaster, shingle roofing, 2 Daisy hot water furnaces, (1606 ft. radiation) electric light, hardwood trimming.

Vancouver, B.C.

Harry Towse, 58 8th ave. west, has been awarded the contract for the erec-

tion of a 1½-sty. frame residence at 2127 4th ave. east for Joseph Read, care W. H. Walsh, Seymour. Cost \$3,000.

Westmount, Que.

Two residences, \$13,500 each, Belmont avenue; owner, T. S. Hudson & Co.; contractor for iron work, Dominion Bridge Co., Ltd., Lachine, Que.

Residence, \$20,000, Grosvenor avenue; owner, T. S. Hudson & Co., B12 Board of Trade Bldg., Montreal; gen. contractor, T. S. Hudson & Co.; painting and glazing, G. E. Blackwell, 4184 St. Catherine street; plumbing and heating, J. A. Gordon, 301 St. Antoine street; roofing, Richardson & Simard, 129 Elgin street, Montreal; iron work, Dominion Bridge Co., Ltd., Lachine, Que.; plastering, J. C. Horton, 40 Elmire street, Montreal; tile, the Dominion Floor and Wall Tile Co., Merchants Bank Building, Montreal.

Residence to cost \$100,000, West Crescent Heights, for H. Timmis, Windsor Hotel, Montreal; architect, E. & W. S. Maxwell, Beaver Hall Sq., Montreal; general contractors, Jno. Stewart & Co., Bethune street, Westmount; 3 storey, 106 x 50, stone and concrete foundation, brick and sandstone, slate, tar and gravel roofing, hot water heating, hardwood interior finish, most modern and expensive fittings.

Res., \$20,000, 2½-sty., 30 x 45, stone and brick, masonry fndn., elec. lgtg., slate rfg., hot water hgtg. Owner, A. McGoun, 37 Bellevue ave.; arch., R. Findlay, Phillips Place. Contracts as follows: Plastering, Watson & Wilson, Jr., 1680 Hutchison street; masonry, Joseph Rattray, 381 Victoria ave.; carpentry, J. B. Johnsen, Montreal; painting and glazing, A. Craig, 41 Jurors street; plumbing and heating, Westmount Plumbing and Heating Co., 4278 St. Catherine street; roofing, Geo. W. Reed & Co., Ltd., 37 St. Antoine street; steel work, Structural Steel Co., Longue Pointe; electric wiring, Montreal Elec. Co., 425 James st.; waterproofing basement, G. W. Reid & Co., Ltd., 37 St. Antoine street.

Business Buildings and Industrial Plants

Bassano, Alta.

Gorman, Clancey & Grindley have purchased site west of First street east for a warehouse, and work on construction will start in spring. Machinery merchants.

Bridgeburg, Ont.

Reeve John H. Atwood, Dufferin st., will build a brick block to cost \$8,000, on S. side Jarvis street; 3 storey, red brick, concrete, gas heating, electric light, plumbing, tar roofing, freight elevator, hardwood finish; general grocery on ground floor; furniture store on 2nd; apartment on 3rd floor; two frame buildings on present site will be removed.

Negotiations are in progress for a factory site for The Tuttle-Bailey Mfg. Co., Jarvis street; supt., Peter Gordon, Ferro-Steel plant, Bridgeburg, negotiating with Grand Trunk Railway Co. for a site in South yard for foundry in which to make c.i. registers. Present plant used to enamel registers now made in Cleveland.

Brussels, Ont.

Ex-Councillor Barker has purchased the salt works and will completely renovate the plant and put in new piping.

Chilliwack, B.C.

Plans have been prepared for an office building to cost \$20,000, near Empress Hotel, for W. H. Nelems Construction Co., Inns of Court House, Vancouver; 2 storey and basement, 50 x 100.

Calgary, Alta.

It is stated that Sir John Langham who has been inspecting the buildings recently erected for him intends to erect a store and hotel building on 8th avenue, between 3rd and 4th street west.

The council has granted permission to the Riverdale Lumber Company to manufacture boxes and a site has been secured in the Manchester division, for a box factory.

The Magnetic Wheat Food Co., Halifax, N.S., have opened up negotiations with regard to locating a factory here. Chas. D. McAlpine, promoter.

Leitner, Euwecke & Peters, Winnipeg, manufacturers of sand lime bricks, plan to build a brick plant, capacity 48,000 per day; clay brick will also be made. Construction of plant to commence in January; ready for operation in June.

Plans have been filed for the erection of a warehouse, cost \$50,000, on 11th ave., for the Flesher Marble Co. Six storeys. Crane will be required.

Edmonton, Alta.

Plans are being prepared for erection of a bank to cost \$75,000, for Royal Bank of Canada; architect, Kenneth G. Rea, 54 A. Beaver Hall Hill, Montreal.

Fort William, Ont.

A company manufacturing wrought iron and steel pipe has been negotiating in regard to location here. F. V. Samuel, Guelph, is said to be interested.

Guelph, Ont.

By-law to be submitted to grant \$25,000 to Dominion Casket Co.; the extension of radial into St. Patrick's Ward.

Hamilton, Ont.

Proposed expansion of the Dominion Cannery, Ltd., Hamilton; \$500,000 appropriated for new buildings. New jam and pickle factory costing \$100,000 contemplated for Hamilton.

A printing office will be established in Simcoe. Manager, Junius Nairn.

Hantsport, N.S.

John Churchill is contemplating the erection of a large brick fruit house, 125 x 45, stone foundation, metal roof. Cost \$4,500.

Lethbridge, Alta.

The Great West Saddlery Co., E. F. Hutchings, president, are contemplating making extensions to their branch; sec.-treas., B. Denby, Winnipeg; local manager, C. H. Beer.

Lachine, Que.

The Dominion Mahogany & Veneer Co. will build a new factory, cost \$75,000; architect, E. & W. S. Maxwell, Beaver Hall Square. Two storeys, concrete, electric light. Required, engine, planing and edging machines. Tenders received by architect until December 5.

Lundbreck, Alta.

D. W. Coloin, Cleveland, Ohio, and consulting engineer W. B. Hanlon, have acquired titles to land containing valuable clay deposits ten miles from here.

(Continued on page 58)

Tenders and For Sale Department

To Engineers

Every man who puts in a tender on your jobs has got to see your plans and specifications first. If you are in Montreal and he is in Vancouver the inspection of your plans is a problem. Let us solve that for you. Place on file copies of your plans and specifications in any or all of the "Contract Record" offices.

More contractors and manufacturers read the "Contract Record" than any other Canadian publication. It is the logical place to look for tenders called, and where all important works are advertised.

Send along your plans for your next job and put a line in your ad. to that effect.

Contract Record

Montreal—B34 Board of Trade.
Toronto—220 King Street West.
Winnipeg—Commercial Travellers' Bldg.
Vancouver—441 Seymour Street.

To Manufacturers of Machinery

A firm wishing to take up the manufacture and marketing of the most complete and up-to-date concrete machinery in the United States or Canada. A proposition will be considered for just the manufacturer. Please address Box 348, Contract Record, Toronto, Ont. 44-49

Sewer Excavator

For sale for immediate use, a Vulcan "Little Giant" Steam Shovel with extra long dipper handle for excavating to 16 feet below surface, mounted on traction wheels, dipper 1½ yd. capacity. Machine just overhauled; new chain, and extra large new boiler; weighs 32 tons; low price. Address

WILLIS SHAW MACHINERY Co.,
39 South LaSalle Street,
Chicago, Ill.
42-t.f.

CITY OF VANCOUVER

Re Tenders for Seymour Creek Extension

Tenders will be received by the undersigned up to Wednesday, December 27, 1911, at 4 p.m., for the following connection with Seymour Creek Extensions:

1. For the supply of 24,000 feet of 24-inch steel pipe for the Seymour pipe line extensions.
2. For the supply of valves for the new Seymour Creek pipe line extension.
3. For the excavation and back filling of a pipe trench along Seymour Creek, suitable for the construction of a 36 inch steel riveted pipe.

Plans and specifications may be seen at the office of Messrs. Hermon & Bhrwell, Room 12 Inns of Court Building, and at the office of the City Engineer, City Hall.

A deposit of an amount equal to five per cent. of the contract price must be made with each tender, by marked cheque, payable to the City Treasurer.

The lowest or any tender not necessarily accepted.

WM. McQUEEN, City Clerk.
City Hall, Vancouver, B.C.
November 8, 1911. 47-49

CITY OF LETHBRIDGE

Paving and Sewage Disposal Works

Sealed tenders for construction of above works addressed to Secretary-Treasurer of the City of Lethbridge, and endorsed "Tender for Paving" or "Tender for Sewage Disposal Works," as the case may be, will be received by registered post only until noon of 27th December, 1911.

The approximate value of Paving Contract, and Contract for Sewage Disposal Works, will be in the neighborhood of \$100,000 and \$80,000 respectively. The bond required for Sewage Disposal Works to be \$25,000, and that for the Paving 25 per cent. of the contract price.

Further particulars can be obtained in connection with the Paving, from the City Engineer, Lethbridge; and in connection with the Sewage Disposal Works, from the City Engineer, Lethbridge, and T. Aird Murray, C. E., Consulting Engineer, Toronto.

Plans for Sewage Disposal Works will be on file at the office of the City Engineer, Lethbridge, T. Aird Murray, and the offices of the "Contract Record, 334 Board of Trade Building, Montreal, and Commercial Travellers' Building, Winnipeg.

G. W. ROBINSON,
Secretary-Treasurer.

Lethbridge, Alta., Canada,
November 27th, 1911. 49-50

Extension of Time

CITY OF EDMONTON ENGINEERING DEPARTMENT

1912 PAVING

Sealed tenders, addressed to the undersigned, and endorsed "Tender for 1912 Paving," will be received at the office of the City Commissioners, Edmonton, Alberta, until twelve o'clock noon (12.00 M.) on Friday, December 15th, 1911, for approximately 100,000 square yards of street grading and paving with curb.

Preliminary plans, and specifications, and all information may be obtained at the office of the City Engineer; plans and specifications are on file also at the office of the Canadian Engineer, 62 Church street, Toronto, and the Contract Record, 220 King street west, Toronto. A deposit fee of Five (\$5.00) Dollars is required. This fee will be refunded when plans are returned.

Tenders are invited for Wood Block, Asphalt Block, Sheet Asphalt, Bitulithic, or other kinds of pavement.

Proprietors of patented pavements are required to furnish their special specifications.

Tenderers are required to submit bids as follows:—

- Tender No. 1—Unit prices, for whole work.
Tender No. 2—Unit prices, for 75,000 sq. yds.
Tender No. 3—Unit prices, for 50,000 sq. yds.
Tender No. 4—Unit prices, for 25,000 sq. yds.

An accepted cheque for five per cent. (5 p.c.) of the amount of tender must accompany each bid.

The lowest or any tender not necessarily accepted.

CITY COMMISSIONERS

Office of the City Commissioners,
Edmonton, Alta., Oct. 19, 1911. 43-49

Note—Time for submitting tenders has been extended from Dec. 1st to Dec. 15th, 1911.

Tenders Wanted

Tenders addressed to the undersigned will be received at 60 Atlantic Avenue, Toronto, up to and including Saturday, December 16th, 1911, for all Standing Timber on the farm known as the Stewart Farm, Homer P. O., Ont.

Timber and Stumps must be removed by March 1st, 1912.

Each and every tender must be accompanied by a marked cheque payable to the order of J. W. Lee & Co., for ten per cent. of amount of tender, which will be forfeited should any party whose tender is accepted fail to execute the Contract. The cheques of unsuccessful tenderers will be returned. The highest or any tender not necessarily accepted.

J. W. LEE & CO.,

60 Atlantic Ave., Toronto, Ont.
November 27, 1911. 49-49

Tenders for Erection of Steel Superstructure of New Osborne St. Bridge

Sealed tenders addressed to the Chairman, Board of Control, will be received at the office of the undersigned up to 11 a.m. on Thursday, December 28th, 1911, for supply of labor and materials required in the erection of Steel Superstructure for the new Osborne Street Bridge. Plans, specifications and form of tender, together with conditions governing tenders as prescribed by by-law, may be obtained at the office of the City Engineer, 223 James Avenue, Winnipeg. The lowest or any tender not necessarily accepted.

M. PETERSON, Secretary.

Board of Control Office,
Winnipeg, Nov. 30th, 1911. 49-49

Sealed Tenders

Marked "Tenders for Drainage" will be received by me at my office in the Village of Clarence Creek, until one o'clock in the afternoon of Friday, December 15th, 1911, for the construction of

THE COBB'S LAKE DRAIN

in the Townships of Clarence, North and South Plantagenet, including four reinforced concrete bridge piers and one reinforced concrete culvert. Plans and specifications may be examined and forms of tender procured at my office, or at the office of Magwood & Walker, Civil Engineers, Cornwall, Ont.

Total length of drain, ft. 45,965
Estimated Excavation, earth, cu. yds. 178,613
hard-pan, cu. yds. 350
Reinforced concrete, cu. yds. 186½

The Municipal Council of the Township of Clarence reserves the right to accept the lowest or any tender, to reject any or all tenders or to extend the time for the consideration of the tenders received on or before the above mentioned date.

A cash deposit or accepted cheque on a chartered bank equal to five per cent. of the tendered price must accompany each tender.

O. GUIBORD,
Reeve of Clarence Tp.

Dated at Clarence Creek, Ont.,
this 14th day of November, 1911. 47-50

City of Moose Jaw Saskatchewan

The Moose Jaw Public Library Board invite competitive plans for a Public Library Building. The cost of the building is to be \$50,000, and plans are to be submitted by December 20th, 1911. A premium of \$100 will be paid for second choice and \$50 for third choice.

For further information apply to the undersigned.
47-49 W. F. HEAL, City Clerk.

Lighting Contract Wanted

I have a complete lighting and power outfit and want to get in touch with towns in the market for electric lighting and power. Am willing to sell the outfit or operate it under a franchise. Would require investment of \$10,000 or \$20,000. If interested write to Box 379, Contract Record, Toronto, Ont. 49-49

Positions Vacant

Advertisements under this heading one cent a word per insertion. Box No. ten cents extra. Minimum charge 25 cents

Architectural Draughtsman

WANTED Thoroughly competent architectural draughtsman. Apply Allen Keefer, Architect, 229 Sparks Street, Ottawa, Ont., stating age, experience and salary expected. 48-51

Manager Wanted

Position as manager open for one who understands procuring of, and filling of contracts for the supply of building and paving materials, including sand, gravel, cement, brick, granite, etc. Applicants to state experience and qualifications and to have some available capital. Apply by letter to "Constructor,"

Messrs. Smith, Rae & Greer,
Barristers and Solicitors
2 Wellington Street East,

49-49 Toronto, Ont.

Business Buildings and Industrial Plants

(Continued from page 57)

as a site for brick plant. The initial plant would cost about \$50,000 and would include steam power plant, pug mill, dry pan and two kilns, capacity 200,000 bricks per week.

Montreal, Que.

The Royal Guardian Building, Sherbrooke street, has been sold to unnamed capitalists for about \$120,000. The building will be remodelled for business purposes. The site comprises 10,000 square feet and the premises must be vacated next May.

Tenders were called until Nov. 30th for stores building, construction of magazine and explosive store building. Specifications at office of commanding officer, 4th Division, and with the Director of Engineer Services, headquarters, Ottawa. Owner, Department of Militia & Defence.

Tenders will be called shortly for flour storage building to cost \$5,000, for Dominion Flour Mills, Ltd., St. Ambroise street, Montreal; engineer, J. A. Jamieson, Board of Trade Bldg., Montreal; 3 storey, 44 x 24, wood and galvanized iron on all sides; electric light, metal roofing, galvanized cornices.

Ludger Bachand, 205 St. Paul street, is excavating for stores and residence to cost \$12,000, on Mt. Royal avenue; architect, A. M. Sigouin, 240 Ontario street, Montreal; 3 storey, 50 x 100, brick encased, masonry foundation, hot water heating, gas and electric lighting, tar and gravel roofing. Building will contain 4 stores and 8 residences.

Niagara Falls, Ont.

Tenders are called until Dec. 31st for garage equipment for John Robinson & Sons, River road; small belt-driven air compressor to inflate tires, run sand blast, etc.

Preston, Ont.

Mr. O'Gorman, proprietor of the O'Gorman Carriage Works at Preston, which were burned out, states that a new factory will be built in the spring.

St. Andrews, N.B.

Excavating has started for hotel annex, Algonquin Hotel, for Canadian Pacific Railway Co., Montreal. Excavation contractor, P. Lyall & Sons, Board of Trade Bldg., Montreal. Five storeys, 45 x 110, fireproof, concrete, elec. ltg. Plans not completed yet. Annex will provide more kitchen space and fifty new bedrooms.

St. Catharines, Ont.

Mr. James Munro, marble cutter, contemplates building a 2-storey brick building on St. Paul street, next to his present building. He will use it for a marble shop and will refit his marble shop up for a store, probably a grocery.

St. John, N.B.

A site has been purchased for a bank building for Bank of British North America; manager, A. P. Hazen.

Sherbrooke, Que.

P. McCullough has applied to council for a 3½-acre site for a factory to build brake shoes for cars, etc.; building to cost about \$40,000. Application for incorporation made—branch of an English concern.

Tilbury, Ont.

Foundations are in for a factory for Tilbury Handle Company; heating apparatus, machinery, lighting equipment, to be purchased later and work on construction will be rushed.

Toronto, Ont.

Contemplated. Bank, Logan and Danforth ave.; owner, Bank of Ottawa. To be built in spring.

Tenders will be called shortly for 3 attached stores and residences to cost \$11,000, for Wm. Waters, 542 Lansdowne avenue; architect, J. G. Hedges, 86 Clinton street; 3 storey, brick structure, steel plate glass.

Tenders will be called shortly for alterations to brewery on Niagara street, for Cosgrave Brewing Co., Niagara st., near Queen; architect, J. W. Siddall, King street, Toronto.

Tenders are invited for addition to factory on King and Niagara streets, for Langmuir Mfg. Co., King and Niagara streets, Toronto; architect, G. H. Hiller & Co., Yonge street; 1 storey, brick addition.

Tenders are invited for erection of a store, residences and office, to cost \$8,000, for M. S. Stonehouse, 207 Lippincott street, Toronto; architect, G. Hedges, 86 Clinton street, Toronto; 2½

and 3 storey. See advt. in "Tenders & For Sale Dept." of this issue.

The O'Keefe Brewing Co., 17 Gould street, are contemplating the erection of a brewery to cost \$100,000; architects, C. F. Hellinger & Co., Boston, U.S.A.; 6-storey, 90 x 125, brick and steel concrete, fire-proofing, concrete floors.

The F. C. Burroughs Furniture Co., Queen and Bathurst streets, will build a new warehouse, 7 storey, 50 x 100, brick, steel, and frame, to cost \$25,000.

Tenders are called for erection of a business building to cost \$65,000 on Yonge street, for R. S. Williams Piano Co., 143 Yonge street, Toronto; architect, Chapman & McGiffin, 59 Yonge st., Toronto; general contractor, Jago & Harris, Confederation Life Building, Toronto; 10 storeys, concrete; plumbing, heating, ventilating and electric work to be let separately.

Vancouver, B. C.

Plans are being prepared for erection of an office building, cost \$75,000.

Tenders received until Dec. 2nd for the following sash and door factory equipment and plant complete: 10 h.p. motor, tensioning machine, chisel mortiser machine, dimension rip saw, band saw, arm sander, 15 h.p. motor, 20-inch Pony planer, wood shaper, sash sticker, small iron frame swing saw, door clamp, emery stand, 48-inch 3-drum sander, buzz planer, bench mitring machine, with shafting, hangers, pulleys, belting and all necessary tools, a quantity of lumber, sashes, doors, both finished and unfinished, and other articles.

A 2000-acre site has been secured on Fraser river for a steel plant to cost \$200,000; plant at first to make only steel bars. Plans being prepared include complete plant for manufacture of rails, beams, etc., later. Construction to start within the next 5 weeks. This company is entirely separate from Canada Pacific Steel Co., also seeking a site. Managing director, G. M. Gibbs (local syndicate) 555 Granville street, Vancouver.

Plans are being prepared for store and apartment house on Cordova street, for Vancouver Freehomes, Ltd., 612 Hastings street west; architect, W. T. H. Bamforth (Co's. architect); 6 storey, 50 x 120, reinforced concrete, steam heating, vacuum cleaning system, elevators, tile, modern plumbing. Plans are also being drawn for another building of similar size on Main street; also for one on Granville street.

The Canada Pacific Steel Co., capitalization \$30,000,000; representative, W. Owen, (steel expert) are contemplating the erection of a plant to make tin plate. Subsidiary plant is in Seattle.

Plans are prepared for store and apartment block to cost \$40,000, for H. C. Munn, 2236 4th avenue west; architect, J. B. Dutour, 319 Pender street west, Vancouver; 3 storey and basement, brick, 50 x 105, terra cotta, vacuum vapor heating system, tile entrance.

Wingham, Ont.

The by-law to grant \$10,000 to the Western Foundry Co. and to grant fixed assessment carried.

A new firm to be known as the Wingham Implement Co., will locate a new factory here as soon as a site is selected. Full particulars from Mayor George Spotton.

Windsor, Ont.

Julius Neuriher has purchased the plant of the Morton Baking Co. on Pitt street west and will enlarge it and also remodel a large store in connection with the business.

Woodstock, Ont.

City Dairy Co., Spadina avenue, Toronto, Ont., plan to erect a dairy building 2 storey, brick, 100 x 50. It is stated that refrigerating apparatus and butter making machinery etc. will be required later. Mr. F. Dean of Toronto is here looking after location.

CONTRACTS AWARDED**Calgary, Alta.**

Business block, cost \$50,000, for Metals Ltd., 9th ave. west, Calgary; arch., J. McDonald, Dominion Block, Calgary; contr., J. C. McNeil, Box 14 Calgary. Three-sty., brick and mill constr., steam htg., elec. light, gravel rfg., fire escapes. Firm deals in plumbing and steam fitting supplies.

Montreal, Que.

Alterations to factory, cost \$8,000, 924-932 St. Lawrence street, for Glickman & Glickman, 124 St. Lawrence Blvd. Arch., C. Dufort, La Patrie Bldg., Montreal; contrs., Demers & Sarassin, 154 St. Dominique st. To change upper floors from residential to manufacturing purposes; hot water htg., elec. light, gravel roof, etc. Power transmission machinery required.

Steel work has started for stores and offices for G. A. Holland & Son Co., 517 St. Catharine street west; architect, Finley & Spence, 46 Beaver Hall Hill, Montreal; general contractor, C. E. Deakin, 11 St. Sacrament street; steam htg., tar and gravel rfg., gas and elec. ltg., light sandstone front (ornamental), tile entrance, show windows of "corner" system (non-freezing) concrete floors, mezzanine flooring in front windows, Rockland sprinkler system throughout, modern vaults for fur storage. Building to be completed by March 15th.

Extension to bottling factory to cost \$10,150, Fortier street, for National Breweries Ltd., St. Lawrence Blvd., Montreal; architect, G. H. H. Eadie; general contractors, Church, Ross & Co., 40 Hospital street, Montreal; 3 storey and basement, 50 x 80, stone and brick, concrete foundation, electric and gas lighting, gravel and felt roofing.

Carriage warehouse and office, solid brick, hot air heating, tar and gravel roofing; owner, Wm. Gray & Son Co., 586 St. Paul street, Montreal; general contractor, Byers & Anglin, 65 Victoria street; plumbing and heating, G. R. Woodburn, 177 Fulford street, Montreal.

Alterations to store and house to cost \$5,500, 146 Mansfield street, for Chas. Edlington, 413 St. Catherine street west, Montreal; architect, D. J. Crighton, Jacobs Bldg., Montreal; general contractor, Jos. Laurier, 388 Ontario street; 3-storey addition, 22 x 40, Roman stone, wood cornice, electric and gas lighting, tar and gravel roofing, hardwood floors, plate glass, hot water heating. Contract for heating and plumbing not let. Foundations nearly in. Contracts not awarded for painting, plate glass or plastering. Building well under way.

Petrolia, Ont.

W. J. Trick, of Oshawa, has a contract for a new bank block for the Met-

ropolitan Bank. Excavation has commenced. The building will be of pressed brick and stone. Complete fittings will be purchased later and heating and lighting equipment.

St. John, N.B.

Messrs. G. & E. Blake have been awarded the contract for plumbing and heating of the building being erected at the corner of Brussels and Union streets by Bishop Casey. The building is of brick, three storeys, with stores on the ground floor and tenements overhead.

Saskatoon, Sask.

Bank to cost \$50,000, for Royal Bank of Canada; local manager, Mr. Chisholm. Architect, K. G. Rea, 54A Beaver Hall Hill, Montreal; general contractor, Claydon Bros., Winnipeg, Man.; 3-storeys, 50 x 100, cut stone, brick, vacuum heating.

St. John's, Que.

Foundry for the Lightning Furnace Co., Ltd., Montreal; sec.-treas., E. Rodier; gen. contr., Chas. Mailhot, Iboville, Que., 20 ft. high, 60 x 120. Foundry equipment required.

Toronto, Ont.

Warehouse, Cost, \$36,000, Richmond st. east, for Scotland Woolen Mills, Ltd., Yonge street, Toronto; arch., A. Yollis, Simcoe street, Toronto; gen. contr., H. Weerman and A. Osherenko, 13 Baldwin street, Toronto. Steel, McGregor & McIntyre, 73 Pearl street, Toronto; roofing, gen. contrs. Heating and ventilating tenders still open. Brick, tar and gravel rfg., steam htg.

Bank to cost \$28,000, Bloor and Sherbourne, for Dominion Bank of Canada; architect, Jno. M. Lyle, 14 Leader Lane, Toronto; masonry, Self Bros. 78 Howard street; cut stone, Geo. Oakley & Son, 278 Booth avenue; carpentry, J. C. Scott; plumbing, Fiddes & Hogarth, 122 King east, all of Toronto.

Factory to cost \$10,000, near 441 King west, for Reilly Mfg. Co., King west; architects, F. H. Herbert, 65 Adelaide street; builder, Jno. Aldinger & Son, Crawford street, Toronto; 3 storey and basement, brick, structural steel, skylights, cut stone, tile coping, fireproof doors, concrete floorings, steps, and floor, galv. cornice, hardwood interior finish and floors, steam heating, felt roofing. Firm manufactures ladies' waists specialties.

Warehouse to cost \$14,000 on Duchess street, for Jno. G. Kent, Confederation Life Building, Toronto; architect, F. R. Cowan, 202 Crawford street, Toronto; builder, Mr. Essery, 2½ storeys and basement, brick.

Factory to cost \$20,000 for Conduit Co., Ltd., Don Roadway, Toronto; architect, Bond & Smith, 19 Wellington street, Toronto; masonry and reinforced concrete, Elgie & Page, 21 Havelock st.; steel, Toronto Structural Steel, Ltd., Traders Bank Bldg.; and carpentry, Wm. Williamson, Queen and Woodbine, all of Toronto. Brick, felt and gravel roofing.

Factory to cost \$8,800, lot 5 plan 1256 C.P.R. tracks, for Dominion Carbonic Gas Co.; architects, Bond & Smith, 19 Wellington west, Toronto; masonry, Chas. Wood & Son, 611 Manning ave.; carpentry, R. G. Kirby, 539 Yonge street; roofing, A. B. Ormsby, Queen and George streets; painting, F. G. Roberts, 256 George street, all of Toronto.

Victoria, B.C.

Contract has been awarded to Pacfitt Bros. for additions to lumber mill, 3-sty., sash and door factory, 48 x 200, \$10,000, frame and galv. iron; owner, Canadian Puget Sound Lumber Company.

Vancouver, B.C.

R. W. S. Chadney, 2009 1st ave. west, is contractor for a 2-sty. frame stable and 2-sty. factory at 36 Lansdowne E., for E. L. Irvine, 1067 Richards street.

Business block to cost \$75,000, Pender and Homer, for Dominion Trust Co., 207 Hastings street; contractor, Norton, Griffiths Steel Construction Co., Ltd., Homer street. Vancouver; 8-10-storeys eventually—4 at present, 50 x 120 feet.

Excavation will shortly commence for and office building to cost \$80,000, 509-15 Richard street; contractors, Dominion Construction Co., T. J. Madlen, manager, 433 Homer street, Vancouver; brick, terra cotta front, tile floors, steam heating, wire glass, elevators.

Office building on Pender street; architect, Somervell & Putman, Pacific Bldg. McMahon, McFarland & Proctor are acting for owner in England. Excavating contractor, Campbell Bros., 1623 Bismarck street, Vancouver; 9 storey, 50 x 100, steel and concrete. Plans and specifications not completed.

Power Plants, Electricity and Telephones**Carillon, Que.**

Power development at Carillon Falls, for National Hydro-Electric Co., Montreal; president, Henry Miles; contractors, The Carillon Construction and Development Company, Montreal; president, Arthur Lyman; engineer in charge, A. D. Watts and Mr. Bergmann, both of Montreal. Company will require electric and drilling machinery during the winter. Power developed by Sept. 1, 1912; work commenced Nov. 20th.

Fernie, B.C.

The following power development to cost \$1,000,000 on Bull River is contemplated for M. A. Devitt and H. W. McCoy, Chicago; engineer in charge, Prof. Mead. A six-strand duplicate line on steel towers from the plant at Bull River Falls, over Lizard pass to Fernie and on through Crow's Nest Pass to Frank. \$5,000 per mile. Installation of power plant to generate 10,000 h.p. at once. Power to reach Fernie by Jan. 1, 1913.

Lethbridge, Alta.

On Dec. 11th the ratepayers will vote on a by-law to raise \$450,000 for street railway system; \$150,000 of this to be used for extension of power plant; engineer, W. A. Reed.

London, Ont.

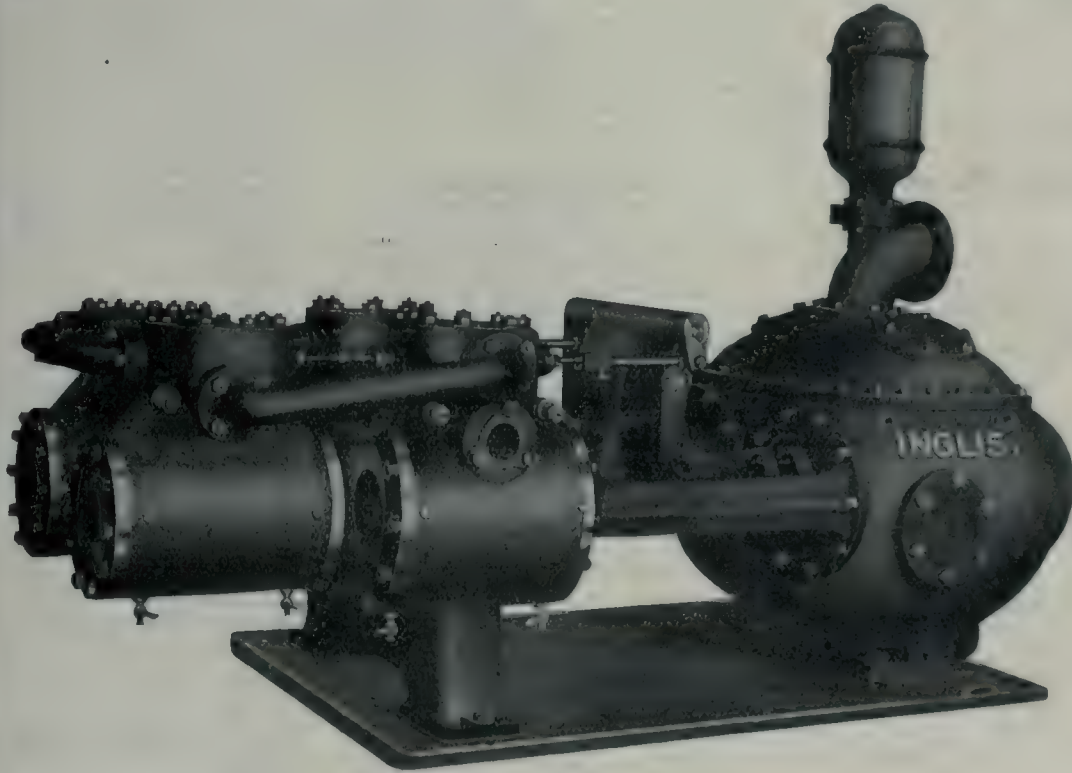
The London Township Council will at once take up the matter of installing hydro-electric power. S. F. Glass, reeve.

Magog, Que.

Bishop Construction Co. Ltd., of Montreal has been awarded the contract for construction of dam power house of the hydro-electric power plant on the Magog river, cost \$125,000. T. Pringle & Son, Ltd., engineers and architects, 419 Coristine Bldg., Montreal.

Water-Works Plants

for Towns and Cities



"Inglis" 1,000,000 gall. Pumping Engine.

Our long and successful experience in the building and installation of Pumping Engines and Water Works Machinery should be a strong argument in favour of "Inglis" products. During the fifty-two years (52) our plant has been in operation, we have built many Pumping Engines, all of which have given entire satisfaction.

Capacities from one to thirty million gallons per 24 hours.

Send us your inquiries.

The **John Inglis Company**

Engineers and Boilermakers

Limited

14 Strachan Ave., TORONTO, Canada

Regina, Sask.

Tenders are called for 132,000 telephone poles; specifications on application to Deputy Minister. Received by Deputy Minister until Dec. 15th. Dept. of Railways and Telephones. Deputy Minister, S. P. Porter.

Tillsonburg, Ont.

A by-law to expend \$6,000 for hydro-electric purposes will be submitted to the ratepayers at the coming elections. Chairman, George W. Tillson.

Wingham, Ont.

The North Huron Telephone Co. contemplates big extensions to its line next year and additional equipment will be needed. W. J. Greer, Wingham, president.

Woodstock, Ont.

A by-law will be submitted to spend \$10,000 on additional lighting.

Business Notes**D'Israeli, Que.**

Fire destroyed one hotel, 6 stores and 3 dwellings on Nov. 26th. Estimated loss, \$75,000, divided between J. Elkes, C. Lapointe, J. St. Hilaire, J. O. Roy, C. Cote, D. Binelle, P. Poulin, C. Fosselin and E. Gregoire.

Quebec, Que.

Seagrave & Co., of Walkerville, Ont., have been awarded the contracts for two combination hose and chemical auto wagons and two 75-ft. aerial ladder trucks. H. V. Beck, representative of the company, 30 St. Francois Xavier street, Montreal, Que.

St. Jerome, Que.

Order of Gray Nuns, 390 Guy street. Convent accommodating 100 children was destroyed by fire. Loss \$22,000. It has not been decided yet whether building will be re-built at St. Jerome.

St. John, N.B.

The Hunter Hotel at St. Martin's was destroyed by fire on the 27th of November. Loss about \$10,000.

St. Thomas, Ont.

Packing factory of St. Thomas Packing Co., manager, W. H. Moody, damaged by fire to extent of \$12,000, on Nov. 29th. The building will be re-built.

Miscellaneous**London, Ont.**

West London Progressive Association will ask the council to build a new bridge across the Thames to connect South and West London. It is likely that a by-law will be submitted.

Ottawa, Ont.

Tenders are called until Dec. 7th for timber on Christian Island; 500,000 ft. B.M. comprising maple, beech, birch, basswood, ash and hemlock. Dept. of Indian Affairs; secretary, J. D. McLean.

Tavistock, Ont.

A fire department will be organized at once and councillor Zimmerman has been appointed to look after the purchase of a hose reel, hose and other apparatus.

Toronto, Ont.

Permit has been granted for three dwellings, \$6,000. Shaw street, brick, stone fdn., shingle rfg., hot water hgt.,

elec. ltg., hardwood floors; owner, Jas. Willings.

Board of Works recommends the ordering of Suburban Railway Co. to extend street railway on Pacific ave. from Bloor street to Annette street; from Pacific ave. to Jane; and the Toronto Street Railway to extend service on Bloor street from a connection with existing tracks on Dundas street to Pacific ave.

Tenders were received by: Public School Board, S. S. 15 York, until Dec. 4, for erection of temporary school, work to be completed by January 1, 1912. Address A. Watt, chairman of Board.

Wyoming, Ont.

The big barns of Wilfrid Chalmers, of Plymouth Township, were completely wiped out by fire with all implements. Loss partly covered by insurance. New barns to be built in spring and farm implements purchased.

New Companies

Conduits Limited, Toronto, Ont.; incorporated with a capital of \$1,000,000 to manufacture and deal in wire conduit and other tubing electrical and gas fixtures, etc. Prov. directors, Irving Stuart Fairty, Hamilton; T. Hunter and Arthur L. McGovern, all of Toronto.

The Nokomis Oil and Gas Company, Ltd., Paris, Ont., incorporated with a capital of \$90,000 to carry on business as prospectors and developers of light, heat and power etc. Prov. directors, Richard Thompson, Robert E. Haire and Alfred E. Finnemore, all of Paris.

Joseph Harrison, Limited, Toronto, Ont., incorporated with a capital of \$40,000 to carry on a general plumbing, heating and contracting business. Prov. directors, Geo. H. Sedgewick, Austin G. Ross and Lionel Davis, all of Toronto.

Bigwin Island Land Company, Limited, Huntsville, Ont., incorporated with a capital of \$100,000 to build and operate, hotels, tramways, telephone or telegraph lines, electric railways &c. Prov. directors, Chas. O. Shaw, John W. McKee and Wm. John Moore, all of Huntsville.

Patterson Land Company Limited, Toronto, Ont., incorporated with a capital of \$500,000 to carry on business as a general land and building company. Prov. directors, Wilson Patterson, Edward A. Patterson and Neil Ramsay Sinclair, all of Toronto.

Elgin Oil and Gas Company Limited, St. Thomas, Ont., incorporated with a capital of \$200,000 to construct and operate tramways, telegraph and telephone lines, reservoirs, wharves, &c. Prov. directors, Geo. W. Smiley, Bert. Samuel Harder of St. Thomas, and Bristol Snively, of Wallaceburg.

Eastern Canada Power Company Limited, Montreal, Que., incorporated with a capital of \$1,000,000 to carry on business as electric light, heat and power company in all its branches. Incorporators, Daniel P. Gillmor, Herbert W. Jackson, and Geo. R. Drennan, all of Montreal.

Carillon Construction & Development Co., Limited, Montreal, Que., incorporated with a capital of \$50,000 to carry on business as contractors, engineers, bridge builders &c. Incorporators, Louis Gosselin, John Donaghy, and Chas. S. Underhill, all of Montreal, Que.

Metropolitan Engineering and Contracting Co., Limited, Montreal, Que., incorporated with a capital of \$50,000 to carry on business as electrical and civil engineers, contractors of public private buildings, &c. Incorporators, Patrick F. Brown, Aubrey H. Elder and Edward G. Trevor, all of Montreal.

The Architectural Metal Co., Ltd., Ottawa, Ont., has been incorporated, with a capital of \$75,000. to carry on business as contractors, metal workers, etc. Provisional directors, Wm. H. Dwyer, R. Wellington Durning and John R. Osborne, all of Ottawa.

A. & P. Steven, Limited, Montreal, Que., incorporated, with a capital of \$50,000, to carry on business of mechanical engineers and manufacturers of plant engines and other machinery. Provisional directors, David H. Charles, Allen H. Charles, and Percy Bercovitch, all of Montreal.

Danford Farms. Ltd., Ottawa, Ont., incorporated, with a capital of \$20,000, to construct and operate steam, electric or other power plants and carry on business as contractors. Provisional directors, Robt. V. Sinclair, John I. MacCraken, and Herman J. Beament, all of Ottawa.

Similkemeen Fruit Land Company, Ltd., Winnipeg, Man., incorporated, with a capital of \$1,000,000, to carry on the business of lumbering in all its branches, manufacture brick and tile. etc. Incorporators, Wm. Thos. Alexander, David J. Taylor and Richard Langtry, all of Winnipeg.

The Robert Ackland Company, Winnipeg, Man., has been incorporated, with a capital of \$20,000, to acquire timber limits, etc., and deal in railway ties, piles and timber and lumber of all kinds. Incorporators, Robert D. Ackland, Alfred A. Hackett, and John W. Ackland, all of Winnipeg.

Building Permits**Ottawa, Ont.**

Mr. Mitchell and A. W. Weeks, brick dwellings; Cameron street, \$4,400; R. A. Kemp, two brick dwellings. Centre st. \$7,400; J. P. Band, brick veneer dwelling, Frank street, \$4,000; M. and B. Berman, brick veneer shop, Le Breton street, \$6,000; Miss Margaret Brennan, brick veneer dwelling, Clarence street, \$7,500; Mr. Miskell, brick veneer dwelling, Third ave., \$2,500; Wm. Fields, two brick veneer dwellings, Stewart street, \$9,000; Thomas Boles, brick veneer dwelling, Daly ave., \$4,800; J. A. Choquette, double brick veneer dwellings, \$3,000; W. H. Martin, solid brick dwelling, Kent street, \$13,000; D. Cuthbertson, brick veneer dwellings, Echo Dr., \$4,500; W. D. Hopper, brick veneer dwelling, Liden Terrace, \$5,500; Arthur Mattice, two detached brick veneer dwellings, Powell ave., \$6,800; S. Coplan, one single and one double brick veneer dwelling, Stewart street, \$7,500; R. C. Epis, Corporation of Ottawa, brick veneer stables, Church street, \$5,000; A. E. Shaver, brick veneer apartment, First ave., \$15,000; Wm. Benson, one double and one single brick veneer dwelling, Archibald street, \$4,800; W. E. Kent, double brick veneer dwelling, Archibald street, \$4,000; A. W. Grant, brick veneer dwellings, Powell ave., \$4,500; City of Ottawa, solid brick incinerator building, Lees avenue, \$34,650.

Contract Record

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Brick

Brick has been termed the aristocrat of building materials, but the term is miserably inadequate, for the pedigree of brick was an established fact three thousand years before the day of Christ, and the beginning thereof was as far removed again. Man is of clay, fashioned by God; brick is of clay, fashioned by man; and yet brick remains and man passes. Brick is of the earth and as enduring as the earth.

Brick is expressive, beautiful, pleasing; it never becomes wearisome, and, skilfully used, it delights. Brick is companionable; inviting. There is an individuality about it all its own: there is something human about it, something suggestive of intellect in the manner in which it lends itself to the ideals conceived by man. Brick is enduring; and unlike the creatures of clay that it shelters, it grows more beautiful with years. Brick, of all materials, is ultimately economical; and it combines low cost with a rare union of beauty and utility.

Brick is adaptable to all occasions, all conditions, all surroundings. In its crudest form, as it is used in the cottage, it fulfils all that is asked of it; in the royal palace, the cathedral, the public building, it can be worked up into as many different combinations of color and texture as the brain of human architect can conceive. And there are a thousand variations between.

Great things have been wrought in brick,—from the Assyrian temples of Western Asia; erected five thousand years ago, to the temples and residential palaces of us moderns. Greater things will yet be achieved in brick, for we are at the threshold of a great revival. The longer man lives the more he learns about brick. And the end is not yet. Brick is illimitable in its scope; unending in its possibilities.

Brick is the concentration of all the virtues of all the structural materials. It is pre-eminent.

Standardization of Brick

From time to time the subject of a standard brick for Canada has come up for discussion, but year after year goes by and the situation remains unchanged. We say unchanged, but the brick industry is no more immutable than other human institutions, and so, as the seasons come around, this matter of standardizing brick becomes more difficult of adjustment; the expense involved to the manufacturer assumes a more formidable appearance. At one time it was thought that the Canadian Clay Products Manufacturers' Association intended to interest themselves in this question and as a matter of fact the subject received some attention at the Brantford convention in January, 1909, but evidently the movement did not receive sufficient general support.

The general complaint of architects and engineers is voiced by S. H. Penlington, who touches upon the matter in an interesting article printed elsewhere in this issue. After speaking of the English standard brick, Mr. Penlington continues: "Strange to say, on this side of the Atlantic, where so much is standardized, brick manufacturers are still back in the thirteenth century making bricks all sizes and shapes, the result being bad scars and unequal settlements in walls where no proper bond can be obtained. Bricks from one maker will not bond with bricks from another; glazed bricks will not bond with either facing bricks or common bricks."

These observations should provide the Canadian trade with food for reflection. The need for a standard brick is emphasized by the fact that the same manufacturers make facing and common brick of different sizes. The architect and engineer require a standard upon which they can rely and upon which they can figure. When they are placing their orders they want to know for certain that they will not have to use an artificial bond to tie the work together.

The standard brick is a practical necessity in the Canadian trade which should have been instituted years ago by our manufacturers. As it is, however, there will never be a more favorable opportunity than the present.

Production of Clay Products

Rightly or wrongly many are disposed to take statistics with rather more than the proverbial grain of salt. Certain it is that the history of all figures that have ever been compiled is not above reproach. Knowing the thankless task with which one is confronted when endeavoring to obtain figures relating to any particular industry, we ourselves are inclined to take statistics warily. At the same time, however, it is possible to be too sceptical and there are some instances in which returns, compiled carefully, systematically and to the extent of human thoroughness, are a valuable guide. The census returns which placed the population of Canada at about that of the City of London may be defective, but allowing for their defectiveness they are valuable in that they give an approximate, if conservative, idea of Canada's progress.

Similarly in regard to the clay industry: while the returns compiled by the Department of Mines at Ottawa cannot be held correct in every detail, nevertheless they fulfil a very valuable function and should be valued accordingly by the trade.

These things are preparatory to a few observations

in connection with the returns for the calendar year 1910, for the timely publication of which we are indebted to Mr. John McLeish, Chief of the Division of Mineral Resources and Statistics, Ottawa. When it is taken into consideration that the building permits issued in twenty-four cities of the Dominion during 1910 totalled \$94,129,423 compared with an aggregate of \$64,509,620 in 1909—an increase of 45.92 per cent.—a substantial growth may very reasonably be looked for in the returns for clay products especially when such a consideration is conjoined to the thought of Canada's general growth.

In a general valuation of structural materials and clay products for 1910 the total is placed at \$19,627,592, as compared with \$16,533,349 for 1909—an increase of \$3,094,243 or 18.72 per cent. To the grand total for 1910 clay products contributed \$7,629,956, as compared with \$6,450,840 to the 1909 total—an increase of \$1,179,116 or 18.03 per cent. The total value of production in 1908 was \$4,500,702 and in 1907 \$5,772,117. This increase is in greater ratio to the grand total than any of the other materials, including cement, and it is highly significant of the trend of the trade and of the veering of public opinion. These statistics represent actual sales; material produced but held in stock over the end of the year not being included until disposed of. For the year 1910 about 438 active firms reported sales of clay products; the average number of men employed was 8,656 and total wages paid, \$3,308,609. Of the total clay products production in 1910 about 78.5 per cent. was made up of building and paving brick, and about 15 per cent. of sewerpipe and tile.

The returns for the production of cement in 1910 are \$6,412,215, compared with \$5,345,802 for 1909. Sand lime brick shows an increase, the figures being \$371,857 for 1910 and \$201,650 for 1909.

In the production of clay products by provinces, Ontario leads last year with an aggregate of \$3,667,810; Quebec is second with \$1,442,842, Manitoba third with a total of \$781,605, while Alberta is close behind with \$753,232. British Columbia, Nova Scotia, Saskatchewan and New Brunswick follow in the order named.

Exports and Imports

The only export of clay products recorded is that of building brick, of which the exports in 1910 were 290,000 valued at \$2,762, as compared with 365,000 in 1909 valued at \$2,255, and 2,344,000 in 1908 valued at \$9,047. The imports of clay and clay products into Canada are, on the other hand, quite considerable and amounted in value during the calendar year 1910 to \$4,331,397, equivalent to about 56 per cent. of the domestic production. In 1909 the imports were valued at \$3,247,539, showing an increase in 1910 of \$1,083,858 or 33.4 per cent. The imports of brick and tile were valued at \$1,755,773, as compared with \$1,249,450 in 1909. Of the brick and tile imported 74.4 per cent. was from the United States and 25.5 per cent. from Great Britain; only \$607 worth came from other countries. In eleven years Canada has imported clay products to the value of \$25,500,738. The increase in imports has been most pronounced in the case of brick and tile, the imports of which in 1900 amounted to \$145,914 compared with \$1,341,310 in 1910.

Western Provinces

Dr. Heinrich Ries, who is investigating the clay resources of Canada for the Geological Survey, reports with respect to the clay working industry in the western provinces: "The main clay-working industry at the present time is the manufacture of common brick, but the product in many localities, as around Victoria and Vancouver, does not supply the entire demand, and common brick are imported in large quantities from Seattle, Wash. Dry-pressed

brick are made in small quantities at a number of points, but the only plants of large capacity are those at Medicine Hat and Clayburn. Most of the pressed brick now used in the western provinces are imported, and command a high market value. The same is true of fireproofing, terra-cotta, firebrick, pottery, and sewerpipe. It will be seen, therefore, that there is room for abundant development and expansion in the home clay-working industries."

Common and Pressed Brick

The ever increasing activity in the Canadian building field is reflected in the returns for clay building brick, and this despite the use of competitive materials.

In 1910 the total production was 695,610,353, valued at \$5,912,648, made up of: 627,715,319 common, valued at \$5,105,354, or an average value per thousand of \$8.13; and 67,895,034 pressed brick, valued at \$807,294, or an average value per thousand of \$11.89. There were 397 active firms reporting as compared with 386 in 1909, and the value of production shows an increase of \$1,069,547, or 22 per cent.

In 1909 the total production was 596,493,364, valued at \$4,843,101; made up of: 539,228,708 common, valued at \$4,212,424 or an average value per thousand of \$7.81; and 57,264,656 pressed brick, valued at \$630,677, or an average value per thousand of \$11.01.

In 1908, the total production was 406,742,030, valued at \$3,128,734; made up of: 353,261,268 common, valued at \$2,611,554, or an average value per thousand of \$7.39; and 53,480,764 pressed brick, valued at \$517,180, or an average value per thousand of \$9.67.

In 1907, the total production was 517,937,648, valued at \$4,250,246; made up of: 439,015,556 common, valued at \$3,455,524, or an average value per thousand of \$7.87; and 78,922,092 pressed brick, valued at \$794,722, or an average value per thousand of \$10.07.

Production by Provinces

The 1910 and 1909 totals for common and pressed brick are as follows: Ontario \$2,785,361 and \$2,557,068; Quebec \$929,492 and \$690,918; Alberta \$750,982 and \$441,606; Manitoba \$746,704 and \$544,548; British Columbia \$394,473 and \$305,520; Saskatchewan \$160,850 and \$144,316; Nova Scotia \$113,436 and \$114,795; New Brunswick \$31,350 and \$44,330.

Exports and Imports

The exports of building brick have never been large, averaging for a number of years past about \$6,000 in value per annum, but falling in 1909 and 1910 to \$2,255 and \$2,762 respectively. The annual imports for a number of years previous to 1903 averaged only about \$20,000 in value. During the past seven years, however, the value of the imports has varied from \$100,000 to over \$200,000 per annum. During the calendar year 1910, the imports were 29,049,000 brick, valued at \$274,482; of which 1,993,000 valued at \$26,447, an average of \$13.27 per thousand, were imported from Great Britain; and 27,056,000 valued at \$248,035, an average of \$9.45 per thousand, from the United States. The imports during the calendar year 1909 were 27,972,000 brick, valued at \$195,360, of which 1,738,000 valued at \$21,680, an average of \$12.47 per thousand, were imported from Great Britain; and 26,234,000 valued at \$173,680, an average of \$6.62 per thousand, from the United States.

Ontario Makes One-half Canadian Production

For a number of years Ontario has produced over 50 per cent. of the clay building-brick production in Canada, though the percentage in 1910 has fallen to 47. The vicinity of the city of Toronto, including the counties of York and Halton, is the principal brick-making section and in 1910 produced about 62 per cent. of the Ontario production, or about 29 per cent. of the total Canadian production of brick. The district next in importance is the county of

Wentworth, comprising the city of Hamilton and vicinity, producing about 6 per cent. of the Ontario production. The Ottawa district, including the counties of Russell and Carleton, also produced about the same amount. Other important districts are Algoma and Nipissing, which cover a wide area, and the counties of Waterloo, Middlesex, Grey and Kent. These eleven counties contributed over 85 per cent. of the Ontario production. Practically all the pressed brick reported as such was made in the Toronto and Hamilton districts.

Manitoba.—The production of building brick in Manitoba in 1910 was 75,834 thousand valued at \$746,704, as compared with 59,110 thousand valued at \$544,548; an increase of 37 per cent. in the value of production.

Saskatchewan.—Returns from eleven operating firms show a production in 1910 of 14,733 thousand brick, valued at \$160,850, as compared with 14,417 thousand valued at \$144,316 in 1909.

Alberta.—Twenty-nine operating firms reported a production of 73,640 thousand brick valued at \$750,982, as compared with 45,480 thousand, valued at \$411,606 in 1909 by twenty-eight firms; showing an increase in value of production of \$309,376, or about 70 per cent. As in other western provinces, the production has been rapidly increasing. Several new plants were in course of construction during the year which were expected to be ready for operation during 1911. The principal centres of present production are Edmonton, Calgary, Medicine Hat, and Lethbridge.

British Columbia.—The production during 1910 by nineteen active firms was 36,316 thousand brick valued at \$394,473. These statistics include reliable estimates for two firms that did not report directly to this Department. The production by fifteen firms in 1909 was reported as 28,445 thousand brick valued at \$305,520. The average price at the yard of common brick during the year was \$9.77, while pressed brick sold at from \$20 to \$40 per thousand. Vancouver, New Westminster, Port Haney and vicinity, Victoria, and Sydney are the principal centres for the production of common brick, while pressed brick are made in considerable quantities at Clayburn.

Paving Brick

Hitherto the only paving brick made in Canada have been those made at West Toronto from shale found on the banks of the Humber river. A beginning has, however, now been made in the manufacture of paving brick in British Columbia at Clayburn, by the Clayburn Brick Co., from shales found in Sumas mountain. The annual production in Ontario has been fairly constant at from 3,000,000 to 5,000,000 brick per season, and the output finds a market chiefly in Toronto. In 1910 the number of paving brick sold was 4,215,000, valued at \$78,980, while during the same year there were imported 10,503 thousand paving brick, valued at \$124,994. These imports include: 2,786 thousand, valued at \$29,936, or \$10.75 per thousand, from the United States, and 7,717 thousand, valued at \$95,058, or \$12.32 per thousand, from Great Britain.

Sewerpipe and Drain Tile

The total value of the sales of sewerpipe in 1910 was \$774,110, as compared with a value of \$645,722 in 1909, and a value of \$514,362 in 1908.

The imports of drain pipe and sewerpipe during the calendar year 1910 were valued at \$175,599, of which \$140,259 worth were imported from the United States, \$35,149 from Great Britain, and \$191 from other countries.

The imports of sewerpipe during the calendar year 1909 were valued at \$170,280, of which \$135,809 worth were imported from the United States, \$34,200 from Great Britain, and \$271 from other countries.

Front and Ornamental Brick

THE interest taken in front and ornamental brick by those engaged in building construction is attributed to the fact that no other commodity has contributed as much to the pleasing effects produced in exterior walls and that no other material possesses the same combination of utility, durability, beauty and moderate cost. Reviewing the progress of the Canadian brick industry during the last few years one discovers that the most noteworthy feature of the trade has been the ever-increasing demand for more varied effect, higher grades of material and better construction, and it is to the enterprise of the manufacturers of front brick that much of the credit is due for this improvement in the public taste. It is well within the recollection of even comparatively young men that the general appearance of our buildings, whether of a commercial or residential character, was monotonous and in many instances even ugly. Block after block could be searched in vain for an inviting facade of design and color.

The monotony of color scheme then so noticeable was due very largely to the limited variety of material and colors possible to employ and which, therefore, confined an attempt at original treatment solely to design and detail, with little opportunity for the exercise of originality in color effects.

But now all is changed, and instead we have available such a variety of shades in facing bricks that almost any desired color effect is susceptible of successful development. The advent of the buff white, gray, speckled, tan, old-gold and iron-spot brick, has relieved not only the tedious similarity of effect which formerly obtained in structures of the same class, but it has created a use, and therefore a value, for embellishing materials such as terra cotta and stone which they never before possessed to so great a degree.

This choice of grades in front brick, which the market now so abundantly affords is due to the more intimate knowledge of clays and the scientific manner of their burning in the kilns, which up to a few years ago, was not a highly developed art. It was not the discovery only of new clay and shale deposits, by which this evolution in making front bricks has been accomplished, but also by a most patient, thoughtful and expensive series of experiments, which followed these discoveries, and without which the raw material would have been of little value.

But notwithstanding the strides made in this industry and the remarkable advance in the knowledge of understanding and manipulating clays, it is a curious fact that it is quite impossible to produce a brick of precisely the same shade and texture at two separate brick yards, particularly in light colors, even though the clay may be of the same general character on each. This gives a certain distinction to each make of brick produced and whereas most other building materials are becoming more and more localized as to their markets, the sphere is becoming wider for the front brick maker, due to the variety of tastes and the fact that each brick yard has more or less of a unique product to offer.

The experience of recent years has demonstrated the peculiar adaptability of front brick to new styles of construction. In much fine work, such as churches, court houses and similar buildings, front bricks are being used for interior wall surfaces. In this use they

supply at low cost a finish that is durable and sanitary with a surface that can be washed. Such walls require no after treatment because the texture and shade of the bricks produce the most attractive effects and also render plastering, painting and decorating unnecessary. Here is economy in cost of construction, in time and special utility too.

Another development in the consumption of light-colored bricks making rapid strides in recent years, is their use in side, rear and court walls for the purpose of finish and reflecting light. Walls of this class provide a hard surface for the weather and are an additional protection to steel work. They will have an attractive finished look, whereas paint and other forms of veneer require frequent renewals at great cost.

Unlike many commodities which enter into our daily use and consumption, the majority of people are ignorant of the front brick industry and many even who are users of the material fail to grasp the marvellous change that has occurred within a few years, or to realize the extent of experiments, research and vast outlay of money, which have brought all this about. It was not very long ago that a brick plant was regarded as an enterprise requiring but a modest investment and attended with the solution of no intricate problems. It is this belief which has disastrously ensnared many capable but uninformed people who were not alive to the needs of a modern and well equipped plant.

Those of use who are identified with this interesting and ancient industry, dating almost from time immemorial, have a pardonable pride that ours is a lively and not a dead or lost art, unlike many contemporaneous arts which flourished in the early history of this old world, but which have long since perished. Ours has been preserved through the centuries with the greatest advances made in the last two decades, but probably, with greater ones to follow.

Under the name "Rostolit," a new paving brick has been put on the European market which is giving satisfactory results. The brick is made of a calcareous siliceous clay and burnt at a good high temperature. The brick was invented by Otto Rost, of Budapest, and has stood a crushing test of 78,000 pounds per square inch. The absorption of the brick is 0.1 per cent.

The sum of over one million sterling spent by China last year on the purchase of foreign building materials is indicative of a far-reaching change which is coming over the habits of the Chinese people. The dilapidated rows of one-storied houses of lath and plaster, which formerly did duty as Government offices, schools, barracks, etc., are rapidly disappearing before buildings in foreign style of brick and stone, fitted with electric light and steam heat; while in all the large cities and trading centres, merchants and shopkeepers are replacing the shanties of former days with modern constructions, in which the yanglou, or foreign upper storey, and the plate-glass window are usually conspicuous features. In places like Shanghai and Peking, where the erection of business buildings and Government offices has been entrusted to foreign architects, the results have the character of our own cities.

A Novelty in Brick Manufacture

We should hardly expect to learn much of the arts of civilized life from the tribes of central Asia, says a contemporary, yet it seems that they make better brick than we turn out. The barbarians employ the same material that we do, and, curiously enough, the thing that imparts superiority to their process of brick-making is one of the powerful agents of Western civilization—steam. When the Asiatics have baked their bricks for three days, the opening of the oven is closed with felt, which is kept wet, so that the bricks, intensely heated, are enveloped in steam. The process causes a remarkable change in the character of the bricks. From red they turn gray, and at the same time acquire a remarkable degree of toughness and hardness. Although porous, they give out a sound when struck like that of clinkstone, and they are said to resist the efforts of weather much better than do the bricks of Western make. Necessity was the mother of invention in this case, for the climate in which these ingenious Mongols live is subject to great extremes of temperature, having a disastrous effect upon bricks made by the ordinary process.

Brick-making in Ontario

Concerning brick-making in Ontario, the British Clayworker has this to say:

"There has of late years been a marked improvement in the quality of bricks made in first-class yards. Kilns of modern construction burn harder and more evenly, and there is a smaller proportion of soft bricks. The present taste in brick houses, too, does not demand the same uniformity of color that was formerly insisted upon; in fact, a variety of shade, instead of being objected to, is rather desired. There is also a much greater range of products than was made years ago. From white and buff to cherry red, and up to a dark even purplish hue, bricks of all tints and shades are freely used, and pleasing effects are sometimes obtained by employing clinker or overburned bricks, greenish or yellowish in color."

Old Roman Bricks

When the preparations for rebuilding the Campanile in Venice were undertaken, archaeologists were afforded an opportunity to make some interesting studies of the bricks. It was found that they had been used in arches, fortifications, the tops of walls, and in other ways before they were built into the Campanile, and that they were not Venetian, but Roman bricks. These ancient bricks were made in courses, for in many, the layers could be seen undisturbed. It is said that bricks made this way can bear a greater weight than modern bricks. The bricks examined were of the first century. One of them bore the imprint of a horseshoe, which may prove that Romans used a horseshoe like ours, although it is generally believed that their horseshoes were strapped on, not nailed.

One of the notable features in connection with the erection of large buildings at Chicago is the amount of architectural terra cotta being used. Brick and terra cotta certainly have the preference in this respect there. It is difficult to recall a structure, with the exception of the new Field Museum, that is not or will not be constructed largely of clay brick or terra cotta.



WINDSOR CASTLE

Courtesy of Brick and Clay Record.

Famed in Song and Story, History and Romance. An Excellent Example of the Enduring Qualities of Early English Brick Work.

Clay Resources of the Western Provinces

Extent and Distribution of Various Materials—Their Economic Value to the Manufacturer—Room for Abundant Development

Specially contributed by Joseph Keele*

DURING the past three years the Geological Survey has included within the scope of its work an investigation into the clay and shale resources of the Dominion from an industrial standpoint. The Western provinces, and the provinces of New Brunswick and Nova Scotia having now been covered, a fairly good knowledge of the extent and distribution of the materials, as well as their economic value, is now in possession of the department. The reports upon them will soon be available to the public.

The most important deposits and the greatest extent of clays and shales lie in the Great Plains re- extent of clays and shales of Canada lying between the eastern boundary of Manitoba and the eastern slopes of the Rocky Mountains. Another area of importance but of comparatively small extent lies along the Pacific coast. A few scattered deposits of less importance are found within the mountains.

Great Plains Region

Surface clays and silts are found widespread in this area, and are used locally for the manufacture of common brick. These clays are generally calcareous, almost all of them giving a strong effervescence with acid. Many of the surface clays are of a silty character, owing their origin to secondary deposition from boulder or glacial clays, containing a large amount of rock flour, which is not a truly plastic material. The silty clays generally produce a weak and porous brick, but are sometimes used to supply a purely local demand.

Many of the surface clay deposits can not be worked on account of small pebbles, which are either scattered through the mass of the clay or else occur in thin layers. Where such deposits have been worked the results have been unsatisfactory, as the pebbles are mostly of limestone, and every brickmaker knows sooner or later what that means. Nearly all of the surface clays are liable to check on the drying racks, and have to be protected from the dry warm winds, which often sweep across the plains.

* By courtesy of the Director of the Geological Survey.

This is done by enclosing the racks with wooden or canvas sides.

The tests made of the surface clays of the Great Plains showed that few, if any, of them would stand fast drying in an artificial dryer, where a temperature of from 120 deg. to 140 deg. F. is used. Most of the common brick in the West are made by the soft mud process. Stiff mud or wire cut machines are rarely used, the brickmakers claiming that bricks made by this process take too long to dry, and are harder to dry without checking than soft mud ones. The burning is mostly done in stove kilns, dry poplar being the principal fuel, but spruce and pine are used where available. The Stephens Brick Company, at Portage la Prairie, have down draft kilns and burn with screened anthracite under a forced draft.

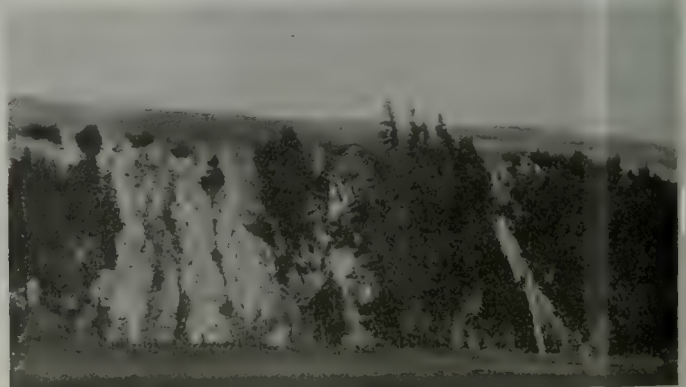
The majority of the surface clays are useless for making dry press bricks, and only in a few localities did the tests show a fair dry press product from them. Some of the clays, particularly in Manitoba, are buff-colored when burned hard, but most of the clays in Alberta and Saskatchewan are red burning. The Manitoba clays in general have to be fired to a fairly high temperature to produce a good hard brick, but like all highly calcareous clays are apt to melt rather suddenly. The arch bricks are almost always fused, while several of the upper courses of bricks are underburned and of a red color, when burned in scove kilns. More kilns of brick are spoiled in the West from underburning than by overburning.

Excellent common bricks of buff color are made from lake laid clay deposits in the Red River valley at Gilbert Plains, Portage la Prairie, Virden and other points. These bricks have been in use in most of the important structures in western cities for many years.

The greater part of the settled areas of the Great Plains region are underlain by beds of shales, clays, sands or sandstone and lignites, either of Tertiary or Cretaceous age. These beds are seldom exposed on the surface, being mostly covered with the mantle of later unconsolidated materials, such as surface clays, sands and gravel. In some places, however,



W. H. Elliott's Brick Plant at Saskatoon, Sask.—Showing canvas sides to drying racks.



Exposures of Cretaceous Shales on Milk Creek, six miles southwest of Pincher Creek, Alta.



Acme Brick Company's Plant, four miles north of Edmonton, Alta.

the Tertiary and Cretaceous rocks form uplands, and along the margins or escarpments of these uplands, and on the banks of streams flowing from them, these beds are often found exposed. At other localities the streams have trenched deeply enough into the surface of the plains to reach these beds. Owing to the prevailing softness of these rocks, and consequently to the ease with which they weather down to form soils, it is often impossible or very difficult to trace out any particular beds, unless provided with some boring apparatus.

The Pembina and Riding mountains in Manitoba are upland masses, flat-topped and of low relief; they are built of Cretaceous shales. The upper and exposed portion of the Cretaceous in these uplands is divided into two sub-divisions, that on top being known as the Pierre shale, and the lower portion as the Niobrara. These shales are generally hard and slate-like, and when ground and mixed with water will not form a plastic mass. But large portions of them are decomposed and soft, so that they can be worked up like surface clays when in that condition.

There is a great deal of difference in the behavior of these two shales under fire. The Pierre shale is rather refractory, and does not give a dense body, until fired to a very high temperature, and its fire shrinkage is rather excessive. The Niobrara shales contain a good deal of lime and are readily fusible, but give a good dense body and at the ordinary temperature to which common bricks are burned, without undue shrinking. The Niobrara shales are worked at Leary, in the Pembina mountains, on the line of the Canadian Northern Railway, a good red dry pressed brick being produced. The Pierre shales are



Works of the Celtic Brick Company, Prince Albert, Sask. Making red dry press bricks from surface clay.

worked for dry press brick at La Riviere, but the results are not very satisfactory, the resulting brick being too soft and porous.

The Pierre shales extend into Saskatchewan, being very abundant in the valley of the Qu'Appelle river at Tantallon, and what appeared to be the Niobrara shales were seen this season in the new cuttings along the Canadian Pacific Railway on the shores of Lost Mountain Lake, 35 miles north of Regina. Owing to their porous nature and lightness when burned, the Pierre shales should be useful for fireproofing and hollow building blocks.

A fairly extensive area of clays and shales is found along the Souris valley, in the southern portion of the province of Saskatchewan. They are worked in connection with a lignite seam at Estevan for brick, and the erection of plants is contemplated at two other points in the same valley. A good red dry press brick is made at Estevan from a thick bed of clay shale which underlies the lignite, and buff wire cut are made from sandy shales overlying it. The clays and lignite are worked by open cuts, and the lignite is used under a forced draft installed on the Bóss system, for firing the kilns. The clays along the Souris valley, wherever tested, were found to be rather easily fusible and it would be unsafe to attempt the manufacture of vitrified wares from them. There is an abundance of clays in this district, mostly easy to mine. Fuel is plentiful, and the large markets for clay wares are comparatively accessible. Other wares besides those already produced at Estevan could be made here.

The escarpment of the Dirt Hills forms a conspicuous feature in the topography of southern Sas-



View of part of the Dirt Hills, Sask. White fire clay beds on Section 28, Range 24, Township 12, west of 2nd Mer.



Clay Pit of the Acme Brick Company, four miles north of Edmonton. Stratified surface clay on top, sand and silt in lower portion.

katchewan, being plainly seen from the Portal branch of the Canadian Pacific Railway and also from the main line west of Moosejaw. The beds composing these hills are of Tertiary age, the materials of which they are made up consisting of clays, sandstone and shales with some thin lignite seams. Included in this series are some of the highest grade of clays so far found in Western Canada. The latter are fire clays, the main body being greyish white in color and rather sandy, but there are some thinner beds

goods later on. This company is thoroughly familiar with the extent and capacity of their clays, as they have gone to considerable expense and trouble in the preliminary investigations. A new branch line of the Canadian Northern Railway, now almost completed, will pass within three miles of their deposits.

The Alberta Clay Products Company erected a plant for the manufacture of sewer pipe about two years ago at Medicine Hat, but no clays suitable for that purpose were found in the vicinity. The plant



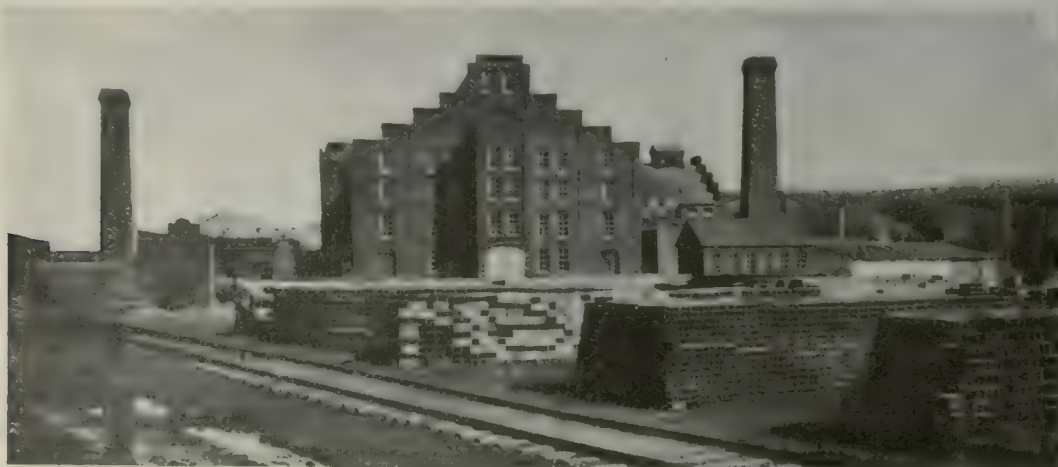
Clay Pit of the Red Cliff Brick Company, Red Cliff, Alta.
Cretaceous clays, shales and soft sandstones.



Lower part of Pit at Sandstone, Alta.—Alternating beds of sandstone and shale. The shale is mined for the manufacture of dry pressed brick.

of a grey color and lenses of white clay entirely free from sand. The fire clays are 30 feet thick in places, and are underlain by grey sandy clays which will make good red wire cut or dry pressed bricks. The white clays are overlain by a great thickness of brown sandy clay shales which are readily fusible, but they cannot be wet moulded as they crack very badly in drying. They are useful however in dry press mixtures with the more refractory clays.

is running in the meantime on fireproofing. They make a good article and there is a great demand for these goods in the Northwest. This company also produces red dry press and wire cut brick. The works are situated in the city of Medicine Hat, and the clay bank is at Coleridge, about seven miles to the east. The clay is brought in daily on three cars over the C. P. R. line and delivered at the works. Part of the Cretaceous, known as the Belly River series, and made



Works of the Alberta Clay Products Company, at Medicine Hat, Alberta. Stock of fireproofing in foreground.

The fire clays are well exposed in Township 12 west of the 2nd Mer., and can be worked right at the surface. They burn almost white, and the sandy fire clay when washed gives fifty per cent. of fine plastic clay, approaching in character the ball clays used in pottery bodies.

A company formed in Moose Jaw is erecting a plant for the manufacture of fire and facing brick at this locality, and will doubtless branch into vitrified

up of soft shales, sands, clays and lignite, are the material used, and the firing of kilns is done altogether with natural gas.

The Red Cliff Brick Company operate at Red Cliff, on the bank of the Saskatchewan river, six miles west of Medicine Hat. This company manufactures red dry press and wire cut bricks, from clays of the Belly River series, which are exposed in great thickness on the river bank at this point. None of the clays in

the Medicine Hat district are refractory, but the Alberta Clay Products Company claim to have a thin seam of black fire clay in their bank at Coleridge.

Clays from some of the beds in this region, and also at other localities in the west, possess very undesirable working qualities. They appear to have been laid down originally as muds, oozes, or slimes, and to have retained their nasty characteristics ever since. They absorb a great deal of water in mixing, and form a sticky, tough mass, exceedingly hard to work up. After moulding they crack badly even in ordinary air drying. In experimenting with these clays, the addition of sand was found to be useless, but their defective working qualities could be overcome by any of three methods:—(1) By pre-heating the clay; (2) by calcining a portion of it, and adding the calcined clay as grog to the raw clay; (3) by the addition of one or two per cent. of common salt.

The Cretaceous shales are the most important source for material in the Calgary district for the manufacture of clay wares. They evidently underlie a great area but are mostly obscured by the overlying glacial drift. They have been opened for working at two points, viz., Brickburn, five miles west, and Sandstone, sixteen miles south of Calgary. Both openings are in high banks at sides of valleys, and show massive layers of grey and buff shales, interbedded with beds of sandstone up to two and three feet in thickness. Some of the sandstone taken out in quarrying the shale is used for building stone, but the majority of it is rejected altogether. Dry press brick is the only product made from the shales at these localities. They are red burning, rather low in fusibility, and cannot be used safely for vitrified wares, but as their plasticity is good they will make wire cut bricks, and they might also be used for the various hollow wares now demanded for structural work.

West of Calgary, between Glenbow and Morley, there are extensive exposures of shales, free from sandstone beds, and consequently, could be worked with much greater economy for brickmaking.

On the Crow's Nest branch of the Canadian Pacific Railway, between Lundbreck and Hillcrest, and also on Milk Creek, six miles southwest of Pincher Creek, there are extensive shale deposits, some of which might be used for sewer pipe or paving brick. These shales occur in an area where there is an abundant supply of good coal, but they are not utilized at present.

Buff and red burning Tertiary and Cretaceous shales are extensively distributed over the area between Calgary and Edmonton, the best exposures being found along the Red Deer river and in the vicinity of Camrose. These shales frequently weather down into very plastic clays. They are likely to furnish good brick and fireproofing material, but are not utilized anywhere in this region. Shales are found outcropping, in great thicknesses, on the banks of the Saskatchewan river at Edmonton and Strathcona, and have been worked for dry press brick at the latter city this season for the first time. The Edmonton shales have been found generally unsatisfactory for wet moulding processes on account of their high shrinkage, and the cracking of wares while drying.

Shale beds of great thickness occur west of Edmonton on the line of the Grand Trunk Pacific Railway, near Entwistle. These shales were found to possess good working qualities for making wet moulded wares, such as wire cut bricks and fireproofing, and some of the beds appear to be suitable for the manu-

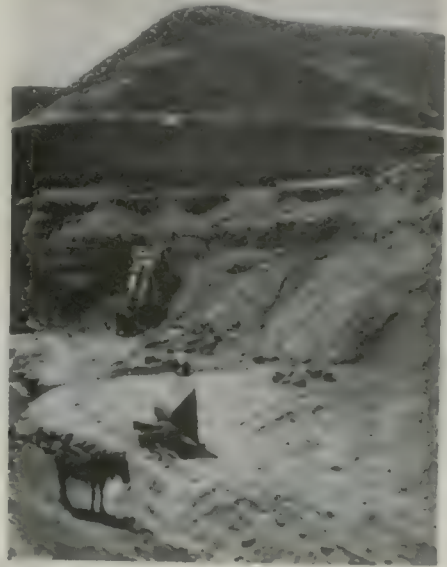
facture of sewer pipe. There is a thick seam of coal underlying these shales, which is being mined, and plans are in progress for a clay-working plant to be operated by the company.

Mountain Region

Surface clay deposits, generally of small extent, occur in many of the valleys within this region. These clays are worked for making common brick at Nelson, Castlegar, Kamloops, Enderby and Kelowna, but unworked clay deposits also occur at Golden, Salmon Arm, and in the Nicola valley. These clays are mostly red burning; they give no trouble in drying, and produce a good hard brick.

Dark grey or black shales are frequently seen along the Canadian Pacific line in the Crow's Nest Pass district, between Frank and Fernie. They are used at Blairmore for making red dry press-bricks of good quality.

Shales suitable for brickmaking also occur in the Nicola and Tulameen valleys, in connection with coal seams, but they are not used at present. So far, no



Portion of the Clay Bank at Coleridge, Alta. Worked by the Alberta Clay Products Company at Medicine Hat.

deposits of fire clay are known to exist in the mountain region, but it is quite possible that fireclays may yet be found, especially when the Grand Trunk Pacific line will render a great area of this region much more accessible for prospecting.

Pacific Coast Belt

Bluish and grey stratified surface clays are found along the lower portion of the Fraser river, on some of the islands off the coast, and in the southern part of Vancouver Island. These clays are of value for making common red brick, being worked for such at New Westminster, Port Haney, Anvil Island, Sidney Island and at Victoria.

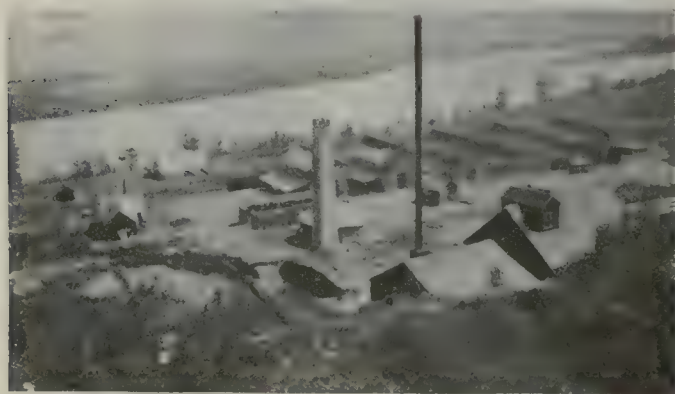
Owing to the heavy rainfall on the coast, the clays are generally too moist for using directly from the bank for drypress or wire cut brick, although the latter kind are made at Port Haney. A plant was erected last season at Anvil Island for making re-pressed bricks, by an English process, known as the "semi-plastic," and working the clay directly from the bank. This process will no doubt produce good bricks if it

can be worked successfully, but the output would be limited on account of the slowness of the operation.

Sewer pipe and fireproofing are made at Victoria, the materials used being a mixture of the ordinary surface clay of the neighborhood, a dark grey hard shale from Comax, and a yellow residual fire clay from Kuyouquot.

By far the most useful series of shales to the clay-working industry in the West are the massive Tertiary beds of Sumas mountain, south of Mission junction. The different beds of shales in this mountain are adapted to the manufacture of pressed, paving and fire brick, sewer pipe, and fireproofing. The shales are mostly hard when mined, but most of them work up quite plastic when finely ground. They have a low air and fire shrinkage, will stand fast drying, and burn to either buff, red or grey colors, with a comfortable margin of safety in the kilns.

The Vancouver Fireclay Company have had for some years a works in operation at Clayburn. A narrow gauge railway extends from the works for a distance of three miles up a gulch in Sumas mountain, the total rise in this distance being 450 feet. The shales are mined at intervals along this railway and used for buff and red dry pressed brick and for fire brick. The same shale beds outcrop on the opposite



Works of the Calgary Pressed Brick Company at Brickburn Alta.—Making dry pressed bricks from shale.

side of the mountain at Kilgard and a works for the manufacture of dry press and vitrified wares is now in course of erection at this point.

Clay-working Industry

The main clay-working industry of Western Canada at the present time is the manufacture of common brick, but the production in many localities does not supply the entire demand, and common bricks are imported in large quantities from Menomence, Wis., and Seattle, Wash. Dry pressed brick are made in small quantities at a number of points, the only plants of large capacity being those near Medicine Hat and Clayburn. Most of the pressed brick now used in the western provinces are imported, and consequently command a high market price. The imported pressed bricks mostly in favor come from Hebron and Dickinson, in North Dakota, and are made from materials almost precisely similar to those found in the Dirt Hills south of Moose Jaw.

All of the fire brick and coke oven blocks used east of the mountains come either from Great Britain or the United States. There is an abundance of fire clay in the Dirt Hills which will very soon be utilized to supply a large portion of this demand. All of the

sewer pipe, terra cotta and pottery is at present imported into the prairie provinces. With the exception of the production at Medicine Hat, the fireproofing and hollow building blocks are all imported. There is a great and rapidly growing market for hollow building blocks in the prairie provinces. In a country where wood and stone practically do not exist and where suitable clays may be found this will surely be the future building material. The ease of construction, the small quantity of wood required, the advantages of the air spaces in walls in this climate, are all factors in favor of the hollow clay block type of dwelling.

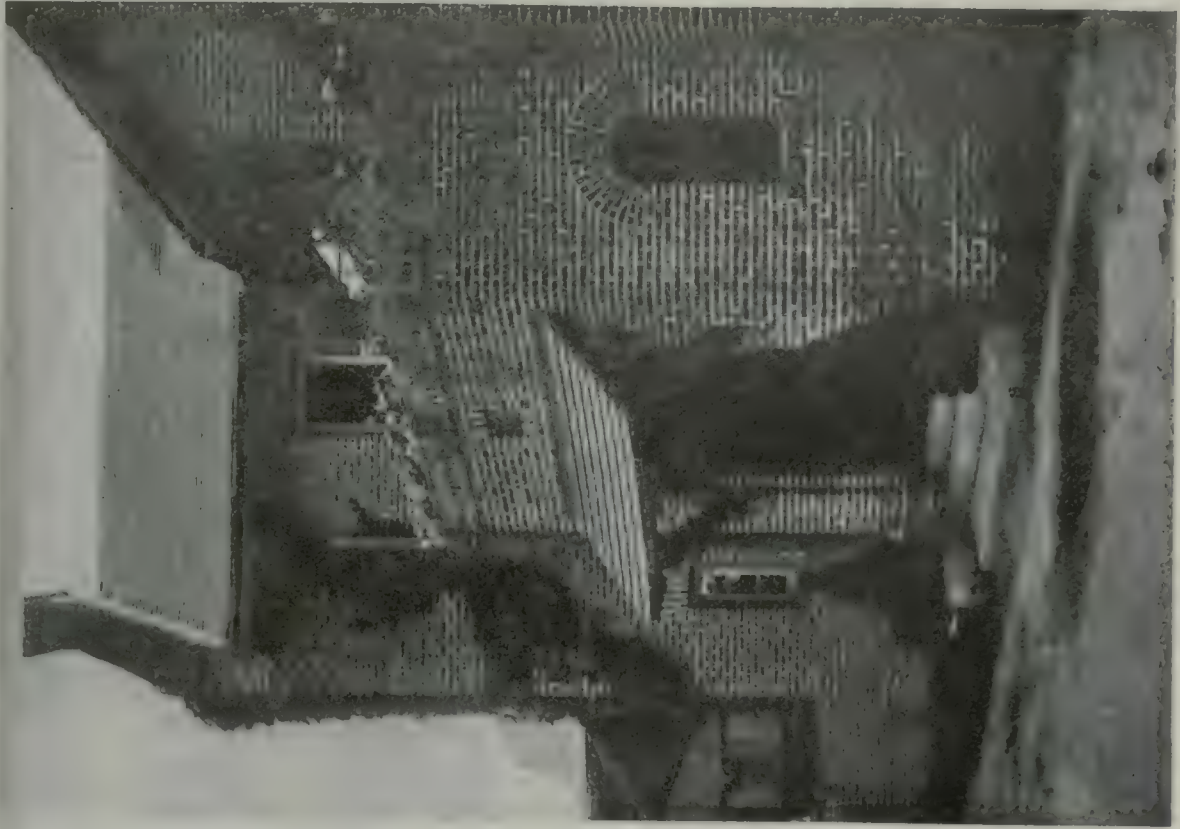
It will be seen, therefore, that there is room for abundant development and expansion in the clay-working industries in the West. The eastern clay-worker is accustomed to fairly fixed conditions of labor, fuel, and markets, short hauls, and reliable clays with which he is familiar. If he contemplates operations in the west he is confronted by new labor, fuel and transportation problems, and above all, he has to consider the technical difficulties which most of these clays present. But the big markets and the high prices are there for expert men who will produce the proper clay wares.*

The De La Nouvelle Pitie Hospital, Paris, which was begun in 1905 and recently completed, consists of a series of buildings for medical and surgical treatment, together with a maternity hospital. The buildings cover a plot of ground approximately 600,000 square feet, built of brick and connected throughout by an underground passage. Each building has a separate underground passage connecting with the kitchen through which meal trucks pass to the various lifts fitted in all parts of the hospital. The total cost was about two and a half million dollars.

Brickwork of modern type came into general use in England about A.D. 1300, after being comparatively unused since the departure of the Romans, Little Wenham Hall (A.D. 1260), in Suffolk, being probably the earliest brick building existing in England. During the reigns of William and Mary, and Queen Anne, brickwork was largely used in house construction by Sir Christopher Wren and others. Hampton Court contains good examples of sixteenth and seventeenth century brickwork. Terra cotta was also employed, as at Layer Marney Towers, Essex (1500-1525), and in parts of Hampton Court Palace.

Architectural treatment of a brick chimney for the Canadian Pacific Railway, at its Windsor Street power house, Montreal, consists of a buff brick for the body of the chimney with a panel course of gray terra cotta blocks spanned by arches of the same material; this course is about 20 ft. below a projecting course of terra cotta near the top. The panels and arches project about 4 in. from the face of the chimney and are backed by common brick with circular reinforcing bands or iron, $\frac{1}{4} \times 2$ in. in size, laid between the two courses at regular intervals. The total height of the structure from the top of the foundation is 211 ft. with an external diameter at the bottom of 17 ft. decreasing uniformly to 9 ft. at the top.

* A detailed description of the deposits, and the results of a series of tests made from them are given in the report on "The Clay and Shale Deposits of Western Canada," by Ries and Keele. A copy may be obtained upon application to the Director Geological Survey, Ottawa.



Exterior Details of Charming Suburban Residence, exemplifying Good Brick Construction in this Class of Work.



The Intelligent Use of Brick as Ornament

Fundamental Principles in Decorative Brickwork—Some Interesting Examples of Successful Treatment—Surface Patterns—Tapestry Bricks

By Philip J. Turner, F.R.I.B.A., Special Lecturer in Construction and Specifications,
Department of Architecture, McGill University.

FROM primeval times down to the present day, there has always been in man, it would seem, an instinct or desire for ornament in some form or other. Many attempts have been made in our own time at ornamentation in brickwork, but in the majority of cases produced on this Continent, the results have been failures, due, more or less, to the want of knowledge of the right use and characteristics of the material in question. In this country it may be said, at any rate, that we are yet in the infancy of the use of brickwork applied intelligently as ornament.

If one turns to the work of architects and builders of the Middle Ages, and makes an honest effort to discern how they obtained their successful and artistic effects, improvements (and every one will agree that there is much room in these days for this in the bricklayer's handicraft) will soon show themselves in the use of this material. As the desire for ornament is perfectly legitimate the only condition to be imposed is that it should be in good taste. How can this condition be fulfilled?

The brick manufacturer cannot be blamed for any lack of artistic feeling, for, at the present time, bricks of beautiful and artistic forms are being, and can be made, and they are also to be had in every variety of shape. Generally, brickwork that is used decoratively can be treated in the following ways: (1) that in which the effect is obtained by making a difference in the levels of the wall surface, such as are to be found under the headings of cornices, pilasters, bands, quoins, etc.; (2) that in which a pattern is worked, on a perfectly smooth face, by the manner in which the bricks are laid; (3) that in which the element of color enters.

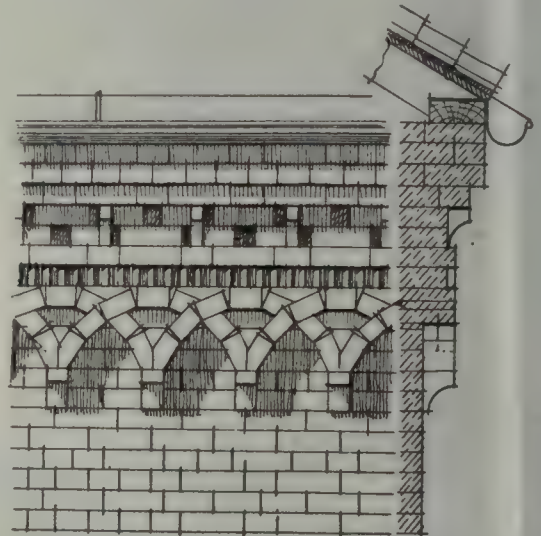
Before proceeding further with the subject, there are certain practical and elementary truths in successful decorative brickwork that must be laid to heart.

Brickwork, in the first place, on account of its very nature, must not be treated in the same way as stone. Bricks are small and severally of little weight or beauty, the interest in the wall being in the thought and care displayed in their arrangement and setting. With stonework it is the natural beauty of the material in surface texture and color which counts, and the importance of the mortar joint is lessened. All moldings and details in brickwork have to be made upon the unit of a single brick. Much foolish design and worse construction might have been avoided in our generation, if stone moldings and ornaments had not been executed in brickwork, and if brickwork projections and recesses had not been applied to masonry.

Moldings suitable to stone are not adapted to a rough material like brickwork, and large projections should not be attempted. Brickwork, moreover, that is supported on iron brackets or other hidden methods of construction, is not honest construction at all and certainly to the practical eye it is always stamped at once as insincere. Moldings that have small projections, each course being self-supporting, should

only be allowed. Though ornamental strings and repeating ornaments can be economically obtained by the moulding in manufacture, refined architectural forms cannot be obtained in cast brickwork; for cast brickwork has a tendency in moulding, drying, and burning to slightly alter its shape by shrinking, and consequently fine horizontal lines have an uneven look.

In modern building the use of elaborate moulded brickwork is rarely successful, owing to the attempts of the manufacturers to imitate in cast work, the refined forms and small detail of cut and rubbed work. Hence brick moulds should be simple and strong. Ornament, moreover, which is machine moulded is neces-

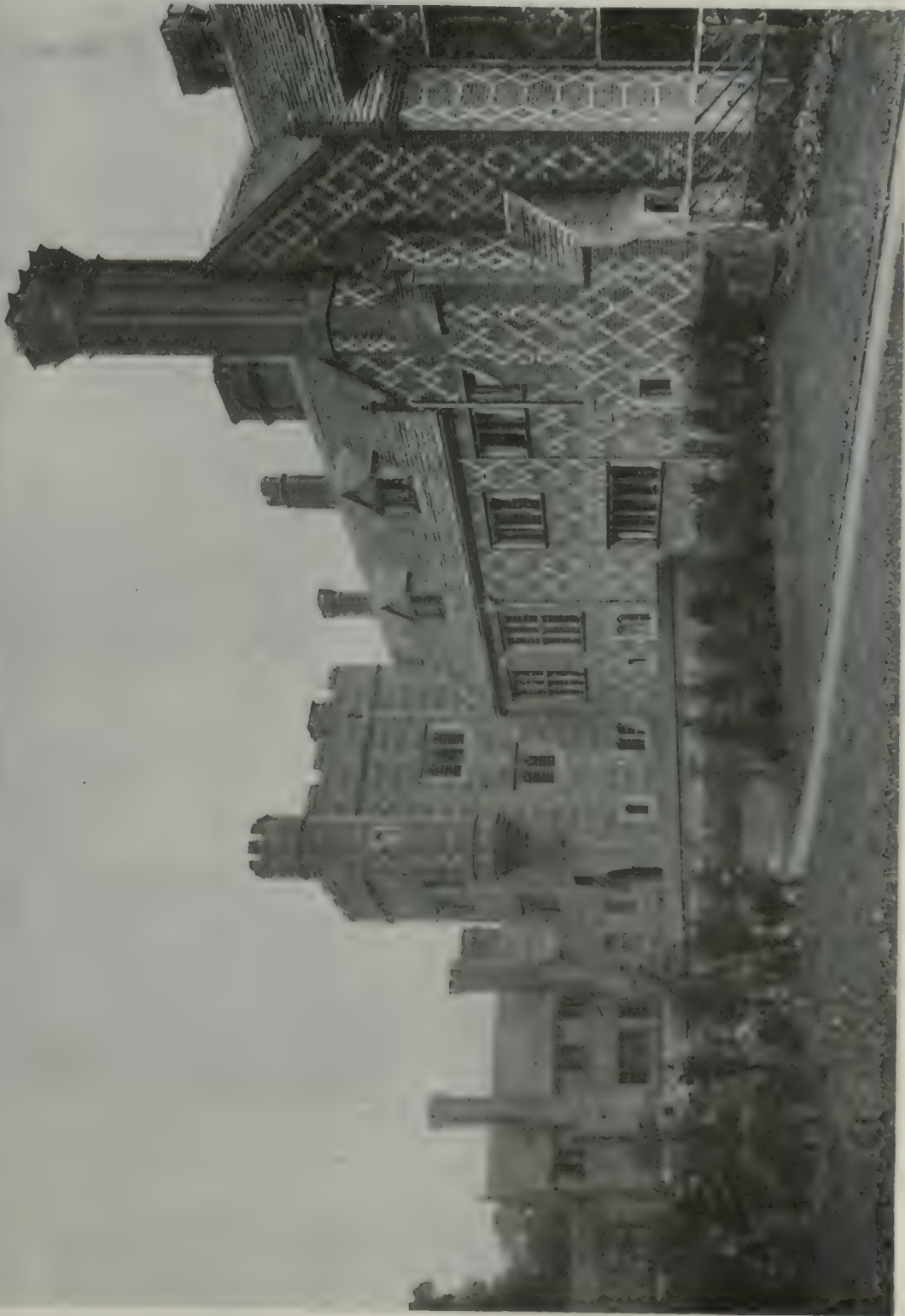


1.—Reproduction of Cornice of Baptistery of San Stefano, Bologna, Italy.

sarily uninteresting in repetition, and lacks the fundamental quality of human labor in its production.

Much of the ornamental brickwork in this country has been derived from good examples in England and Northern Italy, but not always with great success, as the long continued cold weather requires a treatment of such work very different to the milder climates of the Eastern Hemisphere. The upper surfaces of copings and brick projections are the sources of serious danger unless protected by overhanging coverings with drips. If the latter precaution is not attended to, the frost will destroy the mortar joints, and the faces of the walls will in a very short time become stained. Moulded bricks used as bed-moulds to wood or metal cornices may be designed in wide variety and with excellent effect, especially as the unevenness of the horizontal lines are hardly discernible, when the upper members of the cornice are of wood or metal.

Bricks, besides being manufactured with the moulding cast on the dimensions of their depth (as usually laid in a wall) are also made with the moulding on the edge. In this way and by a careful selection of the forms of the moldings, some well-design-



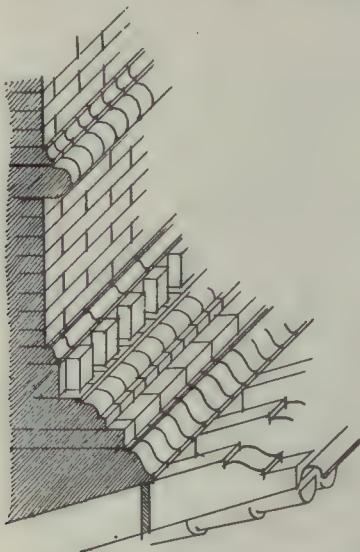
House at Henley-on-Thames, Middlesex, England, (Ernest George & Peto, Architects).—Illustrating
the Possibilities of Surface Pattern Work.

ed cornices in cast ornamental brickwork can be made as indicated by the illustration here given (No. 2).

A more elaborate example of a brick cornice modelled after that of the Baptistery of San Stefano, Bologna, is illustrated (No. 1) as showing the possibilities of enrichment in plain bricks. Only slight projections are used, but the treatment of the recessed triangular patterns between the arches would cause trouble in this country, though snow and ice lodging here, and destroying the mortar joints and eventually the bricks.

Surface Patterns

Diaper work on a plain wall surface can be used with excellent results if judiciously treated. The illustration from a modern house at Henley-on-Thames, England, is an example in point. The contrast between the dark headers and general wall surface is in reality not so marked as brought out on the photograph. The pattern should never be too insistent so as to interfere with other features of the building, and in the house illustrated, the dark red brick surface with the purple headers blend together harmoniously without any vivid contrast. In all surface pattern



2.—Design for Molded Brick Cornice.

work of this style the bricks must be laid to a proper bond with all the joints and perpend truly kept.

Good bond in brickwork, in itself, with careful pointing, even if it cannot be considered as ornament, is at least decorative, and goes a great deal towards giving those pleasing and natural effects that is desired in good and artistic work.

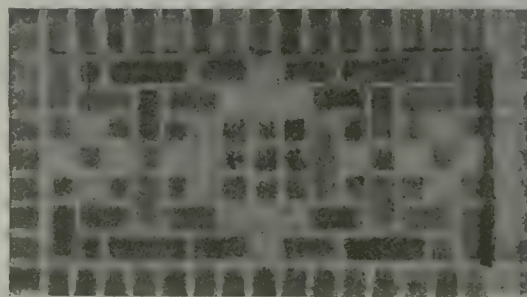
The house here shown is a good example of the right treatment of brickwork in ornament generally, and attention should be called to the successful use of the material in the ornamental chimney projections, turrets, etc. Patterns in diaper work should not be set out on too hard and straight lines, or any attempt made to keep to one design throughout. Such work would never be pleasing to the artistic eye, and it is on this account that diaper work on surface ornament on a large scale requires, as in this house at Henley-on-Thames, the co-operation of a practical craftsman in brickwork with the designer. In the subject before us it is worth while to note also, the coping to the garden wall and gables, the small but effective projections to the brick moulded courses and the way in which all are given drip courses.



3.—Brickwork in the Blair House, Oyster Bay, L. I. — A Modern Reproduction of those used in the famous Baths of Titus.

One feels that there is a sad lack of really good craftsmen in the brick trade (though this is not the only branch in the building world where such craftsmen are wanted) and how many buildings have been ruined by the "throwing" together of the bricks. In this craft, as in all others, what is wanted is, that the man who lays the bricks should take a real personal interest in his own work,—the architect or contractor is helpless otherwise, to obtain satisfactory results. It was because every craftsman in the Middle Ages understood the material he was working in, and was anxious always to obtain the best results from his work, that he has even in the simplest cottage, unmistakably impressed his building with his individuality.

However severely plain a building may be, some form of detail or ornament can be introduced which will give interest to it, and many simple forms can be used that always prove effective, and at the same time need not be omitted on account of the plea of additional expense. What an effective form of ornament, for example, is found in countersunk or projecting string or belt courses! Such a course between two floors will transform a distinctly plain and unprepossessing building into one of interest. In old buildings frequently is to be seen, with good effect, round arches above square windows, the tympanum (the part enclosed by the curved top) of the arch being countersunk several inches. Another simple form of ornamentation is to



4.—Mosaic Panel, Blair House.—Three Sizes of Brick all Multiples of a Single Unit and Three Blending Colors.

be found in the quoins so often met with on buildings of Georgian and Colonial date. Their interlocking appearance imparts an air of solidity and strength to a building.

Tapestry Bricks

Primarily, of course, many beautiful schemes of decoration can be obtained by using a high class and artistic brick, and of these perhaps no brick on this continent has been made to excel in appearance, the "Tapestry" brick which is manufactured by Fiske & Company, of New York. These bricks all vary in shade and have the delicate tone of a fine old Persian

rug. Many buildings are spoilt in the deadly uniform coloring of a pressed brick. It is in the variety of shading which is found in such an one as the Tapestry brick that true artistic value can be obtained. This brick has also a peculiar rough texture not generally found in any other manufacture, and the play of sunlight upon it does not mar as in the conventional brick wall.

Messrs. Carrere & Hastings, the well-known architects, of New York, have obtained some very beautiful effects in brickwork in using different sizes of bricks together. In the examples illustrated at Blair House (Nos. 3 and 4), bricks 18 in. long by 2 in. thick by 6 in. wide have been used. They are a modern reproduction of the bricks used in the Bath of Titus in Rome, A.D. 80. In this work the design consists of three sizes of bricks all multiples of a single unit and three blending colors which are modifications of the primaries. It will be noticed in this example what an important part the mortar joint plays in this design.

Perhaps the very "latest thing" in the evolution of artistic brick work is that species of terra cotta now being made by Messrs. Fiske & Company, and what is called "Brickotta." This is hand moulded and hand finished, divided into units corresponding approximately to brick sizes, and is made of the same color and texture as the surrounding brickwork.

To obtain good results from every treatment of brickwork care must be given to the selection of the



5.—"Brickotta" in Russell Sage Hall, Northfield Seminary, Northfield, Mass. Delano & Aldrich, Architects.

texture, color and size of the mortar joint. The jointing on a wall surface plays an important part. Generally speaking, the texture of the joint should be in harmony with the texture of the brick.

It is irrational to use a smoothly finished joint for a rough texture brick as it is to use a rough finished joint for a smooth brick. The color of the joint should not be neglected. With one quarter inch joint, the surface of the joint is about one-tenth of the whole wall surface, and in some buildings joints are being made as wide as $1\frac{1}{8}$ inches, while the brick itself is but two inches. (An example of this is shown in the previous illustration from Blair House). With these wider joints it is hardly necessary to add that pebbles should be added to the mortar to give the same the proper texture and also to give the mortar sufficient body while the lime and cement are setting.

In "rubbed and gauged work," which is brickwork rubbed to section, and laid with very fine putty joints and not cast as in terra cotta, much may be done in the way of architectural ornament that cannot be carried out in other forms of brickwork. The nature of this latter class adapts itself for carving, and many excellent examples are to be found in this class of work in the 17th century in England and Holland.

In closing this short article, it is to be hoped that

those responsible for the teaching curriculum in our Technical Schools will consider very seriously how an improvement may be made in the practical knowledge given to their scholars in the building trades, and in none more so than that of the subject of this paper. Then it will not be long before there grows up amongst us something of the spirit which inspired the Guilds of Craftsmen of the Middle Ages, and our brick buildings will be relieved of their dull monotony and be instead a pleasure to behold.

The author is indebted to the Eastern Hydraulic Press Brick Company, Philadelphia, for Illustration No. 1; to Mr. F. E. Kidder for Illustration No. 2, and to Messrs. Fiske & Company, New York, for Illustrations Nos. 3, 4 and 5.

"Blueing" Bricks

It is rather an expensive method to use manganese for an addition to a clay in order to make blue bricks, and especially when the clay is very low in iron contents. With a clay high in iron, an addition of from 3 to 5 per cent. of manganese will be sufficient, if the burning is done right. It must be burnt with very little draught and reducing fire in order that the iron contents in the clay will be reduced from the ferric to the ferrous state, which will color the brick black in place of red, as usual. It is difficult to obtain these results in continuous kilns, but in down-draught and chamber kilns, in which paving and blue bricks are burnt, the matter of obtaining black bricks is not a difficult problem. In order to burn black bricks in continuous kilns it will be necessary to use the same method as tile manufacturers use for making blue and black tiles. The bricks the put in saggars and coal dust is packed all around them. The saggars are made tight by putting clay between them, so that no air can come inside the sagger. With this method a black matt brick can be easily obtained. Another method is also to apply a black slip to the surface of the brick, and the clay of the brick does need to be of a black color in that case. The cost of slipping 1,000 bricks will be about 50c.—Tonind. Zeitung.

Clay Products Convention

The Annual Convention of the Canadian Clay Products Manufacturers' Association, which was announced to have been held in Toronto this month, has been postponed and will take place, we understand, some time in January. The actual date of the Convention will be announced later. The Contract Record will make a special feature of the meeting and the sessions will doubtless be productive of much of interest to the trade. Toronto is a great centre for brick and clay products, and this occasion to visit the Queen City and to take a leaf from the book of some of the most successful men in the industry will doubtless be regarded as an opportune one by many manufacturers from outside points.

Ancient and Modern Uses of Brick and Tile

Forms Used by the Romans, Later in Mediaeval England, and the English Standard To-day — A Canadian Requirement.

Specially Contributed by S. H. Penlington, A. R. I. B. A., Toronto

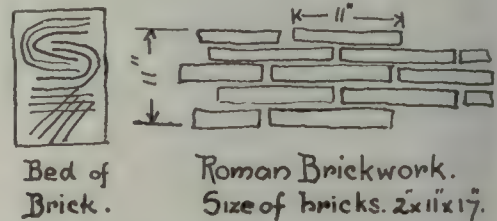
FROM the earliest times in which brick has figured in construction it has been used in the building of walls, arches, piers and vaults.

The Romans used bricks mainly as bonds in stone walls and concrete walls, hence the large size of their bricks. Two or three courses of large flat bricks would form a better bond in a stone or concrete wall than smaller bricks.

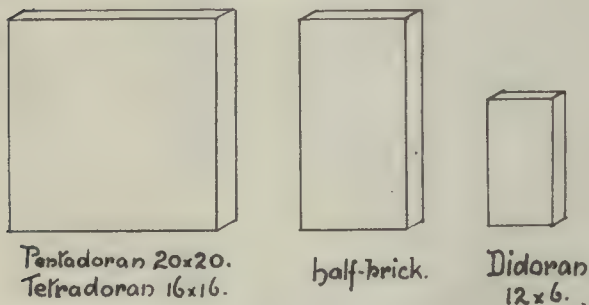
The Roman bricks were of three general sizes, called pentadoran, tetradoran and didoran. The first two were square, about 2 inches thick and having half bricks (see sketch); the third were mostly used in Rome and were about 6 in. x 12 in. The thickness of this brick is assumed to have been about 1½ inches. The pentadoran was of 5 palms, about 20 inches square, and the tetradoran, 4 palms, about 16 inches square.

These bricks were scratched on the back to form a key for mortar, but sometimes this purpose was effected by means of raised lumps. The bricks

manufacturers are still back in the thirteenth century making bricks all sizes and shapes, the result being bad scars and unequal settlements in walls where no proper bond can be obtained. Bricks from one maker will not bond with bricks from another; glazed bricks will not bond with either facing bricks or common bricks. The engineer who has to carry the loads of brickwork in skeleton steel structures finds out that a 9-inch wall is only 8-inch in Winnipeg and Vancouver. The terra cotta maker and stone mason makes his bed joints 12 inches or 13¼ inches high



Roman Bricks



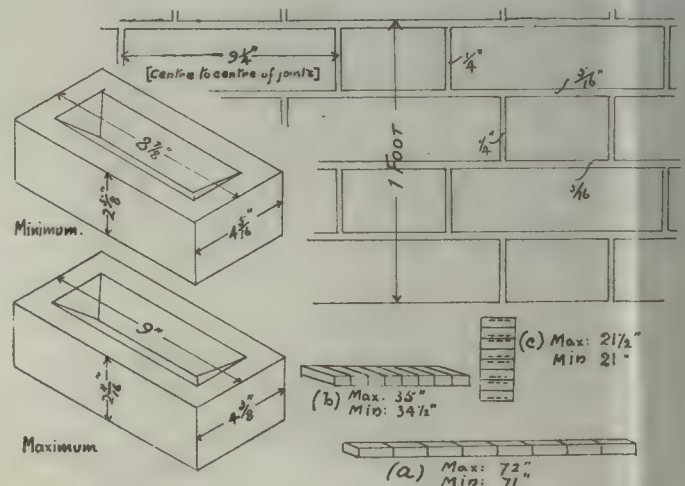
used in the colonies (England and France) were of very good clay, well tempered and burned, but no standard of size was used. They ranged from 8 inches square by 1¼ inches thick, to 11 inches by 17 inches, by 2 inches thick. A block of Roman brickwork measured at Bath is shown in the sketch. The bricks were warped considerably in the burning. They were scratched on the back to form a key for the mortar. The brick earth of which they were made was close, fine grained and well burned.

The earliest English bricks were made about 1260. These are about 9¾ inches long, 4¾ inches wide and 2¼ inches thick. They are to be seen in the south and east of England, where stone is not found, notably in Little Wenham Hall, Suffolk. I have measured old bricks—15 inches long, 5 inches wide and about 3 inches deep—of the late fourteenth century in Suffolk. A similar brick was used at Waltham Abbey early in the fifteenth century, built in the Flemish style.

The modern or Flemish brick used to-day is approximately 9 in. x 4½ in. x 3 in. This approximate size is accepted as the most useful by everybody on both sides of the Atlantic, where the metric system of measurement does not exist, but, strange to say, on this side, where everything is standardized, brick

according to the thickness of the brick used; he is not sure then that there will be a good bond between his work and the brick backing. In order to expedite his work the contractor often has to get his bricks from a distance and these are nearly certain to be of a different size. I have seen facing bricks that were specified to rise 4 courses to 12 inches have a ¾-inch joint, i.e., 2½ inches of mortar to one foot of brickwork, or twice the amount of settlement in the work that there should be, and quite twice the amount of labor.

In England, a standard size of brickwork has been adopted between the manufacturers, architects and engineers, under the title of "The R.I.B.A. Standard Size of Bricks." This is as follows: (1) The length of the brick shall be double the width plus the thickness of one vertical joint; (2) brickwork shall measure four courses of bricks and four joints to a foot. Joints shall be ¼-inch thick, and an extra 1-16, making 5-16 for the bed joints to cover irregularities in the bricks. This gives a standard length of 9¼ inches



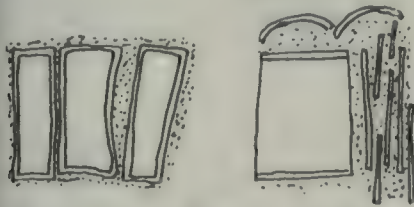
The Standard Brick.

centre to centre of joints. The bricks shall be laid dry to be measured in the following manner: (a) Eight stretchers laid square end and splay end in contact to measure 72 inches; (b) eight headers laid side by side, frog upwards, to measure 35 inches; (c) eight bricks, the first brick frog downwards and then alternately frog to frog and back to back, to measure 21½ inches. A margin of 1 inch less will be allowed as to (a) and ½-inch less as to (b) and (c). This is to apply to all classes of walling bricks, both machine and hand made.

Tile Arches and Partitions

The latest advance of brickmaking is the manufacture of hollow brick or tile. These are hollow squares of clay, stiffened with webs as necessary. They are used for walls and arches, particularly in skeleton steel structures where weight is a consideration. They are particularly useful for fireproof partitions and floors and are made in all sizes and shapes to suit these requirements. The wall tiles are 12 in. x 12 in. and from 2 inches to 12 inches in thickness.

The tile arch is used extensively in modern steel structures to form the floors. It encases the steel



Roman Arch Tiles. Section.
Size $4\frac{3}{4} \times 12\frac{1}{2}$ " } Thickness of Clay $\frac{7}{8}$ "
8 5" x 9"

and makes the floors fireproof. It is also very light, averaging 40 pounds per foot for a tile 12 inches deep. The arches are made in spans up to 10 feet and are from six to sixteen inches thick. On a span of 7 feet a 12-inch arch will take a safe uniform load of 200 pounds per square foot.

The same method of construction was used by the Romans in the floors of their Baths where they had heating ducts underneath. A sketch showing a part of one of their floors, as used at Bath in England, is reproduced herewith.

A recent improvement noted in the United States is the brick-setting machine introduced in the West. The idea of handling brick by machinery originated in New England, and a plant was equipped several years ago with an elaborate system and was the first to use the "unit stack." By this system the unit for handling was 1,500 bricks. This plant was destroyed by fire and was never rebuilt. In 1909 a system of handling from 600 to 1,000 bricks on a somewhat different plan was put into successful operation in the West, and is now being used in Chicago. By this system it is possible for the brick to be carried from the molding machine to the drier, from the drier to the kiln, and from the kiln to the stock yard or the delivery car or cart without being touched by hand. Each of these machines is said to do the work of 40 men.



New Club House at Westmount, Que.

M.A.A.A. Club House, Westmount, Que.

This club house is a fireproof building constructed of grey pressed brick. It is built for the Montreal Amateur Athletic Association and is situated on St. Catherine street west. The equipment is of a very complete character and includes shower baths, about 6,000 lockers, training rooms, dormitories, a restaurant, and lounge and reading rooms. Messrs. Robertson Brothers were the contractors for the brick work and the Atlas Construction Company for the fireproof work. The stone work was supplied by Quinlan & Company. Messrs. Ross & Macfarlane are the architects.

To Remove Paint from Brick Walls

Dissolve 10 pounds of caustic soda or saponified lye in 5 gallons of water, and stir into the solution 5 quarts mineral oil (the cheapest grade will answer); add enough sifted sawdust to make a pasty substance that will hold on a wall without running down. Plaster this thickly on the old paint, and in a few hours scrape off the resolved substance. If you wish to repaint the wall, rinse well with clear water, and apply a coat of vinegar to neutralize the alkali that may have remained in the pores of the brick.

Or, slake in one vessel a quantity of builders' lime, and in another vessel dissolve a similar quantity, by weight, of soda ash, leaving over night. Mix the liquor from the soda ash with the slaked lime next day, adding enough whiting to make a paste, and apply this to the old paint. In this case it is also necessary to rinse the wall from which the paint has been removed, giving it a coat of vinegar before repainting.

A Clayworker's Epitaph

It was a fitting tribute to the life and work of Anton Vogt, jun., son of Anton Vogt, the well-known American kiln expert, that the monument, recently erected on his grave at Guilford College, N.C., should be of clay. The monument was in the form of a cross and was made of terra-cotta, with a white enamel finish. The inscription was especially appropriate:

"He was of clay, he worked in clay,
He died as clay and returned to clay."

Rough-Textured Brick in Architecture

Character and Beauty of Old Colonial Brickwork—Artistic and Restful Effect of Rough Texture—Its Durability and Economy

Specially Contributed by J. Parker B. Fiske, S.B.

IF one makes an examination of the charming brickwork of the Colonial period of America, he will find bricks with considerable variety of color, a decided roughness of surface and great irregularity in shape. This brickwork, however, has a wealth of rich, soft, warm effects and has been rendered more pleasing, each succeeding year, by the action of the sun, rain and frost.

The writer suspects, however, that the character of this charming old brickwork was due to the force of circumstances rather than to an appreciation of its inherent art by the old Colonial builders, for the bricks were made by hand and were therefore crude and rough, and it was therefore necessary to lay them with a liberal mortar joint. For this reason, the finished wall had a certain ruggedness



A Good Colonial Brick Building

ments," the whole character of American brickwork began to change. The bricks lost their ruggedness, the wide mortar joints gradually shrank in size to the thickness of cardboard, and the surface of the finished brickwork took on a "slick and smooth" appearance, wholly unknown in the brickwork of former times.

For many years such brickwork was considered the perfection of art. The brickmaker was urged more and more to improve the mechanical qualities of his brick and to shade them one even, flat color, while the bricklayer was trained to suppress the joint as much as possible. As brickwork thus gained in mechanical perfection, it lost in art. until the best brick walls became dead and characterless.

Is it any wonder, then, that the public came to re-



"Paint-pot Brickwork."—One of these walls has a painted surface, the other is genuine brickwork—the smooth, conventional kind, laid with a narrow mortar joint.—Which is which?

quite in keeping with the homespun clothing and the beautiful rag carpets of the day.

With the invention of the power press and the auger machine, it became possible to make a brick with a smooth surface, perfect edges and corners, while improvements in the burning process gave great evenness of color. As the result of these "improve-

ment" brickwork as most prosaic, necessary, it may be, to shelter mankind from the heat of summer and the cold of winter but wholly devoid of all human interest, except from a purely utilitarian standpoint?

One good authority on architectural matters has expressed the opinion that the old "Philadelphia" style of brickwork did more to retard the develop-

ment of brick construction in America than any other one thing.

Happily we have awakened on this subject. We have discovered that the old Colonial brickwork, because of its very roughness and variety of color, is full of beauty and real interest, reproducing to some extent, as it does, the colors and textures of Nature's own handiwork.

This awakening has been coincident with the development of rough textures in many works of man. The highly finished broadcloth with its flat color,



Brick work in Old State House, Boston, Mass.—A decided roughness and great irregularity of shape.

is no longer popular for men's clothing; the smooth, shiny, varnished surface has largely disappeared from our furniture; wall paper has taken on a rough texture; the rough stained shingle is superseding the painted clapboard; and even in men's hats, the rough-textured finish is rapidly displacing the smooth felt of a year ago. Everywhere man is discovering that rough texture means softness in effect—therefore

easily discovered. The smooth brick seems to shout for attention; it reflects the light; it has a glare and shine unpleasant to the eye; it is a solid monoton-



Rough-textured Brickwork with the "rough cut flush" Mortar Joint one-half inch thick.

ous color, while the mortar joint, which deserves frank treatment at the hand of the builder, is reduced to a narrow white streak. On the other hand, the



English Bond



Flemish Bond

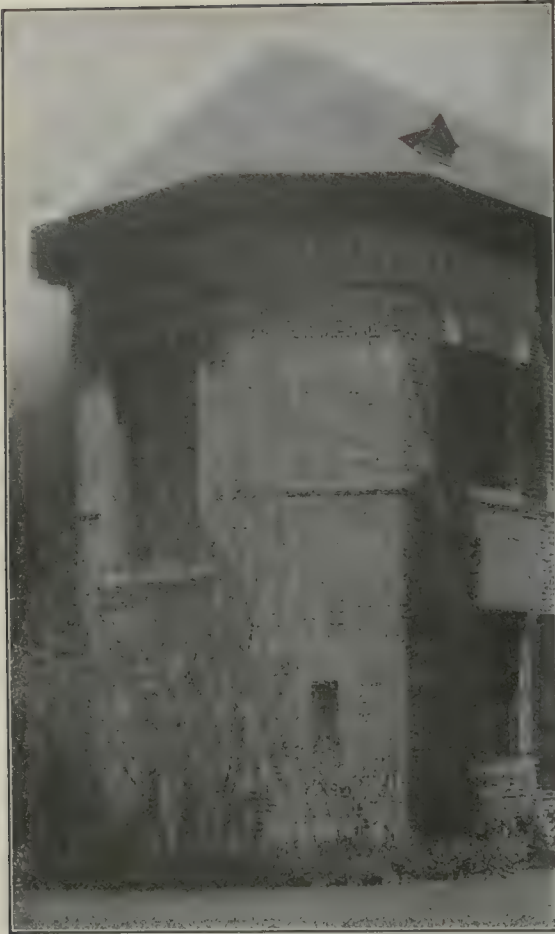


Building at Cedarhurst, L. I. Louis Boynton, Architect. Note the Diagonal Lines created by the use of the "Dutch" Bond.

restfulness to the eye—therefore good art.

As one stands before two brick walls, one of the smooth type and one of the rough-textured type, the reason for the more pleasing effect of the latter is

rough-textured brick has softness and "depth" of effect, and its colors, if skilfully blended, recall the colors of the grass, the flowers or the autumn foliage. It is pleasant to look upon because it is quiet, dig-



House at Oyster Bay, L.I.—Carrere & Hastings, Architects. The Rough-Textured Brick lends itself to both Structural and Decorative Use.

San Stefano, Bologna, Italy



Glazed Tiles, Marbles, Flints, and other Foreign Material were used for Decoration in Mediæval Brickwork.

nified and full of repose. It seems to have grown upon the spot.

These principles, so long forgotten, are now re-asserting themselves with ever increasing force and the rough-textured style of brickwork, in a multitude of soft, warm, blending shades, is rapidly taking the place of the smooth, "paint-pot" kind.

No sooner was the charm of Colonial brickwork "re-discovered" than inventive genius set about improving it along really artistic lines—not by making it more perfect mechanically, which was the fatal mistake of thirty years ago, but by adding to its softness of appearance and richness in color. A new texture, far better than that of the old water-struck brick, was obtained by wire-cutting the surface. A wonderful range of soft, beautiful colors was obtained by burning at a white heat in down-draft kilns, and new methods of selecting the finished brick and blending them together in the wall were developed.

A further interest was added to the finished wall



A Fireplace of Rough-Textured Brick

by the more liberal use of various European "bonds," in which the heads of the brick were turned outward and patterns in the brickwork thereby created.

Coincident with this "blossoming out" of the brick itself has been the rapid development of the wide mortar joint to a point where the mortar is allowed to stand out honestly in the finished wall frankly expressing the purpose for which it was used and really adding to the beauty and interest of the resulting work. The rapidly increasing thickness of the mortar joint has made it necessary to study the composition of the mortar, to adopt more accurate methods of mixing the ingredients than were formerly used, for the wide present-day mortar joint constitutes from a quarter to a third of the entire wall surface and must, therefore, be given careful treatment. A new method of finishing the joint has also been devised largely through the use of coarse,

rough sand and small pebbles, with the result that a pleasing texture is obtained quite in keeping with the brick itself.

The adoption of rough-textured brickwork, the individual brick units of which are more or less rough, and the development of a wide range of color is bringing about a great change in the decoration of wall surfaces, for it is now possible to cut the brick into almost any desired shape while the clay is still soft, and to burn it to almost any desired color and with this material to develop a great variety of brick pattern work. The brick-builder of mediaeval times was obliged to use glazed tiles, marbles, flints, and other "foreign" materials for the decoration of his brick surfaces; the modern brickwork artist finds it possible to use a single material for both his plain wall and his decorative work.

The best authorities tell us that "architecture is the art which seeks to harmonize in a building the requirements of utility and beauty." The rough-textured brick readily lends itself to both structural and decorative use, and therefore, meets the requirements of good architecture in the highest degree.

Coupled with all the artistic advantages of rough-textured brickwork is its durability and economy. At



A Good Brick Residence.—Silver House, Cleveland, Ohio.

falls on the smooth wall stands out in plain view to mar its beauty. Moreover, every passing shower which falls upon the smooth wall causes the dirt to run down in streaks, while upon the rough surface the dirty water settles in the crevices of the brick and is largely lost to view. Perhaps a comparison of the kitchen oil cloth with its smooth, glossy surface and the Turkish rug in the parlor with its thick nap will make the matter clearer. The oil cloth shows every



Brickwork in the Baths of Titus, Rome, A. D. 80.—An almost exact prototype of the Modern Rough-Textured Brick.

first thought the objection arises that the rough-textured brick will gather dirt and become more unsightly than the smooth brick. Exactly the opposite is the case. The reason is not difficult to discover upon consideration. The same amount of dirt falls on the surface of both the rough and the smooth surfaces; much of the dirt on the rough wall is, however, hidden in the crevices of the brick, while all of the dirt which



McAlpin Hotel, New York, the largest hotel in the world.

foot-print, while the Turkish rug—although it may contain much more dirt—does not thus offend the eye. However much we may theorize on this subject, the results of five years of practical experience and careful inspection of hundreds of buildings of both the smooth

and rough types of brickwork, reveals the fact that the rough-textured walls, although they gradually tone down and soften in the weather, invariably present an attractive and cleanly appearance, free from the disfiguring streaks and blotches so often seen upon smooth exterior surfaces.

Rough-textured brickwork is highly economical, not only in its maintenance but in its first cost. The brick themselves cost no more than first quality smooth brick of a corresponding color while the cost of laying, if proper methods are employed, is considerably less.

The writer is constantly receiving assurances from contractors who have followed his method of mortar mixing and brick laying that rough-textured brick can be laid for less money than the smooth, perfect brick. The reason for this is apparent upon consideration. The rough-textured brick, with its thick, coarse mortar joint, does not require the same nicety of workmanship as smooth conventional brickwork; the brick are simply tapped down to the line without too much accuracy and the surplus mortar, which has been squeezed out of the joint, is cut off with the trowel. No pointing, ruling, tucking or other extra finish is required. One contractor, who has recently finished a large operation, goes so far as to state that the cost of labor of his face brickwork has been little, if any more than that of common brickwork.

A Renaissance in brickwork is here. The real value of brick, not only as a practical but as an artistic material, has once more made its appeal to the public. Brickwork has taken on a new interest, hardly dreamed of ten years ago. This is shown with singular clearness by the liberal use of brickwork in our popular magazines. The brick wall (invariably of the rough and artistic type), has been used recently for the decoration of front covers of several leading monthlies, and even the advertisers have adopted the brick wall as a suitable background for their story. The entire back cover of recent issues of the Saturday Evening Post and of Everybody's Magazine, consisted of a brick wall against which was a tablet advertising a dental paste.

The magazines, however, are merely mirrors of public taste and opinion. They are popularizing brickwork simply because it is already growing popular. Throughout the East numberless buildings of all kinds are being clothed in soft, rich, attractive rough-textured brickwork. The rich man is using it for his home—for his mansion, his stable and for the decoration of his garden; the man of moderate means is adopting it for his cottage or bungalow; the railroads are using it for their stations; the Government is using it for hospitals and post offices; cities are using it for their schools and other public buildings, and investors are using it for apartments, hotels, stores, and a great variety of work.

Rough-textured brick is now being used for three of the largest Government hospital buildings in the world, for the largest high school in the world—the Washington Irving of New York, and for the largest hotel in the world—the McAlpin of New York. On the other hand, thousands of fireplaces in the most modest as well as in the most pretentious homes are now being built of this new-old material.

A brick which is structurally sound, not too expensive in its first cost, easy to lay, economical in maintenance, pleasing to the eye upon frequent examination and re-examination, and which possesses

to the highest degree the possibility of self-decoration, fulfils the requirements of a perfect building material. Coupled with all these important points of superiority are the advantages common to all brick, namely, fireproofness, weatherproofness and freedom from depreciation.

Such is a good rough-textured brick and it may safely be asserted that it has come to stay and to take a place in the building world which, as time goes on, will become more and more important as its superiority becomes better known.

New Building for Gordons, Ltd., at Victoria, B.C.

Plastic in nature and lending itself readily to the fancy of the designer in modelling and coloring in a way not obtainable in any other permanent building material, terra cotta has been used for centuries where freedom of design has been required. In architecture terra cotta may be used appropriately



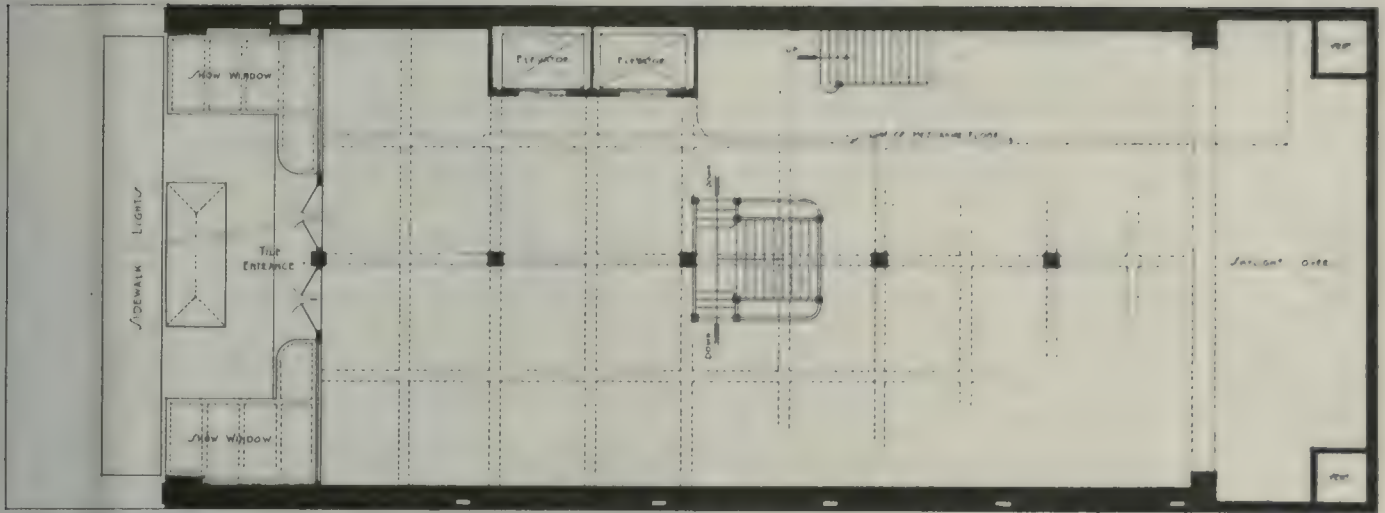
New Building for Gordons, Limited

where stone cannot be employed, the latter being a dignified material more suited to massive work.

A notable example of the successful use of terra cotta is the front of the building of Gordons, Limited, recently completed at Victoria, B.C., by Mr. Thomas Hooper, architect, of that city. This building is situated on Yates street, Victoria. Yates street is not as yet a principal thoroughfare, so it was decided to use an exterior illumination scheme for advertising effect. The design was influenced by this decision and the necessity for plenty of large plate glass areas for daylight and show-window purposes. The nature of the building called for a radical departure from orthodox design and terra cotta was chosen to carry out the scheme.

The necessary glass areas and illuminating possibilities were recognized and made the principal features of the design. The lower storey is more or less of the usual order. In the upper storeys large plate glass panels are set in frames and divided into vertical panels outlined and enclosed by a frame extending up both sides over the fifth storey.

In the completed building the frame has rosettes



Ground Floor Plan, Gordons' Building, Victoria, B. C.

spaced 34 inches centres with ornament between. These rosettes have a 32 candle power frosted lamp in the centre. On the top storey there will be six large electrolier lamps on mullions and end piers. The lintel over the store at second floor will also have six similar electroliers. The illuminations in the rosettes give a soft, yet brilliant appearance. They do away with the spotty and garish effect of the ordinary exterior lights. In the daytime the lamps are hardly distinguishable except on close inspection.

The building is faced in cream white matt glazed terra cotta and is designed for six storeys.

If you have a wall of brickwork and the bricks are very soft, broom down clean and apply a size of acid water, just enough muriatic acid to sour the water. Let this be rinsed off with clear water, let it dry, then apply all the raw oil the wall will take. This is for a first-class job, and the oil will prevent the chipping of the brick afterwards. The oil makes the soft bricks harder, and also waterproof. Hard bricks will not need so much oil. Where the wall has been filled with raw oil, the first coat of paint should be of good quality, and according to what the finish is to be; if to be painted like wood, it should

be thinned with oil and turpentine until the last coat, which should be done with all oil. But if a dead brick finish, then use all turpentine color for the finish, though the priming may be all oil, and the next coat or two half and half, as the dead effect is surer on a partly lustrous ground or on a perfectly full luster.

A building which is somewhat unique in its structural design is that which is in course of erection above the four tracks of the New York Central Railroad at Tremont and Park avenues, New York City. The entire building will be carried by steel columns located on the sidewalks and as there is only 2 ft. between the first floor and the space required by the railroad, it has been found necessary to carry the building by lattice steel trusses 8 ft. wide and with a span of 62 ft. The building has a depth of 100 ft. in Park avenue and a width of 66 ft. The ground floor is laid out as an arcade, with stores on either side, while the railroad platform will be reached by a stairway. An elevator will be installed for the upper storeys which will be utilized as store-rooms. The building is being constructed with a reddish tapestry brick facade and terra cotta trimmings and a green tile roof.



First Floor Plan, Gordons' Building, Victoria, B. C.

Classes and Varieties of Building Brick

Developments in Canada During Last Three Decades—Manufacturing Process—Wide Range of Selection for Present Day Architect

Specially contributed by E. F. Dartnell, Montreal

THIRTY years ago in Canada the bricks that were used in building were almost all of a cheap kind, made by the soft mud process and only in the red, and what was known as white, buff, or grey, brick. While some of these were of a good quality a large number were very inferior, and in a few years, if exposed to the weather, showed signs of deterioration, and in some cases completely crumbled away. Just across the street from where I am writing there is a brick building erected about 25 years ago in which three times during the past twelve years a large number of the brick has had to be taken out and replaced by new, much of the damage being caused by water from the gutter and gutter pipes running over the wall and-freezing and thawing repeatedly.

About thirty years ago dry pressed brick began to be used in the United States and Canada, and for a number of years were considered the acme of perfection in the brick world. As a general rule they were a very well finished smooth and durable brick and carefully sorted as to shade, the great object aimed at being an absolute uniformity of color in the building. At the same time a very large number of moulded ornamental brick were made, and their use in the walls of brick buildings was very general, as well as for fireplaces. At this time in Canada, or at all events in the provinces of Quebec and Ontario, the red and the buff (or so-called white) brick were the only colors known.

Within the past few years a great change has taken place throughout the United States and Canada in brick and brickwork. Some years ago a brick building or brick front was looked upon as being necessarily cheap and much inferior to stone. To-day it is

manifest that a great change has taken place in the manufacture and use of brick, and the best architects are using them largely for work of the highest class and with very happy results. At present manufacturers are turning out brick in every variety of texture and color, white to black, pink, through every shade of red to dark crimson and brown, all shades of yellow, grey, green, mottled, ironspots, etc., and in a great variety of sizes from a small "pony" brick 6 in. by 3 in. by 1 in. to brick measuring 18 inches by 6 in. by 2¼ in., and from a very smooth to an exceedingly rough surface. The architect having at his disposal an almost unlimited range of color, instead of having a building with the walls of one uniform shade, is using as great a range of color as can be obtained from the one clay—in reds using the kiln run from a light red to brick that is almost, if not altogether, black; in greys from a light mouse grey shading off to a dark grey brown; and at other times using a combination of various colors as well as shades.

In many of the brick a great range of color is obtained from the natural clay or mixtures of different clays, while with other clays iron ore, manganese, iron oxides and other substances are added to and used with the clays and burnt into the brick, giving an architect an endless variety to choose from.

With regard to the class of work in which bricks have been used; some of the finest buildings architecturally, in existence to-day are largely, or altogether built of brick. In Italy there are many splendid examples; in England a large number of churches, castles and stately mansions and other large buildings, to say nothing of the cottage homes, are of brick, the Queen Elizabeth School at Winbourne, built in the 16th century, being a good example. Hampton Court,

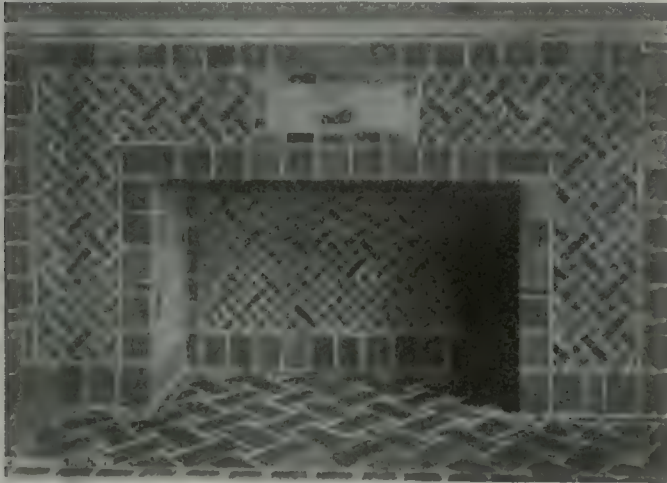


Queen Elizabeth's Grammar School, Winbourne, England, built in the sixteenth century

London, is another, and the new Roman Catholic Cathedral at Westminster, London, is one of the most recent.

In travelling about England you again and again come on brick buildings and walls, some of them centuries old, put up apparently without the least intention of pleasing the eye, but that strike you at once for the exquisite blending of color and texture, the brick used being common, cheap, local brick, but thoroughly burnt and built in without any attempt to sort as to color or shade.

It is astonishing the effects that can be produced through the proper use of brick. While with many of the high grade dry pressed brick, carefully sorted to the one shade and laid up with narrow mortar joints,



Fire place built of tapestry brick of a rough texture for a studio in New York.

the effect was very apt to be as though the walls had been painted over. To-day bricks are used in a great range of shades and with very wide mortar joints, giving them an exceedingly artistic appearance; and in the course of a few months they get a weathered effect that you can never obtain with a smooth brick of an even color.

In New York you will find bricks of many kinds and colors used in the fronts of large and expensive buildings. The Colony Club House is built altogether of black headers, with wide, white mortar joints; the Masonic Temple is of a mouse grey color made from a rough faced brick, the effect being as if the building were faced with velvet; and the Lotus Club is of a somewhat similar grey brick.

In Canada we are now using a great variety of brick—Canadian, English, Scotch, Welsh and American. In the cities of Montreal and Quebec a considerable quantity of Scotch fire brick have been used; and among other buildings the Chateau Frontenac at Quebec and the Place Viger station and hotel in Montreal are good examples of their use.

Up to recently there was but little variety in color in our Canadian made brick, but in the last two or three years the "Don Valley" in Toronto and "La-prairie" in Montreal, as well as other yards, have been turning their attention to producing new colors and textures, and in some cases with very good results.

While color and texture have a great deal to do with the successful use of brick, another very important point is the mortar and mortar joints. With the dry pressed brick the joints used to be made $\frac{3}{8}$ to $\frac{3}{16}$ of an inch thick; with the rough faced brick

now coming into general use the joints are made from $\frac{3}{8}$ to $1\frac{1}{4}$ inches thick, and laid with mortars of various colors to suit the taste of users.

In enamelled brick England leads the world for quality and finish, although there are many yards in England and Scotland turning out brick that are not strictly of the first quality. As yet the United States have not attained the high standard that the best English yards have set up, yet some of them are rapidly improving their products and will likely soon turn out a brick equal to the best English makes. Some of our Canadian yards have recently been turning out these bricks also. In the quality of their common brick the English are well to the front, while in fine face brick, whether dry-pressed, plastic, or re-pressed plastic, the United States takes the premier place, if not for excellence, certainly for variety in color, texture and the number of different sizes made.

Speaking of the use of brick, Ruskin, in his "Stones of Venice," says, "Our fields of good clay were never given us to be made into oblong morsels of one size. They were given us that we might play with them, and that men that could not handle a chisel might knead out of them some expression of human thought. In the ancient architecture of the clay districts of Italy every possible adaptation of the material is found exemplified; from the coarsest and most brittle kinds used in the mass of the structure to bricks for arches and plinths, cast in the most perfect curves and of almost every size, strength and hardness; and moulded bricks wrought into flower work and tracery as fine as raised patterns upon china. And just as many of the finest works of the Italian sculptors were executed in porcelain, many of the best thoughts of their architects are expressed in brick, or in the softer material of terra cotta; and if this were so in Italy, where there is not one city from whose towers we may not



Tail of brick in MacLean residence, Washington, D. C. Illustration shows 18 long red tapestry brick laid up with $1\frac{1}{4}$ in. mortar joint.

descrie the blue outline of Alp or Appennine, everlasting quarries of granite or marble, how much more ought it to be so among the fields of England! I believe that the best academy for her architects, for some half century to come would be the brick field, for of this they may rest assured, that till they know how to use clay they will never know how to use marble."

NOTE.—The illustrations used in this article are reproduced by courtesy of Messrs. Fiske & Co., Inc., New York.

The Expression of Tiles in Many Places

Individual Treatment Suggestive of Hospitality, Comfort, Light—Practical Advantages: Fireproof, Permanent, Non-Absorbent and Sanitary

By Charles F. Binns

THE tile as an interior finish and decoration originated in the Orient, probably in the apartments of the women. The small and closely latticed windows made the interior dark, and the enameled tile became necessary as a reflector of light. For centuries the Western world neglected the use of tile, but, in course of time, they came into employment in Germany for the covering of stoves, and in Holland for the framing of fireplaces.

Floor tile owes its origin to the Roman tessellated pavements, which, however, were made of colored stones. The English introduced encaustic tile in the middle ages, when they were used for the pavement of churches, being made for this purpose by the monks. The true encaustic tile is of two or more colors, the design being cut out of the body clay and inlaid with clay of a different hue. Later on, the potters of Staffordshire, led by Maw and Minton, modified this method and made each tile of a separate color, laying them in the floor in geometric patterns, and thus returning in part to the Roman plan.

More recently, there are indications that the tile is coming into its own. It is being recognized, upon several grounds, as the most satisfactory medium of structural decoration. It is at once fire-proof, permanent, expressive and sanitary,—a combination of qualities which can be claimed by no other material.

The use of tile in the modern house began in

two ways: in the fireplace as a fire-proof decoration, and in the bathroom as a sanitary and easily cleaned wall covering. From these two points of departure the possibilities of the use of tile are spreading fast and far. The early fireplace was a large structure of brick or stone, arranged for the burning of wood. With the increasing use of coal and gas, the primitive wood-fire was abandoned, and with it the open fire disappeared. This was a household loss, for there is nothing which speaks for home so powerfully as the hearth-stone. It is coming back to us, thanks to the tile, no longer now a mere frame set in an iron casting, but a real structure of burned clay. Harmonious in coloring, massive or simple, as the architecture of the home may demand, the ingle-nook of our forefathers is revived in many a household, which erstwhile struggled along in the endeavor to make a home center of a mica-windowed stove or a steam radiator. The tile hearth is safe in the midst of falling sparks or cinders, and yet it is as beautiful and as individual as the most costly rug.

But this use of the tile is only a beginning. The fireplace represents but one half of the home life, the other half is the open porch or broad terrace. Out-of-doors, or only partially under cover, a wooden floor has many objectionable features. For adequate protection, it must be painted; and painted wood does not accord with the best ideas of sincerity in structure. Cement is possible, but devoid of all character and individuality. The floor of vitreous tile is unexceptionable. Tile for such purposes are now made so as to be perfectly non-absorbent. They may be small in size and laid in a decorative design, or they may be large and square, laid with straight joints after the manner of a checker-board. This is more satisfactory than the old plan of broken joints, where the tile were laid alternately. In this case, there are straight lines in one direction and broken lines in the other. In the straight-joint laying, the straight lines run both ways. There is also the possibility of having broken lines in both directions, but this involves the use of tile of two sizes.

Vitreous tile are made in many colors, but there is nothing better than the natural warm red of the burned clay. In some situations a light-colored floor tile is admissible, but the porch is scarcely the place for it. It rather suggests the hotel corridor or the lavatory. These tile are proof against moisture and frost, and the warm coloring harmonizes with every scheme of decoration. Tiling may also be carried into the ves-



Dining-Room Wainscoted with Colored Glazed Tiles



This German Dining-Room Illustrates the Use of Tiles Abroad

tibule. Here, as in other protected places, the floor may be laid with glazed tile. A brilliant glaze is not suitable for floors, not only on account of the liability to scratch, but also because of a possible danger of slipping. Matt or dull glazes can now be procured, however, in a wide variety of color, and it thus becomes possible to carry out the color idea on both floor and walls. The vestibule is apt to be soiled in wet weather by rubbers, dripping umbrellas and rain-coats, but the tile is easily cleaned and does not suffer in the process.

One of the advantages possessed by the modern tile is that it does not necessarily look cold. The white glazed tile has its uses, but even in bathroom and lavatory it is possible to introduce harmonious colorings. The glaze should be bright of surface, but it need not be white. In fact, where the porcelain bath and basin are white, it is not only a relief to have walls and floor of light, pleasing colors, but the white of the fittings gains in purity by the contrast. A wall surface without embossment is best, as it is more easily kept clean, and at the angle between floor and wall a curved base tile prevents a possible accumulation of dirt. The same principle obtains in the kitchen and pantry. (The desire for sanitary surroundings in the preparation of food gives rise to the glass pastry-table and the porcelain refrigerator, and it is but another step to line the whole of the domestic

work-rooms with glazed pottery. Even the ceiling may easily be tiled, while the floor, laid in vitreous or matt-glazed tile, and the walls, covered with white or light-colored tiles of brilliant surface, defy microbes.

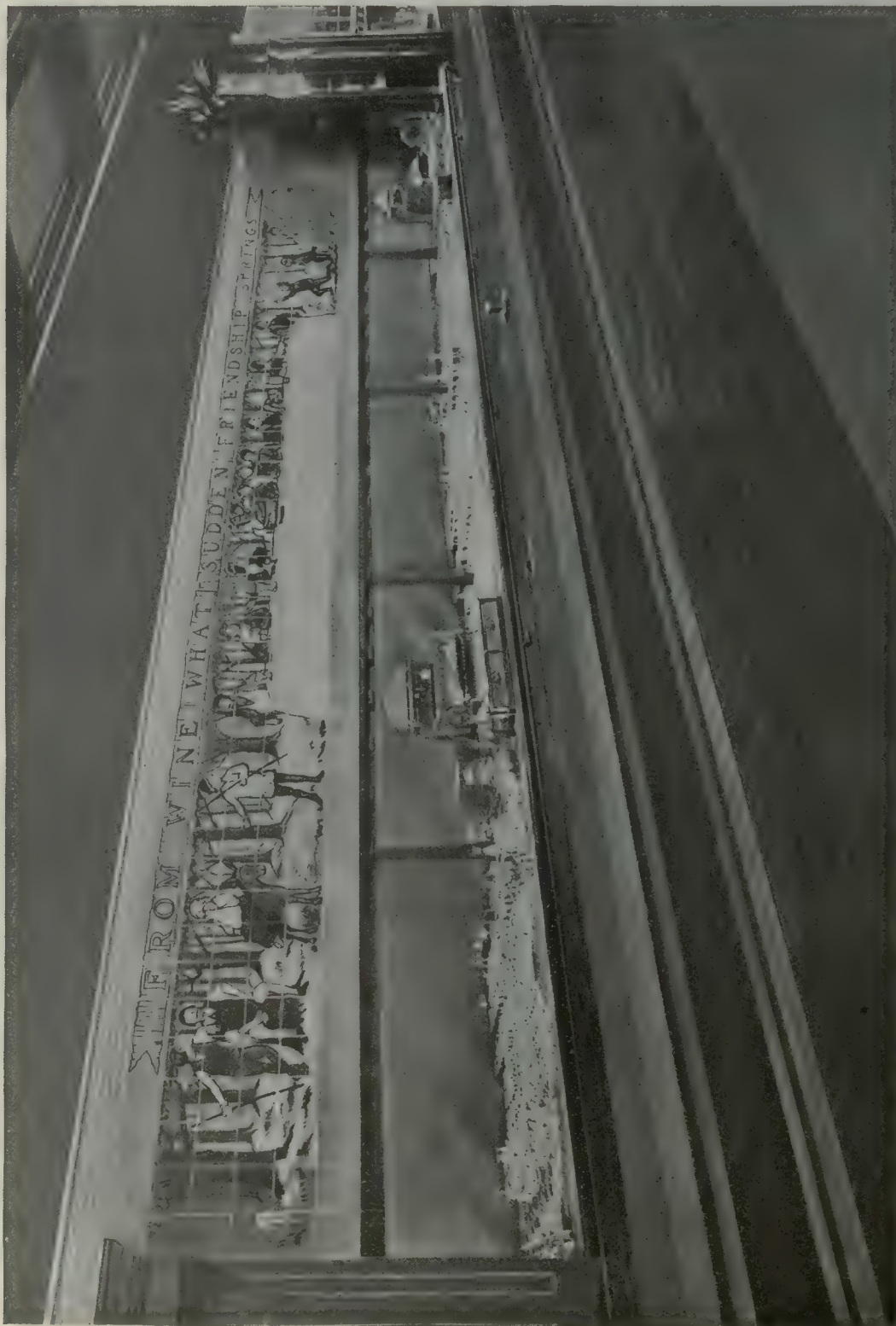
The variety of tiles manufactured, the extensive palette of colors both in unglazed, matt-glazed and bright-glazed surfaces, makes possible the indulgence of individual taste to an unlimited extent. In fact, in no other material can diversity of choice be found combined with permanence, utility and health.

Naturally, the choice of the individual finds its fullest expression in the chamber. The living-room is for all,—it is the family center and speaks of the home life. The chamber is one's own, and here a large part of the personal life is spent. Tile may be used in the fireplace. Painted in blue, Dutch fashion, a delightful homely effect is produced. Here, lounging in negligence before retiring, one may invite one's soul without loneliness, for the humanity of clay wares is always satisfying. The fire-light winks confidentially from the tiled hearth, and the face of the bureau shines in sympathy. The wash-stand is, of course, tiled on top and back, in accordance with the scheme of the room, and, whether the occupant be man, matron or maid, the tile is not found wanting; for it will be virile, or domestic, or dainty, as desired, so that the room will speak the life of its owner.

Those who believe in the doctrines of "The



Entrance Hall in which Tiles are Used for Floor as well as Ceiling



Tile Panel, "The Feast of the Foresters," in the Tap Room of the Hoffman Cafe, Montreal. Tiles for entire Wall Insert over Bar made by Trent Tile Company, Trenton, New Jersey. Architect, Mr. J. Wechselberger.

Colonel" will set apart a room as the nursery. The wall, to a height of four feet or more, will be covered with a bright glazed tile of light, warm color, the base tile being curved to meet the floor. At a height to meet a child's eye, there will be a frieze of the characters dear to childish hearts. The story of Cock Robin or the tales of Mother Goose will be told in simple colors. The walls defy scratches, and the marks of sticky fingers are easily erased.

There is one room in the house around which there hovers an air of mystery, and within which congenial souls alone may gather. It is known as the "den." Designed at first for the exclusive use of the sterner sex, it is found that others have a longing for entrance which will not be denied. Not that there is a strong opposition, for men have an instinctive pleasure in receiving their fair friends amid guns and fishing-tackle. There is comradeship here as nowhere else. But what of the tile? A rich red unglazed floor, which mud and cigar ashes cannot spoil; a wide fireplace for blazing apple loge; walls tiled four feet high in a warm green matt-glaze; perhaps a table with tiled top, for creature comforts are sometimes spilled. Let us away with the musty "cozy corner." With tile and leather and fumed oak, comfort and beauty can be secured without the sacrifice of health.

One of the advantages of tile in a scheme of decoration is the fact that it consists of small units. A colored plaster wall is one large surface. The tone is dull and unbroken, as it were a single note of music in the air. A wall of glazed tile is as a full chord, or as the overtones of a perfect bell; for tile cannot be made of exactly the same shade and color. In this variation there is an unparalleled artistic advantage. • It does not force itself upon the attention, but



Porch Floor Laid with Red Quarry Tiles

is sufficient to create a vibration of color which is of unfailing interest. This refers, of course, to self-colored tiles. More detailed decoration can be secured at will, either by inlaying a design with tiles of different colors or by decorating the tiles themselves. A combination of both may be used to advantage, but for dignity and simplicity there is nothing better than the self-colored tile, whether in floor or wall.

It is said that imitation is the sincerest flattery, and, if this be so, tile as a material has been most enthusiastically complimented. Burned clay is the most enduring substance known. The excavations of ancient cities prove this. The only genuine tile is that made of clay and burned to a proper density.

Sometimes the plaster of the wall is worked off in rectangular spaces, to suggest the laying of tile. Those who advocate the beauty of uniformity should consider this method of securing what they desire. Here is the possibility of mathematical accuracy in line, combined with the perfection of a smooth coat of paint. It is absurd, however, if one really wants the true tiling effect, and is a mistake as adopted for economy in decoration.

In this connection, a word should be said in regard to the laying of tile. The modern school of decoration has discarded the idea of dead uniformity of color in favor of natural variation, as in wood and burned clay. It has also advocated the recognition of construction lines as essential to good design.

The brick wall is no longer laid with hair joints, the mortar being colored to match the brick, but the inevitable joints are frankly recognized as a necessary part of the structure, and therefore an essential in the scheme of color. The same is true of the tile. As it is not intended that the whole wall is one piece of clay, no attempt is or ought to be made to conceal the joints between the pieces. The idea is that of construction, and the work should honestly show how it is put together.

A dark-colored cement is better than white, for more reasons than one. Some would say that a dark joint will not show the dirt, but this is not true reasoning. On this ground, one might advocate black table-linen. The fact is that a white or light-colored



An Unusual Living-Room in which Tiles have been Used on the Floor

cement is made so by the introduction of ingredients which are more or less porous in their nature. The best cement is rather dark in color and, upon setting, it becomes impervious. By the use of such a material for the setting of tile, the joints may be laid as wide as taste demands, without fear of introducing an element of danger in a resting-place for dirt.

When all is said and done, the value of tile depends upon the way in which it is used. It may be employed to good advantage in any home, large or small, costly or inexpensive, and in ways which too often are overlooked; for, when properly chosen, tiles add much to the appearance and comfort of the house.

The Manufacture of Clay Tile in Ontario

Significant Progress of this Industry—Supply Still Considerably Short of Demand—Freight Rates and List of Makers

Specially Contributed by W. H. Day, Dept. of Physics, O. A. C., Guelph, Ont.

IN 1901, according to the reports of the Bureau of Mines, Toronto, the number of clay tile manufactured in Ontario was 21,592,000 feet. By 1905 the number had dropped to 15,000,000, a decrease of over 30 per cent., and the decrease was gradual. In 1905-6 an educational campaign on the value of drainage was inaugurated by the Ontario Agricultural College and has since been continued by the O. A. C. and other agencies. In 1910 the number was 35,000,000, or 2 1-3 times that in 1905. The clay tile industry has been making strenuous efforts to supply the increased demand—many yards have doubled and some trebled their capacity, and quite a number of new yards have been organized. Still, judging from the inquiries for tile received from time to time by the Department of Physics at the O. A. C. and also from the numerous complaints of shortage of tile made direct to our representatives as they go from place to place making drainage surveys, we are led to fear that the industry has fallen far short of rising to the occasion. In some localities at least, throughout the entire summer just past tile have been shipped in from distances of 40 to 150 miles. Shortages are probably the most prevalent in the vicinity of small yards situated some distance from railways, and which have not enlarged their capacity or where there is only a yard or two in a county. In some districts, when a kiln is to be opened on Monday morning, it is not uncommon to see wagons "line up" on Sunday evening so as to begin loading at 12 o'clock, midnight—from 10 to 20 teams sometimes—and by morning few if any tile left in the kiln, the late comers sometimes having to return with empty wagons.

In these circumstances people in various parts have turned to ordering their tile in carloads from the larger yards with shipping facilities, and which keep a larger stock on hand. So that one asks himself, is the history of the Ohio tile industry to repeat itself. Years ago there were several hundred tile yards in that state, but to-day the number is largely reduced, not because of a reduction in the number of tile being used (they are now tiling half way between the lines laid years ago) but because of the tendency of the age toward centralization of manufacture in all lines of goods. Whatever the outcome may be in Ontario, certain it is that at the present time the distribution of tile is a live question among the farmers. Receiving many enquiries from them as to where tile might be procured has led us to compile a list of the tile makers in the province. It has just been completed, and while intended primarily for their use it will probably be of interest to many of the

readers of the Contract Record, especially those who may be brick and tile makers, or contractors and engineers with some drainage practice.

We have used as a basis the list of clay products manufacturers issued by the Mines Branch, Ottawa; also an unpublished list of brick and tile makers furnished us direct by Mr. Thos. W. Gibson, Deputy Minister of Lands, Forests and Mines, Toronto. All the parties mentioned in these two have been corresponded with, the tardy ones several times, to ascertain just who make tile and who do not. And each one was sent a list of the known tile makers in his county, with a request that he add the names of others. Any who were added were in turn corresponded with, and various names were supplied from personal knowledge of those connected with the Department of Physics. So that we are able to present herewith a pretty complete list of the clay tile makers in Ontario. In all, there are 213 yards. See Table III.

The freight rates also are frequently asked for, so that they too are given, and in tabular form for ready reference. The railways state their tariff as so many cents per hundred-weight for a given distance, in car lots, the car to be loaded to its capacity. As the farmer wants to know the freight per 1000 tile an effort has been made to supply this, as closely as may be. The weight of a tile of given size varies somewhat with the different makers, but those given in Table I have been determined by actual test and may be taken as fairly representative.

Table I. Approximate Weight of Tile of Various sizes

Size of tile	Wt. of one tile	Wt. of 1000 tile	Size of tile	Wt. of one tile	Wt. of 1000 tile
	lbs.	lbs.		lbs.	lbs.
3 inches	5¼	5,250	7 inches	18	18,000
4 inches	8	8,000	8 inches	22	22,000
5 inches	10½	10,500	10 inches	27½	27,500
6 inches	14	14,000	12 inches	33	33,000

Knowing the freight rate for any distance and the weight of 1000 tile, the freight per thousand is easily worked out. The results are given in Table II.

Table II. Approximate Freight Rates on Tile

Distance in miles	Rate per cwt.	3 in.	4 in.	5 in.	6 in.	8 in.	10 in.	12 in.
0-10	3c	1.58	2.40	3.16	4.20	6.60	8.25	9.90
10-20	3½	1.84	2.80	3.68	4.90	7.70	9.62	11.55
20-30	4	2.10	3.20	4.20	5.60	8.80	11.00	13.20
30-40	4½	2.36	3.60	4.72	6.30	9.90	12.37	14.85
40-50	5	2.62	4.00	5.25	7.00	11.00	13.74	16.50
50-60	5½	2.88	4.40	5.76	7.70	12.10	15.11	18.15
60-70	6	3.14	4.80	6.30	8.40	13.20	16.50	19.80
70-80	6½	3.41	5.20	6.82	9.10	14.30	17.86	21.45
80-100	7	3.67	5.60	7.35	9.80	15.40	19.25	23.10

100-125	7½	3.93	6.00	7.87	10.50	16.50	20.62	24.75
125-150	8	4.20	6.40	8.40	11.20	17.60	22.00	26.40
150-175	8½	4.46	6.80	8.92	11.90	18.70	23.37	28.05

Credit Valley Brick Co.	Georgetown
Oakville Pressed Brick Co.	Oakville
Smith Bros.	Acton

TABLE III.

List of Clay Tile Makers in Each County in Ontario

ALGOMA

Name	Address
Alsip Brick & Tile Co.	W. Fort William
Dowker Brick & Tile Co.	Fort Francis
Elliott & Sons	Stelton

BRANT

Card, N. B.	Harrisburg
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BRUCE

Adamson, Wm.	Walkerton
Bell Bros.	Paisley
Brownscombe, H.	Cargill
Mawhinnoy, Robt.	Lovat
Reid Bros.	Hepworth
Ries, John	Carlsruhe
Smith Bros.	Port Elgin
Taylor, Mr.	Riverdale
Wright, Samuel	Chesley
Wright, Wm.	Chesley

CARLETON

Munroe, L.	Carp
Peerless Brick & Tile Co., Ottawa	Ottawa
Taylor Bros.	North Rideau

DURHAM

Crowhurst, W. J.	Port Hope
Hamley, R. H.	Bowmanville

ELGIN

Baldwin, D.	Fingal
Becket, E. C.	Orwell
Brown, John	Vienna
Campbell, Neil	West Lorne
Davenport, B. F.	Orwell
Hodder, Jos.	Dutton
Light, Wm.	Aylmer
McCredie, Wm.	Lyons
McGibbon, D.	Shedden
McKay Bros.	Dutton
McVicar, Robt.	Rodney
Oldham Bros.	Southwold
Ponsford, A. E.	St. Thomas
Smith & Son, Alex.	Cowal
Wehlann & Son	Aldboro

ESSEX

Broadwell & Son, Benj.	Kingsville
Curry, W. G.	Sandwich
Hallett & Son, Robt.	Comber
Hill Bros.	Essex
Malden Brick & Tile Co.	North Malden
Miner, John	Kingsville
Murphy, J. J.	Woodslee
Robinet Brick Co.	Sandwich
Siels & Son, Henry	Comber
Wigle, Jason	Leamington

FRONTENAC

Paisley & Chisholm	Kingston
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GREY

Boell & Son, John	Thornbury
Hallman, J. B.	Hanover
Lowe, Jos.	Meaford
Scott & Gower	Meaford
Smith, W. W.	Shallow Lake
Weppler, Henry	Hanover
Wright, J. C.	Proton Station

HALDIMAND

Canfield Brick Co.	Canfield
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HALTON

Brown, Edwin	Bronte
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HASTINGS

Hill & Sons, J.	Madoc
Fargey & Rollins	Tweed
Reed, Almond	Foxboro

HURON

Cole, S. S.	Ethel
Elliott, S. C.	Bluevale
Elliott, W.	Glenannian
Elliott, E.	Wingham
Foster, L.	Zurich
Govenlock, J. M.	Winthrop
Haist, Fred	Crediton
Haist, Jos.	Crediton
Kerr, Fred	Crediton
Kruse Bros.	Egmondville
Kuhn, Henry	Crediton
Logan & Fraser	Blyth
Miller, Wm.	St. Joseph
Phillips, Thos.	St. Helens
Pitblado & Sons	Benmiller
Sproat Bros.	Egmondville

KENT

Clemens, M.	Croton
Cornhill & Son	Chatham
Dumas & Lowes	Chatham
Fox, Geo. J.	Dresden
Gardiner, Wm.	Blenheim
Hales, Chas.	Northwood
Hitch, John	Ridgetown
Jaspersen & Co.	Coatsworth
Jordan, Lewis	Chatham
King, O. P.	Stevenson Siding
Lindsay, S.	Tupperville
Leatherdale, W. R.	Dresden
Martin, David	Thamesville
Moody, G. W.	Highgate
Neilson, G.	Wheatley
Parks, H. W.	Dresden
Rice Bros.	Dresden
Thibodeau, S.	Wallaceburg
Voakes Bros.	Wheatley
Wardle, John	Blenheim

LAMBTON

Armstrong, Geo.	Cromar
Connel, J.	Cuthbert
Dalton, Mark	Cuthbert
Howlett & Sons, F.	Petrolea
Jamieson, A.	Sarnia
Martin & Co.	Alvinstone
McLean Bros.	Brigden
McCormack Bros.	Kingscourt
McCormack, R. J.	Warwick
Oulette, C. P.	Forest
Richardson & Son, Jas.	Wyoming
Rillett, David	Oil Springs
Shuttleworth & Co.	Petrolea
Sipprell, J. H.	Wilkesport
Walton & Sons	Beaver Meadow
Wehlann & Sons	Cairo

LANARK

Baker, H.	Smiths Falls
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LEEDS

Chase, W.	Phillipsville
Paisley & Chisholm	Washburn
Perfect Brick & Tile Co.	Seeley's Bay
Wilson, R. H.	Gananoque

LENNOX

Whittington, Geo.	Napanee
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LINCOLN

Beamsville Brick & Terra Cotta Co.	Beamsville
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MIDDLESEX

Baird & Son, H. C.	Parkhill
Blake, W. C.	Nairn
Blake, E. D.	Englefield
Crosbie, R.	Evelyn
Currie, N.	Strathburn
Dean, J.	Wardsville
Dean & Co., J.	Woodgreen
Dodge, Geo.	Caingorm
Dodge, Geo.	Calvert
George, J.	Putman
Henry, Jas.	Deleware
Jervis & Son, J.	Dorchester Station
McArthur Bros.	Middlemiss
McMahon, J. B.	Kerrwood
Phinn, Geo. E.	Englefield
Richardson & Sons, Jas.	Kerrwood
Waide Bros.	London

MUSKOKA

Watson Brick Co.	Bracebridge
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NIPISSING

Liskeard Brick & Lumber Co.	New Liskeard
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NORFOLK

Anderson & Irwin	Waterford
Buck Bros.	Port Rowan
Mason, Chas.	Simcoe
Port Dover Brick & Tile Co.	Port Dover

NORTHUMBERLAND

Hall, Mrs. H.	Cobourg
Hircock & Son	Cobourg

ONTARIO

Beaverton Brick & Tile Co.	Beaverton
Snelgrove & Teers	Beaverton
Petty, Chas. K.	Cherrywood

OXFORD

Cherrette, E.	Woodstock
Deller & Son, Geo.	Norwich
Deller, Albert	Ingersoll
Entricken, F. W.	Tavistock
Kaar, J. R.	Brownsville
Marshall & Son, W.	Woodstock
Oatman, A.	Cornell
Pratt, Chas.	Platville
Sinden & Fox	Tilsonburg

PEEL

Brampton Pressed Brick Co.	Brampton
Norton, Alsey.	Bolton
White & Proctor	Caledon East

PERTH

Barnhardt, Wm.	West Monkton
Brick, Tile & Lumber Co.	Stratford
Conway, F. P.	Stratford
Cumberland, J. M.	Listowel
Dungey Bros.	Wartburg
Entricken, F. W.	Stratford
Forman & Sons, J. H.	St. Marys
Hohl, Henry	Lisbon
Janes, W. B.	Mitchell
Johnson, J.	West Monkton
Montoux Bros.	Topping
Red Star Brick & Tile Co.	Stratford
Sadler, W. W.	Dublin
Smith, Henry	Listowel
Stratford Brick Co.	Stratford

PETERBOROUGH

Curtis Bros.	Peterborough
Taylor & Hall	Peterborough

RENFREW

Baker, Geo. E.	Arnprior
Jamieson, J. A.	Renfrew
Renfrew Brick & Tile Co.	Renfrew
Waite, Jno. E.	Forester's Falls

RUSSELL

Emard & Dufort	Casselman
Russel Brick & Tile Co.	Russell

SIMCOE

Bell, Ed.	Gibson
Bemrose, Thos.	Beeton
Coldwater Brick & Tile Co.	Coldwater
Maw, Robt.	Minesing
Norton, W. J.	Alliston
Smith, Edwin	Utopia

VICTORIA

Curtain, Francis	Lindsay
Fox, S. J.	Lindsay

WATERLOO

Bechtels, Ltd.	Waterloo
Bechtel, W. B.	Doon
Dahmer, Henry	Conestogo
Ebbage, Chas.	Berlin
Ott Brick & Tile Co.	Berlin
Hohl, Geo.	Lisbon
Koebel, Wm.	St. Clements
Schaefer, F.	Breslau
Schaefer, F.	New Hamburg

WELLAND

Hooker & Co., D. D.	Welland
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WELLINGTON

Bel Bros.	Drew
Fuller, Geo.	Dracon
Haack & Co.	Drayton
Smith & Calfas	Drew
Stroh, Henry	Wallenstein

WENTWORTH

Hamilton & Toronto Sewer Pipe Co.	Hamilton
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YORK

Dominion Sewer Pipe Co.	Swansea
Don Valley Brick Works	E. Toronto
Macell, Walter	Aurora
Norton, David	Woodbridge
Sawden, Thos.	East Toronto
Snowball, Mr.	Unionville
Stonehouse, Wm.	West Toronto
Toronto Fire Brick Co.	Mimico

E. J. Horne & Son, contractors, Halifax, N.S., are re-modelling a six-storey warehouse for J. M. Murphy, Limited, at a cost of \$50,000. The construction is brick and steel. The building will have a metal ceiling, four elevators with concrete shafts and a system of sprinklers. It will be fireproof throughout.

All appearances point to a decrease in the Montreal building permits for the current year as compared with those of 1910. Last month the permits were 264, of a value of \$878,045, against 295 and \$905,427 respectively in the corresponding month last year. Although more permits were issued for the past eleven months, as compared with 1910, their value was smaller. The total was 3,609 and \$13,957, 210, as against 3,404 and \$15,859.059 in the eleven months of 1910.

A hardware exhibition is being planned to take place in Montreal, in the middle of next February. The Montreal Hardware Section of the Retail Merchants' Association of Canada is promoting the project. The executive committee includes Mr. K. Stinson, manager of the Stinson-Reeb Builders' Supply Company Mr. W. H. Ford, sales manager of the Canada Cement Company, and Mr. W. H. Gerke, manager of the Martin-Senour Company, are on the advisory committee.

The Brick-Making Industry of Manitoba

A History of Only Thirty Years—Improved Construction of Modern Times and its Effect on the Trade—Good Prospects

Written exclusively for the Contract Record

ONE does not have to delve far to get at the start of the brick-making industry in Winnipeg, and that means Manitoba, for a short thirty years practically takes us back to the inception. When the famous boom of '82 started, Winnipeg was little more than a frontier town, bleak and desolate. Then moccasins were de rigueur for winter wear, paved streets were unheard of, the roadways were unspeakable and a large percentage of the houses were of logs. Almost over night Winnipeg took on the dignity of a city, fortunes were made in a day—and lost—and with hopes inflated by boom prices newly-made capitalists sought means to demonstrate their affluence. Then it was that the brick industry had its start, small by the standards of to-day, it must be admitted, but a start, nevertheless, and the men who shaped the brick of that day can now point with pride to their handiwork, for it still holds good. In fact, it would be difficult to find a brick manufactured anywhere in Canada that will better withstand the rigors of the Manitoba climate.

Within a brief thirty years that industry has grown from an annual output of thousands to as many millions, and the greater part of that development has been within the last ten years. Until within very recently, Winnipeg, and in fact every Manitoba town and city has been essentially of brick or lumber construction. Stone for foundations is plentiful in most districts, but east and north of Winnipeg were the only ledges of stone which could be advantageously cut for finishing and trimming. This threw the architect back upon brick for permanent construction until within comparatively recent years.

A glance at the map will show that Winnipeg is not advantageously situated as regards bringing in building material from outside points. It is 1,490 miles to an Ontario point producing anything that would be of service, and half that much to Minnesota. Consequently it was not until Winnipeg business interests and business men arrived at a stage in their financial development that would guarantee the huge expenditure on freight, that architects were authorized to plan for some of the handsome structures that have been reared during the past few years.

Four years have wrought a tremendous change in the appearance of Winnipeg's business blocks and financial institutions. Cut stone and imported face brick are the answers. The local quarry at Tyndall, and those of British Columbia, Quebec and Vermont, have supplied the greater part of the stone, and the greater share of the face brick has come from the United States, Menominee brick being the first favorite in the market. This comes in many tints and is a high grade material, well manufactured; so far as the records show the first of it was brought in about fourteen years ago, since when the demands have grown to considerable figures.

It has been stated that the Manitoba brick is of high grade, so far as wearing qualities go, but it is not ornamental, for with one or two exceptions the only clay found is suitable but for the wet method of manufacture. Analyses go to show that while the clay carries a small percentage of iron salts that might be expected to develop tints in the finished brick, there is so high a percentage of alkali that the tints cannot develop. The result is a brick ranging only

from a dull grey-white to a dull yellow or cream color. The exceptions are pits which produce a brick with a light red and flesh tint. These, however, do not burn evenly, and require a great deal of sorting to get a good effect.

An explanation of the quality of the brick may lie in the fact that in Southern Manitoba deposits of clay have been located which burn into a fair quality of hydraulic cement, and all of the brick clays being worked show this quality to a greater or less extent. The result of burning and exposure to moisture is a very lasting brick, which seems to improve with age. In fact attention has been called to some of the older buildings of the city, those dating back to 1885 where the brick of the chimneys and under the leaking eaves is as strong to-day as when first laid. The mortar, perhaps, has disintegrated, but the action of flue gases and water has left the brick as sound as ever.

Many attempts have been made to manufacture a pressed brick from the Manitoba clays, but with only varying success. The chief shipping plants are at Lac du Bonnet, Beausejour and Balmoral, all to the eastward of Winnipeg and approaching the junction of the limestone and Laurentian formation, where it is but to be expected that there would be a change in the chemical composition of the clays. There also the alkali is not so much in evidence, and the finished product is of better appearance and a warmer tone. However, it has not been able to capture the market from the American products which are shipped in from plants in Iowa, Illinois, Pennsylvania and St. Louis. Two of the leading firms selling in Manitoba are the Hydraulic and the Twin Cities Brick Company, with offices in Minneapolis. The three plants of the Menominee company send in a quantity of sand mould brick.

Sand lime brick has already won a place in the West, for lime is readily obtained and a good quality of sand is available. During the last four years several small plants have been installed for the manufacture of this class of material and a new one with a capacity of about eight millions will be in operation shortly. This is bound to have a direct influence on the trend of the trade for the sand lime brick is being produced in a variety of shades and can be tinted to suit any color scheme of the architect.

There is a tremendous market developing for glazed tile in facing steel and ferro-concrete buildings, many of those erected during the past year using this material. It lends itself peculiarly to artistic effects, is light and easily placed, has great wearing qualities, and at the same time resists weather and frost admirably. In combination with tinted brick and a couple of lower floors of cut stone, the effect is most pleasing.

An Estimate of Output

Figures available go to show that the combined daily capacity of the Eastern Manitoba brick plants is close to the million mark, while last year the total output was 77,000,000. This is probably very close to correct as there are a couple of small plants from which figures could not be secured which would more than rectify an over-estimate of output. While the figures for 1911 cannot be secured at present, conservative estimates place the amount of brick used in the Winnipeg district at well over a hundred mil-

lion, Winnipeg city probably having absorbed at least fifty per cent. of the total.

Long winters and a short building season are the unfortunate factors in the brick trade of the Canadian West, for one hundred working days for the plant are about all that can be relied upon with any degree of certainty. It means that every plant must work to the limit of its capacity while it is able, for there are sometimes considerable periods in the spring and fall when bricklayers can work while the yards must lie idle. Every effort must be made to secure supplies to fill the needs of these periods. Again, when necessity demands, brick may be laid in concrete during the freezing weather if the work is properly safeguarded, and each year this class of work is on the increase. Owners prefer to pay the extra expense rather than wait for the opening of the next building season.

Indications are that the next few years will see considerable changes in the brick situation in the West. Building statistics show the marvellous growth of the cities and towns, but there is also an ever-growing demand in the country, which is not recorded, but which will add rapidly to the totals of materials used. It means the opening of new plants, the expansion of existing ones and a keener competition. Rumor indicates that within a year there will be huge government contracts opened in Winnipeg which will mean orders running into millions, for the province is demanding a new university, new government buildings and new court house and law society quarters. Fort Osborne Barracks are to be moved and a new vice-regal residence provided. The trade is in a very healthy and promising condition.

William Alsip,—Pioneer

There are five companies with headquarters in Winnipeg which supply the greater part of the local material used in that city. Of these the Alsip Brick Tile & Lumber Company is the heaviest producer. Credit is generally given a Mr. Lamontaigne as being the first brick manufacturer in the province, he having started a small plant in St. Boniface, immediately across the river from Winnipeg, back in the eighties. It was not until 1899 that the Alsip company entered the field. William Alsip, the head of the firm, started making brick in the plant of his father (and grandfather) at Pittsburg, and began business for himself at Prairie de

Chene, moving west to Decorah, Iowa, in 1878. From there he moved to Grand Forks, N. D., in 1882, remaining seventeen years, until the northern capital attracted him. With his single machine stored on a flat car he reached St. Boniface and started to work. Modern methods and new tricks of the trade soon placed him in the lead, his first recognition from the trade being forced by the fact that from his single machine he secured twice the output of his competitors who operated similar plants. Expansion and absorption account for the six machines in operation to-day, and efficient handling accounts for their huge output, which last year amounted to 26,000,000. Five of the machines are operating on brick, and an augur machine is working on tile and hollow goods, the total output being stated in figures of brick only. Two of the machines are operated in the St. Boniface pits and the other four in Elmwood.

In addition to the brick manufactured in their own plants, this firm last year sold pressed brick to the value of \$13,592, and sand mould brick to the value of \$16,972, the former costing \$25 and the latter \$23 per thousand laid down. Though accurate figures are not obtainable it is estimated that brick numbering roughly two millions were imported that year. The company is also starting the Sandstone Brick Company, with a daily capacity of 84,000, and six drying kilns. W. P. Alsip is the energetic vice-president and general manager of the company.

Waite-Fullerton Company's Progress

The Waite-Fullerton Company, though they have only been in Winnipeg during the present season, have already won a place among the importers of brick for exterior and interior work. Their statement for the six months shows a total of a little over a million, and they have been successful in securing several good contracts. Their lines are pressed brick, terra cotta, hollow building blocks, roofing and floor tiles, and ornamental iron, as well as architectural terra cotta. The greater part of their brick is from Ohio and Pennsylvania plants, with some from Indiana and a couple of lines from the Menominee pits of a cheaper grade. Their specialty, however, is in the special tints and burns, with rough finish or semi-glaze. These lines have taken especially for residences as they permit of a wide selection and the exercise of a great deal of individuality in effects

List of Brickyards in Manitoba

Winnipeg District	Location	No. Machines	Daily Capacity	Yearly Capacity	Manufactured 1910
Alsip Brick Tile & Lumber Co., Ltd.	Winnipeg,	6	250,000	26,000,000	26,000,000
Couture & Marion,	Winnipeg,	2	80,000	8,000,000	7,500,000
Gate City Brick Co.,	Winnipeg,	2	80,000	8,000,000	5,000,000
Kelly & Sons Co.,	Winnipeg,	2	80,000	8,000,000	5,000,000
Winnipeg Sand Stone Brick Co.,	Winnipeg,	2	40,000	8,000,000	
Balmoral Brick Co.,	Balmoral,	1	40,000	4,000,000	3,000,000
Morris Brick Co.,	Morris,	1	40,000	4,000,000	3,000,000
Lac du Bonnet Brick Co.,	Lac du Bonnet,	1	40,000	4,000,000	3,000,000
Manitoba Pressed Brick Co.,	Beausejour,	1	20,000	4,000,000	3,000,000
H. Stephens & Co.,	Portage la Prairie,	2	80,000	8,000,000	8,000,000
A. Snyder,	Portage la Prairie,	2	40,000	4,000,000	3,000,000
Sidney Brick Co.,	Sidney,	2	80,000	8,000,000	3,000,000
Brookdale Brick & Tile Co.,	Somerset,	1	20,000	2,000,000	1,010,000
A. Dykeman,	Brick Spur, Rosendale,	1	30,000	3,000,000	2,000,000
Dryden Brick Co.,	Dryden, Ont.,	1	30,000	3,000,000	2,000,000
Leary Brick Co.,	Leary,	1	20,000	1,000,000	1,000,000
Edrans Brandon Brick Co.,	Edrans,	1	20,000	2,000,000	1,500,000

Estimated total output of yards, 77,000,000

and color schemes. In fact it is to be noted that in the finest section of the Crescent, a select residential part of the city, a big percentage of the residences erected this season have been faced with brick supplied by this firm.

The Waite-Fullerton Company's offices have been made most attractive by the manner of displaying the various goods they carry. The walls have been outlined in squares of about three feet with a white semi-glazed brick, and each square has been filled with various shades or qualities of brick appropriately laid up with the most suitable tint or mortar. Special shapes have been used in framing the doorways, and the floor is laid with selected Moravian tile. Ornamental terra cotta are distributed to advantage and at the window is a broad seat in dark wood, with many deep leather cushions. Walls, floor and ceiling are utilized for display and rolling racks are used to hold samples so that they can be moved about to give customers every chance of judging light effects.

Mr. Fullerton informed your correspondent that the prices of these bricks from the southern yards range from



Office of the Waite-Fullerton Company, Winnipeg

\$30 to \$40 f.o.b. Winnipeg. Of this fifty per cent. is freight, and there is a duty of 22½ per cent. added to factory cost.

Growing Demand for Sand-Lime Brick

There is one branch of the Manitoba brick industry which seems well able to make headway against the imported finishing brick, and that is sand-lime brick. There are two strong companies at present in Winnipeg now manufacturing this material, and a third plant will be ready, well before the opening of next building season. The combined ultimate capacity of these plants will probably be in the neighborhood of 15,000,000, and even then it is doubtful if they will be able to meet all demands. The position is simply this; if an architect desires some other brick than the common Manitoba product it is almost a necessity for him to go outside the province for it, unless he wants to use the sand-lime brick. In but very few localities are there clays which will make a pressed brick, and these clays are difficult to burn to an even color. The sand-lime brick is very strong under compression, fireproof, clean and true in outline, and it works up into a very handsome exterior. In fact some good work has been accomplished in supplying a tinted brick to fill special orders. The manufacturers of this material have a great advantage in the protection offered by the extremely long haul for all outside materials. Two hundred to a thousand miles haul for brick is a long

journey, especially in the face of the rates charged on western lines.

Manitoba Pressed Brick Company

One of the first companies to undertake the manufacture of sand-lime brick on an extensive scale in Manitoba was the Manitoba Pressed Brick Company, with a plant at Beausejour, east of the city. While there might be a certain amount of criticism of this plant from the viewpoint of location, there is no chance of criticism of their finished product. This may be judged from the fact that they secured contracts for facing brick on six of Winnipeg's largest public schools, five business blocks, the Union Depot, Government Examining Warehouse, three factories, two churches, a half dozen residences, and for many public buildings outside of Winnipeg, east as far as Kenora and west to Moose Jaw.

The original company, while realizing that they had a good proposition, were not able to finance it as it deserved. After three years of existence it was re-organized and with more funds available and an energetic directorate it has taken on new life and activity. The president is D. C. Cameron, Lieutenant-Governor of the province, and J. C. McGavin is secretary. The daily capacity of the present plant is 40,000 and last year the total output was a trifle under 6,000,000 brick.

The consideration which led to the establishment of the plant at Beausejour was the fact that at that point there is a tremendous deposit of high grade glass sand,—and it might be added that this same company has also undertaken the development of the glass-blowing industry at that point. Last year the company imported a high grade of marble lime for their works and the result was an output which was nearly snow-white. This year they are using Fowler & Pay's lime from Mankato, and the quality is very little lower if any.

The criticism spoken of is in connection with the establishing of the plant at Beausejour, where the freight rate is \$6 a ton to Winnipeg. The lime cost \$80 a car and the freight from Mankato is \$108. Last year lime cost them \$222 a car laid down, two hundred barrels to the car. With the plant at Winnipeg the raw material could be brought in much more cheaply and considerable handling charges would be eliminated. The question of labor, too, would be more readily solved. Though but four years in operation the company has already won a strong place for itself, and the establishment of labor-saving devices has enabled it to keep production costs very low. At first Manitoba lime was used, but the unevenness of quality and the frequent scarcity have led to the adoption of the imported lime. It has been suggested that the company should burn its own lime, but this is a matter for the future.

S. C. Dunn, manager for Dunn Brothers, dealers in builders' supplies, is authority for the statement that 135,000,000 brick were manufactured by all of the Manitoba yards during 1911, or imported by local agents of outside concerns. Though these figures are difficult to verify, it would appear that they are not far wide of the mark. Dunn Bros., for instance, handled five millions of pressed brick, and seven millions of fire brick during the year. Mr. Dunn places the amount of imported brick which entered Winnipeg at from eight to ten millions. Dunn Brothers draw their outside supplies from Wisconsin and Missouri plants and they carry heavy lines of hydraulic pressed brick in all finishes and colors. They also carry tiles, architectural terra cotta, hollow tile and brick, fire brick and clay, and many lines of finishing and building materials.

Clay Products in British Columbia

**The Supply and Demand, Workable Deposits, Progress of the Industry
—Recent Developments of Leading Firms—Opportunities Plentiful**

Written Exclusively for the Contract Record.

IT is only in recent years that any general demand has been created in British Columbia for brick and tile and other clay products for building purposes. Formerly wood was used for most buildings. The rapid and sudden growth of cities, and the necessity for creating "fire limits" has opened up a large demand for the output of clay manufacturers for building purposes, which are ever increasing. The ability, therefore, for close-by brick yards is a matter of great importance to the growing communities of this province. The Provincial Mineralogist, Mr. W. F. Robertson, says: "In almost every district in British Columbia there is an abundant supply of clay suitable for ordinary brick-making purposes, while in certain districts there are clay deposits suitable for fire brick, pottery, ornamental brick, etc."

The clay deposits near and around Vancouver and the mouth of the Fraser River are chiefly of the glacial period, which may be said to include all the deposits from which

The actual number or even an approximate calculation of the amount of brick produced this year cannot be arrived at as most of the manufacturers are very reticent in information. The Clayburn Company manufactured last year over \$35,000 worth of fire brick and over \$105,000 worth of pressed brick, and the output of the Anvil Island Brick &



Sewer Pipe Factory established this season at the Vancouver Fire Clay Company's Plant.

Tile Company during the last eighteen months was worth nearly \$100,000.

Among the brick-making concerns may be mentioned: The Columbia Clay Company, Anvil Island; Anvil Island Brick & Tile Company, Anvil Island; Port Haney Brick Company, Port Haney; Vancouver Fire Clay Company, Limited, Clayburn; Sydney Island Brick & Tile Company, Sydney Island; New Westminster Brick Yards (John Coughlan & Sons), New Westminster; Cloverdale Brick Company, Cloverdale; Pacific Brick Company, Geo. A. Hinton, Vancouver; Bakers Bros., Saanich Road, Victoria; Victoria Brick Company, Limited, Saanich Road, Victoria;



New Continuous Kiln of the Vancouver Fire Clay Company.

common or red brick are now produced. These glacial clays have a general chemical analysis about as follows: silica, 61 per cent.; alumina, 20 per cent.; iron oxide, 9 per cent.; lime, 4 per cent.; magnesia, 1 per cent.; water floss, 5 per cent.

The demand at present for fireproof building materials,—steel, cement, stone and brick, in British Columbia is almost entirely in the coast district. It is to this district that practically the whole demand for brick and tile is confined, and it is here chiefly that the manufacturers of clay building materials has received any marked development. The brick and tile making industry has not kept pace with the demand, as large importations of brick have been made from across the border, chiefly from Seattle, where last year over seven million brick were shipped to Vancouver alone.

The district brickyards are as yet in their infancy and are worked for the most part on primitive lines. Some contractors assert that concrete comes into competition with the price of even the cheapest class of common red brick in building operations.



New Common Brick Plant at Clayburn.—Piles of Sewer Pipe in foreground; new Continuous Kiln in rear.

Humber brickyard, Saanich Road, Victoria; B. C. Pottery Company, Limited, Esquimalt Road, Victoria.

Vancouver Fire Clay Company, Limited

The works of the Vancouver Fire Clay Company, Limited, are in the Matsqui District, on the south side of the Fraser River, about fifty miles northeast from Vancouver.

They are situated on the Seattle branch of the C. P. R., a spur line, one mile long, having been built out to the company's works at Clayburn. The clay beds are about three miles east of Clayburn and are connected with the company's works by a narrow gauge railway, with a three per cent. grade. A small steam locomotive is used. The clay is delivered in front of two drying pans, where it is crushed and elevated to screens and to the mixer, from which it is fed into two dry press brick machines, with two moulds each.



Mr. E. G. Baynes, President Port Haney Brick Company

The moulded brick are burned in kilns, the burning plant consisting of nine bee-hive kilns holding from 40,000 to 75,000 brick each, and two Millar down-draft kilns holding 180,000 fire-brick each. The fuel used is coal from Nicola Valley. The Company has made some first class brick and blocks for coke ovens. Fine facing brick have also been made. The output in 1910 was \$35,000 worth of fire brick and over \$105,000 worth of pressed front brick, as well as other products. These figures will be largely increased this year.

Additional interesting information concerning recent extensions to this plant has been furnished us at our request by the managing director, Mr. J. B. Millar, who writes: "Our new common brick plant is equipped with Martin A machine, pugmill and rolls manufactured by Baird & Son, Parkhill, all electrically driven by 40 h.p. Allis-Chalmers-Bullock motor. The capacity of this plant is 40 m. a day. Drying is accomplished in a 12-track tunnel dryer equipped with 12-ft. fan and driven by a 40 h.p. motor of same style and make as above. The fan and cars for this dryer were supplied by Sheldons Limited, Galt, Ont. We have now

completed our new 22-chamber continuous kiln in which we have burned about one and a half million brick. This kiln is top fired with slack coal and we have obtained excellent results from it. We are getting a splendid red common brick at a very moderate cost for burning."

Port Haney Brick Company, Limited

This company's plant is located twenty-six miles east of Vancouver on the main line of the Canadian Pacific Railway on the Fraser River at old Port Haney. The products are common brick, drain tile, partition blocks, etc. The Port Haney Company took over the plant from Mr. Dorman, the former proprietor, in 1905. The principal shareholders in the concern are Messrs. Baynes & Horie, contractors, Vancouver, and H. Burnet, the present manager of the works. At the time of taking over the plant Messrs. Baynes & Horie used the whole output in their own contracts. The Company have enjoyed an ever-increasing demand, to cope with which they have made numerous extensions and improvements. The average daily output is at present 35,000, but it is expected that this will be doubled in the near future. A Raymond automatic brick machine and a Ray-



Mr. H. Burnet, Manager Port Haney Brick Company.

mond 11-track dryer are used. Soft burned brick are ground up in a 7-ft. dry-pan and are used to grog the clay, which is of a very rich nature.

The hollow ware machinery used at this plant is entirely independent of the brick-making and consists of a No. 43 special hollow ware machine, automatic cutter, pugmill and crushers, built by the American Clay Machinery Company. The ware can be dried either inside or on top of the dryer. Twenty thousand three-inch drain tile, or the equivalent in hollow blocks, can be made daily. The company are constantly enlarging the capacity of the hollow ware department. Round down-draft kilns are used for burning hollow ware. Scove and clamp kilns are employed in burning brick. The hollow ware produced at this plant is of excellent quality.

The plant was designed and laid down by the manager, Mr. H. Burnet, who, until quite recently, operated a soft mud yard on the Westminster road, a few miles out of Vancouver. This, however, he was obliged to close down owing to the demands of the Port Haney plant. During the term of his management, the works have been transformed from a small open yard to an up-to-date plant with a large and continually increasing output.

The president of the company is Mr. E. G. Baynes, one



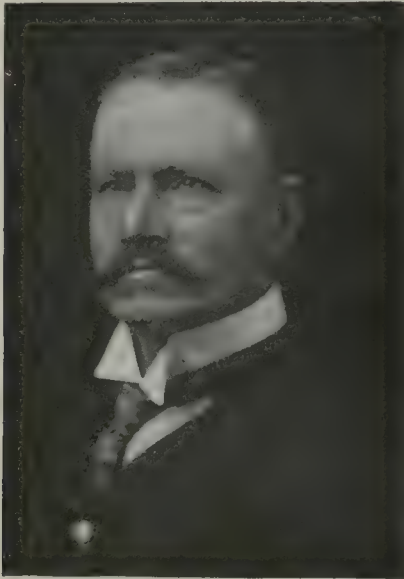
Plant of the Port Haney Brick Company, Limited

of the city's pioneer contractors, who went to British Columbia from the Old Country nearly a quarter of a century ago, since when he has resided continuously in Vancouver. Some seventeen years ago he formed a partnership with W. M. Horie and has acquired an extensive knowledge of all phases of building and contracting. He is a good judge of brick and is, himself, one of his own best patrons in that line. Mr. Baynes has made money not only in brick-making and contracting, but also in real estate. He was born at Bocking, Essex, England, forty-one years ago.

The Secretary-Treasurer of the Company, Mr. W. M. Horie, also a building contractor of extended experience, is a native of Quebec and is a few years senior to Mr. Baynes.

Anvil Island Brick Company, Limited

The new pressed brick works of The Anvil Island Brick Company, Limited, are situated on Anvil Island, Howe Sound, near the Columbia Clay Company's yards, about twenty-four miles northwest of Vancouver. The plant has been completed only a few months, and now splendid red pressed brick of unrivalled quality and color are being



Mr. M. B. Taylor, Manager Anvil Island Brick Co., Limited.

turned out. The samples shown have met with the enthusiastic approval of architects and builders. The Company have constructed a wharf at the works, and they are already preparing for extensions. The material is taken direct from the kilns to the scows, which in turn are taken by tug-boats to the place of delivery. Whether the bricks are wanted at Vancouver City, North Vancouver, New Westminster, Victoria,—or any other point that can be reached by water carriage, their delivery is easy, rapid and cheap.

The present capacity of the works is 30,000 brick daily. There are six Whittaker repress machines and large perforated grinding pans with all the necessary elevators and conveyors for distributing the material to the different brick-making machines, which are of the most modern type.

Three improved down-draft kilns of large capacity have been built. Over these there is a roof of unique construction with a span of 52 ft. Under this roof there is a large drying and storage floor, 120 by 52 ft. This enables the plant to be operated during the wet winter season. At present the company cannot keep pace with their orders.

Construction work on the plant of the Anvil Island Brick Company, Limited, was started a little over a year and a half ago, when the site was all heavily timbered land.

Since that time a large force of men has been steadily employed. Nearly 150,000 yards of excavating work had to be done before the plant and buildings could be erected.

Besides the plant proper, a large boarding house, a residence for the superintendent and several cottages for married employees have been built. From a large deep well a 100-pound pressure can be obtained for the pipe service.

English capital is interested to the extent of \$130,000. Over \$100,000 has already been spent on the plant. The principal investor is Mr. G. A. M. Buckley, who has operated largely in Canadian industries. Three years ago the Company was organized through the energies of Mr. Taylor, the manager. The local board of directors are all influential business men.

The clay averages about 120 feet in depth. The analysis is as follows. silica, 69.20; alumina, 14.00; ferric oxide, 4.50; calcic oxide, 4.50; magnesian oxide, 0.75; alkalies, 3.50; loss on ignition, 3.50.

Mr. Mathew B. Taylor, manager of the Company, had the responsibility of planning and laying down this plant. He is a native of Glasgow, Scotland, and served his apprenticeship as a mechanical and marine engineer. After following his profession for some time he became Engineer and Works Superintendent of the London, (Eng.) Brick Company, the largest in the United Kingdom. Here he had the task of laying down several of the most modern and economical plants in different parts of the country. Each of these, on account of the varying nature of the raw material, presented an individual problem. With ten years of this experience he gained a varied practical knowledge which has made him an authority in the Canadian industry.

British Columbia afforded Mr. Taylor excellent scope for his ability and he has not failed of his opportunity. He has had the congratulations of numbers of practical brick experts and it is generally conceded that the Anvil Island plant is one of the best.

The Anvil Island Brick Company, Limited, is regarded as one of the most promising and substantial industries of the kind in the West.

The head office of the Company is at 324 Seymour Street, Vancouver, B. C.

Columbia Clay Company, Limited

This well known firm was established in 1898 with a capital of \$50,000. More than this amount has been expended in a thoroughly modern plant. The managing director is ex-Alderman Cook, and the secretary-treasurer Mr. H. T. Willett, whose office is at 155 Powell street, Vancouver.

The brick yards are located on Anvil Island, in Howe Sound, some twenty-four miles west of Vancouver City, and comprise ninety acres. The clay formation is glacial and averages about 120 feet in depth. The plant comprises one continuous kiln of 16 chambers, an Imperial brick-making machine (J. D. Fate make), with a capacity of 60,000 daily, used in connection with a Benson automatic cutter; a Martin six-mold soft mud machine, with a capacity of 30,000 brick; a gravity dry kiln, containing 11 tracks, with ten double-deck cars on each track, the capacity of each of the 220 cars being 500 bricks.

The process of drying requires from 24 to 36 hours. The daily output averages about 35,000, sold in Vancouver.

A Welland heavy-duty engine is installed, the cylinder of which is 18 x 22 inches, the horse-power developed being 120. The works are lighted by electricity. Some thirty odd men are employed.

Mr. Cook, the managing director, is the senior building contractor of Vancouver, having been in business here continuously since 1886—the year of the great fire that wiped

out the city. He has always been progressive and diligent in both business and civic affairs. He hails from St. Mary's, Ont., and is about fifty-four years of age.

Cloverdale Brick & Tile Company, Limited

The Cloverdale Brick & Tile Company, Limited, Cloverdale, B. C., commenced operations in May last. The output to the end of October was over 3,500,000 pressed brick. The yards comprise sixty acres of soft mud clay. The Martin machine, with a capacity of 40,000 a day, is used. A dryer with a capacity of 40,000 will be installed at once. Some thirty-five men are employed. So far no tile has been produced. Cloverdale is twenty-eight miles south of Vancouver on the Great Northern Railway, close to the B. C. Electric Railway inter-urban line. The president and manager of the company is Mr. J. H. Davidson, whose offices are at the G. N. R. Depot, Pender Street, Vancouver. The company is capitalized at \$40,000. The sum of \$25,000 has been spent in plant.

Fraser River Brick and Tile Company

The plant of the Fraser River Brick & Tile Company is located at Annieville, on the south side of the Fraser River, below the City of New Westminster, on the line of the Great Northern Railway. Shipping facilities are thus afforded both by rail and water. The site comprises twenty acres, and is of sandy clay, which burns red. The output of common brick amounts to 25,000 a day. One dryer, with a capacity of 100,000 bricks, is installed. Two cars each of two tons capacity, bring the hard clay as it is blasted from the banks, to the brick-making machine. In winter the Park-hill soft-mud machine (capacity 40,000 daily) is used. In summer the product is from a wire cutting machine, manufactured by the American Clayworking Machinery Company, of Bucyrus, Ohio—an automatic cutter of 25,000 capa-



Mr. R. H. Gilbert, Manager Fraser River Brick & Tile Co.

city. At present the burning is done outside, but a continuous kiln will shortly be constructed. A slide valve steam engine, cylinder 14 x 18 inches, and 98 horse power, is used to operate the plant. Twenty-five men are employed. The manager is Mr. R. H. Gilbert, a graduate of McGill University, who went west from Hamilton, Ont., two years ago. Mr. Harry Pack, an experienced mechanical engineer, is superintendent of the works. Mr. Jas. Cunningham, of

New Westminster, is director. About \$35,000 has been expended on the plant.

New Westminster Brick Yards

John Coughlan & Sons (offices, Exchange Building, Vancouver), operate a brick yard near New Westminster. The deposit now being worked is a glacial clay, located about 1,000 feet east of the works. The clay is loaded into small cars which are hauled by wire rope to the plant. The product is a soft mud brick moulded in a Martin machine. The moulded brick are burned in clamp kilns and shipped direct to Vancouver city on the B. C. Electric Railway.

Victoria's Time-Honored Connection with the Trade

For many years Victoria, on account of its being the earliest place of settlement in the province, was the most important brick-making centre. The industry here is con-



Victoria Brick Company's Yard.

finied to the northern end of the city, but within the city limits, on the Saanich road. The clay deposit worked by the three operating yards is of glacial origin of unknown depth, the work so far done being on a layer from six to eight feet in thickness lying on the surface and requiring very little stripping. The clay carries with it enough sand to make good brick (of a deep red color), which stands the weather very well. Soft mud brick dried in racks is the product of these yards.

The Humber brick yard is located on the Saanich Road on the old Humber Estate. It contains about ten pug-mills, some operated by horse and some by a small steam engine. The clay is dug by hand. The moulded brick are dried in the open yard system and burnt in clamp kilns in the usual manner. The yard produces about 5,000,000 common red brick a year.

Baker Bros.' brick yard faces on the Saanich road and is in the centre of an excellent clay deposit. Hand labor is used in excavating the clay which is drawn by horse and cart to the pug-mill, whence it passes to a Monarch soft-mud machine, having a capacity of about 50,000 brick for ten hours. The green brick are carried on pallets to the drying yard on small tram cars and dried on racks. They are burned for about a week in clamp kilns. The fuel used is cordwood. The yearly output is about 5,000,000. Drain tile is also produced, the machine used being of the American Clay Company's manufacture, with a capacity of 7,000 3-in. tile a day. These tile are from three to eight inches in diameter and one foot in length; they are dried like brick and burned for four days in a down-draft beehive kiln, having a capacity of 30,000 3-inch and 10,000 4-inch tile a day. A horizontal steam engine of fifty horse-power is used. Extensive improvements to the plant are contemplated.

The Victoria Brick Company's yard adjoins that of Baker Brothers. Hand labor is used in digging the clay, the bank of which has a face about twelve feet high. The clay is conveyed by horse and cart to the pugmill, and



B. C. Pottery Company's Works at Victoria, B. C.

thence to a Monarch soft-mud brick machine, with a capacity of from forty to fifty thousand brick a day. The moulded brick are stacked in racks and dried in the open air, and burned for seven or eight days in a Boss forced up-draft kiln, the holding capacity being some 300,000. The fuel used is coal. This Kiln is supplemented by the use of clamp kilns using wood as fuel. The annual capacity of this yard is about 5,000,000. The company also manufacture drain tile of standard sizes in a manner similar to Baker Bros. The steam engine is horizontal and sixty horse-power. Extensions are being made every year and more modern machinery will shortly be installed.

The B. C. Pottery Company, at Victoria West, derives its supply of fire-clay chiefly from the coal mines of the Canadian Collieries Company, and manufactures drain and sewer-pipe, chimney-tiles, etc., the sales for the year being chiefly of drain-pipe, and amounting to over \$125,000. The company has recently opened up a shale quarry on the west coast of Vancouver Island, the product of which can be and is used in the manufacture of sewer-pipe.

Clays of the Province of Quebec

In the province of Quebec, an important and widely distributed source of clay suitable for the manufacture of red-brick is found in the deposits of Leda clay which occur in large quantities in the valleys of the St. Lawrence, of the Ottawa and of the Richelieu rivers. These deposits are so extensively distributed that it is needless to particularize localities. It is sufficient to mention that important brick-yards, deriving their material from deposits of Leda clay, are in operation in the following counties: Arthabaska, Bagot, Berthier, Champlain, Chateauguay, Joliette, L'Islet, Lotbiniere, Montreal Island, Nicolet, Ottawa, Pontiac, Portneuf, Quebec, Richelieu, Richmond, St. John, Iberville, Three Rivers, Terrebonne, Yamaska,—and it is safe to say that when the needs arise, numerous workable deposits of this clay can be counted upon within accessible distances of almost any point in the settled parts of the province. This Leda clay is of marine origin and contains fossils which characterize it.

In the valleys of the Chaudiere, St. Francis and Etchemin rivers, and their tributaries, we find numerous deposits of a fine plastic stratified clay, to which so far, on account of the lack of fossils, it has not been possible to assign an age. These deposits may have been formed at the close of the glacial period, when the front of the receding glacier damming the waters of these streams gave rise to lake conditions in that part of the Eastern Townships. This clay is eminently suited to the manufacture of bricks, and large brickyards, making brick of this clay, are operating at Sher-

brooke, Ascot, Lennoxville, St. Victor and other points of this region, whereas numerous unworked deposits are known along the valleys of these streams.

Besides these clays, which are all of comparatively recent origin, there are throughout the province of Quebec, outcrops of shales and slates which constitute a very desirable material from the clay-worker standpoint.

The Utica shale, of which there is a large development on the south side of the St. Lawrence, opposite the Island of Montreal, is eminently suited for that purpose. At Laprairie, it is being worked on a large scale; and the pressed brick which is being manufactured there is second to none in Canada.

Slates occur in the Cambrian formation in the province of Quebec, and quarries are being operated at New Rockland, in Richmond county, as well as in Temiscouata county in the township of Botsford on the line of the Transcontinental Railway. From the working of these quarries, a great deal of waste is produced, and there is no reason why this refuse could not be used to advantage in the clay industry. Other shale and slate deposits are known to occur on the lower St. Lawrence, below Quebec.

Clay Products Exposition, Chicago

The Clay Products Exposition which is scheduled for Chicago, March 7th to 12th next, means a great deal, not only to the manufacturers of clay products but also to the dealers in these materials and to the architects, contractors and builders. It is the aim of the Exposition to show all the best products made from clay. This will include everything from art to utility.

The paving brick and sewer pipe interests have combined in taking an entire side of the exposition building for a comprehensive and complete showing of paving brick, sewer pipe, conduit and other clay products which are used in municipalities. It is probable that a model street will be laid showing different stages of completion.

The sewer pipe men will conduct tests in various ways and will prove the superiority of vitrified pipe. Another large block of space has been taken by the face brick interest to show the very best face brick manufactured in the country. The space is ample to make an excellent showing and there is no doubt that the very finest of building brick will be found in this department.

The terra cotta people have been generous in their reservation of space and every other line is equally well represented. The builder, contractor and architect are interested because they can here find that particular material which will give the best effects and prove most durable. The dealers in the different clay products will be interested because they can go to the Exposition and find the very best things made from clay and will therefore be assured that they are representing the very best and most saleable articles.

The fireproofing interest and their exhibits will appeal to municipalities, insurance companies and others who are always interested in the very live topic of fireproof construction. The fire loss of this country is so enormous in comparison to England, where more burned clay houses are the rule, that it is only a question of time when fireproof buildings will become more plentiful. The Clay Products Exposition will be educational along this line.

This Exposition is not confined to the United States alone: it is international. A number of Canadian manufacturers are taking an interest in the exposition and will be exhibitors. The clay trade in Canada is of growing importance and our manufacturers should see that Canada is well represented.

Clay Workers of the Maritime Provinces

The Yards in Operation, the Men who Work Them, the Material Produced and the Methods of Manufacture Employed

Up to the present time the clay deposits of Nova Scotia have been little developed. Common brick are made at Annapolis, Middleton, and Avonport, in the Annapolis Valley region, and at Shubenacadie, and Elmsdale, in the Shubenacadie valley. Other brick plants have been established, and are in operation at Pugwash, New Glasgow, Sylvester, Eden Siding, and Mira river. In most cases these are operated to supply a somewhat local demand, although the Pugwash and Annapolis bricks are often shipped some distance. Common earthenware is made from the smoother phases of the estuarine clays, south of Elmsdale, in the Shubenacadie valley. Sewer pipe, flue linings, and drain tile are made from the shales at New Glasgow, and some drain tile are produced at Middleton, Avonport, Annapolis, and Shubenacadie. Most of the common brickyards turn out a few hand re-pressed brick. A hard brick, known in the trade as firebrick, is produced from the Carboniferous shales at Westville, in the Pictou field.

There is room for development in the Nova Scotia industry, but the product resulting from it will have to be marketed mainly outside the Province. For this reason, new plants should be favorably located for the shipment of their product. There are few pressed brick works between Ontario and Nova Scotia, and this territory should afford a good field.

The estuarine clays of the Shubenacadie and Annapolis valleys could be used for making red pressed brick, while the fireclay at Shubenacadie is available for buff pressed brick. Much of the smoother clay found in the Annapolis valley could be employed for stoneware manufacture, and the same is true of the clay overlying the 13-foot seam at Inverness. Much of the smoother clay found in the Annapolis valley could be used for making cheap art pottery, and terra cotta tiles. The making of this class of ware would involve the investment of little capital, and the output should find a ready market at the numerous much frequented summer resorts of this beautiful Province.

Large numbers of firebrick are consumed annually by the steel works at Sydney, but these are obtained mainly from Scotland, and the United States. The brick made at Westville have, however, given satisfaction when used as a lining for the ladles, into which the molten steel is poured from the reverberatory furnaces.

It is hoped that some attempt will be made to develop the fireclay at Shubenacadie for firebrick manufacture, and that later, when a railway is built up the Musquodoboit valley, the fireclay on Murphy brook, near Middle Musquodoboit, will also be mined for this purpose. The following details may serve to give a better idea of the clay-working industry in Nova Scotia.

Annapolis Royal.—The Buckler Brick Company, located at this town, is engaged in the manufacture of common brick and drain tile. For making brick, clay enough for moulding 20,000 brick is mixed with four loads of sand, and the whole dumped into the pugmill of the stiff mud machine. The bricks are side cut and show but little lamination. Drying is done on pallet racks, and burning in Dutch kilns. The product is of a good red color. Mr. Buckler's father started a small yard on Sawmill creek about 1850, but this is no longer in operation. The present yard was established about 1885, using a double-header

plunger machine, made by Norsworthy, of St. Thomas, Ontario. The product now made consists mainly of common brick, which are shipped to different ports on the Nova Scotia coast.

Middleton.—A brick-yard, operated by the Middleton Brick Company, is located along the tracks of the Dominion and Atlantic railway on the western edge of the town. The clay is too plastic to be used alone for brick, and sand found underlying the clay is added to reduce the shrinkage. The clay is tempered in a pugmill and moulded in a stiff mud machine. The bricks are dried on pallets, and burned in scove kilns. In burning, the clay shrinks 10 to 12 inches, in about 32 courses. This is 2 inches more than the kilns settle at Avonport, and 6 to 8 inches more than at Bridgeton. Some drain tile are also manufactured. The clay burns to a good red color, and gives a hard, saleable product.



Clay Conveyor, Mira River Brick Co., Cape Breton, N. S.

Avonport.—There are two brick firms in operation at this point, viz., Robert Shaw, and Jacob Walton. Both yards use the estuarine clay. At the Shaw yard both common brick and drain tile are manufactured, the upper part of the bank being used for the former, and the lower part for the latter, but even the brick clay requires the addition of sand. The common brick are moulded on a steam-power soft mud machine, or, if they are to be re-pressed, in a horse-power machine. The yard is also equipped with a stiff mud machine, and formerly some end-cut brick were made on it, but it is now used only for drain tile. Drying is done on pallet racks, and the brick are burned in scove kilns, set 37 courses high, settling 9 to 10 inches in burning. The tile are fired in a circular downdraft kiln. The clay burns to a good red color, but even if a little hard-burned tends to develop a greyish brown tinge.

At Walton's yard, which ajoins Shaw's, the method of manufacture is similar, as is also the clay.

These two yards are not the first started in this vicinity, for Elijah Eldekin established one at Wolfville be-

tween 1840 and 1850. Later an Englishman made a few bricks at Falmouth. Mr. R. Shaw commenced operations in 1862 at Hantsport, and worked 11 years, until his clay gave out. He then moved to Avonport, where his present yard is located. A man named Albert Read had, however, before this begun to make bricks in 1867 on the site of Walton's present yard, but failed, and Walton is really his successor.

Shubenacadie.—James Miller and Sons: the works of this company are located on the Intercolonial Railway, about two miles north of Shubenacadie. The clay deposit, which adjoins the yard, is worked by means of a cutter and scraper, and owing to the toughness and shrinkage of the clay about 10 per cent. of sand is added, before it is moulded. The machinery used consists of rolls, pugmill, and side-cut auger machine. The bricks are dried mostly in an open yard, although pallet racks are sometimes used. Burning is done in scove kilns, set 32 courses high, and giving 10 inches settle. The clay seems capable of burning to a good red color, but the harder bricks show a distinct greyish tint. A few are re-pressed in a handpower machine to supply occasional demand. The sand used in moulding is not screened, and the bricks, therefore, contain numerous pebbles, which cause breakage of the wires,



Kilns at Ryan's Brickyard, Fredericton, N.B.

and also cracks in the brick in drying and burning. The re-pressing is done only on the soft mud brick. Samples for testing were taken of the well burned bricks, and also of some that were only moderately burned. The results of these tests will be found in the next chapter.

Elmsdale.—The Elmsdale Brick and Tile Company, Limited, is located on the Intercolonial railway, about 1½ miles north of the town. The clay deposit is a shallow excavation adjoining the yard, and the clay is removed with plows and scrapers. It requires to be mixed with sand before moulding. The bricks are moulded on a side cut, stiff mud machine, and burned in Dutch kilns. Steam heated tunnels are employed for drying. Some drain tile, fireproofing, and conduits are also made, the latter being salt-glazed. Burning of the hollow ware is done in a circular downdraft kiln. This yard was started by Lantz and Thompson, about 1900, the product being dry-pressed brick.

A second yard, belonging to the same company, (Miller & Sons), is located about an eighth of a mile farther up the track. The clay is similar but the methods more primitive, and only common brick are turned out. There is a line of soak pits, in front of which a track is laid. The horse-power soft mud machines are placed on this, and moved along from one soak pit to another. Drying is done in open yards.

Spares Bros.—This yard is located about one mile up the track from the preceding. The clay and method of manufacture are similar.

Pugwash.—The only plant located at this locality is that of the Maritime Clay Works. The raw material used is a mellowed shale derived from the Carboniferous Limestone formation, the aim being to avoid the use of the fresh shale alone. The material is brought from the pit to the works on a narrow gauge steam road. At the works it is put first through two pairs of rolls, and then charged into a pugmill for tempering. The moulding is done on a sidecut stiff mud machine and re-pressed if front brick are demanded. Drying is done in tunnels, and burning in a Haigh continuous kiln. The manufacture of bricks was started by this firm in 1898. They first tried surface clay from River Philip, near Oxford, there being at that time works near that point, but the clay was found to be unsatisfactory, and did not give good results on a dry-press machine, which was the type then employed. The plant was then moved to Pugwash, and the clay brought there and tried on a stiff mud machine. The shale was adopted later.

Other brick-yards have been in operation in this region in the past, but none are running now. About 50 years ago (1860) a man named Lowden began making hand-moulded brick from surface clay, at a yard situated just south of the present shale pit. This yard was run by different men for about 20 years. At Wallace Bridge, the Battye Brick Company commenced about 1903, and ran for 3 years. The plant is now idle.

New Glasgow.—Several brick plants are operated in the vicinity of this town, as described below.

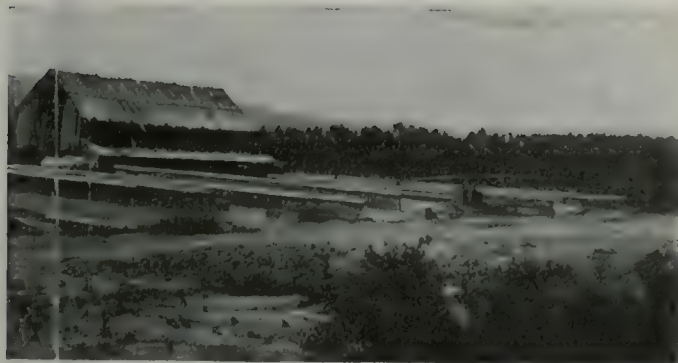
The New Glasgow Brick and Tile Company is situated about 1½ miles southeast of New Glasgow station, and use a partly weathered Coal Measures shale. As they plow and scrape over a considerable area, it has not been worked to any great depth. There are a few scattered cobbles and pebbles in it, which may be drift material, although they are all of local rock. The method of operation is somewhat more detailed than would seem necessary. The clay is first pulverized in a dry pan, whence it passes to a pugmill, and from this through rolls. Moulding is done on a small auger machine, and drying in open yards. The bricks are burned in Dutch kilns with 12 to 13 inches settle. If burned too fast, they naturally develop black cores and swelling, due to the carbonaceous matter and sulphur in the clay. If properly fired, the clay burns to a hard brick of good red color. The following determinations were made on the green brick, and one of the burned brick with black core.—I, green brick; II, outer red portion of burned brick; III, black core of burned brick.

	I	II	III
FeO	0.09	0.03	8.20
Fe ₂ O ₃	8.34	9.96	0.97
O	0.12	Undet. Very small	
So ₂	None.	None	

The analyses were made by Mr. F. G. Wait, of the chemical laboratory, Mines Branch, Department of Mines, Ottawa.

The black core is due to the high percentage of ferrous iron, caused by improper burning, as a result of which the ferric iron was mostly reduced to the ferrous form. Had the moisture and carbon been driven off first, and the brick held at a low red to permit the iron to oxidize, this would not have occurred. As it was, there was an insufficiency of air present, the carbon robbed the ferric oxide of its oxygen, reducing it to the ferrous form. After the carbon was driven off, the heat was raised too rapidly and the pores of the clay closed up so that the iron in the interior of the brick did not get a chance to oxidize again.

George Brooks operates a small common brick-yard, located on the bank of McClellan brook, about 1 2-5 miles east of south of New Glasgow station. The material used



Miller's Brickyard, Eden Siding, Cape Breton, N. S.

at the time of our visit was a somewhat silty clay taken from the bed of McClellan brook, but formerly glacial clay was used. The product is moulded on a soft mud brick machine, and occasionally re-treated on a hand-power re-press. It is dried in open yard and burned in a Dutch kiln.

Dominion Fire Brick and Tile Company.—These works were established in 1901, and lie immediately southeast of the Standard Drain Pipe Works. The material used is a bluish-black shale, which outcrops at the foot of the bluff along McClellan brook. The exact thickness of this good shale is not known, but it is not more than 3 feet, so far as exposed, and it is covered by about 20 feet of shale, similar to that worked by Trotter, and this in turn by sandy and coaly shale and drift. To work this deposit, therefore, it would have to be operated along the face of the bluff, and if worked into the bluff, the over-burden would be heavy. There is no doubt that the bottom shale stands more heat than the overlying shale, and also that worked for the pipe plant. The bottom bed in Brooks' bank also contains fewer concretions.

The plant of the Dominion Fire Brick and Tile Company, which is not a very large one, is situated at the top of the bank, the shale being hoisted up an incline. It is first pulverized in a dry pan, and then, after tempering, moulded in a soft mud machine. Re-pressing is done in a handpower re-press. Mr. Brooks has one circular down-draft kiln. The re-pressed bricks have a granular structure like those made in a dry-press. It is said that the bricks made from the lower clay had been sold for lining ladles. It is also used for making bag-wall bricks for use in the kilns at the pipe works.

Standard Pipe Works.—This plant is a branch of that firm, and of the same name, located at St. Johns, Que. The product consists chiefly of sewer-pipe, but flue linings, hollow blocks, fireproofing and drain tile are also manufactured. The firm has a large and well equipped factory (de-



Pottery at Enfield, N. S.

scribed in previous numbers of Contract Record). The material originally used was a red boulder clay, but in recent years a mixture of the shale and boulder clay, and also the shale alone, have been tried. The mixture stands less fire than the shale, but is said to take a better salt-glaze. In making pipe, they have tried to use shale alone, but this, on account of its carbonaceous character, has to be very slowly fired in order to prevent bloating. The clay also shows a rather high percentage of soluble salts, and this was at first believed to prevent the formation of good salt-glaze. This difficulty was subsequently found to be due to the ware not being fired hard enough. The salt-glaze is improved however, by adding some surface clay to the shale. The siderite concretions may cause fused specks in the ware. The shrinkage of the sewer pipe mixture is a little over 1 inch per foot, and no pipes of more than 24 inches diameter are made. The market for the ware is chiefly outside the Province.

Eden Siding.—Miller Brothers have one yard in operation at this locality, the product of the same being common brick, which are made from a mixture of the surface clay, with about 10 per cent. sand. The materials are mixed in a soak pit, and moulded in a horse-power soft mud machine. Drying is done in an open yard, the brick being sprinkled with sand, as it is claimed that this prevents cracking. The air dried brick are burned in scove kilns set 32 courses high. The product of the yard goes mainly to Sydney, but some brick are also shipped westward along the line of the Intercolonial railway.

Mira River, C.B.—The works of the Mira Brick Company are located on Mira river about four miles from its mouth. The product is made of a mixture of about two-thirds blue clay and one-third sand, but the latter is not screened. A belt conveyor takes the clay from the bank to the works, where it is discharged into the pugmill of the soft mud brick machine. Drying is done on pallet racks,



Standard Drain Pipe Company's Plant at New Glasgow, N. S.

and burning in a seven chamber Haigh continuous kiln. The product goes mainly to Glace Bay and Sydney.

NEW BRUNSWICK

Fredericton.—M. Ryan & Son are the only brick manufacturers at this city. The material used is an estuarine clay somewhat similar to that worked in the Annapolis valley of Nova Scotia. The clay is moulded in a soft mud machine, without any preliminary pugging, but nevertheless makes a good grade of brick. The freshly moulded bricks are hacked at once, and air dried in that manner, although at the time of our visit Mr. Ryan contemplated the erection of pallet racks. Burning is done in a patent double-chambered downdraft kiln, each half having a capacity of 90,000 brick. The clay settles 12 inches in 31 courses, during the burning.

St. John.—There are several yards in operation in the immediate vicinity of the city, all engaged chiefly in the manufacture of common brick.

At Lee's yard the clay, when dug, is thrown into soak pits, and then taken to the machine, where one-third sand is added. Moulding is done on a stiff mud, sidecut machine, and drying on pallet racks. The bricks are burned in scove kilns, showing 8 inches settle in 38 courses. Some of the bricks are re-pressed by hand-power, and sold for facing. Tests of the product are given in a later chapter.

The yard of John Lee & Company is located about 1½ miles west of the city, on the Little River road. They have a second yard about a quarter of a mile nearer town. The clay and methods employed are similar to those used at the first Lee yard, described before.

B. Mooney & Sons also operate a common brick-yard, located at Fairville, a suburb of St. John. The brick are moulded by the soft mud process, dried on pallet racks, and burned in scove kilns.

J. W. Foley & Company have the only pottery in operation at St. John, the works being located on the Silver Falls road. The raw material is imported mainly from New Jersey, U.S.A., and the product consists chiefly of butter crocks, teapots, flower pots, and jars.

The foregoing information is extracted from the comprehensive report on the clay and shale deposits of Nova Scotia and portions of New Brunswick prepared by Dr. Heinrich Ries and Mr. Joseph Keele. A copy of this valuable report should be in the hands of all members of the industry interested in the Maritime Provinces. The pages of the report embrace the results of field work carried on during the summer of 1909 and laboratory tests conducted during the following winter. The object of the investigation was to ascertain, as far as possible, which of the geological formations in the area referred to contained clays or shales of economic value, and, consequently, special attention was given to those that appeared to be promising.

As stated in the report, the geological formation of Nova Scotia range from the Pre-Cambrian to the Triassic and are overlain nearly everywhere by a mantle of Pleistocene material of variable thickness. In certain formations the character of the material is such that there is little probability of its being of any value to the clay worker; others, however, contain a large number of argillaceous beds. The formations calculated to be of value to the clay worker are described in great detail, and valuable information is given as to the possibilities of the various materials. An interesting portion of the report is that devoted to results of crushing, transverse and absorption tests made by Prof. A. Macphail, of the Kingston School of Mines. A description of the method of testing is also given.

Part II of the report is devoted to the origin and prop-

erties of clay. Many valuable notes are contained therein which will be informative not only to the disciple of the clay working industry, but to the finished product, the time-manufacturer.

Clay Products in Ontario

The number of common building brick made in 1909 was 304,988 thousand, worth \$2,374,287, as compared with 246,308 thousand, worth \$1,916,147 in 1909—an increase in both number and value of over 23 per cent. There was a very active demand for brick throughout the year, the yards in particular being barely able to supply the requirements of the building trade.

Pressed brick were made to the value of \$485,596. At the moment, popular taste seems to have veered from the smooth, almost polished surface of the first-class pressed brick with its uniformity of coloring, which sprang into demand a number of years ago, to the rougher, less uniformly formed hard-burned brick now in favor, in which all shades of color are not only permissible, but desired.

The use of paving brick has not become so general as at one time appeared probable. A good vitrified brick makes a durable, easily repaired roadway, but it is undeniably noisy, and to this disadvantage, more than to any other feature, appears to be due the slow progress paving brick has made towards popularity. In 1909, 4,607,620 were produced in Ontario, valued at \$73,700, while last year, the output fell to 3,799,025, worth \$70,648.

The total value of all kinds of brick made in 1910 was \$2,903,531, in the manufacture of which, including tile, 3,559 men were employed, receiving as wages \$1,423,751. The average yearly wage per man was therefore \$400. In 1909 it was only \$303, and it is therefore evident that the brick-making season, which for the most part extends over the months of late spring, summer and early autumn only, was last year stretched out to an unusual length.

Of drain tile the quantity returned as having been made in 1910 was 21,028,000, valued at \$318,456, a considerable reduction from the output of 1909, which was 27,418,000, worth \$363,550.

Sewer pipe to the value of \$357,087 was made last year, an increase of \$45,257, as compared with 1909. Three factories were in operation, namely, Dominion Sewer Pipe Company, Swansea, Ontario Sewer Pipe Company, Mimico, and Hamilton and Toronto Sewer Pipe Company, Hamilton.

From the potteries of the Province, goods valued at \$51,489 were turned out in 1910. This compares with \$43,214 worth made in 1909. The growth of the pottery industry in Ontario is slow. In 1891 the production amounted to \$45,000. Doubtless the explanation is to be found in the scarcity or absence of clay suitable for the finer kinds of ware, the articles now made being for the most part coarse goods. Two or three establishments manufacture higher grade goods, such as the so-called "stoneware," also majolica ware, but the clay for these is imported. Perhaps when population flows over the height of land the kaolinic clays found in the valleys of some of the north-flowing streams may be put in requisition to supply the wants of the inhabitants of newer Ontario.

The Grand Lodge of Nova Scotia (A. F. & A. M.), is contemplating the erection of a temple in Halifax. Mr. Thomas Mowbray, of Halifax, Grand Secretary, has the matter in hand.

Ald. Graffety, of Westmount, was the speaker at the Montreal Builders' Exchange luncheon recently. He took for his subject, "Lumber, Past, Present and Future."

The Director of the Geological Survey

Mr. Reginald W. Brock, director of the Geological Survey, Ottawa, was born at Perth, Ont., in 1874. He lived for short periods in many places, and Mount Forest, Guelph, Paris, Brantford, Toronto, Kingston and Ottawa, may all claim him as an old boy. He obtained his undergraduate training at the University of Toronto and Queen's University, and took a post-graduate course at Heidelberg, Germany. At college he was prominent in both academic and athletic circles. It was in 1891, in Northern Ontario, that he commenced geological survey work as a field assistant. In 1896 he made an important exploration of the country between the Nottaway river and Lake Mistasani. The following year he obtained a permanent appointment on the Survey and was assigned to the British Columbia field. Here, until his appointment as Director, he had charge of investigations of the more important camps,—work which brought him into close touch with the mining industry and gave him a strong interest in its economic side. Indeed, his investigations attracted such attention throughout Canada and



Mr. R. W. Brock, Director Geological Survey

in Great Britain and the United States that he became noted as one of the leading authorities on economic geology in Canada.

In 1902 he was appointed Professor of Geology in the School of Mining at Kingston and he retained charge of the Department of Geology of this school and at Queen's University until his appointment as Director in 1907.

Under Mr. Brock's regime, the Geological Survey has expanded considerably and its reputation abroad has been greatly enhanced. The esteem in which it is held outside of Canada is best shown by the readiness with which such men as Walcott, Lawson, Ries, Daly and others have leant their services in prosecuting its investigations.

The work of the Survey has become more distinctly of practical economic value. Its relation to the clay products industry is close and cordial to a degree that has seldom obtained. The important clay investigations which the Survey has been conducting for the last three years under Dr. Ries, the American authority, and Mr. Joseph Keele (whose article on the Clay Resources of Western Canada will be found one of the features of this issue) is only one of the many lines of investigation of industrial value that the Survey has under way. The admirable report on the clays of Nova Scotia is reviewed elsewhere in this number. That

on the clays of the North West Provinces will be issued in the near future.

Canada was one of the first countries in the world to recognize that geological work was of sufficient importance to receive the support of the government. The Geological Survey of Canada dates from 1841, when the first parliament of the united provinces of Upper and Lower Canada, now Ontario and Quebec, voted a sum of fifteen hundred pounds for the purpose of beginning the study of the geology of the country. Sir William Logan was appointed Provincial Geologist in 1842, and field work was started in 1843. Since then uninterrupted work has been carried on and has increased in importance and usefulness until from small beginnings it has assumed considerable proportions.

Nova Scotia Returns for 1910

According to the returns received by the Provincial Department of Mines, 21,305,500 bricks were manufactured in Nova Scotia in 1910, and 974,819 feet of drain pipe. These bricks were principally ordinary red clay, pressed and stock quality with about 1,000,000 fire brick. The complete returns for the current year have not been received, but it is not expected that they will show any material change. The following yards were operated:

Stephen Brooks, New Glasgow; New Glasgow Brick and Tile Company, New Glasgow; Elmsdale Brick and Tile Company, Elmsdale; Intercolonial Coal Company, (Fire bricks) Westville; James Miller and Sons, Shubenacadie; Westville Terra Cotta Company, Westville; Jacob Walton, Canard; Middleton Clay Working Company, Middleton; Mira Brick Company, Mira River; R. Shaw, Avonport; George Brooks, New Glasgow; Sydney Pressed Brick Company, Sydney; Miller Bros., River Denys; Spear Bros. and Company, Elmsdale; Buckler Brick Company, Annapolis Royal; Maritime Clay Working Company, Pugwash.

974,819 feet of drain, telephone, sewer and other pipe, conduit and tiling, of different sizes were made by:

Standard Drain Pipe Company, New Glasgow; Intercolonial Coal Mfg. Company, Westville; R. Shaw, Avonport; Jacob Walton, Canard; Middleton Clay Working Company, Middleton; Elmsdale Brick and Tile Company, Elmsdale.

Dalhousie University has opened a campaign to raise \$250,000 for new buildings. A site of forty acres has been purchased in Halifax, N.S., and construction work will be started in the spring. The McDonald Memorial Library will be the first building to be erected and the second a Science Building, costing \$40,000 and \$100,000 respectively. Eventually there will be added a convocation hall, arts building, gymnasium, men's and women's dormitories, etc. Mr. George S. Campbell, of Halifax, is chairman of the Board of Governors of Dalhousie University. Mr. Frank Darling of Darling & Pearson, Toronto, who has received much distinction as a designer of university buildings, recently paid a visit to Halifax in acceptance of an invitation to look over the grounds. After the location of the various buildings is planned the services of a landscape architect will probably be engaged.

It is believed that the first brick paving put down in America was laid at Charleston about 1870. This pavement was constructed of hard burned building brick and was laid by one of the citizens at his own expense. In Europe the history of brick paving dates back several hundred years, its use in Holland being a particularly time-honored one.

Vitrified Clay in Sewer Construction

Material Entitled to Rank with "the Indestructible, Ancient Pottery of the Buried and Forgotten Cities of Asia Minor."

Specially contributed by G. H. Tefft, Kansas City, Mo.,

AS a matter of fact and experience a municipal sewer is a poor thing on which to economize. It lies underground, out of sight, and, under the best circumstances, it is bound to be more or less neglected, and can hardly be made too good to start with at any price. All municipal engineers have now reached the conclusion that a sewer must not leak and that there is no good reason why it should. They are equally sure that its interior should be as smooth as possible so as to enable it to carry the greatest amount of sewage with the least amount of friction and the least excavation for steep grades; and all parties are agreed that whatever other characteristics it possesses a sewer should be built to last. These, then, are the main points to be considered in selecting materials for sewerage a town—sanitation, efficiency, and lasting qualities. No true economy can be effected without strict regard to these essentials.

Standard materials for sewer construction have been so long in use and are so satisfactory that an innovation can force its way into popularity only on the plea that it is cheaper. For this reason cities in these days have unusual opportunities to listen to economy talk by the makers of innovations in sewer pipe. At the present day the town of Niles, Michigan, having given ear to this line of oratory, has now thrown the extravagant results of her economy upon the contractor who, fortunately for the city, gave his bond but, unfortunately for him, did not receive one in exchange from the owners of the pipe patents under which he operated.

In San Diego the craze for sewer pipe economy has now given place to an equal enthusiasm for sewer pipe junctions. In Oklahoma City and El Paso the citizens are to-day extravagantly pulling out the sewers which they economically installed some few weeks and some three years ago respectively, or patching them up with wooden boxes. In view of these constant occurrences it would seem that the subject bears study and analysis; and here are some of the results of our investigations along this line.

Cost Analysis Shows Economy of Vitrified Pipe

The total cost of 21 sewer contracts in the City of New Orleans was \$3,380,144.93. The cost of the vitrified pipe for this work by the time it reached the contractor was \$397,740.91—11.7 per cent. of the total cost of the contracts. Similarly, in Greenville, S.C., the sewer pipe item is 15.2 per cent. of the total cost. In Rock Hill the same state, it was 22.1 per cent. In Eastman, Ga., on one contract it ran as high as 29.7 per cent. In Dalton, Ga., it was 23 per cent. In Rock Mart it fell to 16.7 per cent. In Blakely it was 29 per cent. In Irwin, Tenn., 27.1 per cent. In Seattle, Wash., the average of eight contracts brought it to 21.1 per cent. In Toronto, Canada, on seven contracts it figured 21.5 per cent. The average of several contracts in Indianapolis show it to be 19.1 per cent., and the last twenty contracts executed in Kansas City show this same figure, 19.1 per cent.

The total cost of these last twenty Kansas City contracts was \$196,602, which brought the tax bills to a trifle over 73 cents per running foot of the property served by the sewers. Let us take this city as typical, and assume that under pressure of economy talk she should admit into her specifications cheap sewer pipe, instead of adhering to

standard vitrified salt glazed clay which she has always used; and let us assume that by so doing she could save 20 per cent. on the first cost of the sewer pipe item. On this basis each owner of a 25-foot lot would even then be ahead no more than 20 per cent. of 19 per cent. of 73 cents on the first cost or altogether 69½ cents—supposing the extra burden of inspection of the untried materials did not cost the engineering department enough extra to offset it. Only a glance at these figures is necessary to show the absurdly small amount of gain by the city in trying to economize in this particular direction, and if health statistics could be admitted into municipal bookkeeping these considerable amounts would be offset many times over.

Efficiency Demonstrated by Tests

In order to investigate sewer materials in these three particulars,—sanitation, efficiency and lasting qualities—sanitary experts have instituted various standards of tests, and at its last meeting in Atlantic City, the American Society for Testing Materials again took up the important question of framing a set of tests and specifications which should be universally used throughout the country, not only for the purpose of standardizing the quality of each material, but to discover to the investigator the probably best material for any particular piece of work. Their first move has been a study of the demands made upon sewer pipe without regard to costs. In the meantime a great deal can be learned by using any one of a number of good tests, even if these at the present lack uniformity.

The practice of treating fragments of sewer pipe in sulphuric acid is an excellent way to discover the lasting qualities of the material, for the decomposition of all sewage results in the generation of sulphuretted hydrogen which, in turn, generates sulphuric acid.

A thoroughly vitrified clay pipe, even without the glazing which is necessary for other reasons, withstands any amount of treatment with strong or diluted sulphuric acid, but a material which contains lime in any proportion is, of course, immediately acted upon.

The parallel of this test in actual practice may be seen by inspecting almost any of the older septic tanks which are not lined with some vitrified material, and which show between the levels of high and low water in their compartments and on the bottom side of the roof beams marked acid action sometimes resulting in serious destruction.

The absorption test made by coating the broken edges of a thoroughly dried fragment of the material under question with paraffine, then soaking it in clear water for a number of hours and finally weighing it again to discover the per cent. by weight of water which it absorbed through its working surface is an indication of the imperviousness of the material—therefore of its ability to carry sewage without contaminating the surrounding territory and adjacent water supply pipes, and also an indication of its power to resist frost action.

The rattler or erosion test discloses the probable life of the hard wearing surface of the pipes, and will readily show up the difference between an unglazed material and one having a hard porcelain or glass like surface.

Finally, the load bearing test—the one which, though not the most important, is the easiest to withstand—dis-

closes whether or not the pipe will safely bear the superimposed burden of the earth which is back filled over it.

A very limited experience in making tests of this sort on different sewer materials will bring the investigator to the conclusion that the very best sewer materials are the old fashioned ones that we have always been using, and that even after the issue of nearly 800 patents by the U. S. Government for various machines for the manufacture of new fangled sewer pipes, the old vitrified clay pipe has never had a real rival.

Educational Value of Visiting Factories

A visit to a clay sewer pipe factory is the simplest and quickest way to account for this, and eight times out of ten an inspector of public works or a contractor who is purchasing sewer pipe will terminate his tour of inspection with the remark that he had no idea there was so much to the manufacture of this simple, old-fashioned sewer material.

He sees first the great piles of mined clay which geological ages of compression have already made as dense as rock, and to this he notes the careful accuracy with which the softer clays are mixed with the shales and the seasoning to render the raw material workable and burnable.

He sees the remarkable fineness of the dust which leaves the first grinding mills, and the toughness and the denseness of the mud which results from mixing it with just the right quantity of water, in the second series of mills.

He next stands a long time watching the press. The wonderful dexterity and team work of the crew which operates it strikes him immediately; for it is scarcely to be equalled by the best gun crew in the navy, but it is some minutes before he can be made to realize that the smooth, sleek pipe which is squeezed out of it like hot bars from a rolling mill has been subjected to the tremendous pressure of sixty tons, and is already absolutely dense and almost as firm to handle as the original clay which was mined for its manufacture.

After this interesting observation he is still surprised to find that even the drying and the curing of the manufactured pipes is a matter of great care, manipulated and controlled absolutely by miles of steam piping and regulated ventilation—a process several days in duration. He takes great delight in the tremendous strength and deftness exhibited by the men who receive the dried pipes from the descending chute and pile them in tiers in the kilns. The brief glimpse of the pipes under fire, glowing like pink coals ready to absorb and unite with the vaporized salt to form its glassy surface, and so plastic that a steel rod could be thrust through them as if they were soft dough is as unexpected and interesting to him as the great care and delicacy attending the gradual process of cooling them; and he leaves the plant with a far greater respect for and an entirely different point of view toward what he had hitherto considered a very uninteresting article of every day use.

The chief inspector of Kansas City, actuated possibly by the idea that engineering courses in some of the modern technical schools had not impressed the minds of his young inspectors with a proper appreciation of the old-fashioned materials of construction, invited the entire force to visit with him a large vitrified clay pipe factory on the first day that it rained.

At the first intimation of a drizzle the inspectors appeared in large numbers. They were conducted through the entire plant and given full explanations of everything they saw, so that they left with a far better understanding of the vitrified clay sewer pipe which, hitherto, they had always taken for granted.

This would be a very good practice for any city engineering department to adopt, from its chief engineer down to its inspectors. It would tend to overcome the disproportionate interest and attention that all engineers are apt to give new methods and materials, and bring strikingly to their notice the reasons why the old, vitrified clay pipe is the only one which is able to pass all the tests, both physical and chemical, recommended by all engineering associations, and the only one which properly deserves to be classed with the indestructible ancient pottery which explorers are now discovering in long since buried and forgotten cities of Asia Minor.

The Mission of Matte Face Brick

Specially contributed by Frederick W. Donahoe*

The element of beauty in brick was practically an unknown quantity ten years ago. Some attempts at "outline" were made after facing-brick, made as such, replaced the older "sorted commons" with which our forefathers built the outer walls of their more pretentious dwellings, and "moulded brick" conforming to various classic forms became, for a time, seeming architectural necessities. Here and there, builders whose artistic instincts led them to seek "effects" utilized the by-products of the yards favored with good clays or methods of manufacture which the "improved processes" had not contaminated and the "cull pile" gave material with which to weave "artistic brickwork" and then—some genius invented the matte face in facing brick.

Just who the genius was or when he made those brick, is a question upon which no two brickmakers can agree. Some say that an architect, now practising in Windsor, Ont., suggested the idea to a brickmaker in Western Pennsylvania—others claim that a manufacturer of street paving brick in Indiana strung wires across the mouth of his brick machine in order to get a smaller brick for his own house—his emotions possibly torn between the idea of not wanting paving brick in his own walls and at the same time objecting to paying out good money to buy brick which he could manufacture himself.

Whoever the man and whatever the cause, the matte face brick opened a realm of possibilities to the architect and brought an era of prosperity to the brickmaker. Prior to its coming, the demand for mechanical perfection had grown apace; machinery and means to make "perfect brick" were difficult of attainment; perfection was secured by close selection and a consequent ever growing percentage of "seconds," "offshades" and "culls." Face brick plants are seldom situated in localities where much brick building is under way and "culls," which, under better conditions, could be sold for "commons" or backing-up brick, have but little outlet. Hence, while costing as much to make as the "perfect" bricks, these "culls" were practically a dead loss. They represented, in a way, the cash balance the brickmaker should have had in his bank—but didn't.

Authorities have claimed that the same trend of artistic thought which gave us "mission" furniture and dull finished wall coverings demanded a less shiny and a less perfect facing brick. Be that as it may, the vogue of the matte face brick will last as long as the face brick manufacturer can encourage it and keep it alive, for he has escaped the thralldom of the cull-pile.

At the same time, it has had a mission beyond the earning of dividends—it has lifted the trade of brickmaking into an art. It has made possible a brickwork that rivals all that is good in Europe and given an impetus to a new and wondrously beautiful domestic architecture. It has stemmed the tide of the stucco house—itsself an artistic improve-

* Author of "Artistic Brick & The Textile Principle in Brickwork," published by Thomas Moulding Company, Chicago.

ment upon the hideous frame construction of the last century.

It brought to the brick seller the fact that brick was susceptible of advertising. Since the matte surface was so new and so beautiful—so teeming with possibilities—it had a “story” and anything with something to talk about is—to coin a word—“advertisable.” In order to advertise successfully, an article must have a name—hence the weird nomenclature of matte face brick. Starting, let us say, with “Oriental” we have run through the whole list of rugs and are now beginning, or, let us hope, ending, with “Navajo.” The textile idea leads us into “Tapestry,” “Homespun,” “Corduroy” and “Velvet,” “Mission” and “Cloister,” “Devonshire” and “Caledonian,” “Antique” and “Rustique.” These are a few of the many words which have found favor—some of them enough to warrant their registry as trademarks.

So in many ways, the mission of matte face brick has been an uplift—financially, artistically and mentally to everyone with whom it is brought into contact. It is making the brickmaker wealthy, the homebuilder more artistic, and the salesman more resourceful. Is it a fad? And will it last? Ask the man who can make it successfully and then ask the man who cannot. Strange to relate, their opinions differ widely.

Wire-Cut-Lug Paving Block

One of the most notable developments of brick paving in recent years is the success which has attended the introduction of the Dunn System of manufacturing vitrified paving block without the use of the repress. It is only some three years ago since the idea of making wire-cut-lug paving block was conceived by Frank B. Dunn, of Conneaut, Ohio, and to-day seven large paving brick plants, manufacturing upward of two million paving brick monthly, are operating under this method in the United States, while numerous city engineers and many prominent authorities have come out openly in their expressions of preference.

At the start Mr. Dunn was told that city engineers and municipal and county authorities could not be easily educated to adopt any new form of block to take the place of the repressed block which had already proven so satisfactory. He had to meet the natural opposition prevailing against any radical new idea or innovation. However, the wire-cut-lug block proved so undeniably satisfactory after the most exacting tests, that city engineers and municipal

cut block is not put through the repressing process. This has been demonstrated by ample tests made during the past year by city and state engineers and others, in which the wire-cut-lug brick, unrepressed, withstood the abrasion rattler test with less percentage of loss than did repressed stronger, more homogeneous mass is secured if the wire-



Hamburg Road of the New York Highway System
Paved with Wire-Cut-Lug Brick

brick tested at the same time; and under the same conditions. In a number of cases, large contracts have been given out calling for the use of wire-cut-lug block, as they made a better showing in competitive tests.

It is these undeniable facts that have brought about the present situation in the paving brick industry and which make it quite certain that it will only be a question of a short time before most of the paving block used will be of the wire-cut-lug variety and that the repress, to a large degree, will be discarded in the manufacture of paving brick, although it, of course, will continue to be used in the manufacture of many other forms of brick. It is useless to evade this question or to deny the facts in the case, and the writer of this article is simply stating the present conditions with-



Showing the Perfection of a Street Surface Paved with Wire-Cut-Lug Brick. Note the Evenness of the Rows of Brick and the Manner in which Lugs Form Proper Spacing for the Filling.

authorities have not only been compelled to admit its excellence, but in many cases have become so convinced of its superiority that they openly declare their preference.

Many eminent authorities have admitted that in the process of repressing, lamination is likely to occur that is of serious injury to the character of the block, and that a

out prejudice and without any desire to injure the repress business or detract from its acknowledged value as a part of clay working equipment. This brief review of the present status of the Dunn system and of the value of the wire-cut-lug brick is offered as a matter of general news and information of interest to all clay workers.

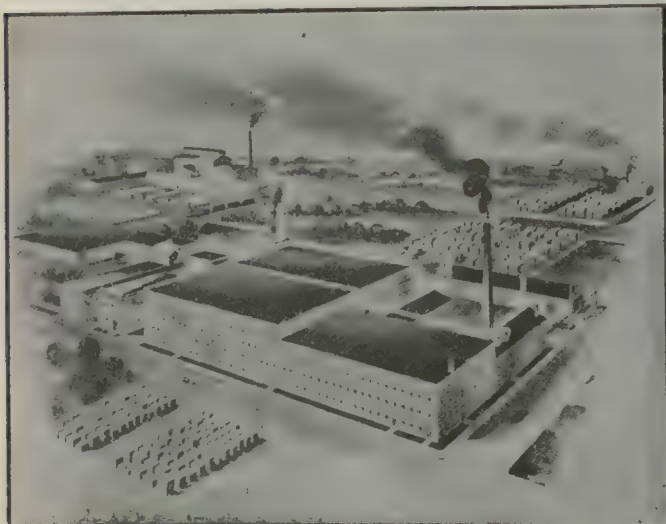


Famous Buffalo-Williamsville Road

Part of the great New York State Highway, showing the appearance of paving with Dunn-Wire-Cut-Lug Block.
After first coat of filler had been applied.

Schultz Bros. Company, Brantford

After a glance at the accompanying view of the present plant of Messrs. Schultz Brothers Company, Limited, Brantford, Ont., it is hard to realize that this progressive firm commenced operations some forty years ago in a frame shed. The great development of this industry may be attributed to the firm's untiring efforts to give the best in quality and service. Messrs. Schultz Brothers operate a large silica pressed or sand-lime brick plant, with a yearly capacity of 4,000,000 bricks, together with a modern plan-



Schultz Bros. Company's Plant, Brantford, Ont.

ing and wood-working plant of large proportions, and a lumber business handling over 4,000,000 feet of lumber annually. At the same time the company are recognized as one of the foremost building firms in the province, the excellent facilities at their disposal having contributed greatly to their success in this line. During the past year the capacity of this large plant has been taxed to the utmost. The company's territory is a wide one. Shipments of silica brick have been made from Montreal in the east, to Lake Huron in the west and north to New Ontario. Altogether the volume of the combined shipping has amounted to over 700 cars annually.

An interesting development at the Schultz Bros.' plant is the manufacture of an attractive buff brick for which there promises a good demand in contracting circles. These buff silica bricks have not only been used on the exteriors of various types of the better class of business blocks and residences with different colors in mortar joints used for contrast, such as white putty or pink joint, but for interior facing work, for which they seem to be particularly adapted, giving a very pleasing appearance and color effect. These bricks were used in this way, together with the white or natural color bricks for a panel effect, in facing up the corridors of the new Collegiate Institute Building (architects, Chapman & McGiffin, Toronto), recently completed at Brantford. There can be just a sufficient number of different shades of buff in a quantity of these bricks, accomplished by a variation in the amount of coloring entering into the process of manufacture, to make a tapestry effect, so much to be desired in modern high class brick work.

Hamilton Pressed Brick

That progressive industry, The Hamilton Pressed brick Company, of Hamilton, Ontario, is continuing to forge ahead in a manner that is particularly illuminating as to the possibilities in this field for an aggressive firm with a good product. During the past year there has been a continuous and ever increasing demand for Hamilton pressed brick, as a consequence of which the manufacturing facilities have had to be doubled. The accompanying illustration is from a photograph of the long line of kilns at this plant. This is in striking contrast to the modest view published in our Clay Products' Number of last year. The company possess excellent transportation facilities, the plant being right on the main line of the Toronto, Hamilton & Buffalo Railroad. This fact, taken in conjunction with the excellent and unlimited deposits of high grade shale which the company is working, places The Hamilton Pressed Brick Company, Limited, in the front rank of the Canadian industry.

The head office of the company is located in the Spectator Building, fifteen minutes on the electric car to the plant. Messrs. Henry and Robert W. New are respectively President and Manager of this concern.



Kilns of The Hamilton Pressed Brick Company, Limited, situated on the Main Line of the T. H. and B. Railroad



View of the Calgary Silicate Pressed Brick Company's Plant

Calgary to the Fore

A progressive firm of a progressive city is the Calgary Silicate Pressed Brick Co., Ltd., of Calgary, Alta. The up-to-date plant operated by this Company—installed by the Berg Machinery Company, of Toronto, was completed and taken over in September, 1910. In rather more than a year they have made two million brick and the demand for their product is ever increasing. Like many another good concern, however, the Calgary Silicate Pressed Brick Company, Ltd., have had their troubles. One of their earliest difficulties was in connection with water. They were unable

and so the prospect of another temporary shut-down was averted. The Company's product is said to rival that manufactured in Winnipeg and other large cities. Their sand is very fine and they make an excellent grade of brick. The Company speak enthusiastically of the Berg press which, they find, sustains all the claims made for it by the makers. The output of the plant this year is over 3,000,000. In addition to their brick business the Company handle a full line of builders' supplies. During the last six months they have unloaded nearly two hundred cars of material at their warehouse. The whole business is under the management of Mr. G. Silvester, who is an old timer in the West, having left Toronto in 1883.



Mr. G. Silvester, Calgary Silicate Pressed Brick Company

to get a supply from the city and failed with a well which they put in at a depth of 170 feet. As a result they were obliged to close down until late this spring. Shortage of coal has also greatly handicapped them this year. Record prices have been paid for coal this season owing to the coal strike. Fortunately the president of the company, Mr. John Breckenridge, was interested largely in a coal mine

G-K Sewer Joint Compound

Our attention has been called recently to a new preparation for making sewer joints which, it is believed, will offer a solution to many of the difficulties which confront contractors and engineers in sewer work. This material is known as the G-K Sewer Joint Compound, and is manufactured by the Union Clay Products Company of 50 Church street, New York City. The composition of the material is not given out by the manufacturers, but in substance it is of a tarry nature, and in use is heated in a kettle until it becomes of the requisite fluidity and then poured exactly as a lead joint is poured, but doing away with the necessity of calking. The manufacturers claim for the compound that it will save the contractors practically all pumping expense wherever water is encountered in their trenches. Joints have been poured with the G-K Compound where the pipe has been entirely submerged in water, and where the compound had to be led down into the annular space by a funnel. They claim also that the joint is absolutely water-tight, and that it reduces infiltration to practically nothing, and correspondingly does not permit of any seepage of sewage with consequent pollution of the surrounding soil. In connection with infiltration, Mr. L. W. Freeman, Assistant Engineer of the Borough of Richmond, City of New York, has testified that in testing a section of 15-inch vitrified pipe sewer on Staten Island (in which the joints were run with G-K Compound) he found an infiltration at the rate of only 450 gallons per mile per day after an immersion of six days with a 5-foot head of water.

Denison Hollow Tile

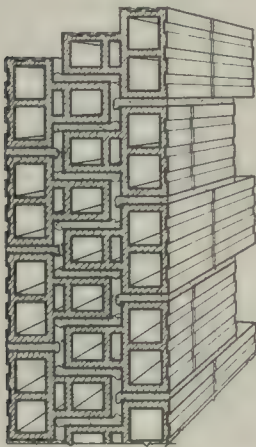
Canadian clay products manufacturers will be interested in the new Denison Hollow Tile which is now being extensively used in the United States for residences, hotels and other public buildings. The walls of the New Hotel Statler, which is being erected at Cleveland, Ohio, at a cost of \$2,500,000, will be built of this tile.

The architects, George B. Post & Sons, well known as designers of many important buildings in the country, adopted the Denison tile after a careful investigation of its merits. They are said to have demonstrated to their entire satisfaction that this tile was most suitable for their purpose and that through its use a large saving could be effected. The estimates of the engineers are reported to show a saving to the builders of \$25,120 through the use of Denison tile. This saving was effected in the following items:

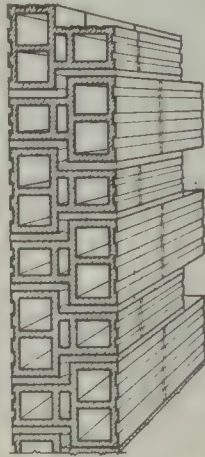
150 tons of steel saved, at \$45 . . .	\$ 6,750.00
122,683 ft. furring saved	13,495.00
Saving in mortar and laying up	4,875.00

A saving was effected in wall loads of 50 lbs. per square foot, a total of 3,000 tons. This represents a saving of steel as above noted. All furring was omitted, because walls built of Denison tile require no furring.

The horizontal manner in which Denison hollow tile are laid is said to produce a stronger, a more satisfactory and better load-bearing wall than is possible when tile are



Twelve-inch Wall



Eight-inch Wall

placed vertically end on end. With the Denison tile, a perfect bed for the laying of the mortar joints is secured, the tile locking and matching so perfectly, as shown by the illustration, that series of supporting vertical columns are formed with an entire wall completed and formed in one solid bonded mass. The strength of these vertical columns can readily be seen in the illustration.

Manufacturers of clay products who have secured manufacturing rights for Denison tile are reported to be meeting with great success.

The Denison products are protected by patents both in Canada and in the United States.

Mr. Denison claims that his tile is particularly suitable for use in our Canadian climate and he is open to arrange for Canadian rights to manufacture it. All communications should be addressed to W. C. Denison, Schofield Building, Cleveland, Ohio.

A New Spreader Cart for Laying Concrete Pavement

On account of the large amount of concrete paving and surface work that is being done these days, especially in laying concrete base for asphalt and other pavements, there

has been a demand for some means of transporting the concrete from the mixer to the point of distribution other than by the old wheelbarrow method. The concrete hand-cart, holding about 6 cubic feet of material, was one of the first improvements on the wheelbarrow for transporting concrete from the mixer in surface construction. Although the cart has certain advantages over the barrow in this class of construction, contractors have felt the want of a cart that would be handled by a horse or mule, and that would be capable of receiving an entire batch from the mixer.

A cart of this description not only does away with a great deal of hand labor, but also provides a means of more rapid construction for concrete paving. By the wheelbarrow and hand-cart method, a considerable number more of men are required to transport the concrete from the mixer, and as only a small portion of the batch can be taken out at a time, this method is very slow where batch mixers are employed on this class of work. At the present time there are on the market several different types of spreader carts for transporting the concrete in full batch from the



Spreader Cart manufactured by Acme Equipment & Engineering Company.

mixer to the place of distribution. The one described herein, however, has certain improvements over others, the principal of which is the controllable discharge. By means of this cart a full batch from a half or three-quarter yard mixer can be discharged into the cart at once, and one man and a horse can transport the load to the point where the concrete is to be laid, and the load deposited in layers very evenly and in any thickness desired, as the discharge is always under the absolute control of the operator. This cart is very low and compact, the top being 36 inches from the ground, level with the wheel-base. The gates for controlling the discharge of the load are so constructed that the cart is absolutely grout proof.

These carts have been in use by several of the large paving contractors throughout the country and have received marked approval. They are manufactured by the Acme Equipment and Engineering Company, of Cleveland, Ohio, who also manufacture a line of concrete buckets and equipment.

Messrs. Coughlan & Sons of New Westminster, are in the front line of the B. C. brick-making industry. The capacity of their plant is 12,000,000 common brick a year. They report excellent results from their 16-chamber continuous kiln, plans for which were furnished by the Builders' Brick Company, of Seattle.

Vancouver is open to receive more competition from the brickmakers of the province. It is significant that during 1910 more than seven million brick were shipped into the city from Seattle, Wash.

West Toronto district probably holds the record for the manufacture of bricks in the city of Toronto. In this section there are fifteen brick manufacturing plants and during the past season about 22,000,000 bricks were made. The past summer proved to be a record one for the manufacture of brick. Several new yards are being established now for operation next year.

Contracts Department

News of Special Interest to Contractors, Engineers, Manufacturers and Dealers in Building Supplies.

Information for insertion in these columns is invited from Architects, Contractors, Engineers, etc.

Waterworks, Sewerage and Roadways

Chilliwack, B.C.

By-laws carried and City Engineer J. D. Croil advises improvements as follows: macadamizing streets, \$45,000; road machinery, \$10,000; drainage \$10,000.

Hamilton, Ont.

City Engineer A. F. MacAllum. The council are considering paving of the following streets: King street, Sherman to Delta, \$29,165.50; Main street, Sherman to Ottawa, \$58,952.52; Barton street, Trolley to Ottawa, \$29,473.75; Trolley street, Main to Barton, \$19,832.75; Ottawa street, Main to Barton, \$35,793; Trolley street, Barton to G. T. Ry., \$6,707.75; Sherman avenue, Main to King, \$14,424.50; Aberdeen ave., Queen to Garth, \$28,425.

Harriston, Ont.

The Wellington County Council will guarantee bonds to the extent of \$35,000 for a new waterworks system.

Lethbridge, Alta.

Tenders are called for paving and sewage disposal; sec.-treas., G. W. Robinson; city engineer, A. C. D. Blanchard; paving contract about \$100,000; sewage disposal works, \$80,000. Further particulars in connection with paving and sewage disposal works from city engineer, Lethbridge, and T. Aird Murray, C. E. con. engineer, Lumsden Bldg., Toronto. Plans, etc., at offices of city engineer, Lethbridge, T. A. Murray and the "Contract Record," Winnipeg, and Montreal branches. Tenders received by sec.-treas. until Dec. 27th. See advertisement in "Tenders and For Sale Department" of this issue.

London, Ont.

The by-law to raise \$125,000 for storm sewer system will be submitted to the ratepayers; also one to vote \$20,000 for West London bridge.

Melita, Man.

On Dec. 19th by-laws will be submitted to raise \$8,000 for sidewalks and street improvements, and \$4,000 for fire fighting apparatus.

Montreal, Que.

The following tenders were received for the furnishing of a new twelve million pump for the low level pumping station as follows: John McDougall & Co., \$29,300 and \$30,400; J. Ingilis & Co., \$25,300; Canada General Electric Co., \$25,300; Chapman & Walker, \$23,100, and \$24,500; Laval Steam Turbine Co., \$37,000.

Ottawa, Ont.

The council are considering the submission of a \$2,000,000 by-law for a filtration plant. City Engineer, N. J. Ker.

Spring Hill, N.S.

Engineer H. W. L. Doane, 25 Young avenue, Halifax, has been engaged by

town to prepare plans and specifications for a sewerage system.

Toronto, Ont.

Tenders are called until Dec. 19th for construction of following sewers: Morley avenue, East Toronto outlet, Sec. No. 2, storm overflow sewer, Dagmar avenue; specifications with city engineer. Chairman Board of Control, Mayor G. R. Geary.

City Engineer Rust has recommended construction of asphalt pavement on the following streets: Danforth ave., Broadview to Greenwood, heavy asphalt, \$84,311; Pauline ave. and Ada street, south to Bloor and Wallace ave., \$9,890, medium asphalt; Elizabeth street from Queen to Hayter, \$19,345, medium asphalt; Sarnia ave. from Campbell ave. to G. T. R. tracks, \$2,204, medium asphalt.

Vancouver, B.C.

City Engineer Fellowes has recommended the following: Creosoted wood block pavement, 41 ft. wide, on Cambie street, \$10,900; bitulithic, 42 ft. wide, on Denman, \$72,560; creosoted wood block, 66.5 ft. wide, on Robson, \$10,924; creosoted wood block, 41 ft. wide, on Smythe, \$63,746; stone block, 20 ft. wide, lane running east and west through block 36, D. L. 541, \$3,932; creosoted wood block, 41 ft. wide, on Homer street, \$11,304. Endorsed by Board of Works.

By-laws to be submitted for construction of sewers, \$800,000; purchase of land for parks, \$500,000; Vancouver exhibition, \$85,000; new plant for engineer's department, \$100,000; old people's home, \$50,000; grading, bulkheads and culverts on roads, \$200,000; overhead viaducts, \$400,000; waterworks extension on Seymour creek, \$350,000; park improvements, \$100,000; purchase of corner of Park Drive and Venables street, \$4,100; waterworks extension, \$175,000; fire hall in D. L. 301, \$14,500; fire hall in West Kitsilano, \$10,000; morgue and emergency hospital, \$50,000; land at corner Granville street and 4th avenue, \$20,400; cold storage and extension of city market, \$9,000; grading and rocking of street in D. L. 301, \$90,000; new police headquarters, \$150,000; Harris-Georgia street bridge, \$550,000; general hospital, \$60,000; opening streets in Hastings townsite, \$150,000; rock crushing plant and bunkers for city, \$40,000; addition to Juvenile Detention Home, \$6,000; lot A. block 28, D. L. 264A. for widening lane, \$3,950; clearing streets in city, \$7,000; rocking and planking roads, \$350,000; clearing and rough grading lanes, \$58,000; day nursery, \$7,500; for school purposes, \$721,500; improvements to cemetery, \$10,000; Westminster road improvements, \$65,000. Total, \$5,372,050.

Welland, Ont.

By-law to appropriate \$20,000 for the purpose of constructing filtration basin; also to grant fixed assessment for the

canning factory to be erected by Mr. Goodwillie.

Winnipeg, Man.

Tenders are called for pumping machinery, manufacture, delivery and erection of vertical centrifugal pump driven by an induction motor—maximum quantity of water to be pumped, 1,000,000 imp. gals. per 24 hrs. Specifications at office of city engineer, 223 James street. Received by chairman Bd. of Control until 11 a.m. Dec. 29th. Sec: Bd. of Control, M. Peterson.

Tenders are called until Dec. 18th for supply of c. i. water pipe, gate valve and hydrants required in extension of fire waterworks system, 223 James avenue. Secy. Board of Control, M. Peterson.

Railways, Bridges and Wharves

Balsam Bay, Man.

Tenders are called until Dec. 29th for construction of breakwater at Victoria Harbor, Lake Winnipeg, Man. Plans, etc., at Department, and at office of W. Z. Earle, district engineer, Winnipeg, and on application to local postmaster. Dept. of Public Works, Ottawa; Secretary, R. C. Desrochers.

London, Ont.

Plans are being prepared for construction of a 40 ft. breakwater between Nissouri and Dorchester. Tenders to be called later. County Engineer, Charles Talbot.

Maisonneuve, Que.

The Canadian Northern Quebec Railway Company are ready to commence work at once on the erection of a new station.

Middlemiss, Ont.

Plans will be prepared for bridge over Thames between Dunwich and Ekfrid. in Middlesex county. Address Chas. Talbot, London, for further particulars.

New Liskeard, Ont.

Surveys have been made for construction of branch railway for Temiskaming & Northern Ontario Railway. Chairman, J. L. Englehart. Branch about 30 miles from main line to Elk Lake. Construction will start in spring.

St. Catharines, Ont.

A by-law will be submitted to provide a high level bridge across the old Welland canal at a cost of \$450,000.

Strathcona, Alta.

Estimates are prepared for extensions to present trackage during 1912, majority of which will be located north of the river, also two important extensions on south side; also that connecting Whyte avenue with Jasper by way of Fifth st. west and high level bridge. Total amount \$400,000. The estimates are to be considered by Edmonton council. City engineer, A. J. McLean; supt., Mr. Knight.

Toronto, Ont.

City Engineer Rust will advertise for tenders for construction of subway on Coxwell ave., instead of constructing by day labor, as originally intended.

Vancouver, B.C.

Three sites under consideration for shipbuilding plant, cost \$500,000. Plant will be for yachts and mercantile vessels at first; afterwards possibly enlarged to build larger steamers. A site has already been secured in St. John, N.B.

Tenders are called for docks for Union Steamship Co., Carrall street; Manager, E. H. Beazley. New tenders are being called by E. H. Beazley for wharf, 200 x 95, including pile-driving. Dalton & Eveleigh, architects, have the plans for the other proposed extensive improvements.

Application will be made to legislature for authority for proposed railway N. and E. to Peace River country. Proposed route: N. E. from Vancouver to Lillooet; north to a point near Fort George; across Parsnip river to Pine river pass; along Pine river valley to South Pine river and Coal Brook, etc., to Hudson's Hope, with branches. Local capital interested. Robert Kelly, 1186 Nicola, is mentioned in connection.

Winnipeg, Man.

Tenders are called until Dec. 28th for supply of labor and materials required bridge. Plans, etc., at office of city engineer, 223 James avenue. See advt. in "Tenders and For Sale Department" of this issue. Sec. Board of Control. M. Peterson.

CONTRACTS AWARDED**Ottawa, Ont.**

Railway for National Transcontinental Co. General contract awarded, J. P. Mullarkey, Ltd., Coristine Bldg., Montreal. Section between Ottawa and Pembroke, 100 miles. Grading and bridge, building will be commenced shortly and continued throughout winter. Sub-contracts have not been awarded yet.

Victoria, B.C.

Railway to cost \$600,000 for Canadian Northern Railway; T. G. Holt, executive agent. Contractors, Moore & Pethick, Victoria. Forty miles of E. & N. Ry. at upper end of Cowichan Lake. Clearing, grubbing and bridge (building included).

Public Buildings, Churches, Schools, etc.**Brandon, Man.**

Plans have been prepared for building to cost \$80,000, for Manitoba Winter Fair Board and Fat Stock Association. President, J. D. McGregor; secretary, Mr. Small; architect, Thos. Sinclair; 80 ft. long, 160 wide, 64 ft. high; seating capacity, 6,000, and when necessary, 15,000. It is expected to start work next spring.

Chilliwack, B.C.

A by-law has been approved by the ratepayers and plans will be prepared at once for city hall to cost \$21,000; city engineer, J. B. Croly.

Calgary, Alta.

School to cost \$4,300, Sirine Estate; architect, H. McLellan, c/o School Bd., Calgary; general contractor, H. Church,

739 14th avenue west, Calgary; 2 storey, 30 x 36, frame, concrete foundation, shingle roofing, electric lighting, hot air heating.

Durham, Ont.

The Public School Board are contemplating the erection of a new school to cost \$25,000.

Dauphin, Man.

On December 15th two by-laws will be submitted to raise \$7,000 for school purposes and \$3,000 for improvements to the town hall.

Duncans, B.C.

Arrangements are being made to rebuild hall of Independent Order of Odd-fellows, destroyed by fire last week. Grand Master, W. H. Cullin, Vancouver.

Granton, Ont.

Plans are prepared for new lodge hall for Order of Foresters (Court Carleton). A site has been already purchased.

Hamilton, Ont.

The Roman Catholic Diocese plan to erect two schools to cost \$60,000; one school on East avenue south; the other near St. Mary's Cathedral both to contain assembly halls as well as class rooms, etc. No architect chosen yet. Chairman Building Committee, Rev. Dean Mahoney, St. Mary's Presbytery, Park and Colborne streets, Hamilton.

Work has started on addition to S. School to cost \$4,000, Peel and Napier, for Zion Tabernacle, A. H. Going, pastor; architects, Geo. E. Mills, 614 King east, Toronto; 1 storey, 40 x 40, brick and stone, stone foundation, steam heating, electric light, shingle roof, hardwood finish. Architect in charge.

Kingston, Ont.

Tenders are called for construction of new asphalt floor in drill hall. Specifications at offices of commanding officer, 3rd Div., Kingston, and with Director of Engineer Services, Headquarters, Ottawa. Received until noon, Dec. 23rd by Director of Contracts. Department of Militia and Defence; Deputy Minister, Eugene Fiset.

London, Ont.

It is planned to expend about \$100,000 on remodelling and additional equipment for the Y. M. C. A. here. Architects to be consulted, Shattuck & Hussy, Chicago; associates, Burke, Horwood & White, 28 Toronto street, Toronto.

Montreal, Que.

The Protestant Board of School Commissioners will obtain legislation from Quebec to authorize raising of \$1,000,000 to be expended on school buildings.

"Gaiety" Theatre to cost \$100,000, for The Canadian Amusement Co., Orpheum Bldg., Montreal; architect, Ross & McFarlane, 1 Belmont street, Montreal; general contractor, C. E. Deakin, 11 Sacrament street, Montreal. Sprinkler system, seating (1,650) wiring and plastering contracts not awarded yet.

A permit has been granted for theatre and stores to cost \$90,000 on St. Urbain street, for Dymont & Duffield, E. Dymont, London, Ont.; architects, Ross & McFarlane, Beaver Hall Hill, Mont.; general contractor, C. E. Deakin, 11 Sacrament street, Montreal. 2 storey, 70 x 149, gas and electric light, tar and gravel roof, two fire escapes, steam boiler. Plans approved some time ago; building started without a permit.

The Mechanics & Fraser Institutes have under consideration the merging

of interests, finances, etc., and erecting a new building for library and educational purposes.

Chas. Dagenais 407 Roy street, is in charge of tearing down old Olivet Church on Mountain street, purchased by C. P. R. some years ago as a site for Windsor street station extension. No plans ready yet.

Niagara Falls, Ont.

New tenders will be called for hockey rink for Niagara Falls Hockey and Athletic Club, Ltd.; secretary, R. C. MacFarlane, Niagara Falls; architect, C. M. Borter, Niagara Falls South. Tenders previously received were higher than funds warranted, more stock to be issued.

Ottawa, Ont.

Tenders are called until Dec. 19th for supply of sorting cases for post office. Plans etc. on application to T. A. Hastings, clerk of works, Postal Station "F" Toronto, and at Dept. of Public Works, Ottawa. See advt. in "Tenders and For Sale Dept." of this issue. Dept. of Public Works, Ottawa; secretary, R. C. Desrochers.

Outremont, Que.

The Clerics of St. Viateur have applied for permit to construct Institutions for Deaf and Dumb and Blind on St. Viateur, Bernard and Bloomfield streets. Detailed plans presented shortly for approval.

Regina, Sask.

Architects Darling & Pearson, 2 Leader Lane, Toronto, are preparing plans for the erection of a hospital, three stys., stone and brick. Cost \$100,000.

Victoria, B.C.

Plans are being prepared for municipal buildings, cost \$50,000, for the recently acquired city yard on waterfront and include store rooms, waterworks, stores department, stables and cottages.

Plans are being prepared for addition to Parliament Buildings to accommodate 100 clerks. Department of Public Works, Victoria; Prov. Supervising Architect, R. F. Lawrence.

Woodstock, Ont.

Tenders are called until Jan. 15th, 1912 for church to cost \$32,000, for Chalmers Presbyterian Congregation; chairman, Building Committee, J. A. McKay, 119 Oxford street; architect, Chapman & McGiffin, 59 Yonge street, Toronto; Brick, slate roofing, hot air heating. Plans etc. from chairman and architects. See advt. in "Tenders and For Sale Department" of this issue.

Windsor, Ont.

Plans are prepared and tenders will shortly be called for erection of public school; 2 storey and basement, brick, stone foundation, shingle roofing. Bd. of Education; architect, J. L. Wilson, Chatham.

Westmount, Que.

Work is in progress for church to cost \$60,000, for St. Matthias Congregation; Rector in charge, Rev. E. Bushell, 20 Churchill avenue; architect, Ross & McFarlane, 1 Belmont street, Montreal; electric wiring, Collyer & Brock, 131 St. Alexander; heating, The Garth Co., 28 Craig west, Montreal. Seats have not been purchased yet.

Yorkton, Sask.

Tenders are called for erection of a hospital for Sisters of Sacrament. Fa-

ther Superior, General A. Delaere, The Monastery, Yorkton. Architect, W. W. LeChance, Saskatoon, Sask. Plans and specifications at office of Waldon Co., 92 Princess street, Winnipeg, at the Monastery and at the architect's office. Received by the Father Superior until 6 p.m. Dec. 15th.

CONTRACTS AWARDED

Echo Place, Ont.

School, cost \$15,000, for Tp. of Brantford. Sec.-treas., J. L. Barnes, Eagle Place; architect, G. W. Hall, Brantford; general contractor, Bennett & Bowden, Brantford. Two storeys and basement, 46 ft. by 70 ft., 4 rooms, brick, reinforced concrete floors, concrete fndn., steam heating, elec. and gas lighting, slate roofing, interior finish Georgia pine (oil finish), ventilating system. Contract let Dec. 6th. Plumbing and heating not let yet.

Montreal, Que.

Alterations are being made to Chalmers Church, St. Lawrence Blvd., to convert building into a moving picture theatre. Gen. contractor, L. J. Grossman, 449 St. Lawrence Blvd.; electric wiring, Wise Electric Co., 787a St. Lawrence Blvd.

Toronto, Ont.

Contracts for repairs to schools have been awarded as follows: Humberside Collegiate, plumbing in science dept., \$1,160; Bennet & Wright; and the following tenders have been passed by the committee for work in Oakwood school: Science dept., \$3,085; Dienenough Co.; plumbing \$1,152, Bennet & Wright; elec. work, \$520, J. J. Beattie; cabinet work, \$3,825, Bustin, Baldwin Co.

Residences

Calgary, Alta.

Rowley & Carver, 610 Grain Exchange will build residences to cost \$4,000 in Elbow Park. Architect, R. Mitchell, Calgary; 2 storey, 35 x 26, frame, concrete foundation, hot air heating, shingle roof, electric light, hardwood interior finish.

Horace Cromar, Calgary, has plans prepared by architects Laing & Smythe, 8th avenue east, for erection of a 3-storey brick apartment house 50 x 50, to cost \$30,000.

A permit has been granted for two residences to cost \$4,000 for J. R. Henderson, 1037 11th avenue west; 2 storey, 18 x 34, frame, concrete foundation, furnace heating, electric lighting, shingle roof.

A permit has been granted for residence to cost \$4,300, Mt. Pleasant, for W. S. Collins, 1325 10th avenue east; 2-storey, 19 x 36, frame, concrete foundation, electric light, shingle roofing, hardwood interior finish, steam heating.

Jas. A. Hay, 324 15th avenue west, has been granted a permit to erect a residence to cost \$3,500 on Mt. Royal; 2-storey, 30 ft. 6 in. x 27 ft., frame, concrete foundation, shingle roof, hot air heating, hardwood finish.

Montreal, Que.

R. Forget, 179 Nicolet street, is excavating for a tenament to cost \$3,500 on Nicolet street; 3-storey, 24 x 44, gas and electric light, tar and gravel roofing, stone foundation.

Foundation has been started for a

residence to cost \$3,800, Christophe Colomb, for A. Lacroix, Mt. Royal and St. Andre, Montreal; 3-storey, 27 x 53, gas and electric light, tar and gravel roof.

Work is in progress on a residence to cost \$7,000 on St. Urbain, for D. Raymond, 244 Clark street; 3 storey, 24 x 107, gas and electric light, tar and gravel roof.

Work is under way for a residence to cost \$12,000 on Laurier avenue, for D. Raymond, 244 Clark street; 3 storeys, 50 x 60, gas and electric light, tar and gravel roof.

New Hamburg, Ont.

J. Ingold, North Easthope, has purchased a lot on Church street for the erection of a large residence for which plans are now being prepared.

Ottawa, Ont.

R. E. McKinsty, 91 2nd avenue, has been granted a permit to erect dwellings to cost \$4,000 on 1st avenue: 27 x 38, brick, veneer, concrete foundation, hot air heating, electric lighting, gravel roofing.

A permit has been granted for a residence to cost \$4,000 on Riverdale ave., for Wm. Alford, 201 Riverdale avenue, Ottawa, 30 x 35, brick veneer, concrete foundation, hot air heating, electric light, gravel roofing.

Permit has been granted for two residences to cost \$6,000 on 4th avenue, for Lincoln Johnston, 84 4th avenue; 2 sty., 24 x 35, brick veneer, stone foundation, steam heating, electric light, shingle roofing.

A permit has been granted for dwelling to cost \$2,500 on Ella street, for G. A. Clark, 106 Kent street, Ottawa; 19 x 33, brick veneer, concrete foundation, hot air heating, electric lighting, tar and gravel roofing.

W. E. Hunt, 176 Florence street, will build a new residence, 32 x 27, double brick veneer, concrete foundation, electric light. Cost \$4,000.

Port Colborne, Ont.

The Maple Leaf Milling Co., manager, Hedley Shaw, are contemplating the erection of 20 concrete cottages for employees.

Toronto, Ont.

Tenders are called for alterations to apartments to cost \$3,500, N. S. S. Anderson and University avenue, for H. Rottenberg, 125 University avenue; architect, I. Feldman, 199 Yonge street; 3 storey, steel and brick, tar and gravel roofing, structural steel.

Thos. J. Fort, 562 Gladstone avenue, will build a new residence, 2 storey, semi-detached brick. Cost \$10,000.

A permit has been granted for erection of apartments to cost \$3,500, 162 Franklin avenue, for J. L. Owen, 73 Adelaide west; 2 storey, brick, stone foundation.

J. J. McKinney, 48 Warren road, will build a residence to cost \$3,700 on S. S. Heath street; architect, J. H. Galloway, 23 Toronto street, Toronto; 2 storey and attached, cut stone sills, slate roofing.

Tenders will be called shortly for erection of a residence to cost \$11,000, on S. S. St. Clair, for A. E. Kirkpatrick, 199 Yonge street; 2 storey and attached, brick.

Work is in progress for 5 pair dwellings to cost \$17,000, Beatrice Place,

for Geo. Lucas & Sons, 301 Ontario street, Toronto; architect, W. G. Hunt, 679 Dovercourt road, Toronto; semi-detached, brick and roughcast; shingle roof. No. 620 Gurney furnace, wall ties.

Tenders will be called shortly for a residence to cost \$8,000, Bedford Park, for R. W. E. Burnaby; architect, Thompson & Belfry, 43 Victoria street, Toronto; carpentry, J. Doherty, Eglington; 2 storey.

Excavation is done for pair dwellings to cost \$4,000, on Shanley street, north side, for Jno. Hines, 57 Hallam street, Toronto; 2 storey, semi-detached, brick.

Excavation is done for three attached residences to cost \$7,500, for W. J. O'Reilly, 52 Colborne street, Toronto; 2½ storey, brick, tar, gravel and slate roof. Owner is builder.

R. C. Vaughan, 66 Dunvegan road, is excavating for 2 pair semi-detached residences to cost \$12,000; 2½ storeys.

Excavation is done for 2 pair residences to cost \$10,000 on Carlaw avenue, for W. J. O'Reilly, 52 Colborne street, Toronto; 2½ storeys, semi-detached, slate, tar and gravel roofing, ornamental galvanized iron cornice.

A permit has been issued for 2 attached residences to cost \$5,800, W. S. Symington avenue, for Harry S. Cooper, 40 Ritchie avenue, Toronto; 2 storeys, brick, hot air heating, electric lighting.

Work is in progress for detached residence to cost \$5,000, in St. Andrew's Gardens, for Robert Doherty, 41 Foxbar road, Toronto; architect, J. W. Gray, Confederation Life Building, Toronto; 2 storey and attic.

H. J. Cummings, 740 Keele street, will build 1 pair residences to cost \$4,000 on Rountree avenue; architect, J. Shuttleworth, cor. Dundas and Western avenue; 2 storey, semi-detached, brick.

Excavation is done for 2 pair residences to cost \$8,000 on E. S. Shaw st., for W. Dunseath, Archer street, Tor. architect, J. G. Hedges, 86 Clinton street, Toronto; 2 storey, semi-detached, brick.

Owner, Tucker Bros., 335 Howland avenue, have been granted a permit to erect one pair dwellings on Davenport and Albany to cost \$4,500; 2 storey, brick, hot air heating, shingle roofing.

Tenders are open for erection of an apartment house to cost \$13,000, 31 Winchester street, for McKnight Construction Co., 152 Yonge street, Toronto; 3 storey, 93 x 60, steam heating, electric wiring, plumbing, painting and plastering, mantles, tiles.

Excavation is done for 3 pair residences to cost \$12,000, on Coady ave., for W. N. McEachren, 63 Victoria st., Toronto; 2 storey, brick, stone foundation, tar and gravel roof, hot air heating, electric light.

A permit has been granted for a residence to cost \$3,500, Indian road and Conduit, for J. H. Mills, 38 Lansdowne avenue; 2 storeys and attic, brick.

Tenders will be called at once for erection of a residence to cost \$3,700 on Yonge street, for J. J. McKinney, 48 Warren road; architect, J. H. Galloway, 23 Toronto street, Toronto; 2 storey and attic.

A permit has been granted for a residence to cost \$4,500, N. S. Westminster avenue, for E. C. Finch, 143 Sunnyside avenue; 2 storeys and attic, brick.

Tenders are called until Dec. 18 for all trades required in erection of a residence in Russell Hill drive; architect, F. S. Baker, Traders Bank Building, Toronto. See advertisement in "Tenders and For Sale Department" of this issue.

Vancouver, B.C.

Plans are prepared for apartment house to cost \$20,000, Cedar Cottage; architects, Dawson & Penticost, 513 Holden Building, Vancouver; 3 storey, 66 x 107, 24 apartments, concrete basement, hot water heating. Stores may be placed on ground floor. The architects are preparing plans for two other large buildings contemplated.

CONTRACTS AWARDED

Montreal, Que.

Excavation is done for 3 flats to cost \$6,500, on Park avenue, for H. Frey, 1720 St. Urbain street; builders, Dagenais & Frey, 251 Clark street; 3 storey, 25 x 64, wood and brick, stone foundation, gas and electric light, gravel roof.

Ottawa, Ont.

Residence to cost \$4,500 for A. W. Grant, Powell avenue; general contractor, Geo. A. Eamar, 320 Bronson avenue, Ottawa; 2 storey, 31 x 32, brick, veneer, stone foundation, electric lighting.

Apartments to cost \$14,000 on McLeod street, for A. Higman; architect, Arthur L. Weeks; general contractor, E. J. Shuttleworth, 29 Euclid avenue; 81 x 64, brick veneer, concrete foundation, steam heating, electric light, gravel roof.

Toronto, Ont.

Two detached residences to cost \$6,500 on Hughes avenue, for D. J. Taylor, Yonge street arcade; architect, Edwards & Saunders, Victoria street; builders, W. E. Symons, 20 Glendale avenue; 2½ storeys, brick.

Residence to cost \$8,000, Russell Hill Drive; architect, Thompson & Belfry, 43 Victoria street, Toronto; masonry contractor, Moore & Stewart, 203 Augusta avenue; carpentry, Wm. Murphy; 2½ storeys, Indiana cut stone, slate roofing, hot water heating, electric lighting, mantles, quarter cut oak, interior trimming, tiles, hardwood flooring. Tenders still open for some trades.

Residence to cost \$5,000, 15 Edna avenue, for Amelia Sparling, 11 Binscarth road Toronto; architect, C. P. Sparling, Yonge street; builder, Wm. Nixon. 2½ storeys, brick and stone.

Residence to cost \$6,200, 4 Pricefield road, for J. Patterson, King and West Market; architect, Chadwick & Beckett, 20 Toronto street; builder, Edwin White 35 D'Arcy street, Toronto; 2½ storeys, brick.

Excavation is done for 1 pair dwellings to cost \$8,100, E. S. Shaw street, for L. Walkey, 326 Shaw street; builder, Robert Temple, 84 Somerset avenue; semi-detached, 2 storey.

Residence to cost \$10,000, 326 Roxboro street east, for T. Bradley Hyde, 64 Isabella street; architect, S. H. Townsend, 15 Gerrard east; builder, E. A. Gall, 93 Bleeker street; 2½ storeys, brick.

Foundations have been started for 3 attached residences, to cost \$4,800, on Ashdale and Gerrard streets, for J. Brown & Co., Gerrard east; builder, H. E. Hunt, 337 Leslie street, Toronto; 2-storey, attached, brick veneer front, roughcast siding.

Business Buildings and Industrial Plants

Brantford, Ont.

Tenders were called until Dec. 11th for erection of a factory for Brantford Oven and Rack Co., Ltd.; architects, G. W. Hall, 321 Colborne street, Brantford. Plans etc. at office of architect.

Calgary, Alta.

Permit has been granted for furniture factory for J. Reid & Sons, 117 17th ave. west. Frame, concrete foundation, hot air heating, electric lighting, shingle roofing. Usual interior finish. Owner is building a small plant, \$2,000 to commence; proposes erection of larger building later.

J. L. Hellburn is representative of a company capitalized at \$25,000 who are looking for site for erection of a candy factory.

E. A. Hayden, Kensington avenue, N. W. is planning to build a store and apartment block, 2 storey, 80 x 50, brick veneer, to cost \$10,000.

Coalmont, B.C.

S. R. Tilson is contemplating the erection of a gent's furnishing store to be ready for occupation February 1st, 1912.

Guelph, Ont.

Bell Telephone Co. of Canada have purchased site from Wm. Scriven on Cork street and plan to erect new exchange to cost \$40,000.

Kingston, Ont.

The Commercial Box & Envelope Co., Ltd., of Canada, capital \$200,000, it is stated, will locate in Kingston. B. B. McFadden, Commercial Envelope Co., president.

The Canadian Locomotive Co. have applied to council for a fixed assessment of \$100,000 for next ten years. Preparations for doubling plant are being made. Vote taken on January 5th or thereabouts.

Ladner, B.C.

Sawmill at Ladner's Landing for The McLelan Lumber Co., 744 Hastings w., Vancouver; architect, E. F. Mitchell, Seattle. The company state they are still open for tenders on general contracts and machinery. Pile driving will be commenced in a few days by day labor.

Lethbridge, Alta.

The Mooney Biscuit Co., Winnipeg, are considering the location here next spring of a distributing warehouse. General manager, W. C. Mooney.

W. J. Stokes, of the Empire Hotel, is contemplating remodelling the building; a 2-storey addition will be made.

Mitchell, Ont.

The Whyte Packing Co. will build a large new brick ice house at once.

Montreal, Que.

A company to be known as British-Canadian Cannery Co., Ltd., capital \$500,000 bonds, \$750,000 common stock, contemplate the erection of about five canning factories in Ontario. C. H. Cahan, 37 Royal Insurance Bldg., Montreal, and Sir Henry Bate, Ottawa, are mentioned in this connection.

Mrs. W. A. Hastings, 84 Redpath st., will build a stable to cost \$4,000, rear 84 Redpath street; architect, H. E. Shorey, 56 Beaver Hall Hill, Montreal; 3-

storey, 45 x 38, brick, concrete foundation, hot water heating, electric lighting, tar and gravel roof.

The Royal Guardians, Sherbrooke and Park avenue, have secured property corner Sherbrooke and Hutchison. The residence on site is to be remodelled as a head office for the company. Possession given next May.

Newbury, Ont.

The Heinz Pickle Company, Pittsburgh, Pa., are considering the location of a plant here.

Ottawa, Ont.

Tenders are called for re-building garage on Sparks street, for Pink, McVeity & Blackburn, Sparks street; architect, J. P. McLaren, 104 Sparks street. Three storeys, reinforced concrete, steam heating, reinforced concrete roofing, electric lighting, steam heating, electric hoist to carry 6,000 lbs. Building was gutted by fire three weeks ago; old foundation walls to be reinforced; add. 1 sty.; fire-proof construction throughout.

Prince Albert, Sask.

Messrs. O'Connor & Hahon, and Knights of Columbus, are planning the erection of office and stores, 4 storey, 65 x 75, on Central avenue. Building will be erected next year.

Port Arthur, Ont.

A by-law may be submitted to grant concessions to W. R. Sinks, of Chicago, who contemplates locating a new industry here.

Sandwich, Ont.

The Home Bank, Toronto, have purchased the Robinet Block and necessary alterations will be made for an up-to-date bank building.

Ernest Thresher is contemplating the erection of large new business block to contain several stores.

St. John, N.B.

The Sydney, (N.S.) Foundry Co. will use the Roslyn rink as part of their plant. It is to be converted into a structural boiler warehouse. The building is being strengthened in order to stand the heavy machinery which is soon to be installed.

Tilbury, Ont.

By-law will be submitted at municipal elections to grant loan of \$3,000 to Hallett Bros., for a brick and tile plant.

Toronto, Ont.

The T. Eaton Co., Yonge street, have taken out a permit for new warehouse on James and Albert streets, 10-sty. and basement, fireproof.

Brunswick-Balke-Collender Co., 67 Adelaide street west, plan to erect a factory, \$80,000, Atlantic & Hanna sts. Vice-president, Julius Balke; Factory Supt., J. C. Schank. Factory to be erected shortly. Firm manufactures billiard tables, etc. This company is capitalized at \$12,000,000. Proposed factory will employ 150 hands.

Tenders are open for erection of a warehouse to cost \$14,000 on Duchess street, for Jno. G. Kent, Confederation Life Bldg., Toronto; Architect, J. Cowan, 65 Adelaide street, Toronto; 2 storey, brick, tar and gravel roofing, structural steel and iron, cut stone.

Tenders are open for erection of an office and warehouse to cost \$5,000 on Monroe avenue, for G. S. Ransom, 72 King street east; architect, J. H. Stanford, Parkdale; 2 storey, brick.

The Glidden Varnish, Wallace avenue, will build offices and warehouse to cost \$14,000 on Wallace avenue; architect, Prack & Perrine, Gilkinson street, Hamilton; 2 storey, brick and concrete construction, concrete foundation, structural steel, art stone, cement floors, hardwood finish, fire-doors, cornice of art stone, Hyrib metallic lath, metal sash, skylights, wire glass, vault.

Tenders are open for erection of a foundry to cost \$6,000, on Morrow ave., for Canadian Harrison Van Winkle Co., 114 Jarvis street; architect, P. H. Herbest, 65 Adelaide street; 1 storey, brick, concrete foundation, slate and glass roofing, structural steel, skylights, coping, paving brick and cement floors, steel sash, machinery, fireproof doors, galvanized iron cornice, ventilators, plumbing. Foundry equipment.

The Imperial Life Insurance Co. are contemplating the enlargement of business building, on Victoria street; steel, brick, fireproof, hollow tile with stone facade, tar and gravel roofing, steam heating, electric light.

Foundations are started for warehouse and office to cost \$75,000 on Front street for Geo. J. Foy, Ltd., 3 Front street east; architects, Curry & Sparling, 90 Yonge street; five storey, 200 x 60, mill construction, metal windows, brick, cut stone, metal sash, metal skylights, side-walk lights, vaults, galv. cornice, electric elevators, gravity carrier system, tar and gravel roofing, steam heating, electric light. Supplies will be purchased by architect; work done by day labor. Storage for wines, liquor, etc.

Vancouver, B.C.

Plans are contemplated for addition to bakery for Shelly Bros., Ash and 10th avenue, Vancouver; architect, Wm. F. Gardiner, Hartney Chambers, Van. Two storeys, 32 x 100; day labor. This is temporary accommodation. Plans to be prepared shortly for a 3-storey fire-proof building.

D. Campbell, c/o Campbell Walker Brokerage Co., Hutchinson Bldg., will build a store and apartment house; 6-storey, on Seymour street. No plans drawn as yet. Hugh Braunton will be the architect.

Victoria, B.C.

The King Edward Hotel, Yates and Broad streets, to be taken over on Jan. 1st by Wolfenden & Millington. The building will be remodelled and refitted as an hotel only.

Plans are prepared for store and apartment house to cost \$125,000, on Johnson street; architect, Breseman & Durfee, Sayward Bldg., Victoria; reinforced concrete, 60 x 105, 8 storeys on ground floor, brick and terra cotta facings, steam heating, elevators, wire glass, metal window frames, tar and gravel roofing. Tenders on general contract called shortly.

Victoria, B.C.

Plans have been prepared for erection of a business building to cost \$125,000 on Johnson street; architects, Breseman & Durfee; 6 storey, 105 x 60, fireproof, reinforced concrete, pressed brick. Building to be used for hotel, offices and stores. No permit issued yet, nor contracts awarded.

Welland, Ont.

Plans are completed for hotel extension to cost \$15,000, Main street; owner, J. Cooper, proprietor, Dexter House;

architect, A. E. Nicholson, St. Catharines; 3 storey, brick, concrete foundation, steam heating, electric light. Date for closing tenders not yet decided.

The Pittsburg Nut Bolt and Nail Co., Pittsburg, Pa., have purchased a site and plan to establish a branch factory here in Industrial Park.

Woodstock, Ont.

The by-laws granting aid to the Woodstock Spring Mattress Company and the Woodstock Automobile Company will be submitted to the ratepayers to establish factories here.

CONTRACTS AWARDED

Calgary, Alta.

Storehouse to cost \$50,000, C. P. R. Rt. of Way, for Canadian Pacific Railway; general contractor, Jones & Blackshire, Calgary; 2 storey, 50 x 150, reinforced concrete, steam heating, electric light, tar and gravel roofing.

Fort William, Ont.

Storage elevator, cost \$500,000, for Grand Trunk Pacific Co. Contractor, J. S. Metcalf Co., Ltd., 54 St. Francois Xavier street, Montreal. Construction of 2,500,000 bus. elevator, concrete construction.

Guelph, Ont.

Stove foundry for Guelph Stove Co., Ltd.; architect, W. A. Mahoney, Guelph; general contractor, W. E. Taylor; carpentry, Geo. Ibbotson; plumbing, Stevenson & Malcolm; Guelph, roofing, T Irvin & Sons, Hamilton.

Montreal, Que.

Bank of Ottawa, \$19,000; 2 storey, 29 x 71; architect, H. C. Stone, 84 St. Francois Xavier street; general contractor, E. G. W. Cape, Beardmore Bldg., Montreal; electric wiring, Collyer & Brock, 131 St. Alexander; plumbing and heating, M. J. Quigley, 4228 St. Catherine street.

Warehouse to cost \$20,000, Cote St. Paul, for The Imperial Oil Co., Ltd., Board of Trade Bldg.; general contractor, Reid McGregor & Reid, 668 St. Catherine street west; 3 storey, 80 x 40, concrete and brick, concrete foundation, hot water heating, electric lighting, asbestos composition roofing.

Leather factory on William street, for Marlatt & Armstrong Co., leather merchants, 305 Craig west, Montreal; architect, E. W. S. Maxwell, Beaver Hall Hill, Montreal; general contractor for superstructure, Reid, MacGregor & Reid, 668 St. Catherine street west, Montreal.

Ottawa, Ont.

Offices to cost \$6,250 on Rideau street, for C. A. Douglas, F. Graves and R. McMorran; architect, J. A. Ewart, Sparks Chmbrs., Ottawa; general contractor, A. Garvoek & J. C. Law, Ottawa. Added storey, solid brick, steam heating, electric lighting.

Shop and dwelling to cost \$13,000, Kent street, for H. Martin; architect, Geo. Tomlinson, 348 Waverly street; concrete contractor, H. Halev. Sweetland avenue, Ottawa; masonry, St. George & Sons, Cumberland street, Ottawa. Other tenders not called for yet. Awaiting favorable weather to commence concrete.

Toronto, Ont.

Garage to cost \$25,000, Huntley street, for C. S. Boone, 142 Crescent Road; architect, Chadwick & Beckett, 20 Toron-

to street; builder, Teagle & Son, 55 Boswell avenue.

Alterations to warehouse to cost \$7,000, 80 Wellington street west, 4 storey, brick; owner, Sterling Lace & Novelty Co., 80 Wellington street west; architect, Curry & Sparling, 90 Yonge street. Contractors as follows: masonry, Thos. Brick, 716 Broadview avenue; carpentry, Wm. Clark, jr., 425 Avenue road.

Laundry to cost \$3,000, McCaul and Renfrew Place, for Jno. Gardner, McCaul street, Toronto; 2 storey, brick, structural steel, cut stone; plate glass, sheet metal cornice, hardwood floor, tar and gravel roofing, cement and stone foundation. Architect, H. Simpson, 82 King street east, Toronto.

Vancouver, B.C.

Warehouse on Corral street; general contractors, Smith & Sherborne, 515 Bank of Ottawa Building. Excavation contractor, G. T. R. Transfer Company, 430 Dufferin street east.

Hotel, Georgia street, cost \$1,000,000. Architect, W. S. Painter, Painter & Swales, Metropolitan Bldg., Vancouver. Contractor, Skene & Christie, 770 Howe street, Vancouver. Detailed plans not ready till about March. Plans for boiler house being prepared. Work on this started at once.

Power Plants, Electricity and Telephones

Blyth, Ont.

The council is considering the matter of installing hydro and a public meeting will be held to discuss the question.

Calgary, Alta.

A preliminary estimate has been prepared for electric light extensions aggregating \$175,000.

Grandview, Man.

Two by-laws will be submitted Dec. 19, one to raise \$45,000 for fire fighting apparatus, and the other for \$7,500 for electric light and power.

Hamilton, Ont.

Sub-station for Hamilton Hydro-electric Department. Consulting Engineer, E. I. Sifton. Contractor, G. F. Webb, Wentworth street. Contract let Dec. 4th; building to be completed Jan. 30th. Contract ratified Dec. 11th, work will begin at once.

Killarney, Man.

A by-law will be submitted on 19th inst to raise \$14,000 for the purchase of the Collison Electric Light plant.

Listowell, Ont.

The town is taking up the matter of installing hydro power with the commission engineer and a full report will be made shortly.

London, Ont.

London & Northwestern Railway have under consideration the water power development of Aux Sable River. Project of construction of power plant and dam placed before county council by D. A. Stewart, London, and N. R. Gibson, of Smith, Kerry & Chace, Toronto. Matter to be considered by next year's council. The present council favor the project. Engineers, Smith, Kerry & Chace, Confederation Life Bldg., Toronto.

Portage la Prairie, Man.

Tenders were called until Dec. 11th for electric wiring at Old Folks Home

(Continued on page 123)

Tenders and For Sale Department

To Engineers

Every man who puts in a tender on your jobs has got to see your plans and specifications first. If you are in Montreal and he is in Vancouver the inspection of your plans is a problem. Let us solve that for you. Place on file copies of your plans and specifications in any or all of the "Contract Record" offices.

More contractors and manufacturers read the "Contract Record" than any other Canadian publication. It is the logical place to look for tenders called, and where all important works are advertised.

Send along your plans for your next job and put a line in your ad. to that effect.

Contract Record

Montreal—B34 Board of Trade.
Toronto—220 King Street West.
Winnipeg—Commercial Travellers' Bldg.
Vancouver—441 Seymour Street.

To Manufacturers of Machinery

A firm wishing to take up the manufacture and marketing of the most complete and up-to-date concrete machinery in the United States or Canada. A proposition will be considered for just the manufacturer. Please address Box 348, Contract Record, Toronto, Ont. 44-49-50F

Sewer Excavator

For sale for immediate use, a Vulcan "Little Giant" Steam Shovel with extra long dipper handle for excavating to 16 feet below surface, mounted on traction wheels, dipper 1½ yd. capacity. Machine just overhauled; new chain, and extra large new boiler; weighs 32 tons; low price. Address

WILLIS SHAW MACHINERY Co.,
39 South LaSalle Street,
Chicago, Ill.
42-t.f.

CITY OF VANCOUVER

Re Tenders for Seymour Creek Extension

Tenders will be received by the undersigned up to Wednesday, December 27, 1911, at 4 p.m., for the following connection with Seymour Creek Extensions:

1. For the supply of 24,000 feet of 24-inch steel pipe for the Seymour pipe line extensions.
2. For the supply of valves for the new Seymour Creek pipe line extension.

3. For the excavation and back filling of a pipe trench along Seymour Creek, suitable for the construction of a 36-inch steel riveted pipe.

Plans and specifications may be seen at the office of Messrs. Hermon & Bhrwell, Room 12 Inns of Court Building, and at the office of the City Engineer, City Hall.

A deposit of an amount equal to five per cent. of the contract price must be made with each tender, by marked cheque, payable to the City Treasurer.

The lowest or any tender not necessarily accepted.

WM. McQUEEN, City Clerk.

City Hall, Vancouver, B.C.

November 8, 1911.

47-49-50F

CITY OF LETHBRIDGE

Paving and Sewage Disposal Works

Sealed tenders for construction of above works addressed to Secretary-Treasurer of the City of Lethbridge, and endorsed "Tender for Paving" or "Tender for Sewage Disposal Works," as the case may be, will be received by registered post only until noon of 27th December, 1911.

The approximate value of Paving Contract, and Contract for Sewage Disposal Works, will be in the neighborhood of \$100,000 and \$80,000 respectively. The bond required for Sewage Disposal Works to be \$25,000, and that for the Paving 25 per cent. of the contract price.

Further particulars can be obtained in connection with the Paving, from the City Engineer, Lethbridge; and in connection with the Sewage Disposal Works, from the City Engineer, Lethbridge, and T. Aird Murray, C. E., Consulting Engineer, Toronto.

Plans for Sewage Disposal Works will be on file at the office of the City Engineer, Lethbridge, T. Aird Murray, and the offices of the "Contract Record, 334 Board of Trade Building, Montreal, and Commercial Travellers' Building, Winnipeg.

G. W. ROBINSON,
Secretary-Treasurer.

Lethbridge, Alta., Canada,
November 27th, 1911. 49-50

Extension of Time

CITY OF EDMONTON ENGINEERING DEPARTMENT

1912 PAVING

Sealed tenders, addressed to the undersigned, and endorsed "Tender for 1912 Paving," will be received at the office of the City Commissioners, Edmonton, Alberta, until twelve o'clock noon (12.00 M.) on Friday, December 15th, 1911, for approximately 100,000 square yards of street grading and paving with curb.

Preliminary plans, and specifications, and all information may be obtained at the office of the City Engineer; plans and specifications are on file also at the office of the Canadian Engineer, 62 Church street, Toronto, and the Contract Record, 220 King street west, Toronto. A deposit fee of Five (\$5.00) Dollars is required. This fee will be refunded when plans are returned.

Tenders are invited for Wood Block, Asphalt Block, Sheet Asphalt, Bitulithic, or other kinds of pavement.

Proprietors of patented pavements are required to furnish their special specifications.

Tenderers are required to submit bids as follows:—

Tender No. 1—Unit prices, for whole work.

Tender No. 2—Unit prices, for 75,000 sq. yds.

Tender No. 3—Unit prices, for 50,000 sq. yds.

Tender No. 4—Unit prices, for 25,000 sq. yds.

An accepted cheque for five per cent. (5 p.c.) of the amount of tender must accompany each bid.

The lowest or any tender not necessarily accepted.

CITY COMMISSIONERS

Office of the City Commissioners,
Edmonton, Alta., Oct. 19, 1911. 43-49-50F

Time—Time for submitting tenders has been extended from Dec. 1st to Dec. 15th, 1911.

Tenders Wanted

Tenders addressed to the undersigned will be received at 60 Atlantic Avenue, Toronto, up to and including Saturday, December 16th, 1911, for all Standing Timber on the farm known as the Stewart Farm, Homer P. O., Ont.

Timber and Stumps must be removed by March 1st, 1912.

Each and every tender must be accompanied by a marked cheque payable to the order of J. W. Lee & Co., for ten per cent. of amount of tender, which will be forfeited should any party whose tender is accepted fail to execute the Contract. The cheques of unsuccessful tenderers will be returned. The highest or any tender not necessarily accepted.

J. W. LEE & CO.,

60 Atlantic Ave., Toronto, Ont.

November 27, 1911. 49-49-50F

Tenders for Erection of Steel Superstructure of New Osborne St. Bridge

Sealed tenders addressed to the Chairman, Board of Control, will be received at the office of the undersigned up to 11 a.m. on Thursday, December 28th, 1911, for supply of labor and materials required in the erection of Steel Superstructure for the new Osborne Street Bridge. Plans, specifications and form of tender, together with conditions governing tenders as prescribed by by-law, may be obtained at the office of the City Engineer, 223 James Avenue, Winnipeg. The lowest or any tender not necessarily accepted.

M. PETERSON, Secretary.

Board of Control Office,
Winnipeg, Nov. 30, 1911. 49-49-F

Sealed Tenders

Marked "Tenders for Drainage" will be received by me at my office in the Village of Clarence Creek, until one o'clock in the afternoon of Friday, December 15th, 1911, for the construction of

THE COBB'S LAKE DRAIN

in the Townships of Clarence, North and South Plantagenet, including four reinforced concrete bridge piers and one reinforced concrete culvert. Plans and specifications may be examined and forms of tender procured at my office, or at the office of Magwood & Walker, Civil Engineers, Cornwall, Ont.

Total length of drain, ft. 45,965
Estimated Excavation, earth, cu. yds. 178,613

hard-pan, cu. yds. 350
Reinforced concrete, cu. yds. 186½

The Municipal Council of the Township of Clarence reserves the right to accept the lowest or any tender, to reject any or all tenders or to extend the time for the consideration of the tenders received on or before the above mentioned date.

A cash deposit or accepted cheque on a chartered bank equal to five per cent. of the tendered price must accompany each tender.

O. GUIBORD,
Reeve of Clarence Tp.

Dated at Clarence Creek, Ont.,
this 14th day of November, 1911. 47-50

To Contractors

Scaled bids for all trades required in the erection of a residence in Russell Hill Drive, will be received by the undersigned up to noon of **Monday, December 18th.**

The lowest or any bid not necessarily accepted.

F. S. BAKER, Architect,
Traders Bank Building
50-50

City of Moose Jaw Saskatchewan

The Moose Jaw Public Library Board invite competitive plans for a Public Library Building. The cost of the building is to be \$50,000, and plans are to be submitted by December 20th, 1911. A premium of \$100 will be paid for second choice and \$50 for third choice.

For further information apply to the undersigned.

47-49-50F W. F. HEAL, City Clerk.

Lighting Contract Wanted

I have a complete lighting and power outfit and want to get in touch with towns in the market for electric lighting and power. Am willing to sell the outfit or operate it under a franchise. Would require investment of \$10,000 or \$20,000. If interested write to Box 379, Contract Record, Toronto, Ont. 49-49-50

Tenders Wanted

Scaled tenders will be received by the undersigned, in accordance with amended specifications, on or before noon, the 15th day of January, 1912, for the erection and completion of a new church building to be erected by the Chalmers Presbyterian Church, Woodstock.

Plans, specifications and further information may be obtained from J. A. McKay, chairman, Building Committee, 119 Oxford street, Woodstock, or at the office of the Architects, Chapman & McGiffin, 59 Yonge street, Toronto.

Lowest or any tender not necessarily accepted. 50-50

CITY OF WESTMOUNT City Surveyor's Department

Tenders are invited for:

1. Supply of one steam road roller.
2. Supply and erection of bituminous macadam mixer plant.

General conditions, form of tender and all particulars can be obtained at the office of the City Surveyor.

Tenders in sealed envelopes marked either "Tender for Steam Road Roller" or "Tender for Bituminous Macadam Mixer Plant" will be received by the City Clerk, Westmount, up to twelve noon, 3rd January, 1912.

Tenders will be opened by the Mayor sitting in public in the City Hall, at 5 p.m., 3rd January, 1912.

The City Council does not bind itself to accept the lowest or any tender.

ARCH. CURRIE,
City Surveyor.

City Hall, Westmount,
8th December, 1911. 50-52

Situations Vacant

Advertisements under this heading one cent a word per insertion. Box No. ten cents extra. Minimum charge 25 cents

WANTED—A qualified builders' hardware salesman with good connection in Western Canada and accustomed to figuring from Architects' plans, to travel for large United States manufacturer. Address replies, stating experience, salary required and copies of references immediately, to Box 389, Contract Record, 220 King Street West, Toronto, Ont. 50-52

Positions Vacant

Architectural Draughtsman

WANTED—Thoroughly competent architectural draughtsman. Apply Allen Keefer, Architect, 229 Sparks Street, Ottawa, Ont., stating age, experience and salary expected. 48-51

Positions Wanted

Position wanted by building superintendent and engineer with general building experience, including reinforced concrete. Also had experience in deep foundation work, mass concrete and dam construction. Box 390, Contract Record, Toronto, Ont. 50-50

Advertising Manager—Of a large manufacturing concern of Cleveland, Ohio, desires to connect with a going house, who are looking for results in advertising. Is competent of writing own copy, compiling of catalogues, folders, circulars, etc. For further information address Box 385, Contract Record, Toronto, Ont. 50-51

Power Plants, Electricity and Telephones

(Continued from page 121)

and at Industrial Training School. Plans etc. at office of Prov. Architect, Ft. Garry Court, Winnipeg. Dept. of Public Works, Winnipeg; Minister of Public Works, Colin H. Campbell.

St. John, N.B.

The St. John Railway Company will convert a building formerly used as an electric power station into a factory for construction of street cars.

Stettler, Alta.

The street lights are being installed here on Main street and Alberta avenue. Additions are being made to the power house. Residences and business houses are being made ready for electric lighting. The boiler plant and generator capacity have been enlarged to meet increased load.

Toronto, Ont.

New tenders are called for power house to cost \$8,000, Liberty street, for E. W. Gillette Co., Ltd., King west; architect, A. R. Dennison & Stephens, 18 King west; builder, R. Dennison & Son, 159 William street; 1 storey and basement, structural steel, brick, concrete foundation, skylights, cement, tar and gravel roofing, electric work, machinery, reinforced concrete, boilers, stack, plumbing.

Vancouver, B.C.

Estimates are prepared for cluster lights, 1912, Georgia, from Granville to Stanley Park; Pender street, from Granville to Georgia; Powell street, from Carrall to Campbell avenue; Hastings street, from Jackson to Campbell ave.; Campbell ave, from Powell to Harris; Harris street, from Campbell avenue to Main street; Main street from bridge to Broadway.

Business Notes

Fergus, Ont.

The Bloomfield Mills, formerly one of the Canadian Cereal Companies, were badly damaged by fire. Loss \$30,000.

Prince Rupert, B.C.

The Government Buildings were destroyed by fire on 27th Nov., among which was the land registry office.

Quyon, Que.

The Dowd Milling Company's roller mill burned. Cost \$10,000; local manager, John Hunt; local agent, David McCulloch.

Regina, Sask.

More than \$20,000 has already been raised for erection of tuberculosis sanitarium. The government will donate \$25,000. A small infirmary will be erected first.

Rosser, Man.

Purchase authorized for new school—secretary-treasurer, W. H. Beachell; John Turner, sec-treas., Brooklands, S. D., Dickens P. O., Man. The trustees authorized borrowing \$20,000 for completing new school and purchase of site for another. For further information address John Turner.

Sparta, Ont.

J. T. Donnelly's cheese factory reported completely destroyed by fire; machinery badly damaged. loss \$5,000. Will probably be re-built next year.

St. Thomas, Ont.

The council will be asked to submit a by-law for \$10,000 to ratepayers in January for erection of isolation hospital to cost \$10,000; 1 storey. 76 x 18; 30 x 20, brick, concrete foundation, shingle roof, low pressure steam heating (boiler, round hot water heaters) hardwood floor, pine finish, direct ventilation, telephone, electric lighting, one refrigerator. Architect, J. F. Findlay, St. Thomas.

Sarnia, Ont.

Tenders will be called for equipment of town hall with fire escapes and providing the necessary exits. Town clerk, J. D. Stewart.

Sault Ste. Marie, Ont.

An appropriation of \$75,000 has been asked by the school board for school extensions.

South Vancouver, B.C.

The congregation of St. Peter's Anglican Church are raising funds for a new church.

Thamesville, Ont.

The Library Board have opened negotiations with Carnegie Library Fund Directors in regard to a new library here.

Toronto, Ont.

Factory of Roden Bros., cut glass manufacturers, burned; damage to machinery and contents, about \$15,000, to building, \$2,000.

Tenders are invited for erection of a theaterium to cost \$5,000 for The Suburban Amusement Co., 84 Victoria street, Toronto; brick. Address Mr. Tickner, 84 Victoria street.

Vancouver, B.C.

Department of Militia & Defence, Ottawa, will have competitive plans prepared for the erection of a drill hall on Deadman's Island.



A. H. WAGSTAFF & CO.
Brick Manufacturers

A. H. WAGSTAFF, 428 Greenwood Avenue
Phone Beach 591

WORKS: GREENWOOD AVENUE
Phone Beach 140

Toronto, October 11th 1911.

The Federal Engineering & Supplies Co.,
284 Yonge St.

Toronto.

Dear Sirs:-

In answer to your inquiry re.Scandinavia Belting,we take pleasure in saying that we have used several Scandinavia belts,and they have given us every satisfaction. In fact for one drive in particular which ran our large fan,we could not get any belt to give satisfaction until we tried your Scandinavia. Since putting on Scandinavia,it has given the best of results,and has run two years night and day and is as good as new at the present time.

They are also good for dirty and dusty Drives and where there is steam or dampness and we have no hesitation in recommending Scandinavia to any users of belting.

Yours very truly,

A. H. Wagstaff & Co.

TURBINE PUMPS

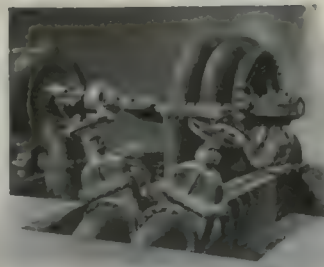
for Water Works Purposes

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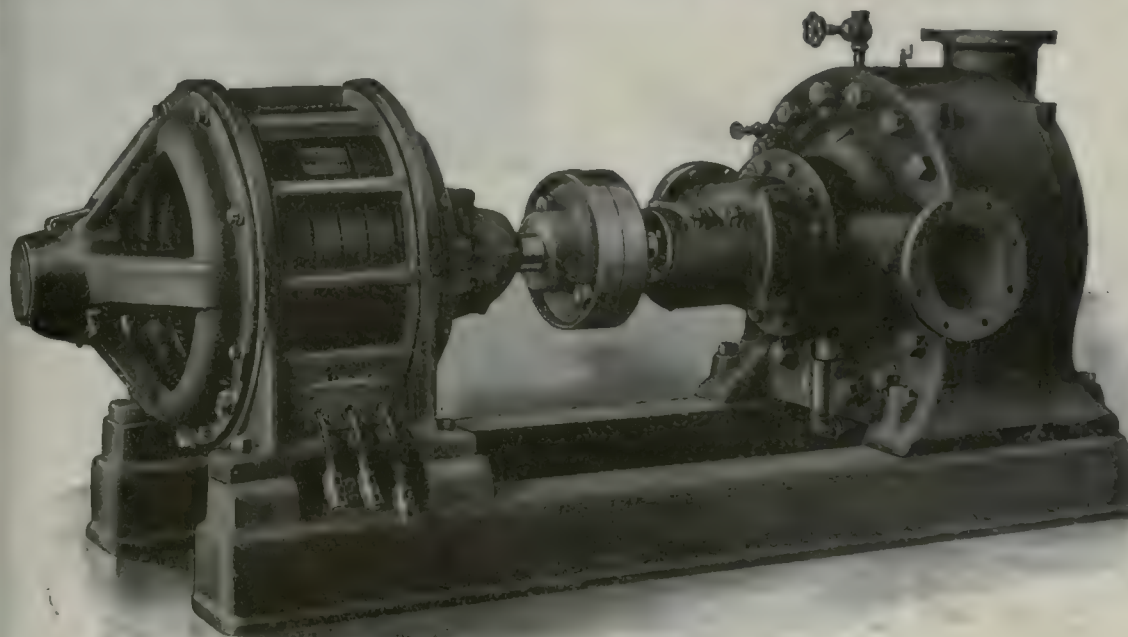
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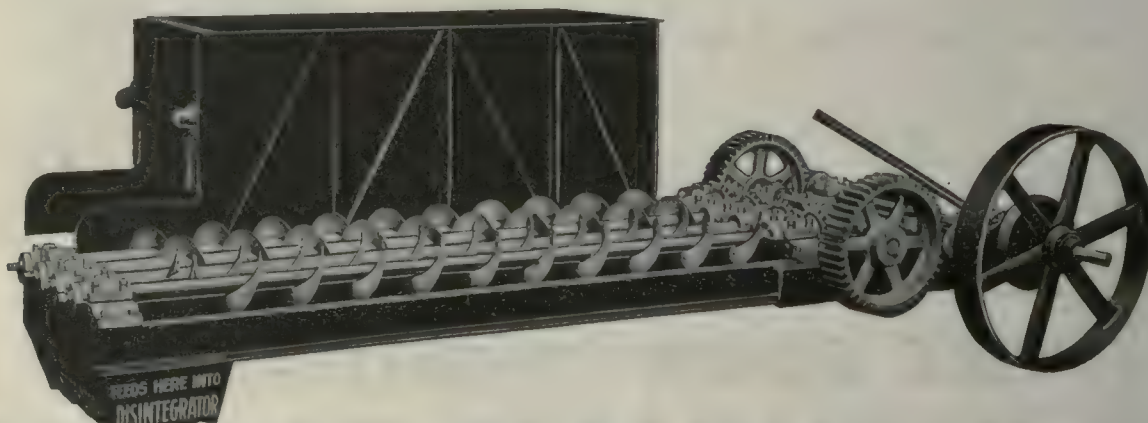
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Contract Record

ESTABLISHED 1886

A Weekly Journal of
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Manitoba Government's Ill-Considered Architectural Competition

The Manitoba Government has adopted and published conditions of a competition for the selection of an architect for the Manitoba Parliament buildings. These conditions run to considerable length, and it may or may not be in their favor that they appear to be modelled on no known form for a competition of this nature.

In brief, architects of the British Empire are asked to submit preliminary drawings, and of those submitted five will be selected by the assessors. The five competitors thus selected will receive a premium of \$2,000, presumably apiece, on completion of the plans in detail. One of them will then be selected to design the building, either using the plan submitted, revising it, or substituting an entirely new one, as the assessors shall decide.

Probably this scheme of competition would work out as well as any other towards the desired object of securing the best set of plans complying with the necessary limitations, but its practical value appears to be entirely destroyed by the conditions imposed, two of which deal with the personnel of the board of assessors and with the time limit for sending in plans.

"The assessor," so run the conditions, "shall be appointed by the Lieutenant-Governor-in-Council, and work in conjunction with the Premier, the Minister of Public Works and Deputy Minister of Public Works, and Provincial Architect." In fact here is a government committee of four with the addition of one outsider, presumably an architect of standing, but who would necessarily be subordinate to his employers, who would constitute the majority of the board. Further down the document states that "the government reserves the right to nominate any other assessors in addition to those named," which may mean just nothing at all, except as a useful club to

hold over an obdurate assessor. The Government would be well advised to shift the responsibility to an independent commission of experts.

But the condition which appoints February 15th next as the final date on which preliminary plans may be sent in, renders the whole scheme abortive so far as extra-Canadian architects are concerned, and in fact looks very much like a frame-up with some ulterior object in view. After ostentatiously throwing the competition open to all architects domiciled within the British Empire, it is a travesty to close it at a date when few of them will even have heard of it.

The whole scheme seems ill-conceived and hasty, and might well be withdrawn and reconsidered.

Municipal Responsibility for Compensation

A noteworthy precedent was established at Montreal recently by Mr. Justice Charbonneau in the case of Bernier vs. the City of Montreal. Bernier, while working for the city on sewer excavation work was buried beneath a pile of earth and drain pipes and was severely injured. He brought action to recover from the city the sum of \$2,000, on the ground that the authorities, as employers of labor, fell within the scope of the Workmen's Compensation Act.

In granting the petitioner permission to enter suit for the amount claimed, the Judge reviewed at some length the history and meaning of the Act. One of the primary considerations under the Act is whether the object in view, or construction, is undertaken for monetary gain. The Judge contended that such works as water supplies, sewerage and so on, were undoubtedly undertaken by municipal corporations directly or indirectly under this heading. "As far as constructional operations are concerned," he added, "it seems to me necessary to submit civic corporations to the same obligations as would be imposed upon a private contractor."

Maintenance works come under a different category, according to Judge Charbonneau, for the reason that they are not undertaken for profit and that it is a duty which the municipality has no choice but to assume.

The case is interesting in that it is illuminating as to the responsibility of the municipality. In the Workmen's Compensation Act no exception is made in favor of municipal corporations, and the town or city assuming the responsibility of carrying out construction work by day labor is transformed, in the eyes of the law, into a chief of works answerable to the law equally with the contractor.

Labor and Capital

A clearing up of the industrial atmosphere in the United States in the settlement of the sensational criminal trial at Los Angeles, Cal., is not without its influence in Canada. In the United States, those who followed the developments of the trial are hopeful that hereafter there will be a material lessening of the friction between employers and employed.

With honest assurance, employers have been accused, in their relation to events preceding the trial and during its brief course, with conscienceless oppression of labor, and the working class has been charged, in equally good faith and as a class, with reckless efforts to injure its employers. The grossly vicious acts of men supposed to be and accepted as leaders of organized labor have led employers to be-

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lieve that they reflected the tendencies and sentiments of their constituents, and the latter, with firm belief in the innocence of such reputed leaders, have bitterly upheld them and attributed malignant purposes to those supposedly backing the prosecution of the case. The confessions of the accused men should demonstrate that neither class has been wholly right; that both have largely been wrong. Labor is shown that the attitude of the employers was assumed with a clear conscience and in supposed self-defence, and employers are awakened to a knowledge that the confessed and convicted criminals represent truthfully neither the masses of labor nor the sentiments of its unions. Justification of the attitude of the employer should now be apparent to the intelligent workman, and the immediate and comprehensive repudiation by the latter of the radical and vicious element within its ranks should give capital a better understanding of the real disposition of labor.

Importance of City Planning

At Vancouver, B. C., there is a feeling among architects and engineers that a permanent committee should be appointed to plan for the future development of the city. Mr. Heath, the architect for the projected stadium at Cold Harbor, is of the opinion that a civic centre should be planned at once—not for the Vancouver of to-day, but for the Vancouver that will be developed with the opening of the Panama Canal. He considers that the city should prepare itself to take its place with New York, Boston, Liverpool and other great seaports and that delay will only mean a double or treble expense in the future. Vancouver undoubtedly has a great future and it is to be hoped that this movement will gain greater momentum.

It is time Canada at large awakened to the great importance of city planning. With all the discussions, all the lectures, all the conventions and all the paper schemes, practically nothing has been accomplished in Canada with the exception of the work of the Ottawa Improvement Commission—and concerning this, perhaps the least said the better.

Montreal Building Under-Estimated

Why is it that Montreal, with the largest population in the Dominion, makes a comparatively poor showing in the total value of the building permits? During the past year the city has had a period of exceptional activity in the contracting trade, yet the amount of building, judged by the official permits, is below that of cities of considerably smaller population. This, of course, is not according to fact, and the publication of the figure is regarded as detrimental to the prestige of the city by giving a wrong impression of its growth. There are two or three reasons for this unsatisfactory estimate of building activity, the main one being the under-valuation of the proposed cost of the buildings by many of those who take out the permits. This is done to avoid the payment of fees on the true value. Mr. A. Chausse, the building inspector, estimates that, on an average, the city loses about fifty cents for every \$1,000, to say nothing of the taxes which are levied on the estimated value of the structures.

Another reason for the small showing of Montreal is that the outside municipalities, such as Maisonneuve, Outremont, Westmount and Verdun, although

really part of Montreal, have their own charters, and the building permits do not figure in the totals of Montreal. There is probably no remedy for this, but the fact that the buildings are erected practically within Greater Montreal and yet do not count in the total, has an unfavorable effect when the city's building progress is considered. Two wards—Longue Pointe and Cote des Neiges—are not included, as they issue no permits, being specially exempted from the building regulations when they were annexed to the city. Then again, the harbor work, running into millions of dollars, is omitted, as the Commissioners are not bound to take out permits, while another adverse factor is that hitherto municipal work has not been included in the total.

The year 1910 may be taken as a typical instance of this condition of affairs. The total permits were 3,507, of an estimated value of \$15,715,859. This does not give a true idea of the work done. The figures given below, says Mr. Chausse, more nearly represent the value of the building operations:—

Value of permits	\$15,715,859
Construction (no permits) Longue Pointe ...	125,000
Construction (no permits) Cote des Neiges ...	10,000
Harbour Commissioners' buildings	1,250,000
Municipal	250,000
	\$17,350,859
Extra work after permits taken out	2,649,141
Total	\$20,000,000

To this must be added a very large amount of work done in outside municipalities.

The Board of Control are taking measures to place Montreal in its proper position as regards buildings, and Mr. Janin, the engineer, and Mr. Chausse, have, at the Controllers' instance, reported on the subject.

One suggestion is that in order to stop these false estimates every person who takes out a building permit shall send in with the statements, plans and drawings and a statement in writing, sworn to before a Justice of the Peace or a Commissioner of Deeds, giving details as to ownership and a statement as to the cost of the structure. The violation of the by-law would render any person liable to a heavy fine. It is also suggested that architects should make a separate declaration of the estimated cost of buildings for which they have drawn up plans and specifications. It is probable that, if the changes are adopted by the council, legislative power will have to be obtained in order to make them effective.

The Advertiser's Creed

I believe in publicity and in every legitimate method of catching the eye and reaching the ear of any possible customer.

I believe that repetition must result in emphasis, that emphasis must in time attract attention, that attention must create interest, that interest must yield orders.

I believe that the way to sell goods is to advertise them, to tell people about them continually, to talk straight and to talk honest.

I believe that the market is as big as the world, that a slice of it belongs to me, that my goods are worthy of it, and that I am going to get it.

Engineering Ethics and Qualifications

The Hon. Mr. Justice Riddell's Inspiring Address before the Engineers' Club of Toronto—High Ideals for the Profession

THE Qualifications of the Engineer and the General Ethics of the Profession formed the subject of a particularly forceful and interesting address by The Honorable Mr. Justice Riddell at the mid-day luncheon of the Engineers' Club of Toronto on Wednesday, December 13th.

The speaker was introduced by the President of the Club, Captain Gamble. At the outset he addressed those present as "brother engineers," and told his hearers that he had had some training in engineering work, having taken a post-graduate course leading up to the degree of Bachelor of Science upon the termination of his regular Arts' course at the university.

Mr. Justice Riddell defined engineering as "the science of rendering natural powers beneficial to man; of taking the raw material and applying it to the school of art." The profession had attained a place as high as that occupied by the other professions. Not so very long ago there were only three professions. If a boy did not enter the army or the navy, his choice lay between law, medicine and divinity. In those days the engineer was not considered to have any social status. The general conception of him was a "grimy, greasy, horny-handed driver of a locomotive." Times had changed, however, and the strides made by the physical sciences had told upon the profession. The engineer had come to be regarded as a gentleman and his calling to be recognized by the great universities, the excellence of whose courses testified to the consideration that is being given by the heads of learning to the work of the engineer.

Apropos of the qualifications of the engineer, Mr. Justice Riddell laid particular emphasis upon the value of mathematical training and paid a high tribute to the accuracy which it engendered. While it was not necessary for the engineer to trouble himself with "aeroplane" mathematics, it was a prime necessity for him to attain that absolute precision which comes from mathematical methods. "Pretty near" was not near enough in engineering work; indeed, the habit of getting "pretty near" had caused great calamities. Accuracy was the key-note to success in all engineering work and there could be no accuracy unless the engineer was a mathematician. The speaker quoted Lord Kelvin, who once stated that even though he could express himself in mathematical formulae, he would never vouch for his accuracy unless he could actually construct a machine upon such formulae.

Of all professions, that of the engineer called for the exercise of the intellect. And what greater pleasure was there than that derived from intellectual achievement! The studies of the engineer should bring him a thorough appreciation of what nature actually is. There should be the love of the work which an engineer should find in the discharge of his duties. In the fulfilment of his professional functions he should experience a personal pleasure which should impress upon him that he was engaged in a work which had stronger claims on him than anything else could possibly have. If the engineer liked his work

in this manner and was paid well for it, what more could he wish? He, the speaker, had worked through the calculus without thought of any return save the pleasure it gave him in doing so.

While acknowledging the value of the leading text books published in the engineering interests, likening them to those which provide the basis for the legal mind, Mr. Justice Riddell warned the engineer against becoming a slave to tables and formulae. The man who was really master of his work was he who schooled himself thoroughly in the principles and methods by which those formulae had been computed; who had made himself a sufficient master of his subject to be able, for instance, to prepare afresh a new table of logarithms if occasion demanded. He had once cross-examined a railway engineer who had been unable to define a one-degree curve or to state whence its name was derived. Such was the result of a superficial grasp of principles.

The Engineer as a Witness

The Engineer in a Court of Law formed the subject of some extended observations by the speaker. The habits of carefulness and accuracy formed in the natural order of things by the engineer should make him the best of expert witnesses. He should be able to deal in particulars and not in generalities and the opinions which he gave should be formed carefully and based at all times upon well-established hypotheses. There were numbers of men in the profession who came up to this standard, but again there were many who did not. Frequently the speaker had encountered differences of opinion between engineers which should not have existed. In his experience, lack of accuracy in engineering witnesses of high standing had been a frequent source of trouble.

Lord Bramwell, an eminent lawyer, had once said of his brother, Sir Frederick Bramwell, equally eminent as a consulting engineer: "There are three kinds of liar: the liar, the damned liar, and my brother Fred."

Lying and misrepresentation should have no part in the work of the engineer. As a rule it did not, but again sometimes it did. He had known mining engineers report on veins that were not discernible with a microscope and on the other hand he had heard of the omission of veins which might have been discovered by the veriest novice. Such practices were unworthy of the engineer and could not be condemned too strongly.

The speaker concluded by congratulating the engineer upon the high place he had attained in public estimation and urged him to continue to give the best in his power, having regard always to accuracy and honor.

Capt. Gamble tendered the thanks of the Club to Mr. Justice Riddell, who made a short reply in which he expressed his willingness to assist the engineering profession whenever it might lie in his power.

Dean Galbraith testified briefly to the high character of the speeches delivered at the Club and to the benefit derived therefrom by the members.

Municipal Administration and the Engineer

Editor, Contract Record:

I have read with interest the article entitled "Municipal Administration at Victoria, B.C.," published in the November 1 issue of the Contract Record.

Certainly I must agree with you that Victoria has made itself ridiculous.

This is not the first time that I have heard about Victoria. I remember hearing the city discussed by members of the Canadian Society of Civil Engineers at the annual convention of that body in Winnipeg last January. And the men who were carrying on the discussion had been on the ground and were speaking of facts.

After all, Victoria is only a little worse than the majority of cities and towns throughout Canada. Eight municipal engineers out of every ten are continually making reports to the council to clear themselves of charges and complaints. This is only what is to be expected so long as the people elect shoemakers, bakers and even foremen of labor gangs to represent them in council and to plan the expenditure of thousands and millions of dollars. In many cases these men do not know how to make a success of their own business, let alone the city's. Often they jump at the opportunity to get their name before the public in some such way as holding a municipal office. When they are elected, they attend council and committee meetings and appear ready to imbibe sound advice from the heads of the different departments, but afterwards they turn around and promote their own views and give their own instructions, in direct opposition to such advice.

The city engineer, who is supposed to have charge of construction and design, has often obtained his knowledge and experience at the cost of much time and study—and often hardship and sacrifice, and as a rule he is the best judge of what is the most satisfactory and economical way to obtain the desired results. He cannot afford to take any wilful chances; he cannot afford to blunder; he cannot afford to lose his reputation. In the last case he might as well start life all over again. And this he realizes to the full. This being so, can a man in such a position afford to advise without making reasonably sure of the advice he is giving? And yet we find men who cannot even agree among themselves whose only common interest seems to lie in running amuck of their engineer!

Whenever the engineer has had any extended experience in municipal work, he knows enough to protect himself at all times by giving his advice in writing, but even at that, if the work does not pan out as it should, the public never get to hear of such advice.

These are not the only means taken to secure the arms and legs of the engineer. In not a few cases he is practically forced to take on miscellaneous proteges of aldermen in the shape of foremen, office help and even laborers, providing them with jobs which in many instances have to be specially adapted to the individual or to his patron. I have known cases where the engineer has been instructed by the council to find work for men who had been fired shortly before for not doing what they were told. Then later the engineer would receive blame for having such men in the employ of the city. Sometimes the engineer receives a little soft soap in the way of a half-

apology, on the side, but that does not help him in public estimation.

In small places it is not an infrequent occurrence for an engineer to set a gang of men to work on, say, a water main on a certain street. About the middle of the morning some alderman will come along, call the foreman over, ask him what he is doing and instruct him to go to such-and-such a street and start there first. At the next council meeting the engineer lodges a protest and perhaps gains his point. This occurs two or three times more with different aldermen—and the next thing the engineer knows is that he is looking for another job where he can go through a similar programme.

As long as such practices are countenanced by the authorities and as long as the people elect unfit men to represent them, just so long will the municipal engineering profession lean toward a lower level; for any man who works for any length of time under such conditions must ultimately become a mere figure-head with no ambition in him other than to draw his pay, and drift on.

In my opinion there will be no improvement in municipal administration throughout the country until these poorer classes of men are wiped out and replaced by really intelligent representatives,—men who are "doing things" and who can at least run their own businesses successfully.

As an alternative to the present system, is it not possible that better results would be obtained under the commission form of government and by the appointment of say three men, one a qualified engineer, one a good banker and the other a successful, practical business man? These men, I take it, would be elected one each year for a term of three years. In such a case the engineer would be held responsible for results only and would be freed from annoying interference with the small details of his work.

The trouble is that in the majority of cases under the present system the engineer does not have a fair show.

Yours very truly,

"An Engineer.."

At Bassano, in Alberta, a town which owes its existence to the C. P. R. and a wide-awake publicity agent, they have adopted a "slogan" with which to carry on an active advertising campaign. If at first blush the slogan may seem to verge on the profane, it will, at least, achieve the object for which it was coined—that of attracting attention. "Bassano,—the Best in the West by a Dam Site," is the watchword with which this new town expects to "draw all men unto it." The liberties the publicity agent has taken with the King's English may be partly condoned when it is considered that everything within the vicinity of Bassano is being run on a big scale, especially the huge C. P. R. irrigation dam across the Bow River, which is one of the biggest engineering enterprises now being carried on in the Dominion.

Mr. John Redmond has just received from Tasmania a gift of historic interest to the Irish party, in the shape of a brick taken from the cottage in which John Mitchel, editor of the "United Irishman," and one of the leaders of the Young Ireland movement in the forties, lived on parole while under sentence of fourteen years' transportation.

A Noteworthy Convention at Montreal

Canadian Public Health Association's First Annual Congress—Valuable Papers by Engineers — Symposium on Biological Sewage Disposal

THE First Annual Congress of the Canadian Public Health Association was held in the new medical building, McGill University, Montreal, December 13-15.

The meeting was attended by some of the foremost authorities in the Dominion, and many excellent papers dealing with various phases of medical, sanitary, engineering, municipal and other questions were presented.

The great object of the congress was to co-ordinate the work of the engineer, the doctor and the chemist, and to bring about a better understanding between municipal, provincial and federal health departments.

The congress was inaugurated on the evening of December 13th by His Royal Highness the Duke of Connaught, who heartily commended the work of the association. It was announced by the Hon. Martin Burrell that in all probability a Department of Health would be instituted by the Dominion Government. Sir Lomer Gouin, Premier of Quebec, stated that in order to extend hygienic work in the province, the Quebec Government had decided to divide the whole province into ten sanitary districts, each of which was to be placed under the direction of an expert who would report directly to the government. These hygienic experts would be appointed by a competitive examination from the Universities of McGill and Laval.

Lord Strathcona sent a cheque for \$2,500 to promote the work of the association.

Valuable Papers Before Engineers' Section

On the second day, December 14, there was much of interest in the section of sanitary engineers and architects, which was presided over by Mr. T. Aird Murray, of Toronto. In addition to a number of the papers detailed in our issue of November 29, interesting addresses were given as follows: "Housing Problems," Dr. C. J. Hastings, Medical Health Officer for Toronto; "Municipal Powers in Dealing with Town Planning Schemes," Mr. R. A. Outhet, Montreal; "Rehousing in Canada," Mr. W. D. Lighthall, K.C., Westmount; "Statistics on Housing and Co-partnership Schemes," Prof. P. E. Nobbs, F.R.I.B.A., Montreal; "Town Planning from an Architect's Point of View," Mr. C. P. Meredith, Ottawa; "Town Planning and Civic Authorities," Dr. J. C. Laberge, Assistant Medical Officer, Montreal.

After the papers had been read, the chairman pointed out that the section had been started to bring sanitary engineers into closer contact with the medical officers, in order that there might be greater unity than there had been in the past. Instead of the departments working in an isolated fashion there should be unity in policy and action. It was their desire that the section should develop into a useful part of the association. He suggested that they should form a committee to carry on the work. This was agreed to, and as it was decided that the chairman should be convener and nominate the committee, he suggested Mr. Geo. Clark, Saskatoon; Prof. Gillespie, To-

ronto; Mr. T. J. Farmer, Montreal, and Mr. R. R. Knight, Toronto.

A considerable part of the session was devoted to a discussion of town planning. Dr. C. A. Hodgetts, medical adviser to the Commission on Conservation, Ottawa, condemned the large apartment house of the big city and also alluded to the mistake of laying out large areas without due consideration for convenience and beauty. He deplored the sacrifice of these things to the greed for financial gain and suggested that legislation for town planning should be secured.

Dr. Laberge, Montreal, contended that the engineer should be specially trained for town planning and that some effort should be made to educate the general public. In his opinion, the matter of laying out streets and deciding upon their width should be one for the authorities, and not be left to individual initiative.

Dr. Hastings dealt with the transportation problem, which he considered a question for the authorities to take up, as theirs was the responsibility of abolishing the slum districts. Mr. Outhet discussed at some length British laws on the subject of town planning. Prof. Nobbs considered that the first step toward the establishment of garden cities is to secure satisfactory building laws in our towns and cities. Mr. Meredith, of Ottawa, was satisfied that nine-tenths of the areas that had been developed in the cities had expanded without any technical supervision. In how many cities had the formation of civic centres and grouping of buildings been discussed? He hoped that the time would soon arrive when the public would show a keen and intelligent interest in these matters.

Symposium on Biological Sewage Disposal

The third day of the congress, December 15, was occupied chiefly by a symposium on biological sewage disposal. The first paper, by Dr. P. H. Bryce, chief medical officer of the Department of the Interior, Ottawa, was on "Physical and Economic Aspects of Biological Sewage Disposal Plants." Summarizing the stages in the evolution of sewage disposal Dr. Bryce divided these into four—(1) 1860-80, the sewage farming period; (2) 1880-90, antiseptic and germicide period; (3) 1890-1900, septic tank period; (4) 1900-10, the colloid period. Dealing with what sewage is, it was stated that if by any method it is possible to hold back or extract readily the solid matters which are suspended and will not go through filter paper with a flow of one foot per minute, but will settle from quiet sewage, we shall have not only prevented any danger from this source, but will also have lessened pro tanto the amount of biological work to be done later in the purifying process. It is in this direction that the last ten years have witnessed the most remarkable developments. The high point has now been arrived at when 70 per cent. of the organic matter of sewage may be mechanically and—largely—automatically removed, when the sewage flow is not greater than four millimetres per second or ten inches per minute, and especially where

the sewage is allowed to rest from two to four hours.

"Progress in Canada in Biological Methods of Sewage Disposal During the Last Twenty Years," was the subject of a paper by Mr. Willis Chipman, C.E., Toronto, who traced the history of practical attempts at sewage purification in Canada, referring to the International system and the use of polarite and ferrozone. This was followed by the septic tank system, which was adopted by several places. The Canadian septic tank boom of the last ten years had commenced to subside, but engineers had profited largely by the experience gained. Many of the tanks constructed during the last five years had been more accurately called sedimentation tanks—sludge receivers rather than sludge digesters. Percolating and sprinkling filters were now being adopted by municipalities throughout Canada, but none were as yet in operation, as far as Mr. Chipman knew, except the percolating filter of the Stoddard type at Vernon, B. C. At the present date engineers favor tanks for the removal of the solids by sedimentation, the treatment of effluent upon filters, and the disinfecting of the filtrate after a second sedimentation. By the end of the decade now closing every inland city and town would probably have adopted some method of sewage purification.

After reading his paper Mr. Chipman spoke upon the urgency of a closer union between sanitary engineers and bacteriologists. It had been suggested in the previous paper that seventy per cent. of organic matter could be removed; that might be so in laboratories, but it was not so in practice. If they divided that percentage by half it would be nearer the result. Bacteriologists could assist engineers by not painting such rosy results to municipalities, who were apt to expect too much from engineers. Many councils could not be persuaded to adopt modern methods of sewage disposal or consideration of public health, but the schemes appealed to aldermen only when it was shown that they would save money.

Another paper was on "Chemical Problems Involved in Methods of Sewage Disposal," by Dr. G. G. Nasmith, of Toronto. Dr. J. A. Amyot, Toronto, dealt with "Bacterial Problems Involved in Biological Methods of Sewage Disposal."

A comprehensive paper entitled "Engineering Problems Connected with Biological Sewage Disposal," by Mr. T. Aird Murray, C.E., Toronto, is printed elsewhere in this issue.

At the adjourned annual meeting, held in the afternoon, the constitution of the association was adopted. Dr. C. A. Hodgetts, Ottawa, was elected president, and it was decided to hold the next congress at Toronto.

New Coal Mining Plant at Lethbridge, Alta.

The installation of the most modern machinery employed in coal mining has just been completed at the Lethbridge collieries, situated eight miles west of Lethbridge on the Crow's Nest line of the C. P. R. The sinking of two shafts was commenced on August 20, 1910. Within sixteen months one of the finest coal mining plants in Canada has been placed ready for operation. The shafts are about 600 feet deep. One is 21 by 17½ ft. and the other 15 by 10 ft.

The buildings at the plant are of brick. The "tipple" and screening plant are of steel. The machinery comprises the following equipment: Hoisting engine, drum, 3,000-ft. air compressor and a 150,000 cubic foot capacity ventilating fan, manufactured by

Walker Brothers, England; 1,000 h.p. boiler with chain grate and self-feed stokers manufactured by Wilcox & Babcock; electric generators furnished by Allis-Chalmers-Bullock; and engines manufactured by Belliss & Morcom, England.

The water system now in operation conveys water three miles to the works from the Belly River by steam power. Electric power will shortly be installed for the whole plant. The coal output now consists of 150 tons a day and there are at present two hundred employees on the company's pay roll. With the powerful hoisting engines just installed, it is expected that the output in the near future will reach 1,500 tons daily. The coal seam is 5½ feet wide.

Gauging Records, Niagara River

Diversion of water from the Niagara River has resulted in appreciably increasing the impairment of Niagara Falls and has lowered the river stages above the rapids, according to records of river gaugings kept under the direction of the chief of engineers of the army. Comparison of records of gauges during 1909 and 1910 with those for the period from 1906 to 1908 indicate that this has resulted from the estimated increased diversion of 11,000 cubic feet per second between 1906 and 1910. The greatest effect is shown on the Canadian side of the Horseshoe Falls, where there has been a lowering of about 3½ inches attributed to this cause, although the decrease of 1½ inches in the shallow waters at the east end of the horseshoe has resulted in exposing greater lengths of crest line. The records of the gauges at the Canadian end of the falls show a lowering in the four years, for mean stages of Lake Erie, of about 9½ inches, 6 inches of which are accounted for by extensive breaking away of the crest line and consequent increased volume of flow over the centre of the falls. The stages of the upper river are shown by a comparison of the gaugings for this period to have been lowered 1¾ inches in the pool above the upper cascade, with a corresponding effect of ¼ inch on Lake Erie stages.

Meters on street sprinkling carts are advocated in the annual report of Mr. Robert Laidlaw, general superintendent of the Cincinnati water department. The present rule of charging \$18 per month for a 250-gal. cart and \$33 per month for a 550-gal. cart, regardless of the territory they sprinkle, is said to be unreasonable. The contractor who has a small territory to sprinkle and can cover it in four hours per day pays the same amount as the large contractor who sprinkles during the whole day, the latter using two or three times as much water as the former. Under the present rule, it is stated, the men are very careless; they flush the streets, making them seas of mud and in many cases are said to injure the pavements. To minimize these complaints Mr. Laidlaw recommends that a 2-in. meter be attached to every sprinkling wagon and that contractors be charged 12 cents per 100 cubic feet for water used.

What the brick maker needs to bring him up to the modern standard is publicity, which in almost every line of business has revolutionized selling methods. The fact that the brick business has been one of the last to use modern sales methods has undoubtedly been a deterrent factor.

Engineering Problems Connected with Biological Sewage Treatment*

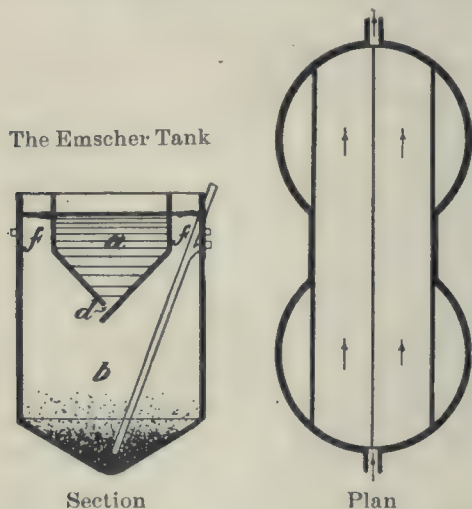
By T. Aird Murray, M. Can. Soc. C. E.

THE term, "Biological Sewage Disposal," is here used to designate systems which depend upon artificial filters for the reduction of putrescibility. The term does not include natural systems, such as "Land Intermittent Filtration," or "Broad" or "Sub-Irrigation," all of which may provide similar results with reference to cause and effect.

Efficiency results and the design of any system of biological sewage disposal depend upon the combined efforts and conclusions of the chemist and the engineer.

Up to within a recent period the chemist has taken little or no interest in sewage disposal. The engineer has been left alone to build sewage disposal works upon entirely empirical bases without reference to any axiomatic data relative to the chemical and biological

The Emscher Tank



processes accompanying the reduction of putrescible matter to non-putrescible. This has been well illustrated in Great Britain, which presents the greatest variety of sewage disposal systems to be found. It is not uncommon to find two adjacent towns discharging their effluent into the same river with entirely different systems of sewage disposal constructed in order to obtain the same results.

Great Britain has been, and remains, the post-graduate field, where the schoolroom can study every feature of failure as well as of success. This is to a large extent due to the fact that the "Old Country" presents the earliest attempts at sewage purification, and that other countries have profited by its experience, more or less.

Great Britain itself has recognized the chaotic and undetermined want of definite principles, and within recent years formed a Royal Commission to report upon the whole question of sewage disposal. Germany and several of the American States also determined to get at the base of things, and make an effort to put the question on a scientific basis. The Lawrence Experiment Station of Massachusetts as representing the American States and the Hamburg State Institute of Hygiene are illustrations of this scientific activity.

The result of this scientific activity is simply this: that the man who designs works can guarantee certain results if they are based on certain data.

There is no longer any reasonable apology for the hypothetical theories on which either the septic tank or the contact filter bed were founded. These are taken as simple illustrations of empirical conclusions based on no scientific data relating to cause and effect. It was held that, with a septic tank it was necessary to exclude light, independent of the fact that the scum forming on the surface of such tanks excluded all light. It was also held that the exclusion of air was necessary, although it is necessary in order to provide ultimate oxidation or non-putrescibility. It was further held that a contact filter bed was the ideal method of obtaining oxidation of a sewage liquid, in spite of the fact that during the period of contact all oxygen was excluded from the bed, and that it acted at such times as a septic tank.

It required the Fifth Report of the Royal Commission on Sewage Disposal, with all its experimental work at the original installation and elsewhere, to prove the whole fallacy of total sludge elimination, and also the experiments of Dunbar, of Hamburg, to show that it required just three times the area of filtration works to oxidize a septic effluent than a fresh sewage effluent. It even took a lot of hard arguing to prove that no oxidation of sewage took place in a contact bed when the bed was full of sewage and no oxygen was present.

What was the excuse for the contact bed? Simply this: no sooner was it found that liquid sewage was rendered non-putrescible by passage through sand or gravel, and the problem was presented of equal distribution over the sand and gravel. This problem was answered by the easiest and most apparent solution of simply filling the gravel or sand bed so that every particle of material was brought into contact with the sewage. When the filter became mature, then nitrates and nitrites were found in the effluent. It was judged that the bed should have a period of time allowed when saturated with sewage during which certain bacteria might have their fill; and that it should have a further period of rest when the sewage was drawn off, allowing the same bacteria to recuperate. It required the chemist to point out that the supposed time of rest was really the period of bacterial activity, and that the time of contact was just so much waste time, during which the sewage was robbed of any dissolved oxygen it originally contained.

Also, we have heard the statement that oxidation requires sunlight, and that a filter must not be covered in to the exclusion of light, independent of the fact that six inches below the filter surface, all light must be excluded.

We have said that the Sanitary Engineer has now a surer basis for determining design. The old excuse, "of just having to try something to see how it will work," can no longer be made in a case of failure. All the recent research and experimental work, together with collection and classification of practical data, point to certain defined principles which are now being held in common by most authorities. The subject of sewage disposal, instead of being conglomerate, may be said to be, at least, approaching the crystallized stage.

The limited space of time allowed will not permit an examination of all the engineering problems affected by recent scientific investigation. It may suffice to give some attention to the following:—

1st. The immediate removal of settled solids from contact with the fresh flowing sewage, so as to avoid

* Part of a Symposium on Biological Sewage Disposal, Canadian Public Health Association Congress, Montreal, Dec. 13-15, 1911.

a septic liquid, and yet obtain all the benefits due to a septicized sludge.

2nd. The equal distribution of a settled sewage liquid over the surface of a filter bed, avoiding saturation and the consequent exclusion of air.

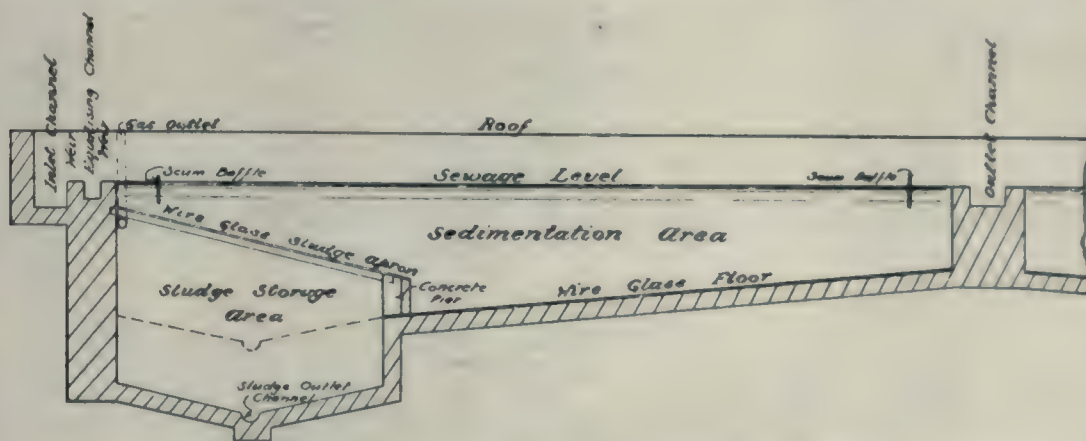
3rd. The protection of various parts of a biological sewage plant from frost conditions.

First.—The author in reviewing the Fifth Report of the Royal Commission on Sewage Disposal in the fall of 1908, published in the Canadian Engineer, referred to the new well-known conclusions of the Commission, that the so-called septic tank fell short in accomplishing some of the main claims set up by its promoters. He pointed out that if it is desirable to maintain septic action, then such should only be allowed to take place in an independent tank for sludge storage. This conclusion has found almost general acceptance, with the result that several new designs of sedimentation tanks have been promoted.

Septic action when confined to the settled sludge provides the following features: (a) A more concentrated form of sludge containing about 80 per cent. of water as against 90 per cent. in the case of fresh, settled sludge. (b) A sludge which, if thoroughly septicized, is practically without odour. (c) A sludge which is reduced by about 25 per cent. by the partial

with such filters it is much more difficult to obtain non-putrescibility with septic liquids than with fresh, the products of decomposition being less easily oxidized than the organic compounds usually found in fresh sewage. Two forms of tanks are here described, both constructed in order to obtain the maximum benefits due to septic action, and at the same time avoiding the above objectionable features. The one is called the "Emscher" Tank and the other the "Lethbridge" Tank.

The Emscher tank is the invention of Dr. Imhoff, and was designed by him in connection with the Emscher drainage area in Germany. The tank is based on the Dortmund type; that is, it is circular cone-shaped. The upper portion is used as the sedimentation area, and is separated from the sludge storage area by the aprons as shown. The solids in settling pass down and through the opening at the base of the apron, and the overlap prevents any gases or particles of sludge from entering the sedimentation area. The gases are carried off by vents at the perimeter surface. This form of tank has received a great amount of attention of late on this continent. Rudolph Herring has called favorable attention to it in contributions to the Engineering News, of New York, and that journal has further published a very full description,



Section
The Lethbridge Sludge Sedimentation and Separation Tank

elimination of its organic content by putrefaction. (d) Septic action, if allowed to take place in an enclosed tank, provides control of the gases which are the products of decomposition.

The main objections to the usual form of septic tank lay in the fact that putrefaction of the settled solids took place in contact with the supernatant liquid. This caused a similar phenomena to that observed in a glass of soda water containing lemon seeds. The gases attach themselves to the seeds, raising them to the surface; the gases escaping, the seeds sink. So with a septic tank. The liquid flows over an area of putrefying, settled sludge; the evolved gases are constantly attaching themselves to and raising particles of sludge, with a consequent return of much of the already settled solids to the supernatant liquid in the form of fine particles. The history of a septic tank is simply the gradual increase of the amount of suspended solids in the settled liquid effluent. Instead of a maximum removal of suspended solids we obtain a minimum, requiring either a very much extended filter area, or a constant chokage of filters. Further, it is acknowledged that the duty of a biological filter is not to act as a straining, but as an oxidizing machine; and it has been clearly shown that

giving efficiency working data collected in Germany. Experimental plants have also been installed in Chicago and elsewhere. The author has no personal experience or knowledge of the tank, but would judge that there is no reason why it should not fulfil the objects for which it is designed. His interest in the tank is accentuated, however, by the fact that, while Dr. Imhoff in Germany has been puzzling out a form of tank for the above-named objects, he has also been engaged in designing a tank for similar objects in Canada.

Last year in designing sewage disposal works for the city of Lethbridge the author, with reference to separation of suspended solids, determined to meet, as far as possible, the following problems:—

- (a) The maximum removal of suspended solids.
- (b) The immediate separation of the settled solids from contact with the supernatant liquid in the sedimentation area.
- (c) The production of septicized sludge and the production of a non-septic settled liquor.

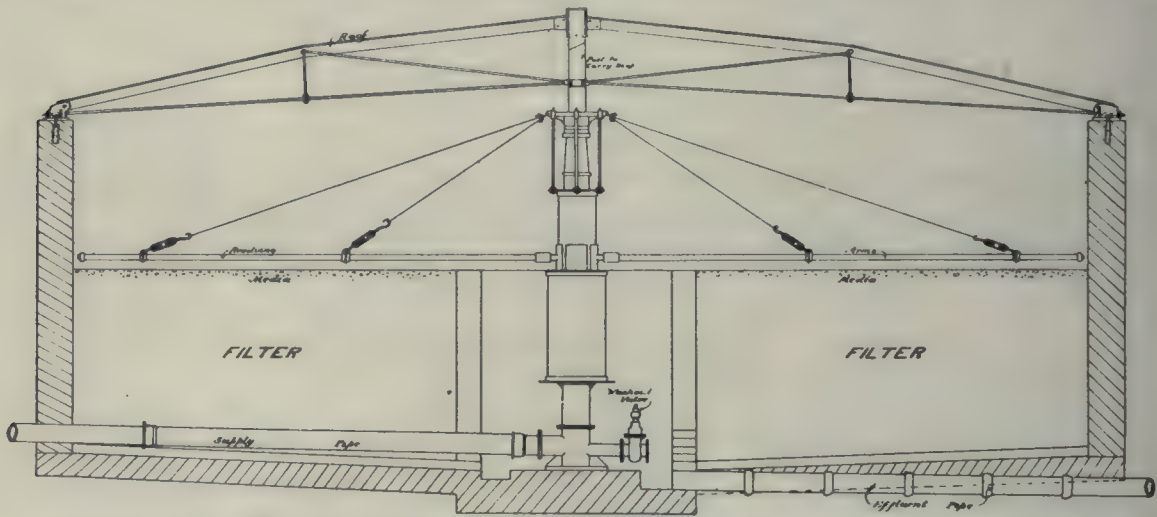
It is considered that these problems are solved in the "Lethbridge" tank, which, under this name, has been patented.

Referring to the sketch, it will be seen that the

tank is of the usual rectangular shape. A sludge apron projects into the tank, overlapping a sludge storage basin. The apron is given a steep grade to allow of settled solids to slide to the forward base; the forward base is also given a steep grade to allow of solids to gravitate to the sludge storage basin. The apron and forward base are lined with wire reinforced glass for the purpose of reducing friction and ensuring immediate delivery of the settled solids into the sludge basin. The capacity of the sludge basin is made equal to three months' storage of sludge at 80 per cent. of water. The gases given off from the putrefying sludge rise and impinge against the under surface of the apron and follow up the inclined plane, and are drawn off by vent-pipes to the outside of the tank. The overlap of the apron over the forward base makes it impossible for the septicized sludge or its products to come into contact with the supernatant sewage liquor in the sedimentation area.

The essential difference between the "Lethbridge" tank and the "Emscher" lies in the basis of design. The former is designed to suit the rectangular shape, and the latter, the circular.

In adopting the rectangular shape the following



Device for carrying Roof over Sprinkling filters where Revolving Apparatus is used and adopted at North Toronto and Lethbridge

factors were taken into consideration:—

It is generally concluded that more efficient sedimentation, even velocity of flow, and avoidance of eddies can be obtained by the rectangular form than by the circular.

Circular tanks have been adopted more generally for the removal of grosser solids and such heavy matters as humus given off from biological filters.

Rectangular tanks are generally less expensive than circular in construction, are more simple in operation, and require less depth of excavation.

Reliable data exists as to the possible efficiencies of rectangular tanks, and it is known that a sufficient proportion of the solids can be removed in order to obviate chokage of the filter media; and, therefore, there does not appear to be any good reason for departing from this particular form of design.

Second.—The equal distribution of a sewage liquor over the whole surface of a filter, and at the same time avoid saturation, has presented a somewhat difficult problem to the sanitary engineer.

The contact bed was the first attempted solution. That every particle of the filter media came into contact with the sewage was ensured by simply filling

the filter. This, unfortunately, also ensured the total exclusion of all air, and enabled the Royal Commission to report that collected data proved that a cubic yard of filtering media in which air is constantly present will oxidize twice as much sewage as a cubic yard in a contact bed.

Various designs of distributors to provide a continuous sprinkling of sewage over the filter area have been put on the market, and have given the name of the "sprinkling" or "percolating" filter to such types.

Distributors may be divided into "fixed sprays," "revolving" or "travelling" distributors.

Fixed sprays have been used more generally in America, and revolving or travelling distributors in Great Britain. There is a decided tendency to adopt the latter type in preference to the former. With fixed sprays it is practically impossible to obtain equal rates of distribution. As a rule, only from 80 to 90 per cent., and sometimes less, of the filter area is in operation. Further, fixed sprays are apt to cause an odor nuisance by the liberation of gases.

Clarke, the chemist employed at the Lawrence Experimental Station, Massachusetts, after a recent trip to Great Britain, stated before the Boston So-

ciety of Civil Engineers, that he formerly held the opinion that fixed sprays were the common-sense solution, but that he now concluded that revolving or travelling distributors gave greater efficiency per unit of filter area.

It has been felt that moving distributors are more likely to be affected by frost conditions than fixed sprays. However, the cities of Moscow and St. Petersburg have lately adopted these types, and in the Canadian West, Regina, Lethbridge and Calgary are also adopting them, while Moose Jaw and Swift Current are adopting the fixed Stoddart type. Comparative efficiency data will be collected as soon as possible with reference to frost conditions in this country.

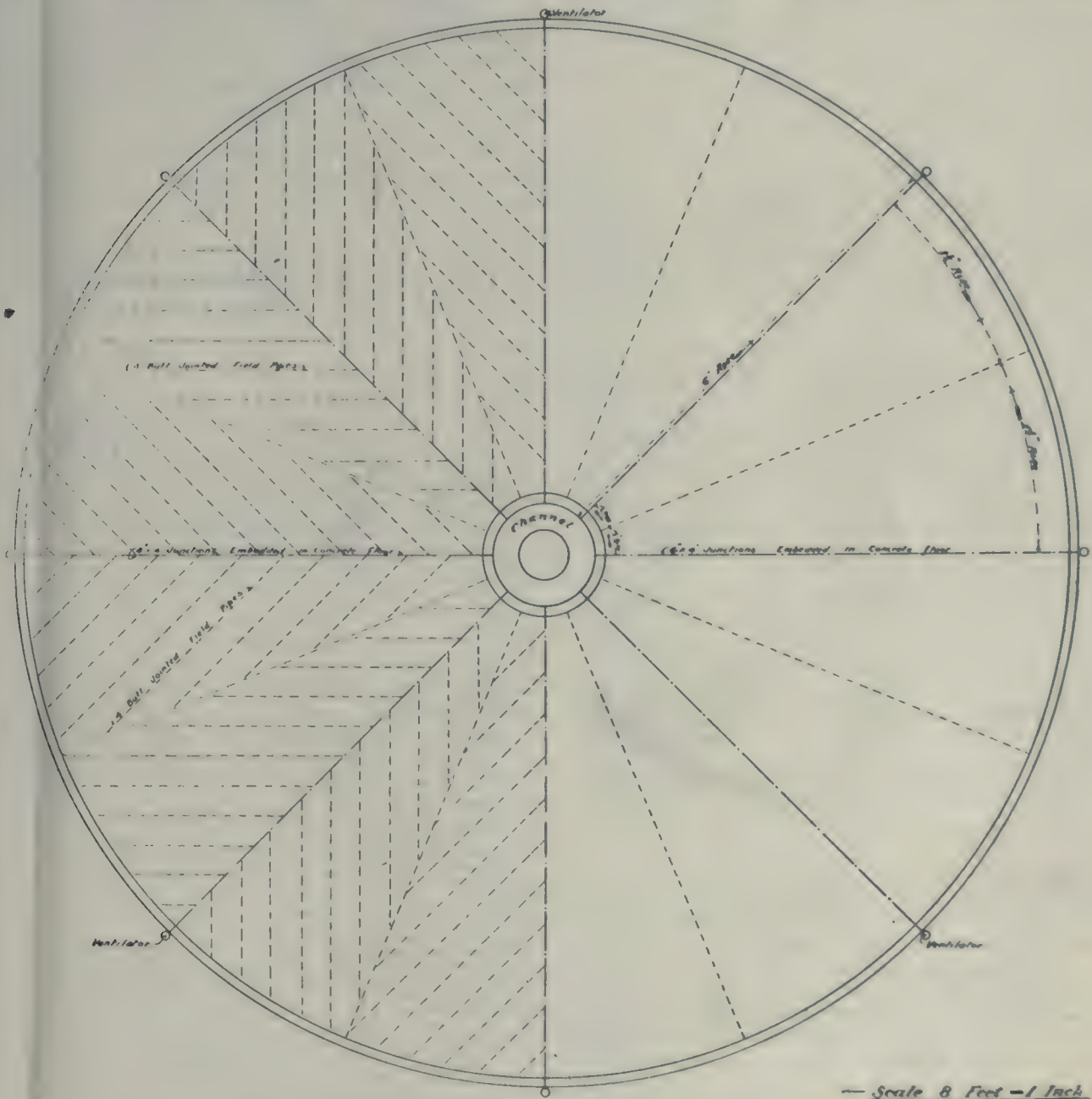
The question of avoiding saturation is one of extreme importance in connection with a sprinkling filter. Filtering material in its voids has two capacities, viz., its water-retaining and air-containing capacity. Water-retaining capacity is obtained by filling a filter with a measured quantity of water to saturation, measuring the quantity run off, the difference representing the amount retained by adhesion. Air capacity is represented by the measured

quantity run off. The finer the filter material, the less will be the air capacity, and the coarser the filter material, the less will be the water-retaining capacity. Filtering material may be so fine that practically no oxidation will take place. On the other hand, the air capacity may be so great that no greater efficiency in oxidation will take place than by spraying the sewage through an equal area of atmosphere.

In a well-constituted biological filter three processes take place, viz., retention, absorption, and oxi-

a domestic sewage of average strength, representing a per capita water supply of fifty gallons, a well-settled liquor, from which 60 to 70 per cent. of the solids have been removed, may be treated on percolating filters at the rate of 150 gallons per cubic yard of filter area with material ranging from two to three inches in cube.

Third.—The question of frost interference appears to trouble many minds in this country. Well, we have frost, and we have got to have sewage disposal.



Method of Draining Filter Floor to Centre

dation. An equilibrium must be maintained, otherwise immediate difficulties arise. At equilibrium a filter is capable of lasting fourteen to sixteen years without renewal. The choice of filtering material relative to size and character forms one of the most important problems in connection with biological sewage treatment. No fixed rule can be laid down. Everything depends upon the character of the sewage and the efficiency of the primary removal of suspended solids. It may, however, be taken that with

If it is possible to overheat houses, hotels and railway cars, it may also be possible to spare a little of this superheat to warm up a filter bed. The question is, does the biological treatment of sewage lend itself to a cold climate? It certainly does, because it occupies less area than any other system. Every part can be easily roofed in, from the detritus chamber to the final humus basin.

Certain modifications in structure are, however, advisable. For instance, on referring to the sketch

of the percolating filter, it will be observed that the usual method of draining to the perimeter into an open channel is departed from, and the sub-drainage is taken to the centre of the filter. Also, it will be noted that an improvement has been effected in the design of the central drum of the distributor by enlarging it so that a stationary metal standard is carried through to carry an iron structural roof. The latter contrivance reduces the roof cost by 40 per cent.

The best form of covering for the detritus and sedimentation chambers will usually be met by providing reinforced concrete roofing, either arched or beamed, while the filters can be cheaply covered with iron constructional frame work and timber or corrugated iron roofing.

The question of the necessity or otherwise of artificial heat cannot yet be answered, as we have no data in the colder parts of Canada as yet. It may be possible to do without artificial heat when we consider that sewage is usually delivered at about 42 degrees F.

In conclusion, let us remember that any biological system for the treatment of sewage will only do so much and nothing more. By detritus chambers and sedimentation tanks a large proportion of the solids can be retained, and have to be subsequently dealt with. By biological filtration the settled liquid can be rendered non-putrescible. Do not expect a more clarified effluent from the filter than the influent. The object of the filter is not to clarify, but to oxidize. A clarified effluent means the retention of the 20 to 30 per cent. of solids not retained by the sedimentation tank and the eventual chokage of the filter. A good filter effluent should show an apparent amount of solids in the form of humus, which is easily settled out.

Beyond all, let us remember that the effluent is not yet fit to turn into a water source used as a domestic supply. All that has been done is to remove that which will cause an aesthetic nuisance. The pathogenic nuisance yet remains, and the germs of disease particularly associated with sewage can only be eliminated by disinfection or a further effort in the shape of sand filtration.

What has been done is to obtain an effluent which can easily and economically be rendered non-pathogenic.

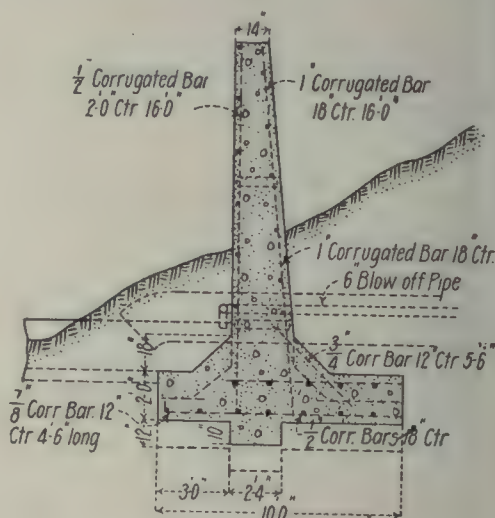
Some pieces of Roman tessellated pavement have been found, about nine feet below the surface of the ground, at the south-eastern corner of the precincts of the Southwark Cathedral, in England. Another discovery of the same kind was made in 1834, and the section which was then brought to light has been let into the paving of the south aisle of the chancel. The same policy will probably be followed with regard to the preservation of the present pieces. The main relic of this Roman pavement—which is supposed to have been the pavement in a villa—is about two yards square and has now been removed, each inch-wide sett of the tessellation having been taken up with separate care. There is no pattern; the setts are composed of the ordinary Roman red brick, and the color and fineness of the surface still remain. In the same area odd parts of the same pavement also came to light, and it is expected that when the forthcoming alterations to the eastern steps and the rest of the wall are begun, a continuation of the same building will be discovered. Various sections of Roman pottery, tiles, glass, and metals have also been found.

Cost of Reinforced Concrete Retaining Wall

By C. L. Samson, La Salle, Ill.*

The retaining wall shown in the accompanying sketch, was built on a hillside along the property line of the owner. The object of the wall was to secure the foundations of some buildings about fifty feet further up on the hill. The hill slopes away quite rapidly from the foot of the wall and for this reason the footings of the wall had to be carried down further than would have otherwise been necessary.

The wall was originally planned to be 90 feet long, but before completion of the 90 ft. section, it was decided to extend the wall to a total length of 440 feet. The contract price for the entire wall was \$5,531. After building 305 feet of the wall the contractor's affairs became involved in other contracts and the last 135 feet of the wall was built by the owner under the supervision of the writer. The original contract price was based on a wall of the section



shown on the drawing with an allowance for extra labor and material where it was found that the footings had to be carried lower to secure good bearing. A proportionate deduction was made when a lower wall was found to be sufficient. The same ratio between width of base to height of wall was preserved for all heights of wall.

Excavation was done with pick and shovel, and earth was re-shoveled from the bank of trench by the contractor.

Concrete was mixed in a Ransome mixer and was made in half yard batches. The mixer was set part way down the hill so that the charging platform was slightly lower than the upper ground level. Stone and sand were piled on the bank as near the mixer as possible and cement was stored in a small shed on one side of the charging platform. This shed held a two or three days' supply of cement.

Concrete was conveyed from mixer to trench through spouts during part of the work, and during the remainder in one-half cubic yard steel side dump cars on a track, laid on trestles alongside the trench, and was dumped directly into the trench. There was little difference in costs between these two methods in this particular case, since about the same amount of labor was required to keep the spouts clean and in proper place, as was required to handle the dump car. One car only was used. When the length of haul became so great that the fresh batch was ready to

* In Engineering and Contracting.

be dumped before the car came back from depositing the former batch, the mixer was moved. The same gang alternated between digging and mixing but the same men worked on forms and steel all the time.

The last 135 feet of wall was built by owner. Methods employed were about the same as above described except that earth from the trench was wheeled up an incline and dumped along the wall for backfilling. It is the opinion of the writer that this method cost very little more and saved the much greater expense of backfilling afterward. In this section of wall two or three of the more efficient laborers were selected to build the cribbing, forms, and to set the steel while the rest of the gang was digging. The distribution of the mixing gang was as follows:—

Wheeling sand and stone to mixer	3 men
Putting cement and water in mixer	1 man
Dumping mixer and running mixer engine	1 man
Wheeling concrete car	2 men
Spading concrete	1 man

The itemized costs of the last 135 feet of wall containing 130 cubic yards of concrete were as follows:—

Excavation	\$172.31
Forms	155.68
Cribbing	28.37
Cutting and setting steel	24.96
Mixing and placing concrete	120.22
Backfilling	17.18
Railroad and runways	14.75
Wheeling out cement	10.25
Cleaning up premises	28.50
Total labor	\$572.22
Teaming:	
Stone	\$81.28
Cement—Portland	11.86
Sand	32.00
Total teaming	\$125.14
Switching charges	4.00
Cost of materials—	
Stone, 105.3 yards	\$124.38
Cement, 190 barrels	168.95
Sand, 54 yards	48.00
Twisted steel, 11,645 pounds	308.60
Total material	\$649.93
Summary of Costs:	
Labor	\$572.22
Teaming	125.14
Switching charges	4.00
Material	649.93
Total cost of 135 feet of wall	\$1,351.29

No charge is included for form lumber. Old lumber left on the job by the contractor was used. There is no doubt that the labor charge on building forms is high due to the fact that this lumber was of mixed sizes, short lengths and badly warped and twisted. No claim is made by the writer to originality in the design of this wall. Several walls have been described in the technical magazines during the last three or four years which have been of the same general design of the one described.

Grout instead of bituminous filler for brick pavements is recommended by Mr. Samuel Whinery, con-

sulting engineer, in his preliminary report to the Commission on City Expenditures at Chicago. It is pointed out that the advantage of the bituminous filler lies in the fact that the streets may be thrown open to travel as soon as the filler cools and hardens, which will be well within twenty-four hours. If the grout filling is used, the street must be closed until the cement sets hard enough to withstand the travel—from four to seven days. Notwithstanding this, the grout filler, in Mr. Whinery's opinion, is so superior, and so increases the useful life of the pavement, that it should be used, except in the case of busy streets, where the closing of traffic would work a hardship.

A Modern Highway in Quebec Province

In the Cartierville Road, which skirts the Riviere des Prairies for some four miles at the back of the Island of Montreal, the officials of the municipality have a model highway in regard to construction and economy. The road was built under the supervision of Mr. F. C. Laberge, by Messrs. Demers & Laframboise, of Montreal. The work was begun in September, 1910, and will be completed next spring, operations now having ceased for the winter. The earth in the original roadway was removed to a depth of about one foot and the foundation of the new roadbed was then started. This consists of a layer of broken stone of an average diameter of eight inches. Over this was spread a layer of four-inch crushed stone. This was rolled and a third layer of two-inch stone then deposited evenly over the surface. For a top dressing crushed stone dust was used. This was applied in a wet state. Under the pressure of a heavy roller it penetrated to the foundations of the roadbed and soon became almost as solid as rock. Wherever wet or springy spots or natural depressions in the ground were found, clay tile was employed for drainage purposes. The roadbed was rounded somewhat before the first layer of stone was applied, then the mass of stone was built to a greater thickness in the centre than at the sides. The macadam was twenty-four feet wide at the base and sloped to twenty feet across the surface. The road is several feet higher than the level of the river, so that no danger is anticipated from freshets. The cost of the road will be \$7,000 a mile.

Water purification at Minneapolis will be carried out in a plant designed to afford unusual flexibility of operation, required by the rapidity and extent of the changes in the character of the Mississippi River water which will be used. For this purpose the plant has been provided with cross connections and bypasses to an unusual extent, and, in addition, many devices of an unusual nature have been introduced to increase the efficiency of the works. The water is to be coagulated with sulphate of alumina, lime being added when necessary to secure the required alkalinity; it will then pass through rapid filters and finally be sterilized with hypochlorite. A description of the plant given in the Engineering Record points out some of the novelties of design, such as the use of concrete batch mixers for slaking lime, an adaptation of grain spouting devices for delivering chemicals from storage bins, means for opening metal drums of hypochlorite while they are entirely submerged in water, and motor-driven propellers for agitating the solution of chemicals so as to secure a mixture of uniform strength.

Proposed Fire and Police Station, Montreal

The foundations are being laid at the corner of Marechal street and St. Antoine road in Notre Dame de Grace Ward, Montreal, for the most up-to-date fire and police station in that city. The architecture will be of the class known as "Style Moderne." The structure will provide accommodation for the men and apparatus of both branches of the city's protective service and will include the patrol service equipment for the district police department. The main construction is of concrete on a steel frame with concrete foundations. The front will be faced with Montreal limestone and Laprairie pressed brick, and the other walls also will be faced with pressed brick. Terra cotta will enter very largely into the construc-

palaces and temples of brick with marvelous skill and effects of beauty that we have yet hardly equaled. Some of the most beautiful Italian and French palaces were built of brick during the Renaissance, and the history of England can be traced in its mansions, manor houses, palaces and churches of soft red brick.

In our country, brick for a time was rejected by all lovers of beauty, because its manufacture sank into a mechanical process whereby hard, tight, flat cakes of hideous color and mathematical precision were turned out by machinery to provide a building material that should be at once cheap and durable.

Within the last twenty-five years, however, architects have been forcing on the manufacturers a de-



Proposed Fire and Police Station, Montreal. Architect, Theo. Daoust; General Contractor, Joseph Marcott.

tion of the walls, partitions, and flooring, so that the building will be practically fireproof. The lighting will be by electricity, electroliers being used in the larger apartments. The roofing will consist of a patent gravel known as "Security." The arrangements for heating and ventilation have been very carefully studied and designed.

The architect for this station is Mr. Theo. Daoust, St. James street, and the general contractor, Mr. Joseph Marcott, 565 St. Antoine street. The building is to be completed by the first of October next. The contract price is \$62,000.

Brick-making as an Art

Brick-making as an industry is being superseded by brick-making as an art. The ancient Egyptians, Assyrians and other races of the Orient wrought their

mand for beautiful brick. Architects, designers and manufacturers are now working in unison to produce brick that shall meet every demand for beauty. The result is brick of rich, variegated color and texture that charm the eye and that are in active demand for exterior construction.

Use of Terra-Cotta in Place of Copper

Terra-cotta is to be used instead of copper for supporting the glass in the large windows which occur at the upper floor levels of one of the tall office buildings about to be erected in the lower section of the Island of Manhattan, N. Y. The terra-cotta will be painted green and, according to the architects, its use gives the same effect as copper, and, while equally strong, is less expensive.

Hints for Cold Weather Concreting

The increasing practice of carrying on concrete construction throughout the winter months has resulted in an accumulation of experience that should have weight with those contractors and engineers who now close down the concreting plant during cold weather. Satisfactory results can be obtained in all classes of work.

The cost of an idle plant and the cessation of profits must be considered. The actual extra expense occasioned by the protective measures necessary for safe concrete work will certainly be far less than the actual losses were work to stop. This yearly loss is not justified on the grounds of custom. It is now an unreasonable drain on the contractors' yearly profits, for the successful examples of previous winters have demonstrated the entire safety and the moderate extra expense accompanying cold-weather concreting.

However, the practice of mixing, placing and protecting concrete in cold weather in the same manner as in warm weather is most certainly to be condemned, says a writer in the Bulletin of the Universal Portland Cement Company. Freezing will not damage concrete that has had a chance to harden under favorable conditions for from twenty-four to forty-eight hours. The freezing simply retards the process of hardening, which again proceeds under favorable conditions, and in the end the concrete obtains its full strength.

Concrete that is frozen before the action of hardening has started is not apt to be permanently injured if upon thawing it is not again frozen until it has had a chance to harden sufficiently to withstand the action of subsequent freezing. Alternate freezing and thawing is very apt to damage green concrete.

A given amount of heat expended in heating materials and protecting the work from freezing immediately after placing will be infinitely more effective than an equivalent amount of heat expended in attempting to hasten the hardening of concrete that has been mixed with cold materials and subjected during the next few days to unfavorable conditions.

Heating the materials accelerates the rate of hardening, lengthens the time before the concrete becomes cold enough to freeze, and in temperatures but little below freezing will insure the hardening of the concrete before it can be damaged by freezing.

Thus it is imperative to mix and place concrete in such a manner as to insure proper hardening during the first few days.

Lowering the Temperature

Lowering the freezing point of the concrete is probably the simplest and cheapest, but not the best method of concreting in cold weather. Ordinary salt is most commonly used, and while the addition of a limited amount retards the hardening somewhat and lowers the initial strength, the ultimate strength of the concrete is not affected by its use. More than ten per cent. of salt should not be used, and this amount is not effective for temperatures lower than 22 deg. F. The use of acid in place of salt is not to be encouraged.

Large plain mass work, such as retaining walls and abutments, do not require the same care and protection as thin walls, columns, beams and floor slabs. The additional equipment considered necessary in any case for winter work is comparatively limited,

consisting generally of a sufficient amount of canvas for housing in or covering the work, salamanders or other form of heaters for maintaining a temperature above the freezing point and some provision for heating materials.

Sand and stone may be heated by piling directly upon pipe coils supplied with steam or by covering with tarpaulins and applying the steam directly to the material to be heated. For heating water a steam pipe placed in an ordinary barrel is not to be recommended. A suitable tank should be provided, the water being heated by means of a coil supplied with steam from the boiler supplying the mixer engine, or from one erected for this purpose.

When Not Necessary to Heat the Sand

For heavy mass work, thick walls, abutments, etc., it is not necessary to heat the sand if dry and free from lumps of frozen matter. The water should be heated. If the concrete goes into place unchilled it will harden rapidly, as mass work retains its initial heat for a long time, and additional heat is generated during the process of hardening. If the forms are tight and made of heavy material it will only be necessary to protect the top or exposed surface of the work with tarpaulin, applying a jet of steam or by covering with boards or building paper and applying a thick blanket of straw or manure. A thickness of 12 inches of manure laid on paper or canvas and kept dry will protect the work from freezing for days at a temperature as low as 10 degrees F. Manure should not be placed directly upon the concrete, however.

Careful inspection of winter work is necessary before removing the forms. Frozen concrete, which upon thawing has but little strength, closely resembles thoroughly hardened concrete in appearance, and when broken frequently shows a fracture through the aggregate, but with these precautions concrete work properly handled may be successfully carried on irrespective of weather conditions.

Brickmakers were First Strikers

According to scriptural quotations brickmakers were the first strikers, as is shown by the following extracts from the Bible:

"And the Egyptians made the children of Israel to serve with rigor. And they made their lives bitter with hard bondage, in mortar, and in brick and in all manner of service. And Moses and Aaron went in and told Pharaoh, 'Let the people go that they may hold a feast.' And the King of Egypt said unto them, 'Wherefore do ye let the people from their work? 'ye make them rest from their burdens.' And Pharaoh commanded the same day the taskmasters, saying, 'Ye shall not more give the people straw to make bricks as heretofore. And the tale of the bricks which they did make heretofore, ye shall lay upon them; ye shall not diminish aught thereof; for they be idle; therefore, they cry, 'Let us go.' Let there be more work be laid upon the men, and let them not regard vain words.' Pharaoh said to the children of Israel, 'Ye are idle, ye are idle; go therefore now and work; for there shall be no straw given you, yet ye deliver the tale of bricks.'"

What followed is a matter of history. They walked out and stayed out for forty years, and then their descendants got other and better jobs.

Hypochlorite Treatment of Water for a Temporary Auxiliary Water Supply*

By E. A. James, B.A.Sc., Engineer for North Toronto.

In discussing the treatment of public water supplies with hypochlorites, it is not necessary to enter into the question of the efficiency of the process. Its use as a disinfectant has extended over a sufficient length of time and under such variable conditions, to make it possible to draw certain general conclusions as to the advisability of different devices in its application.

The active agent—hypochlorous acid—may be obtained either from hypochlorite of lime or soda. The use of hypochlorite of soda, while preferable on account of greater unit amount efficiency and ease in handling, is not considered practical at the present time, on account of the higher cost in separating the available chlorine by electrolysis and the higher cost of chloride of sodium as compared with chloride of lime in this country, the lowest figure being about 8 cents per pound of available chlorine. Hypochlorite of lime, containing forty per cent. available chlorine ordinarily known as bleaching powder, may be obtained from a number of firms at about one and one-half cents per pound.

The municipality of North Toronto obtains its water supply by means of shallow wells, from a gravel stratum underlying clay. The wells and pumping station are located in the base of a valley drained by a small stream, which eventually flows into the River Don. The stream flows past the wells and pump-house at a distance of about 100 feet. The stream water shows constant pollution by the presence of B. Coli, and has been pronounced unsafe for domestic supply by the Ontario Provincial Board of Health.

The population of North Toronto approximates 5,500, and the amount of water pumped per day is about 200,000 gallons. Under ordinary conditions, the wells are capable of satisfying the domestic supply, but during the summer months the supply is not sufficient for the additional requirements of street watering and garden sprinkling.

There is no question as to the purity of the well water, its only defect consisting in its characteristic degree of hardness.

During the year 1909 a dam was built across the stream causing the water to pond back for a distance of about one hundred and fifty yards, at an average depth of four feet, allowing the water to pass through a small rough sand and gravel filter, and then into a small underground tank, from whence it was pumped direct into the main in order to augment the well water supply during the summer months.

Several cases of typhoid followed the introduction of this water, and analysis proved that little or no pathogenic purification resulted from the small filter. The result was that the stream source of supply was discontinued.

Although arrangements were on foot during 1910 to increase the available quantity of well water, such could not be completed in time to meet the extra summer demand.

A survey of the stream proved its origin in springs from the same gravel stratum as the wells, and the water to be chemically very similar, showing high degrees of hardness, the source of the normal dry weather flow not being more than a mile above the pumping station. The stream is open to cattle and children and several dwellings exist back from the stream provided with cess-pools, the drainage from which must eventually reach the stream.

The turbidity during dry weather is practically nil, and the bed of the stream is wonderfully free from vegetable growth. The normal discharge is about 180,000 gallons per day while the velocity of flow is about 50 feet per minute. During rain, turbidity increases rapidly, and after rain decreases also rapidly.

Efficient treatment of this matter pointed to slow sand filtration, preceded by sedimentation during periods of turbidity. This, however, was unpracticable because of, (a), length of time required to complete the necessary plant,

SAMPLE OF RAW AND CHLORINATED STREAM WATER, NORTH TORONTO WATER SUPPLY ONE PART OF CHLORINATED TO 1,000,000 OF WATER USED

Dates	Bacteria in raw water per c.c.	Chlorinated water per c.c.	Percentage reduction of bacteria	B. Coli in raw water present	B. Coli in chl'd. water abs't
16	1,160	67	95.9	"	"
18	960	140	85.5	"	"
19	470	21	95.5	"	"
20	870	8	99.0	"	"
21	740	16	97.8	"	"
22	3,500	55	93.3	"	"
23	600	40		"	"
27	986	130	86.9	"	"
28	1,200	100	91.6	"	"
29	475	31	93.4	"	"
30	840	129	84.5	"	"
Aug.					
2	450	12	93.3	"	"
5	900	7	99.2	"	"
6	700	6	99.1	"	"
Average	1026.5	544	94%	all	all

Water slightly turbid after rain.

Early Results from City of Toronto Disinfectant Plant Installed in the Spring of 1909

Bacteria reduction effected by Toronto water disinfecting plant. April 3 to 23, 1911.

Using .33 parts to 1,000,000 available chlorine added numbers indicate bacteria per c.c.

EFFECT ON TOTAL BACTERIAL CONTENTS

April	Raw water	Disinfected	Numbers	Reduction per cent.
3	1,680	450	1,230	73.2
6	710	140	570	80.2
7	810	380	430	53.0
9	280	180	100	35.6
9	4,120	980	3,140	76.2
10	1,425	380	1,145	73.3
11	290	60	230	79.3
13	3,310	70	3,240	97.9
14	150	40	110	73.3
15	2,670	960	1,710	64.0
16	1,210	50	1,160	95.9
17	460	170	290	63.0
18	9,270	1,890	7,380	79.6
20	3,520	1,420	2,100	59.6
22	280	100	180	64.3
23	1,890	80	1,810	90.4

EFFECT ON B. COLI

	Sample	B Coli Absent	B Coli Present
Raw water	16	9	7
Disinfected water	16	16	0

Percentage positive tests for "B Coli" in c.c. of raw water for 16 tests 44 per cent.

* Slightly re-arranged from an illustrated paper given before the Canadian Public Health Association, Montreal, Dec. 13-15, 1911.

Percentage positive tests for "B. Coli" in 1 c.c. of disinfected water 0 per cent.

The question then asked was, "Do the characteristics of the water allow of disinfection, without preliminary treatment? Several samples of the water were taken and analyses made, with the result that disinfection was recommended during periods of non-turbidity, and that at other times the water be not used. This incurred no hardship, as during wet weather when turbidity existed, the wells were sufficient for domestic purposes, the roads and gardens not requiring sprinkling.

After experiments were made, it was found that the water required more than one part in 1,000,000 of chlorine to eliminate the colon group of bacteria in 1 c.c. samples. Consequently, the consent of the provincial authority was obtained for the erection of a temporary plant and its operation, on condition that daily samples of the raw and treated water were submitted to the Provincial Bacteriologist for analysis, and that the standard of efficiency should consist in the elimination of B. Coli in 1 c.c. samples, and that the treated water should not contain more than 100 total bacteria per c.c.

Two barrels were used in which the strong liquor was held in readiness to be fed into the intake trough which had baffle boards set as shown in the sketch. This was added so as to give about .5 parts of chlorine per 1,000,000.

At this rate of application it would require with chloride of lime containing .33 per cent. of available chlorine as follows:

- 1.5 lbs. of chloride of lime 1,000,000 lbs. of water
- 1.5 lbs. of chloride of lime 100,000 gal. of water.
- 15 lbs. of chloride of lime 1,000,000 gal. of water.

In order to make a 1 per cent. solution sufficient for 1,000,000 gallons of water it would require the 15 lbs. of chloride of lime to be mixed with 1500 lbs. of water or 15 lbs. of lime to 150 gallons of water.

Results of analyses of samples of the water taken on the dates when the water was mixed with the town supply are shown below. The samples of raw water were taken from the stream pond, and the chlorinated water after treatment, but before it became diluted and mixed with the ordinary well water.

These samples dated respectively July 18th, July 27th and July 30th, show over 100 total bacteria in the treated water with percentage reductions between 80 and 90. In these cases the turbidity was convalescent after rain, and showed slight turbidity in the pond. The water on these dates was really not fit for chlorination without preliminary sedimentation or filtration.

In all, fourteen samples were taken between July 16 and August 6. Of these, the treated water showed three samples with bacteria above 100 and under 141; three samples over 50 and under 100; three samples over 20 and under 50; five samples over 5 and under 20.

The average number of bacteria in the raw water was 1,024.5 per c.c.; in the treated water 54.4 per c.c., and the average reduction efficiency 94 per cent.

If we ignore the three dates on which the water was convalescent, the average number of bacteria in the water was 1,051 per c.c., in the treated water 33 per c.c., and the reduction efficiency 96.8 per cent.

In every sample of the raw water, B. Coli proved present. In every sample of the treated water B. Coli proved absent.

One or two complaints were made of a peculiar taste in the water, but curious to relate these complaints referred to days in which the water was not chlorinated.

CHEMICAL ANALYSIS OF NORTH TORONTO STREAM WATER, PARTS IN 1,000,000

Free Ammonia	Albuminoid Ammonia	Oxygen Consumed in 4 hrs.	Chlorine	Hardness
.036	.09	2.2	10.	333.

Total hardness 333.

Temporary 279.

Clark's scale, total, 23.31.

Clark's temporary, 19.43.

The amount of hypochlorite that may be used seems to depend to a certain degree upon the hardness of the water, the taste of chlorine being apparent in soft water much more quickly than in relatively hard water. If there is any oxidizable matter in the water, such as ferrous carbonate or various organic compounds, it is necessary that enough hypochlorite be used to oxidize these before disinfecting action is obtained. It is, however, not clear what proportion of the organic matter may remain unoxidized and sterilization be effected. This must be developed according to local condition.

Specifications for Fraser River Jetty

Specifications for the Fraser river jetty at Steveston, B. C., call for the entire work in one contract. The breakwater will be divided into two divisions, one 3100 feet long, and the other 3800 ft. The first division will be of single piling, driven 10 ft. deep, capped with 8x8 timbers and faced on the channel side with 3-in. planks, driven 4 ft. above low water mark. On each side for the entire length will be mattresses of brush, two ft. thick, with a foot of rock, 100 lbs. to the sq. ft. These mattresses will be 15 ft. wide at the shore end, and extending to 50 ft. at the outer end.

The second or outside division, 3800 ft. in length, will be a double bulkhead, made of 2 rows of piles, 5 ft. apart, and faced on the inside with 3-in. planks. The space between will be filled with brush, and 18 ins. of rock on top of the brush. The same kind of mattresses will be used, but wider, ranging from 40 to 75 ft. There will be in addition rock along the sheet piling to within one foot of the top, with a slope of $1\frac{1}{2}$ to 1 on the channel side, and a natural slope on the other side. The end of the bulkhead will be protected by transverse matting, to prevent scouring.

A provision relative to current wages is included in the specifications, the minimum for a 9-hour day being as follows: Foremen carpenter, \$4.50; carpenters, \$4; engineers for pile driver, \$4; blacksmiths, \$4; blacksmiths' helpers, \$3; ordinary laborers, \$2.75; driver with one horse and cart, \$5; driver with two horses and wagon, \$7.

An important development in connection with the construction work of the Canadian Northern railway has been made public through the award of a contract to Messrs. Moore & Pethick, of Vancouver, for the construction of forty miles of road on Vancouver Island. The value of the contract is estimated at \$600,000. As the contracting firm have almost concluded their grading work on the Cowichan Lake branch of the E. & N. line it is expected that they will start upon their new contract before the end of the year. It is anticipated that the work will prove rather heavy on account of the grades. Four-tenths of one per cent. is the maximum grade obtained, which is regarded as (b), excessive cost of such a plant as a temporary measure. highly creditable in view of the roughness of the country covered. With this additional contract awarded a total of 100 miles is now under construction on the Vancouver Island system of the Canadian Northern.

The Building and Ornamental Stones of Ontario*

Dr. W. A. Parks.

Pursuant to instructions, I spent three and a half months of the field season of 1910 in making an examination of the stone quarries of the southern part of Ontario. The inquiry was conducted with the object of ascertaining the status of the building stone industry and it was restricted to that part of Ontario lying south of the Ottawa and French rivers. It is proposed to issue the report as the first part of a work on the Building and Ornamental Stones of Canada.

In addition to examining the quarries in Ontario, I spent a week in the granite and in the marble areas of Vermont, as well as a short time in the slate region of western New York. The quarries of the Missisquoi Marble Company at Philipsburg, Que., were also visited.

Limestone, sandstone, granite, and marble are quarried in the Province; but although the outlook is bright in certain directions, it cannot be said that the industry as a whole is in a flourishing condition. In all, 240 quarries were visited; but of these only about 70 are at present actually producing stone. This number includes certain quarries in which building stone is produced incidentally only to operations for crushed stone or lime. Quarries known to be worked for lime making only, are not included in the figures given above. As far as I am aware, all quarries at present producing building or ornamental stone were examined; but it is not to be supposed that the numbers given above include all openings from which building stone may have been obtained from time to time. From the properties visited about 300 specimens were collected which will be subjected to various physical and chemical tests with the object of ascertaining their durability, strength, and ease of dressing.

Limestone

In the Province of Ontario, limestone is obtained from a number of different geological formations. The stones from these formations are determinable by certain more or less fixed characteristics, which make a geological basis of classification the most easily understood.

The Beekmantown or Calciferous limestones, which are exposed over considerable areas eastward of Brockville, are of dark color and liable to be marred by the presence of cavities. This stone may be recognized in buildings in eastern Ontario by the brown color it assumes on weathering. It was formerly quarried to a large extent near Brockville and Prescott, for bridge and canal construction. Very few quarries are now in operation, and these are worked from time to time only, to fill the demands of local building.

Roughly speaking, the Chazy limestones form a ring which extends from the Ottawa to the St. Lawrence, in that part of the province lying east of Ottawa. The stone is for the most part of a grey color and has the property of retaining its tint on weathering. On the Ottawa, small operations have been conducted near L'Orignal, and more extensive work on a deposit of high-grade stone east of Hawkesbury. In the vicinity of Winchester are many small openings, worked intermittently only. Along the St. Lawrence the quarry on Sheek Island near Mille Roches is the most important.

The Trenton and Black River limestones occupy the middle of the Chazy ring in the east of the province, and occur as narrow strips in the Ottawa valley as far up as Pemroke. A broad belt of this rock also occurs between Georgian bay and Lake Ontario, forming the shore of the latter body of water from Kingston to Bowmanville. The stone when fresh quarried is light grey to dark bluish-grey

in color, and may be recognized in buildings by the fact that it assumes a much lighter color on weathering, in some cases becoming almost white. The stone of these formations has been much used in the past for canal and bridge work as well as for ordinary building. Some of the largest quarries now in operation are in Black River or Trenton areas, more particularly at Ottawa, Point Ann, Kingston, Longford, and Tweed.

The Niagara limestones occur as a narrow belt from Queenston Heights to the Bruce peninsula: forming the brow of the Niagara escarpment which owes its existence to the presence of these hard limestones. Different types of stone occur, but they are all of a light color, with a tendency to yellow rather than to grey tones. Great quantities of Niagara stone were formerly quarried for canal and bridge construction, at Beamsville, Thorold, and Queenston. Good building stone is now obtained at the two latter places as well as at Hamilton, Wiarton, and Owen Sound. Much crushed stone is made from Niagara rock, more particularly at Ancaster, Dundas, and Owen Sound (Clinton).

The Guelph rock occurs as a narrow lenticular patch west of the Niagara formation, stretching about 80 miles northward from Paris. The freshly quarried stone is always of a yellow or buff color, but tends to a grey tint on weathering, and is highly magnesian in character. This stone was formerly largely employed for building in Guelph, Galt, Preston, Hespeler, Fergus, Elora, and Durham. Most of the present output of Galt, Guelph, Fergus, etc., is converted into crushed stone, but a little material for building is still produced at Guelph, and near Erin.

In the western peninsula of Ontario, the only formation productive of limestone is the Onondaga (Corniferous). The stone is of a light grey color, and turns somewhat darker on weathering. The only important quarries now in operation are at St. Marys; but excellent building stone occurs in the Amherstburg quarries, which are, however, now being worked for other purposes. A large amount of material is being quarried at Port Colborne, and at Hagersville, but it is nearly all used for flux, road making, and in the manufacture of Portland cement. Very pure limestone for lime making, and for use in the chemical industries, is obtained near Beechville.

Sandstone

In the eastern part of the province, there occurs along the Rideau lakes, and in other small areas, a sandstone of Potsdam, or in part Beekmantown (Calciferous) age. This material has been quarried from the vicinity of Brockville, to Perth and Smiths Falls. Some of the stone is white, other parts are spotted; and near Perth is a small deposit of purple banded stone. The only quarry now in operation is near Westport, where a heavy example of the stone is being obtained for canal construction. Farther north, in the township of Nepean, a white and yellow banded sandstone—the so-called Nepean stone—has been quarried for many years, and has been used in many structures in Ottawa; more particularly the Parliament buildings, and recently, the new Museum. The chief output of the quarries is paving blocks. The building stone is produced only when contracts are obtained.

The Medina sandstone—unquestionably the finest building stone that has been quarried to any extent in the province—occurs at many places along the face of the Niagara escarpment, from Merritton to Orangeville. Three types of this stone may be recognized: a grey, a brown, and a mottled. The grey stone is still obtained in considerable quantity from Milton to Inglewood, and is largely used in Toronto. The brown stone, of which the Parliament buildings and numerous other structures in Toronto

* From the Annual Report of the Provincial Department of Mines.

are built, was obtained from the Medina formation at the Forks of the Credit. These quarries are now all idle, as the increasing difficulty of production has made the cost of extraction too high for present economic conditions.

The Oriskany sandstone occurs only in the county of Haldimand, and is, throughout most of its extent, an inferior stone for building purposes. The best grade of stone is found north of Cayuga, but it is now being quarried on a very small scale at one point only.

Crystalline Limestone

The great Archaean or crystalline area, which occupies the central and northern part of the province, is rich in bands of crystalline limestone, in Renfrew, Lanark, Haldimand, Hastings, Frontenac, etc. At a great many places a small amount of quarrying has been done, but no extensive operations have ever been conducted. The most important structure built of this stone is the post-office in Renfrew. Older buildings at Marmora, and at Lanark, show the stone to be durable, and of excellent appearance. The only quarries of any importance now in operation are those near Renfrew, which are worked more particularly for the making of lime.

Marble

Many of the belts of crystalline limestone are sufficiently fine in grain to deserve the name of marble. Most of these marbles are not white, but are variegated in color, many of them presenting a very attractive appearance when polished. Geological Survey reports contain numerous references to deposits of this kind at various points in the area. At the present time two companies are actively engaged in the production of marble, and with every chance of success. The Ontario Marble Company is operating near Bancroft on a marble belt which is yielding a number of varieties of variegated stone of exceptional beauty. The North Lanark Marble Company is engaged in extensive operations to the eastward of Clyde Forks on the Kingston and Pembroke railway. The stone consists of a white or lavender colored base with colorings of buff or green serpentine.

Decorative Materials

Of the decorative stones other than marble, there is no present production. The unique blue mineral sodalite, formerly obtained near Bancroft, is no longer quarried, although the deposit is by no means exhausted. Serpentine and iridescent feldspars are known to occur in the Archaean area, but, as there is no actual production, they do not properly come within the scope of the present report.

Granite

The Archaean area contains many granitic masses, which will eventually be quarried for building and monumental purposes. Hitherto, very little attention has been directed to this class of stone in Ontario, particularly in the interior. At Kingston, quarrying operations were carried on many years ago, and small amounts were also obtained near Gananoque, and at Brockville. At the present time, the only quarries of importance are being worked north of Gananoque, more particularly for the making of paving blocks. A small amount of building and monumental stone is, however, produced.

Gneiss

Gneiss has been quarried to a very small extent near North Bay and Gravenhurst. More recently a small quarry was opened near Parry Sound, which is still in operation.

While a considerable amount of fairly good building stone will continue to be produced from the different formations throughout the province, I am of the opinion that we must look to a development of the crystalline limestones, marbles, and granites, for a regeneration of the stone in-

dustry. Concrete is taking the place of stone for all heavy construction, and is rapidly replacing it for the cheaper types of building. With increase of wealth, the highest grades of stone are demanded for buildings of a monumental character. Most of our sandstones and limestones fall short of this standard, but when more is known of the crystalline limestones and marbles they will be more largely employed for structures of the highest type.

In the erection of fine buildings in the cities, there is a growing tendency towards the use of granite, which is likewise replacing limestone for monument bases. Modern quarrying methods and machinery have largely reduced the difference in cost of quarrying and working granite, as compared with the softer stones. In consequence, we may confidently expect to see a steadily increasing demand for granite. This demand can not be met either by the quality or the amount of granite at present produced in the province. Is it not a reasonable assumption that some at least of the numerous deposits of granite in the province will be able to supply the demands of the future?

It cannot be denied that there is a serious decline in the production of building stone. The chief causes for this decline, and the reasons for the present condition of the industry are tabulated below:—

- (1) The use of cement for heavy construction, such as the building of bridges and canals.
- (2) The use of cement blocks and artificial stone for architectural purposes.
- (3) The cheap importation of Indiana limestone, and Ohio sandstone.
- (4) The modern custom of erecting steel buildings, and facing them with terra-cotta, glazed brick, or artificial stone.
- (5) The failure of the Medina brown stone.
- (6) The increasing demand for granite, to which the province has failed to respond.
- (7) The high wages demanded by stone-cutters, and the difficulty of procuring a sufficient number of competent men.
- (8) The fact that most of the stone quarries are in the hands of very small operators, who work them only on receiving an order. In consequence, there is always a delay in delivery, and stone of a mixed character is shipped. These same owners do not devote their time to the stone business: it is merely incidental, hence receives little attention. If there were more strong companies actively and aggressively carrying on stone quarrying as a business, the cost of stone would be reduced, and the use of concrete, for architectural purposes, restricted.

Application is to be made by the Westmount City Council to the Provincial Legislature for powers to change the system of civic administration. It is proposed to abolish the ward system, reduce the number of aldermen, and appoint departmental heads instead of committees.

Mr. A. H. Harkness, B.A.Sc., Toronto, and J. Morrow Oxley, A. M. Can. Soc. C.E., Toronto, have entered into partnership under the firm name of Harkness & Oxley. They are giving special attention to the design and supervision of structural steel work, reinforced concrete and mill construction for buildings, tanks, water-towers and bridges. Their services have been retained in connection with the following projects: C. P. R. building, Toronto; new warehouse for R. S. Williams & Sons; Knox College; Y. M. C. A., Toronto, and Confederation Life Building, Winnipeg. The office of the firm is situated at 705 Confederation Life Building, Toronto.

From the Seat of Government

Building Trades Settling Down at Ottawa—Work of Improvement Commission Criticised by Expert.

Special to the Contract Record

Ottawa, December 16.—The building rush is over for the season here. The contractors on all the large buildings are well ahead with their work and in the majority of cases the work is limited to interior finishings, such as plastering, plumbing, finishing and painting.

Within the past week or more a large number of men, especially bricklayers and builders' laborers, have been laid off work, and many of them have left for the shanties to spend the winter. At the time there are few idle men in the city. With the cessation in building activity nearly all of the men laid off have secured jobs in various other lines of work, either in the city or outside.

There is no change in the wages from last year. Contractors are paying masons and bricklayers 52 cents an hour, carpenters 35 cents an hour and builders' laborers 28 cents an hour.

The price of materials remains the same as in the spring. Dealers quote cement at \$1.80 and sand from 85 cents to \$1 a cubic yard, according to the length of haul; plaster paris, local delivery, \$6 to \$7, and to out-of-town buyers, \$4.75 to \$5 a barrel.

Civic Improvement at Ottawa

Mr. Thomas W. Mawson, lecturer upon Town Planning and allied subjects, at the School of Civic Design in Liverpool University, does not think much of the Ottawa Improvement Commission, which has been spending money at the rate of \$60,000 a year in an effort to beautify the capital city of the Dominion. One great mistake that has been made, the lecturer made clear, when recently in Ottawa, is that both the city and the commission are working out their expansion without a definite and comprehensive plan that should provide for extensions even so far as fifty years hence. Mr. Mawson means that the work should be all financed and begun now, but that the idea should be formulated and the city and the commission proceed piece by piece towards something permanent, inspiring and worthy. Mr. Mawson emphasized the fact that it is not too late for Ottawa to begin such a plan.

Dealing directly with the work of the Ottawa Improvement Commission, Mr. Mawson pointed out that the work is too piecemeal and patchy. Where there should be beautiful and uninterrupted stretches of green grass and entrancing vistas the effect has been destroyed by introducing shrubs and trees and often formal flower beds. There has also been a mistake made in the inappropriate use of natural objects. At Nepean Point Park, for instance, a very striking Japanese fountain has been mounted upon a red cement base and flaunts its grotesqueness to the sky amid surroundings that are no more Japanese than Moscow. The lecturer threw upon the screen at this point a shady glen traversed by a pretty path, a scene he had taken at another part of the driveway. That was the spot, he said, where such an object would have been appropriate. And the audience agreed with him. A series of pictures was then proceeded with in which the lecturer contrasted the stiff and crude rustic bridges of the Ottawa Improvement Commission with the graceful union of classic stone and concrete design with natural foliage that is followed in the best European practice.

In regard to present developments of the city of Ottawa Mr. Mawson pointed out that a big mistake had been made in erecting the massive Grand Trunk Station at a point where there was so little space for approaches. It would become a danger point in the future, he said. All

the European capitals and commercial centres realized many years ago that a large station should have wide approaches and a broad open space to accommodate the traffic going to and from the station building.

In regard to the actual plan of the city the lecturer pointed out that the square plan had been discarded in present day planning; it was uneconomic. The other things to be considered in city planning, the expert stated, were; pure air and water. and sanitary sewage disposal; utility and convenience; and beauty.

Mr. Mawson's lecture was delivered to a large audience which included many members of the Government and representatives of the Ottawa Improvement Commission. It is probable that some such action as Mr. Mawson recommended will be taken. It has been suggested that the Government and the city act conjointly, and further, that the city be formed into a federal district.

Mr. Mawson, it may be stated, planned the gardens of the Peace Palace at the Hague, the public gardens at Copenhagen, and also the remodelling of the town of Dunfermline, Scotland, for the Carnegie Trust. He has planned and carried out many other important works.

Changes in Mechanics' Lien Act of Alberta desired by Calgary Builders' Exchange

Special to the Contract Record

At a crowded meeting of the Calgary Builders' Exchange held recently, Major Duncan Stuart of the firm of Duncan Stuart & Warner, barristers, delivered an able address on the Mechanics' Lien Act for the Province of Alberta.

Major Stuart explained that a cardinal point of the Act was the protection of the workman to ensure the payment of all wages for the work performed on the building. In his opinion the legislature would hesitate to make any changes in respect to this portion of the Act. The fact that sub-contractors are protected only to the amount due by the owner to the contractor, after they have given notice of their claims to the owner, was exemplified, and Major Stuart then proceeded to show that contractors and supplymen were entitled to priority over a mortgagee in respect of the extent to which the property had been enhanced in value by their work and material. With respect to workmen employed on a job, they must file their lien within sixty days after the completion of their work; all others must file within thirty-one days. Various other technical phrases of the Act were described and a general discussion followed in which Mr. W. A. Mackinnon, of the Western Planing Mills, referred to the unfair treatment with which the supplymen had to contend. He fully agreed that the workmen employed on the job should be protected, but urged that the men working in the mill of the supply men needed support also, and that therefore the supply men themselves must be paid for materials delivered to a job. A remedy for existing conditions could be found if the owners demanded that a contractor provide bond for a percentage of the contract.

Mr. MacDonald, architect, the next speaker, expressed himself in favor of the contractor and supply man. He said that a great deal of trouble was caused by owners employing incompetent contractors for the reason that they figured lower than a really good man could do the work for, with the result that the contractor failed in business and the sub-contractors and supply men were unpaid. The architects were continually warning their clients against this condition of affairs. He would like to see the Government method more generally used in private practice, whereby a contractor undertakes to provide a list of all materials delivered on a job each month and have the list verified.

Mr. W. J. Richards thought that contractors and supply men would be a great deal better off if there were no Lien Act, or one that simply protected the workmen's wages; they would then be in a position to take measures to protect themselves.

A resolution was carried asking that the president appoint a committee to deal with the matter and report the amendments they would suggest with a view to having them presented to the provincial government.

The following is a list of addresses to be delivered before the Exchange during the winter sessions:

"Decorative Plaster," J. C. McFarlane.

"Mechanics' Lien Act," W. C. Warner, barrister.

"The Effect of Materials on Architectural Design," G. G. Irvine, A. R. I. B. A.

"Plumbing and Heating," Jas. Marr.

"Town Planning," L. M. Gotch, A. R. I. B. A.

"Organization," H. A. Singley, of P. Lyall & Sons.

Business Organization Discussed at Montreal Builders' Exchange

Special to the Contract Record

The last fortnightly dinner of the Montreal Builders' Exchange was held at the St. Lawrence Hall on Wednesday, December 13th, and was presided over by Mr. James Ballantyne, the president. The speaker was Mr. W. H. Goodwin, managing director of Goodwin's Limited. His theme was "Business Organization." Mr. Goodwin treated his subject under four heads: Motive, material, means, and manner. That is to say, he described why men should organize, how they should organize, and how to make the best use of the material to be found in their employ. The first thing to be considered in the construction of a building was its purpose and around this should be crystallized the requirements of the system. The man who did not see the need of organization was the man with a narrow vision. It was necessary to know both the fixed and the overhead charges or one could lose without knowing why. Mr. Goodwin particularly impressed upon his hearers the importance of treating their employees as men and not as machines. He advised their taking the men into their confidence and making them feel their importance in connection with the undertaking on which they were employed. It was better to have a foreman's authority recognized by the man below than to have the power given by the man above. If employers would down among their men and inculcate in them right ideas regarding the dignity of their employment there would be fewer strikes. It was better to smile at the men than to swear at them, and it was better to work with men than merely to "work" men. A hearty vote of thanks was moved by Mr. Thomas Gilday.

The annual banquet of the Builders' Exchange will be held in the Windsor Hotel on January 9th when it is expected that members of both the Dominion and Provincial cabinets and other prominent men will be present.

The steel department of Factory Products, Limited, 220 King street west, Toronto, have just issued their stock list. Quotations are for immediate acceptance, and as they are subject to change without notice a prompt investigation is recommended. The company are prepared to handle, at once all orders for materials quoted in the stock list. The electrical and mechanical department of this concern is splendidly equipped and is in a position to fulfil the most exacting demands of the trade. The lines stocked include generators and motors; wires and cables; lighting fixtures and electrical supplies; "Osram" tungsten lamps; locomotive cranes; harbor equipment; lifting magnets; oil furnaces and heating appliances.

Personal News and Notes

The Cook Construction Company, Vancouver, B. C., has been incorporated with a capital of \$100,000.

Allard & Bourbonniere, Contractors, Montreal, Que., are reported to have dissolved partnership.

The Winnipeg Ceiling & Roofing Company are increasing their capital stock from \$250,000 to \$300,000.

Building permits issued this year up to November 30 by the City of North Vancouver totalled \$717,043.

The Port Moody Building & Trading Company, Ltd., Port Moody, B. C., has been incorporated with a capital of \$10,000.

The time for the completion of the G. T. P. prairie section has been extended to Dec. 1, 1912, and to Dec. 1, 1914, for the mountain section.

Vancouver's building permits up to the end of November totalled \$16,060,157, compared with \$12,196,240 for the corresponding period of 1910.

Hamilton building permits last month totalled \$278,800, almost exactly \$40,000 in excess of the total of the corresponding month of last year.

At the next session of Parliament application will be made to incorporate the Architectural Institute of Canada as the Royal Architectural Institute of Canada.

The C. P. R. has erected a building at Winnipeg for the housing of its dining and sleeping car attendants. It is understood that the company will put up similar buildings at all important points from coast to coast.

Mr. Louis Coste, Ottawa, left recently for Victoria, B. C., to report on the proposed harbor works which are planned by that city in preparation for the great increase of trade expected upon the opening of the Panama Canal.

Foremen in the employ of the City of Vancouver, B. C., have been charged with taking bribes from workmen, mostly foreigners anxious to obtain city jobs. City Engineer Fellowes has been asked to make a thorough investigation.

Excavation is now in progress on the "Fort Garry," the new G. T. P. hotel now under construction at Winnipeg. The proposed building, which was illustrated recently in these columns, will be 14 storeys high and will cost \$1,500,000.

The Montreal Council will be asked by the Board of Control to raise the pay from \$2.00 to \$3.15 per day for civic laborers and from \$3.00 to \$3.15 for carters. If this is carried, contractors who get work from the corporation will also have to pay the higher rates.

The number of permits issued at Calgary, Alta., last month totalled \$545,340, compared with \$590,604 for the corresponding month of 1910. The decrease is accounted for by the severe weather in the early part of the month. The total for 1911 to the end of November is \$12,209,478.

The examinations for admission to the study of architecture or registration in the province of Quebec will be held on the 22nd of January, 1912, and the following days at the rooms of the Province of Quebec Association of Architects, 5 Beaver Hall Square, Montreal, at 9 o'clock each day.

The Province of Quebec Association of Architects has sent to Mr. DeSerres, president of the Montreal Technical School, a letter suggesting that technical courses be organized for the welfare of the workers concerned in the building trades. The question has been submitted to the board of directors of the school.

Strathecona's latest industry is the Terra Cotta Company, Limited, a concern capitalized at \$100,000 which is preparing to open a modern plant early next spring. A valuable property fifteen acres in extent has been purchased

in the east end of the city. The directors of the company include the Mayor of Strathcona (Mr. Davies), Alderman Vogel and A. C. Rutherford.

The Standard Cement Company has been registered with a capital of \$400,000 to carry on business in cement, brick, stone, asphalt, and other building material, and to repair and construct buildings. The company is also empowered to undertake various electrical works necessary to its operations at Black Lake, P. Q.

The contract for the construction of the St. John Valley Railway has been signed by the Provincial Government and the Quebec & St. John Railway. The road will run between Grand Falls and St. John. Location of surveys of the line will begin at once and construction will start in the spring. The road, when completed, is to be operated by the Intercolonial Railway of Canada. The line will tap the most fertile section of New Brunswick.

The underwriting of the P. Lyall & Sons Construction Company, Montreal, has been placed by the Quebec Trust & Savings Company, the whole issue being taken within twenty-four hours. The capital of the company consists of \$1,250,000 in bonds, \$1,500,000 in preferred stock, and \$1,750,000 in common. The bond issue, in addition to covering the plants, also covers real estate holdings of a present value of nearly \$750,000. The preferred stock is retained by the present holders.

Messrs. Laurie & Lamb, engineers, Montreal, advise that an order has been secured from the city of Patterson, N.J., for a 60-ton Heenan & Froude destructor, the order being placed with the United States Licensees of the System, the Destructor Company, 111 Broadway, New York. The contract price was \$81,000, notwithstanding a bid received for another type of destructor at \$48,000. The Heenan & Froude type was given the preference on account of the low cost of operation.

About three million dollars has been expropriated by the Canadian Pacific Railway for construction work in connection with the entrance of their lines into Edmonton next year, and to provide accommodation for increase in business done in the Alberta capital by the company. Construction operations on their property in the city will be commenced immediately after Christmas, with a view to having all traffic handling facilities ready for use by the time trains are running over the new high level bridge. This will be early next fall, according to officials of the road.

The many discussions in Montreal concerning underground tramways have taken a more definite shape, in the instruction by the council to the city attorneys to prepare a draft amendment to the city charter authorizing the city to construct underground electric lines. The city attorneys have also been authorized to prepare a draft amendment asking for authority to construct a double line of street cars on each side of the city aqueduct from Montreal to Lachine, and if necessary to operate the same with electricity or any other power except steam. The distance is about seven miles. When the city obtain the requisite power from the Quebec Legislature the council will decide who is to build and operate the tramways in both instances.

The Montreal Water and Power Company have appointed Mr. J. O. Meadows, sanitary engineer to the provincial board of health, to be the chief expert in charge of the new filtration plant of the company. During the completion of the plant, Mr. Meadows will only give such time to the company as is necessary for the general supervision of the installation of the equipment, including the chemical and bacteriological laboratories. When the plant is finished, he will sever his connection with the board of health and give his entire services to the company. Mr. Meadows,

who is a science graduate of the university of Wisconsin, was in 1906 and 1907 assistant in the United States Department of Agriculture, co-operating with the Ohio State Board of Health in the examination of filtration plants. From 1907 to 1909 he was employed by the United States Government on the Isthmian Canal Commission in charge of the sanitary control of the water supplies of the Canal Zone. He is a member of the American Public Health Association. Mr. Meadows has done good work in installing sterilization plants in Montreal and the outside districts. Latterly he has been engaged for the board of health in improving the water supplies of the province.

Among recent incorporations we note the following: MacDonald Contracting Co., Ltd., Toronto (directors, W. R. & F. M. MacDonald, and John A. MacAddress, Toronto), capital \$40,000; Butwell Brick Co., Ltd., Toronto (directors, Mark & Harry Butwell, Toronto), capital \$75,000; T. A. Burrows Lumber Co., Winnipeg, Man. (directors, Frank Carlyle, W. A. Chalk and Marshall Anderson, all of Winnipeg), capital \$500,000; Bishop Construction Co., Ltd., Winnipeg (directors, John Bishop, Henry Bristow, A. E. Holmes and M. E. Bishop, all of Winnipeg), capital \$10,000; British North American Construction Co., Ltd., Vancouver, B. C., capital \$100,000; Uno-Rail System, Limited, Montreal (directors, D. J. Stewart, B. J. Forrest, J. B. Johnson, all of Montreal), capital \$100,000; Land Corporation of Ontario, Ltd., Toronto (directors, S. C. Smoke, J. G. Smith and N. Sinclair, Toronto), capital \$2,500,000.

Roller-Bearing Wheels

Coal dealers, ice dealers, oil merchants, cartage agents and a host of others whose business it is to transport heavy loads by waggon or traction engine will be interested in the fact that the Pickering Patent Wheel Company of Canada, Limited, have secured a factory and five acres of land at Farnham, Que., and are about to commence the manufacture of their roller-bearing wheels for the Canadian trade. The Pickering patent wheels have been made on a small scale at New Glasgow, N. S., for some time, and are in great demand in the Maritime Provinces, owing to their advantages over all old style hubs carrying heavy loads. Sample sets have been in use in most of the large cities of the Dominion and the demand has increased to such an extent that the New Glasgow factory of late has proved utterly incapable of filling the orders received by the company. The new factory will be equipped to a capacity of 35,000 wheels per year, and even this will not long suffice, for the firm hold orders at the present time for 33,000 wheels. It is said that 60,000 wheels are used up in Montreal every year. Henceforth, no doubt, many of these will be replaced by the Pickering Patent Wheel. The company's interests are being promoted by The Business Organizers and Appraisal Company, whose offices are at 30 St. John street, Montreal, where also the head offices of the Pickering Company are at present. Mr. A. C. Lari-viere, the well-known carriage manufacturer, of Montreal, is the president, and Mr. F. H. Chapleau, of the same city, and engaged in the same line of business, is the vice-president. Mr. F. G. Pickering, the inventor, is the chief engineer. The company have secured exceptional terms from the town of Farnham and are looking forward to a large share of the heavy wheel trade both for waggons and automobiles throughout the country.

Mr. J. T. Ewart, the ice dealer; The Nova Scotia Steel & Coal Company; The Imperial Oil Company, Limited, and many other companies and individuals, speak highly of the new wheel from practical experience. The company's plant is on the Yamaska River and both the C. P. R. and the G. T. R. have sidings on the property.

Contracts Department

News of Special Interest to Contractors, Engineers, Manufacturers and Dealers in Building Supplies.

Information for insertion in these columns is invited from Architects, Contractors, Engineers, etc.

Waterworks, Sewerage and Roadways

Carleton Place, Ont.

On January 1st a by-law to raise \$200,000 for a waterworks system will be voted on.

Chatham, Ont.

County Council of Kent are contemplating laying four miles of river road in Raleigh township; cost \$48,000.

Edmonds, B.C.

By-laws will be submitted for \$250,000 for new roads, etc.; \$100,000 for waterworks extension; \$10,000 for sidewalks. Clerk, W. Griffiths.

Hamilton, Ont.

Tenders are called until Dec. 20th for supply of pump and construction of sewers on following streets: Ferrie E. of Hughson to John; Trolley south of Maple ave. to Cumberland ave., 1 15 h.p. motor and centrifugal pump for Wentworth street sewage disposal works. G. H. Lees, chairman, Board of Control.

City will apply to Ontario Railway Commission for permission to borrow funds as follows: Water mains, \$74,469; check valves, \$3,000; new shops, \$1,000; beach pump house, improvements, \$1,000; new high-pressure boilers at Burlington beach, \$12,000; meters, \$6,000; new conduit, \$8,861; high-level reservoir improvements, \$4,500; new services, \$10,000; mountain pump house improvements, \$500; piles at intake pipe, \$800; new hydrants, \$1,000. Total, \$123,130.

Kincardine, Ont.

Commissioner, W. Welsh. An extension to filtration system is proposed. Engineer is instructed to report on present system and the cause of scarcity of water.

New Westminster, B.C.

Tenders are called for ten or twelve ton steam road roller, with high and low pressure cylinders and scarifier. Received by city clerk until December 18. City clerk, W. A. Duncan; city engineer, J. W. B. Blackman.

Ottawa, Ont.

A by-law will be submitted to provide for waterworks supply to endorse expenditure of \$2,300,000 to bring water from McGregor's Lake. City Clerk, John Henderson; City Engineer, N. J. Ker.

St. Lambert, Que.

Tenders are called for construction of sewers on Hickson street. Received by J. H. Beatty, St. Lambert, until Dec. 18th. Town engineer, Mr. Dickson.

Stratford, Ont.

By-law to raise \$23,000 for extensions and improvements for the waterworks

was passed by council. The pump and motor and a number of meters will be bought.

Toronto, Ont.

Tenders are called for water mains. 36-in. main on John street, Grange and Beverley streets. Specifications at office of City Engineer. Received by G. R. Geary, Mayor, until December 21.

Tenders are called until Dec. 19th for the following sewers: Morley avenue, from Applegrove avenue to 250 ft. south of Gerrard; east Toronto outlet, sec. No. 2; storm overflow Dagmar avenue. Specifications at office of city engineer.

Tenders are called for the laying of 36-in. main on John, Grange and Beverley street. Specifications at office of city engineer. Received by chairman until noon, Dec. 21st. Mayor Geary, chairman Bd. of Control.

City Engineer Rust will extend Gough avenue southerly at a width of 50 ft. connecting with Harcourt.

Tenders are called until Dec. 21 for supply of 12-in. and 6-in. check valves for waterworks department. Specifications at office of city engineer. G. R. Geary, chairman Bd. of Control.

The following streets will be widened: McLean, Cedarvale, Cockburn and Willow avenues; Coleman avenue extended.

Work is in progress for pumping station to cost \$36,000, Eastern avenue. City clerk, W. A. Littlejohn; city engineer, C. A. Rust; 2-storey, brick. Equipment required later.

Westmount, Que.

Tenders are called for supply of one steam road roller; supply and erection of bituminous macadam mixer plant. Particulars from city engineer. Received by city clerk until January 3, 1912. City surveyor, Arnh. Currie. See advertisement in "Tenders and For Sale Department" of this issue.

Vancouver, B.C.

Plans for the proposed drainage as prepared by City Engineer Fellowes at the last meeting of the Board of Works are as follows: Sec. 1. Western section of the city from Blanca drive at Point Grey to Granville street, six square miles. Outlet for this section near Alma drive, with a possible storm sewer outlet near Balaclava drive.

Sec. 2. Maple street trunk sewer district, practically complete, over one sq. mile.

Sec. 3. Maple street trunk sewer section, with drainage area of 2,302 acres, or about 3½ square miles. The main sewer will be on Bridge street, from 14th to 7th ave., where it will be divided, storm sewer leading to a ravine between Ash and Heather streets, the regular flow taken into the city yard.

Sec. 4. China Creek trunk sewer, with area of 4777 acres, or 7½ square miles, drawing South Vancouver from 17th ave. to Wilson road and into Burnaby.

Sec. 5. North of the G. N. right-of-way from False Creek to Hastings Townsite, and north to 1st avenue. Area 363 acres, or over ½ square mile. Construction on a part of this section has been started.

Windsor, Ont.

A petition asking for a new sewer on Gladstone avenue is being considered by the Assessment Commissioner. The work will be commenced very shortly it is expected.

CONTRACTS AWARDED

Hamilton, Ont.

City engineer, A. F. MacAllum; contractors, S. Cheeseman, 664 King street west. Fairholt road, from Main street to Dunsmure road, at 98c per foot. J. J. Armstrong, 48 Burns street: Pipe sewers, Gordon street, from Berlin avenue to Lincoln street at 57c. per ft.; Linden street, from Berlin avenue to Lincoln street, at 47c. per ft.; Lincoln street, from Barton street to Linden st. at 70c. per ft.; Berlie avenue, from Barton street, to Linden street, at 94c. per ft. Contract for Ottawa street not let yet.

Railways, Bridges and Wharves

Banff, Alta.

The Canadian Pacific Railway, Montreal, are planning alterations to the hotel; reinforced concrete, centre tower to go up to a height of 14 storeys; electric light, fireproof. Cost \$250,000.

Calgary, Alta.

A site has been purchased for works for Dominion Bridge Co., Montreal, Que., south of Peddington; director of Company, J. E. L. Ross; Mayor of Calgary, Mr. Mitchell. Plant to employ at start about 400 hands, increasing to about 1,500. Work is expected to commence early in 1912.

Chatham, Ont.

New tenders will be called for bridge. Baptiste Creek, for Essex and Kent counties; county clerk, J. Gosnell, Chatham. Tenders received were too high. A bridge at Sombra is also contemplated later.

Edmonton, Alta.

Application will be made for permission to construct branch railway from a point on main line near Independence to Fort Assiniboine. Plans have been approved for entire route, entrance to Edmonton not submitted yet. It is thought that G. H. Webster, Calgary, will have charge of the construction in the spring. Holder of charter, J. D. McArthur, 304 McArthur Bldg., Winnipeg.

Evendale, N.B.

Tenders are called for construction of low water wharf. Pleasant Hill road. Plans, etc., at office of district engineers at St. John, Chatham, and on application to local postmaster. Received until January by secretary. Secretary, R. C. Desrochers.

Kincardine, Ont.

Tenders were called for bridge on 10th Concession of Brant but were not satisfactory and new tenders will probably be called in January.

Fort Churchill, N.W.T.

Application will be made for construction of railway by Northern Territorial Railway Co. Route, Ft. Churchill to Wallaston, Sask., Lake Athabasca, Alberta and thence to Portland Channel with branch to Edmonton.

London, Ont.

D. A. Stewart, of the London and Northwestern Radial Railway, states that the company wishes to start work next spring on the construction of a line between here and Sarnia.

Bridge at William street is under consideration. If division of cost between city and street railway can be settled the bridge may be built.

County Engineer Charles Talbot has been instructed to prepare plans for the following bridges, concession 8, between London and West Nissouri, 22 ft. span, between London and Biddulph, 40 ft. span; between Lobo and London at Vanneck, 30 ft. span; between East Williams and Adelaide, 40 ft. span; between West Williams and Adelaide, 65 ft. span; between Adelaide and West Williams, near Warwick Town Line, 20 ft. span; over the Sable between Biddulph and Osborne, 50 ft. span; between Mosa and Ekfrid at Strathroy, 40 ft. span.

Montreal, Que.

Plans have been prepared for extension of railway lines as follows: Longueuil to Boucherville; St. Lambert to LaPrairie; thence via Chambly, St. Hilaire and St. Charles on east side St. Lawrence to Sorel. Line to Chambly under way, to be completed in spring, balance during summer. Owner, Montreal Southern Counties Ry. Co., 606 Canadian Express Building, Montreal.

Ottawa, Ont.

Tenders are called for reinforced concrete bridge, 6 spans, three over water; floor, creosoted blocks, 1-in. sand cushion on 6-in. concrete; 8-ft. walks, space being left for conduits; width of roadway 40 ft., two sets of standard gauge electric railway rails; concrete piers and abutments; piers 70 ft. long by 12 ft. thick, piers have batter 1 in 24; strata, sand 10 ft., coarse sand and gravel 20 to 25 ft., rock 30 to 40 ft. below surface; high water level 17 ft. 6 in. below arch. Received by chairman and members Bd. of Control until 4 p.m. December 21st. Cost about \$130,000. City Engineer, N. J. Ker.

Saskatoon, Sask.

Extension of railway yards for Canadian Northern Railway; general manager, M. H. Macleod; assistant general manager, J. R. Cameron; general superintendent, A. Wilcox. Extensive additions are planned for the C. N. R. yards next spring.

Three Forks, B.C.

Rambler-Cariboo. Mine Company; manager, W. E. Twicky, are making arrangements to move concentrator from near mine to a point on new C. P. R. extension (about one and one-half miles). Aerial tramway to be built from mine to new location (one and one-half miles long).

Truro, N.S.

New tenders are called until Dec. 26th for construction of freight shed. Plans, etc., at station master's office, Truro, and at the office of the chief engineer, Moncton, N.B. Government Railway Managing Board, Ottawa; chairman, A. W. Campbell.

Vancouver, B.C.

Building inspector advises erection of 600 ft. retaining wall at 12th and Quebec streets and estimates are being prepared. W. McQueen, city clerk.

Plans have been filed for new branch for Canadian Northern Railway; general manager, M. H. Macleod. Route shows proposed line north from Edmonton to Peace River country to point on Pacific coast.

Wheatley, Ont.

The Harbour Committee are making arrangements for the building of a new pier at Two Creeks. Work will be commenced as soon as possible.

Winnipeg, Man.

Tenders were called until Dec. 15th for supply of 100 tons second hand or re-lapng rails, 50 or 60 lbs. per yd. and necessary fastenings, delivery f.o.b. cars Lac du Bonnet, Man. Specifications at office of engineers. Board of Control, M. Peterson; power engineer, Smith Kerry & Chace, Carnegie Library Bldg., Winnipeg.

CONTRACTS AWARDED**Ottawa, Ont.**

Railway for National Transcontinental Co. General contract awarded, J. P. Mullarkey, Ltd., Coristine Bldg., Montreal. Section between Ottawa and Pembroke, 100 miles. Grading and bridge, building will be commenced shortly and continued throughout the winter. Sub-contracts have not been awarded yet.

St. John, N.B.

A. R. Gould, Bangor, Me., representing Quebec and St. John Railway, will have charge of construction of railway between Grand Falls and St. John. Surveys to begin at once; construction to start in spring. Contract signed by railway and provincial government. Railway to be operated by Intercolonial Railway when completed.

Public Buildings, Churches, Schools, etc.**Bassano, Alta.**

S. E. Whiting of Bassano, is preparing plans for building to contain stores in front with theatre in rear, on Third street east. Seating capacity of theatre, 800.

Brantford, Ont.

Officials of Dominion Government have been examining sites for proposed post office and customs building, to cost \$200,000.

Calgary, Alta.

Trinity Methodist Church, Rev. W. J. Haggith pastor, are working to raise \$40,000 for the erection of a new church.

Guelph, Ont.

A new building for the accommodation of the dairy classes in connection with the winter fair may be built next year.

Hamilton, Ont.

Architect, Mills & Hutton, Bank of Hamilton Chambers. City will ask for plans for alterations to basement of City Hall. It is to be cut up into offices and furniture and safe will be wanted. In addition to the furniture and safe required in the proposed alterations to the basement, a new electric elevator and steam heating plant will be purchased. Dynamos, switchboards required also. Estimated expenditure \$20,000.

Montreal, Que.

Plans have been revised for general post office on James street, to permit of addition of one storey, not provided for in plans approved by late government. Re-construction in fireproof materials of front. Architect, Theo. Daoust, 90 St. James street, Montreal.

The Montreal & Eastern Townships branches of the Canadian Mining Institute contemplate establishing suitable headquarters here.

Site has been purchased for a theatre, 328-344 Bleury street, for the Quebec amusement Co.; manager, H. W. Conner, "The Nickel." 100-ft. frontage, depth 165 ft. If arrangements can be made with present occupants, preparations for re-building will commence next May.

Ottawa, Ont.

Tenders are called for erection of smallpox hospital, Porter's Island; architect, Mr. Sullivan, Sparks street, Ottawa; 3-storey, solid brick, concrete foundation, electric lighting. Received by Bd. of Control until Dec. 21st.

Regina, Sask.

Architects, Darling & Pearson, 2 Leader Lane, Toronto, are preparing plans for the erection of a 3-storey, stone and brick hospital to cost \$100,000.

River Glade, N.B.

Plans are approved for addition to sanitarium and heating system for New Brunswick Provincial Government; architect, F. Neil Brodie, St. John, N.B.; superintendent, Dr. Townsend. Plans call for the construction of two buildings on either side of the present Jordan structure, and also for the installation of water and heating system.

St. Lambert, Que.

The town of St. Lambert is about to award tenders for some electrical and plumbing work about the Municipal Buildings and streets.

St. Mary's, Ont.

A by-law will be submitted to raise \$40,000 for building new school. Plans will be prepared immediately.

Sechelt, B.C.

Plans will be prepared for erection of hotel and sanitorium to cost \$1,000,000. Architect, W. Marbury Somervell, 744 Hastings west, Vancouver. Buildings to be erected in units—plans for first call for 4-storey, 200 rooms, cost \$200,000.

000. The sanatorium to be a few hundred yards away; all structures to be first-class construction. English capitalists represented by B. P. Bigwood are financing project.

Smith's Falls, Ont.

A by-law will be submitted by the Tps. of Montague and N. Elmsley to aid in the erection and equipment of a public hospital here.

Tecumseh, Ont.

It is reported that Mr. A. Durocher, of Montreal, who is at present here, will erect a sanatorium beside the mineral springs.

Toronto, Ont.

The Riverdale Business Men's Association passed a resolution asking the Board of Education to provide in their estimates of next year for enlargement of High School.

Permit has been granted to erect fire hall, cost \$26,000, on Balmoral avenue. City Clerk, W. A. Littlejohn. 2½-sty., brick.

Board of Education are about to locate a site for proposed High School of Commerce. Supt. of Buildings, C. H. Bishop; Principal, R. H. Eldon. It is expected the building will be erected next year.

Plans are being prepared for Sunday school, cost \$60,000, on Walmer road, for Warner road Baptist Church; Pastor, Rev. John MacNeil, 88 Albany ave. Necessary funds subscribed.

The Library Board is planning branch library at Bloor and Gladstone; 80 ft. frontage, wings 65 ft., shelving capacity 20,000 vols., \$33,000. Offer accepted of room in Earlscourt Church; Boone & Ascot street (Rev. P. Bryce, pastor) for use as temporary branch library; also recommendation that room in Spruce Road fire hall, Balmy Beach, be fitted up as branch library. Chief librarian, G. H. Locke.

A permit has been granted for chemical laboratory to cost \$7,000, city hall. Building to be 1 storey of steel construction.

A permit has been granted for alterations to fire hall to cost \$6,600, Fort street; 2-storey brick addition.

Plans are under consideration for erection of technical school. Supt. of Building, Mr. Bishop; committee to report, Supt. Bishop, Principal MacKay; trustees, Hiltz and Ellis, R. J. Stevenson and W. P. Cohoe. Plans call for manual training shops, gymnasium, lunch rooms, reading rooms, laboratories, class rooms. Secretary Board of Education, W. C. Wilkinson.

Tenders are open for addition to Georgia House, to cost \$33,000, (private hotel) west side of Beverley street. Architects, Eden-Smith & Son, 190 Yonge street, Toronto; brick, 4 storeys and basement, structural steel, brick foundation, skylights, cut stone, galv. iron, cornice, floors, steam and hot water heating, steam and hot water No. 1 Daisy 4640 ft., radiation Safford, or Gurney Rod radiators, gas and electric light, Georgia pine, interior finish, wall hangers, passenger elevators.

Plans are being prepared for the erection of gymnasium, reading rooms and swimming tanks in connection with New St. Andrew's Presbyterian Church, King and Simcoe streets. Estimated

expenditure, \$60,000.

Pastor, Rev.

Vancouver, B.C.

Tenders are called until Dec. 20th for alterations and additions to post office fittings. Plans, etc., from local postmaster. Department of Public Works, Ottawa. Secretary, R. C. Desrochers.

Victoria, B.C.

First Baptist Church have purchased a 144-ft. lot on Fisguard street near Quadra. Plans will be drawn at once for a new church.

Winnipeg, Man.

A by-law carried to raise \$600,000 for school purposes. M. Peterson, secretary Board of Control.

CONTRACTS AWARDED

Echo Place, Ont.

School, cost \$15,000, for Township of Brantford; sec-treas., J. L. Barnes, Eagle Place; architect, G. W. Hall, Brantford; general contractor, Bennett & Bowden, Brantford. Two storeys, and basement, 46 x 70, 4 rooms, brick, reinforced concrete floors, concrete foundation, steam heating, electric and gas lighting, slate roofing, interior finish Georgia pine (oil finish). Ventilating system.

Contract let Dec. 6th. Plumbing and heating not let yet.

Montreal, Que.

Church, cost \$10,000, for Delorimer Methodist Congregation; Rev. Dr. W. R. Young. Architects, Peden & McLaren, 20 Alexis street; plastering and carpentry, Henry Morgan, 1 Beaver Hall Hill. One storey, 16 ft. 130 x 30, brick, stone foundation, hot water heating, electric lighting, gravel and canvas rfg.

Sandwich, Ont.

Town Hall, cost \$10,000. Architects, Crane & Pennington; mason work, Thompson Bros., Windsor; carpentry, Major & McLean, Sandwich; plumbing and heating, James Purser; painting and glazing, T. W. Brooke; electric wiring, Clarke Electric Co. Work commences immediately.

Vancouver, B.C.

Isolation Hospital (laundry). City clerk, W. McQueen; architect, S. M. Eveleigh, care Dalton & Eveleigh, 615 Hastings street west, Vancouver; general contractor, Campbell & Wilkie, 615 Pender street west, Vancouver; heating apparatus supplied by Murray Bros., \$2,917. New tenders will be called for laundry fittings and disinfecting apparatus.

Weston, Ont.

Hospital, for National Sanatorium Association; architect, A. R. Denison & Stephenson, 20 King street west; carpentry, R. G. Kirby, 539 Yonge street; steel, McGregor McIntyre, 75 Pearl st., Toronto.

Residences

Blenheim, Ont.

Geo. Taylor is planning to build a brick veneer residence to cost \$3,000.

Calgary, Alta.

A permit has been granted for two residences to cost \$5,000, for Anson Pier, Box 512; 2-storey, 20 x 38, frame, concrete foundation, hot air heating,

electric lighting, shingle roofing, hardwood interior finish.

A permit has been granted for two residences to cost \$6,000 for J. A. Knoeph, 1710 10th street west, 2-sty., 24 x 36, frame, concrete foundation, hot air heating, electric light, shingle roofing, hardwood interior finish. Owner is builder.

G. E. Wood, Sunnyside, is contemplating the erection of an apartment block, 180 x 40. Cost \$12,000.

A permit has been granted to erect six residences to cost \$6,000, Sunnyside, for O. W. Manzer, 1146 Sydenham avenue, 1-storey, 18 x 26, frame, concrete foundation, hot air heating, electric lighting, shingle roofing.

Montreal, Que.

Excavation is done for six flats, cost \$7,000, Mance street, for U. Limoges, 93 Laurier ave.; 3-sty., 25 x 55, stone front, gas and electric lighting, gravel roofing, stone foundation.

Excavation underway for three flats, cost \$3,500, on Mance street, for A. Desjardins, 33 Casgrain street; 3-sty., 25 x 50, stone, stone foundation, gas and electric lighting, gravel roofing.

A. Tremblay, 446 Cuvillier street, will build three flats to cost \$3,000, 29 Duquette; three storeys, 42 x 25, pressed brick, concrete foundation, furnace heating, gas lighting, gravel and tar roofing. Owner is builder.

Ottawa, Ont.

A permit has been granted for two residences, cost \$7,500, Oakland avenue, for J. A. Grierson, 119 Elm street; 2-sty.; 24 x 36, concrete foundation, steam heating, electric lighting.

Outremont, Que.

J. A. Linioges, Terrebonne, Que., is excavating for six flats to cost \$8,000; 3-storey, 60 x 68, brick, stone foundation, hot water heating, electric lighting, gravel roofing.

Port Credit, Ont.

Tenders were called until Dec. 18th for erection of residence to cost \$10,000, for Chas. Hamilton; architect, Chadwick & Beckett, 20 Toronto street, Toronto; 2½ storeys, brick, stone and stucco, stone foundation, slate roofing, hot water heating, mantles, hardwood interior finish.

Sherbrooke, Que.

Tenders are open for residence to cost \$3,000, Sanburn, for B. A. Dugar, c/o Gas & Electric Dept., Sherbrooke; excavation contractor, Jno. Chavert; 2-storey, 28 x 34, frame, stone foundation, hot water heating, electric lighting, hardwood interior finish. Tenders close Dec. 23rd.

Toronto, Ont.

Tenders are open for five residences, cost \$19,500, 9-16 Pricefield road, for R. C. Bustard, 1538 Yonge street; architect, J. H. Stanford, Yonge St. Arcade, Toronto; 2-sty. and attic.

Tenders were called until Dec. 18 for residence, cost \$8,000, on Russell Hill Drive; architect, F. S. Baker, Traders Bank Building.

A. McMillan & Costain, 109 Main st., have completed excavations for dwellings, \$6,000, Gerrard street near Horwood road. Architects, W. H. Radcliffe, 2189 Gerrard street east; brick, concrete foundation, shingle roofing.

Excavation is done for two pair of residences, cost \$8,000, on e.s. Carlaw avenue, for D. E. Moore, 344 Shaw st.; architect, W. C. Kerr; 2-sty., semi-det., brick.

A. T. Stewart, High Park avenue, is excavating for pair of dwellings, cost \$6,000, on Howard Park avenue; 2-sty. and attic, semi-det., brick.

R. B. Burkell, 180 Rusholme road, is excavating for three att. residences, cost \$6,500, Ossington ave; architect, W. C. Mason, 358 Montrose avenue; 2½-sty., brick.

Excavation is completed for pair residences to cost \$6,000, S. S. Albermarle avenue, for A. G. Chambers, 585 Pape avenue; 2-storey, semi-detached, brick.

Geo. C. Annan, 503 Dupont street, has completed excavation for a 2-storey, solid brick residence on east side of Hilton street to cost \$3,500.

Excavation is done for 2 pair residences to cost \$9,000 on E. S. Ossington avenue, for J. A. Humbleton, 148 Rusholme road, Toronto; architect, Mr. Harris; 2½ storeys, semi-detached, brick.

Work is in progress for a residence to cost \$7,500 on Wellesley street, for E. Wickett, Wellesley street; architect, E. G. Wilson, 77 Victoria street; 2-storey, galv. cornice, cut stone, mantles, sheet metal roof.

A permit has been granted for 2 pair and 1 detached residence to cost \$17,500, west side Bedford road, for F. H. Urquhart, St. George street, Toronto; architect, J. Hunt Stanford, Yonge St. Arcade, Toronto; 2-storey and attic, brick, slate roofing, hot water heating, electric lighting, cut stone, mantles, plate glass.

Tenders are open for residence to cost \$7,200, Treford Place, for F. J. McRea, 6 Mansfield avenue; architect, J. G. Hedges, 86 Clinton street; 2-storey, brick, attached.

Tenders are open for residence to cost \$6,000, S. S. Albermarle avenue, for A. G. Chambers, 585 Pape avenue; architect, P. H. Finney, 43 Victoria street; 2½ storey, brick, semi-detached.

Excavation is done for residence to cost \$3,800 w. s. Huron street, for S. Shaver, 402 Dovercourt road; architect, J. Snowden, 9 Chapel street; 2½ storey, brick.

Excavation is completed for pair dwellings to cost \$5,500, 152 Bedford road, for Urquhart & Sharp, 1420½ Bloor street west; 2-storey, semi-detached, brick.

Excavation is done for 2 detached dwellings to cost \$4,600, corner Medland Crescent and Oakmont road, for James Penngelly, 742 Keele street; 2½ storeys, brick.

J. G. & A. C. Clunhill, 415 Clinton street, have completed excavation for 2-storey, semi-detached, brick dwelling on Woodbine avenue, to cost \$4,000.

Excavation has started on 3 detached dwellings to cost \$5,800, east side Symington avenue, for S. Robertson, 28 Antler avenue; 2 storey, brick.

Plans are being prepared for a residence to cost \$4,000, Sullivan, near Beverley, for L. Foulds, 21 Leader Lane—2½-storeys, solid brick, shingle roofing.

H. J. Cummings, 740 Keele street, will build a pair residences to cost \$4,000,

on Rowntree avenue; architect, J. Shuttleworth. Two storeys, semi-detached, brick.

Deeth & Son, 44 Grove avenue, will build a new 2-storey brick residence on Rusholme road to cost \$3,100.

Tenders are open for the erection of an apartment house to cost \$9,000, N. E. corner Linden and Huntley, for H. P. Baird, 525 Huron street, Toronto; 3-storeys, brick, brick foundation, steam heating, gas and electric lighting, cut stone, mantles, electrical work, metallic lath, plate glass, reinforced concrete, galvanized iron cornice, tile.

Plans have been prepared for erection of a residence to cost \$4,000, E. S. Delaware avenue, for J. Johnston, 70 Westmoreland avenue; architect, L. E. Price. 2-storeys, brick.

A. McTaggart, 208 Dovercourt road, will build a 2-storey brick residence on S. S. of Temple avenue, to cost \$2,500.

Excavation has been completed for a 2-storey brick dwelling to cost \$3,500, west side Franklin avenue, for J. L. Owen, 73 Adelaide street west, Toronto.

CONTRACTS AWARDED

Banff, Alta.

Apartments to cost \$36,000, for Dr. R. G. Brett; architect, Sam Howard; masonry contractor, F. T. Horner; 3-storey, 80 x 50, brick veneer, frame, steam heating, electric lighting, gravel and pitch roof.

Residence to cost \$3,200 for Mrs. Stevens, Banff. General contractor, J. Stanley, Banff; 2-storey, 36 x 30, concrete foundation, hot air heating, electric light, shingle roofing, hardwood finish.

Residence to cost \$3,000, for F. Green, grocer; general contractor, F. Ballard; 1-storey, 40 x 30, frame, concrete foundation, hot air heating, electric lighting, shingle roof, hardwood finish.

Residence to cost \$3,000 for Dr. R. G. Brett; general contractor, S. Howard; 2-storey, 30 x 30, frame, concrete foundation, hot air heating, electric light, shingle roof.

Calgary, Alta.

Two residences to cost \$10,000, Elbow Park, for G. R. Rhodes; general contractor, W. G. S. Hooley, box 1771, Calgary; 2-storey, 30 x 34, frame, concrete foundation, hot air heating, electric light, shingle roofing, hardwood finish.

Montreal, Que.

Ten flats to cost \$6,000 on Marianne street, for J. B. Beauchamp, 864 Papi-neau avenue; builder, Jules Dugal, 766 Chausse street, Montreal; 3-storey, 50 x 40, brick and stone, gas and electric light, gravel roofing, concrete foundation, stove heating.

Montreal West, Que.

Residence to cost \$5,000, Percival avenue, for R. E. McLean, Montreal West. Architects, Peden & McLaren, 20 St. Alexis street, Montreal West. Excavation and foundation, J. J. Kirkpatrick, Montreal West; brick and masonry, MacDonald & McColl, Prud'homme avenue, Montreal; carpentry, D. F. Deslauriers, 1031 St. Antoine street, Montreal; plumbing and heating, Thos. Bain, 155 Guy street, Montreal; roofing, Richardson, Simard & Co., 129 Elgin

avenue, Montreal; electric lighting, E. A. Gregory, 64 LaSalle street, Montreal; plastering, Gray & Wighton, 244 Pine avenue west, Montréal.

Ottawa, Ont.

Four residences, cost \$8,000, on King Edward street, for J. Mundy, 361 St. Patrick, general contractor, Alex. Campbell, Ottawa; 2-sty., 70 x 26, brick veneer, stone foundation, hot air heating, electric lighting, tar and gravel rfg.

The brick work is in progress for residence, cost \$15,000, for D'Arcy McGee; architect, C. P. Meredith, 126 Sparks street; general contractor, McCullough & Adamson; 2½-stys., 52 x 42; solid brick; stone foundation, electric lighting, steam heating, tar and gravel roofing.

Apartment house to cost \$12,500, for J. C. Moxley; architect, Kenneth B. Hanis; general contractor, A. Christie, 359 Elgin street, Ottawa; brick veneer, 37 x 26.

Outremont, Que.

Foundations are in for a cottage to cost \$10,000 for Messrs. Holland and Langridge, 280 McDougall avenue; solid brick and stone, hot water heating, gravel roofing, electric light.

Foundations are in for 4 flats to cost \$5,000, Champaigne avenue, for A. Vaillancourt, St. Viateur; 2-storey, 28 x 40, brick veneer, concrete foundation, hot water heating, electric light, gravel roof. Owner is builder.

Excavation is done for two cottages to cost \$10,000, Quebec street, for Morin & Outimet, 2754 St. Hubert street; 2-storey, 28 x 40, solid brick, stone foundation, hot water heating, electric light, gravel roofing. Owner is builder.

The foundation is started for residence and garage to cost \$12,000, for O. Lamoureux, 96 St. George Cartier Square, 35 x 50, solid brick and stone, hot water heating, electric lighting, slate roofing, stone foundation. Owner is builder. Estimated cost of garage, \$2,000.

J. O. Limoges, Terrebonne, is excavating for six flats, cost \$12,000, on Hutchison street; 3-sty., 50 x 70, brick veneer, stone foundation, electric light, gravel roofing. Owner is builder.

Quebec, Que.

Apartments to cost \$175,000, 144 Grand Allee, for Grand Allee Apartment Company, Ltd., Quebec; architects, McDowell & Henderson, Bank of Toronto, Montreal; general contractor, G. W. T. Nicholson, Eastern Townships Bank; plumbing and heating, Vandy & Matt, Quebec. 6-storeys and basement, reinforced concrete with brick facing, electric and gas light, gravel roof.

Sherbrooke, Que.

Work is in progress for erection of a residence to cost \$4,500 on London street, for H. E. Fuge, 30 London street Sherbrooke; 2½ storeys, 40 x 50, frame, concrete foundation, steam heating, electric lighting, asbestos shingles, hardwood interior finish. Owner is builder.

Toronto, Ont.

Residence, to cost \$6,500, Hugo avenue, for D. J. Lander, Yonge street Arcade; architect, Edwards & Saunders, 18 Toronto street, Toronto. Builder, W. E. Simmons & Co.

Residence to cost \$4,500, Waller st., for D. H. Atkinson, 121 Tyndall avenue; architect, J. H. Galloway, 23 Toronto street; 2½ storeys, shingle roofing, brick. Owner is builder.

A permit has been granted to erect a residence to cost \$3,500, Centre Island lake shore, for H. H. Macrae; builder, W. Nash, 79 Corevale avenue; 2 storeys, frame, shingle roofing.

Residence to cost \$3,000, on Kingwood road, for Miss Taylor, Scarboro Junction; builder, A. Morris; 2½ storeys, brick and frame.

Three att. residences, cost \$5,600, for Jas. Willings. Builder, Walter Nash, 79 Gore Vale avenue, Toronto.

Work is in progress for residence, cost \$3,500, on Lake Shore road, for H. H. Macrae; builder, Walter Nash, 79 Gore Vale ave.; 2-sty., frame.

Waters & Elliott, 24 Vermont street, are excavating for three pair residences, cost \$10,500, Patton road and Campbell ave.; 2½-sty., semi-det., brick and stone, felt and gravel roofing.

Vancouver, B.C.

Plans are prepared for four bungalows to cost \$6,800, on James street, for B. C. Investment Co.; architect, Western Bungalow Co., Trust Bldg., Vancouver; general contractors, Currie & Mullen. Each bungalow to cost \$1,700.

Business Buildings and Industrial Plants

Berlin, Ont.

Jos. Zuber, proprietor, Walker Hotel, plans to make interior alterations to cost several thousand dollars. Changes to be started about the first of the year.

Barnford, Ont.

Work will commence shortly on addition to planing mill (moulding shop) for Mickle, Dyment & Co.; 2-storey, 19 x 56, corrugated iron nailed to timber frame, concrete piers foundation, corrugated iron roof and siding. Wood working machinery will probably be required.

Brussels, Ont.

A by-law will be submitted to loan \$10,000 to Pryne & Son, flour mill proprietors, to enlarge the mill and install new machinery.

Calgary, Alta.

A permit has been granted for a workshop to cost \$3,000 on 3rd avenue east, for Woodcraft's Ltd. (wood-polishers, etc.); 2-storey, 25 x 60, brick, concrete foundation, steam heating, electric lighting, Ruberoid roofing.

Duncans, B. C.

Messrs. Le Neven, Parry & Eliot streets, have cleared the site occupied by Keat's livery before recent fire. It is stated that offices will be placed there. Plans are being prepared by them for garage on opposite corner.

Granby, Que.

Bonus granted to erect a wire plant and plumbing factory for The Granby Hardware Co., Ltd. The business of Sanitary Plumbing Manufacturing Co. will also be taken over and operated by same company.

London, Ont.

A site has been purchased by Sir George Gibbons on Dundas street, for the erection of a new store.

Plans will be prepared shortly for building for Bank of British North America to be erected in the Spring on Talbot street.

Montreal, Que.

Bank of British North America will tear down and re-build its head office on St. James street, next year, frontage 68 x 95. A modern structure throughout will be erected.

Work will probably start in the spring on the erection of an office building to cost \$150,000, cor. St. Catherine and Victoria streets, for Johnson Bros., 483 St. Catherine street west, Montreal; architects, MacVicar & Heriot, 104 Union avenue, Montreal; 5-storey, 53 x 120 white stone front, steel, concrete and terra cotta, fireproof throughout, tile floor, show-rooms finished in solid mahogany.

Caron Bros., wholesale jewelers, Bleury street, purchased lot 44 x 80, corner of Bleury and Bernard streets, and intend to erect next spring a 10-storey office and light manufacturing building.

W. P. Downey, 26 Peter street, Montreal, intends to build a large new factory next spring; dealer in bakers' supplies.

Mount Forest, Ont.

The by-law to loan the Mt. Forest Carriage Co. an additional sum of \$14,000 was carried by the ratepayers.

Port Arthur, Ont.

Negotiations are still in progress for stove works to cost \$200,000, for Port Arthur Stove & Manufacturing Company; capital \$500,000. W. J. Lindsay, representative. Company, in consideration of certain civic privileges, may build a large plant to employ two hundred hands.

Rosetown, Sask.

A site has been purchased for the erection of an hotel; 3-storey, frame, 60 x 120, cement and stone basement; all modern conveniences. Sale effected by C. W. Homes Land Company.

Rosetown, Sask.

Arrangements are being made for the establishment of a flour mill here.

Sarnia, Ont.

Messrs. H. J. Neal and C. E. Werning have bought the big baking plant of Scott Bros. and it is likely that important extensions will be made later.

St. Andrews, N.B.

Plans are being prepared for sardine canning factory (Chamcook, three miles from here), for Canadian Company represented by Canadian Pacific Railway men; capital \$1,000,000. Secretary-treasurer, Chas. Haycock, formerly of Seacoast Railway Company, Eastport, U.S. Piers and number of cottages of concrete to be built at once. Architects working on plans of can factory.

Sandwich, Ont.

Ernest Thresher is planning the erection of a large new business block to contain several stores.

J. W. Scott is contemplating the erection of new business block on Bedford street. Plans are being prepared.

Saskatoon, Sask.

The Standard Trusts Co., Keewayden Bldg., Winnipeg, have purchased a site for an office building on 22nd street; 50 ft. frontage, price paid, \$50,000. Oddifellow's Temple now on site. Work will probably commence in the spring. Provincial manager, T. F. Calder.

Sparta, Ont.

J. Donnelly is having plans prepared for a new cheese factory to replace one recently burned. Building to be of concrete construction.

Toronto, Ont.

Plans are in progress for storage plant, near G. T. R. on Esplanade, for C. E. Boyd, 33 Front street east; architect, E. Bird, Traders Bank; eight storeys, brick, steel and concrete, dynamos, boilers, refrigerating machinery.

Tenders are open for garage to cost \$6,000 on Gwynne street, for Mr. Manley, Queen street west; architect, S. Yollis, Simcoe street, Toronto; 1-sty. brick

Excavation has started for 3 attached storey, to cost \$48,600, for McConnell & Griffith, 65 Dundas street; 3-storey, solid brick, tar and gravel roofing, electric lighting, galvanized iron

Excavation is done for store room to cost \$3,000, College and Shaw, for M. Gangel, College and Shaw streets; architect, Thompson & Belfry, Victoria street; 3-storey, brick.

Excavation is done for store and dwelling to cost \$3,000, St. Clair avenue, for F. M. Arthur; architect, N. Chappell, 1245 St. Clair avenue; 2-storey, brick.

Tenders are open for erection of warehouse to cost \$10,000, for Hamilton Brewing Association, Ltd.; architect, H. E. Hand, 15 James Bldg., Toronto; 2-storey and basement, brick, concrete foundation, struc. steel, cut stone, paving brick floors, rolling steel doors, wire glass, sheet metal cornice.

Plans have been prepared for the erection of a warehouse to cost \$8,000, south side of Davenport road, for Stewart N. Hughes, Yonge street; architect, F. R. Berry. Three storeys, brick, concrete and brick foundation, tar and gravel roofing, structural steel, cut stone, tile coping, fire doors, galvanized cornice, skylights.

Plans are completed for erection of an hotel to cost \$30,000, for P. J. Mulqueen, Tremont Hotel, Yonge street, Toronto. Architect, J. Wilson Gray, 607 Confederation Life Building, Toronto. 5-storeys high; building to be equipped with revolving doors, structural steel, skylights, cut stone, terra cotta, tile flooring, pad stones, hardwood finish, fire doors, reinforced concrete, fireproofing, boilers, fan lights, plate glass, copper cornices, plastic relief work, glass partitions, ornamental iron, passenger and freight elevators, electric hotel sign, iron derrick, fire escapes, cast iron stairs, brass work, sidewalk lights, iron grille, bronze elevator system, fire-doors, woodwork treated with solignum.

Toronto, Ont.

Work is in progress for erection of a factory to cost \$18,500 (manufacture of rubber goods) for Dunlop Tire Co., Ltd., Booth avenue; architect, J. L.

(Continued on page 65)

Tenders and For Sale Department

To Engineers

Every man who puts in a tender on your jobs has got to see your plans and specifications first. If you are in Montreal and he is in Vancouver the inspection of your plans is a problem. Let us solve that for you. Place on file copies of your plans and specifications in any or all of the "Contract Record" offices.

More contractors and manufacturers read the "Contract Record" than any other Canadian publication. It is the logical place to look for tenders called, and where all important works are advertised.

Send along your plans for your next job and put a line in your ad. to that effect.

Contract Record

Montreal—B34 Board of Trade.
Toronto—220 King Street West.
Winnipeg—Commercial Travellers' Bldg.
Vancouver—441 Seymour Street.

Sewer Excavator

For sale for immediate use, a Vulcan "Little Giant" Steam Shovel with extra long dipper handle for excavating to 16 feet below surface, mounted on traction wheels, dipper 1 1/4 yd. capacity. Machine just overhauled; new chain, and extra large new boiler; weighs 32 tons; low price. Address

WILLIS SHAW MACHINERY Co.,
39 South LaSalle Street,
Chicago, Ill.
42-t.f.

Tenders Wanted

Sealed tenders will be received by the undersigned, in accordance with amended specifications, on or before noon, the 15th day of January, 1912, for the erection and completion of a new church building to be erected by the Chalmers Presbyterian Church, Woodstock.

Plans, specifications and further information may be obtained from J. A. McKay, chairman, Building Committee, 119 Oxford street, Woodstock, or at the office of the Architects, Chapman & McGiffin, 59 Yonge street, Toronto.

Lowest or any tender not necessarily accepted.
50-50-F

CITY OF WESTMOUNT

City Surveyor's Department

Tenders are invited for:—

1. Supply of one steam road roller.
2. Supply and erection of bituminous macadam mixer plant.

General conditions, form of tender and all particulars can be obtained at the office of the City Surveyor.

Tenders in sealed envelopes marked either "Tender for Steam Road Roller" or "Tender for Bituminous Macadam Mixer Plant" will be received by the City Clerk, Westmount, up to twelve noon, 3rd January, 1912.

Tenders will be opened by the Mayor sitting in public in the City Hall, at 5 p.m., 3rd January, 1912.

The City Council does not bind itself to accept the lowest or any tender.

ARCH. CURRIE,
City Surveyor.

City Hall, Westmount,
8th December, 1911.

50-52

TENDERS WANTED

Tenders wanted for heating and wiring apartment house.

J. H. McKNIGHT,
152 Bay St., Toronto, Ont.
51-51

Tenders Wanted

For the several trades required in the erection and completion of a proposed Church of England Building at Sudbury, Ont., will be received up to noon, Thursday, February 1, 1912.

Plans and specifications may be seen at Secretary's office, Bank of Montreal, Sudbury, Ont. The lowest or any tender not necessarily accepted.

All tenders to be on forms provided, to be sealed, marked "Tender" and addressed to

W. J. MONTGOMERY,
Sec. Building Committee,
Church of Epiphany,
Sudbury, Ont.
Sudbury, Dec. 12, 1911. 51-1

City of Moose Jaw Saskatchewan

The Moose Jaw Public Library Board invite competitive plans for a Public Library Building. The cost of the building is to be \$50,000, and plans are to be submitted by December 20th, 1911. A premium of \$100 will be paid for second choice and \$50 for third choice.

For further information apply to the undersigned.

47-49-50F W. F. HEAL, City Clerk.

CITY OF LETHBRIDGE

Paving and Sewage Disposal Works

Sealed tenders for construction of above works addressed to Secretary-Treasurer of the City of Lethbridge, and endorsed "Tender for Paving" or "Tender for Sewage Disposal Works," as the case may be, will be received by registered post only until noon of 27th December, 1911.

The approximate value of Paving Contract, and Contract for Sewage Disposal Works, will be in the neighborhood of \$100,000 and \$80,000 respectively. The bond required for Sewage Disposal Works to be \$25,000, and that for the Paving 25 per cent. of the contract price.

Further particulars can be obtained in connection with the Paving, from the City Engineer, Lethbridge; and in connection with the Sewage Disposal Works, from the City Engineer, Lethbridge, and T. Aird Murray, C. E., Consulting Engineer, Toronto.

Plans for Sewage Disposal Works will be on file at the office of the City Engineer, Lethbridge, T. Aird Murray, and the offices of the "Contract Record, 334 Board of Trade Building, Montreal, and Commercial Travellers' Building, Winnipeg.

G. W. ROBINSON,
Secretary-Treasurer.

Lethbridge, Alta., Canada,
November 27th, 1911.

49-50-F

Lighting Contract Wanted

I have a complete lighting and power outfit and want to get in touch with towns in the market for electric lighting and power. Am willing to sell the outfit or operate it under a franchise. Would require investment of \$10,000 or \$20,000. If interested write to Box 379, Contract Record, Toronto, Ont. 49-52

CITY OF VANCOUVER

Re Tenders for Seymour Creek Extension

Tenders will be received by the undersigned up to Wednesday, December 27, 1911, at 4 p.m., for the following connection with Seymour Creek Extensions:

1. For the supply of 24,000 feet of 24-inch steel pipe for the Seymour pipe line extensions.
2. For the supply of valves for the new Seymour Creek pipe line extension.
3. For the excavation and back filling of a pipe trench along Seymour Creek, suitable for the construction of a 36-inch steel riveted pipe.

Plans and specifications may be seen at the office of Messrs. Hermon & Bhrwell, Room 12 Inns of Court Building, and at the office of the City Engineer, City Hall.

A deposit of an amount equal to five per cent. of the contract price must be made with each tender, by marked cheque, payable to the City Treasurer.

The lowest or any tender not necessarily accepted.

WM. McQUEEN, City Clerk.

City Hall, Vancouver, B.C.
November 8, 1911.

47-49-50F

Positions Vacant

Advertisements under this heading two cents a word per insertion. Box No. ten cents extra. Minimum charge 25 cents

Architectural Draughtsman

WANTED—Thoroughly competent architectural draughtsman. Apply Allen Keefer, Architect, 229 Sparks Street, Ottawa, Ont., stating age, experience and salary expected. 48-51

WANTED—A qualified builders' hardware salesman with good connection in Western Canada and accustomed to figuring from Architects' plans, to travel for large United States manufacturer. Address replies, stating experience, salary required and copies of references immediately, to Box 389, Contract Record, 220 King Street West, Toronto, Ont. 50-52

Positions Wanted

Advertisements under this heading one cent a word per insertion. Box No. ten cents extra. Minimum charge 25 cents

Advertising Manager—Of a large manufacturing concern of Cleveland, Ohio, desires to connect with a going house, who are looking for results in advertising. Is competent of writing own copy, compiling of catalogues, folders, circulars, etc. For further information address Box 385, Contract Record, Toronto, Ont. 50-51

Business Buildings and Industrial Plants

(Continued from page 59)

Havill, Mail Bldg., Toronto; 2-storey, brick addition.

Tenders were called until Dec. 16th for warehouse on King and Parliament streets for Aluminum and Crown Stopper Co., manufacturers of aluminum corks; architect, F. H. Herbert, 65 Adelaide street east, Toronto; 6-storey; following trades required: steam heating, standard fire-doors and fire shutters, electric wiring. Plans at office of architects.

Vancouver, B.C.

The Canadian Pacific Railway are planning to erect employees' hotel at all important points. G. M. Bosworth vice-president, is looking over the situation.

Plans are completed for store and apartment building to cost \$10,000 on 50th avenue and Main street, for W. H. Day, 354 15th avenue west; 2-storey, frame.

Victoria, B. C.

Excavation tenders have been called for store and apartment house to cost \$100,000 on Johnston street, for Chas. Hayward and F. S. Barnard; architects, Bresnan & Durfee, 516 Sayward Bldg., Victoria. Six storeys, reinforced concrete, steam heating, face brick, glazed terra cotta, tar and gravel roofing, tile and terrazzo, interior finish mahogany and white enamel.

The Canadian Puget Sound Lumber Company plan to erect an office building to cost \$40,000, Store and Discovery street; four storeys, brick and concrete. A site was secured a week ago and tenders will be called on general contract in a few days.

Tenders were called until Dec. 15 for erection of an undertaker's establishment, Broughton & Wilcox streets, for B. C. Undertaking Company; two-storey, brick (face and common), terra cotta, marble entrances, hot water heating, tar and gravel roofing, leaded glass, concrete. Building will have chapel, fireproof receptacles, offices, etc.

CONTRACTS AWARDED

Calgary, Alta.

Garage to cost \$4,000 on Seventh avenue, for E. J. Young, 7th avenue east; architect, Lang & Major; general contractor, J. Harrison, box 1243; 2-storeys, 80 x 49, brick, concrete foundation, steam heating, electric lighting, patent roofing, concrete floors, gasoline tanks and equipment.

Lachine, Que.

Wood veneer factory to cost \$75,000, for The Dominion Mahogany & Veneer Co., Lachine, Que.; architect, E. & W. S. Maxwell, Beaver Hall Square; general contractor, F. J. Jago & Co., 626 Coristine Bldg.; 2-storey, concrete, electric light. Required, engine, planing and edging machines. Work not started.

Montreal, Que.

Foundations are started for store and 9 flats to cost \$8,000 for J. E. Desjardins, 14 Harmony street; 3-storey, 45 x 50, pressed brick, gas and electric light, gravel roofing, concrete foundation.

Foundations are in for store and 9 flats to cost \$6,000, Parthenais street, for J. R. Beauchamp, 864 Papineau st.; builder, Jules Dugal, 766 Chausse street; 3-storey, 38 x 100, stone and brick, gas and electric lighting, gravel roofing, stone heating, concrete foundation.

Extensions to store and dwelling for A. Dini, 415 Cadieux street, Montreal; general contractor, Laurier & Co., 1513 St. Denis; 1-storey, 26 x 12, brick, stone foundation.

Clothing factory to cost \$200,000 for H. Vineburg & Co., 163 St. James street; architect, C. Dufort, La Patrie Bldg.; general contractor, Atlas Construction Company, 745 St. Catherine street west. 7-storeys, 175 x 105, cement and steel, mushroom reinforcement, steam heating, electric and gas lighting, tar and gravel roofing, hardwood floors. Sub-contracts will be awarded in a few days. Elevators and sprinkler system will be required.

J. A. Gordon, 301 St. Antoine, has been awarded the contract for the plumbing and heating system in the warehouse of G. E. Durnford, St. Paul street.

New Westminster, B. C.

Telephone Exchange to cost \$9,000, for B. C. Telephone Company, Vancouver. General contractor, Smith & Buckland, New Westminster. Construction will begin at once.

Ottawa, Ont.

Stone work is under construction for extension to East Block for the Dominion Government. Architect, D. Ewart, West Block; general contractor, Doran & Devlin, Ottawa; three storeys, 178 x 80, Nepean stone shoddy, sandstone trimmings, steam heating, electric light, concrete roof, concrete foundation, birch flooring, marble, cement and plaster wainscoting.

Stores and sample rooms, cost \$20,000, Bank street, for Robert Gill; architect, Horwood & Taylor, 130 Sparks st.; masonry, Shuttleworth & Black; carpentry, Holbrook & Sutherland; three storeys, 49 x 50, brick and steel, electric light, concrete roof, stone foundation.

Outremont, Que.

Box factory to cost \$20,000 on Bloomfield avenue, for Pariseau Bros., 419 Mitcheson street, Montreal; masonry, S. Rochon, 781 St. Denis street, Montreal; 2-storey, 200 x 100, part brick encased and part solid brick, concrete foundation, hot water heating, electric light, mill construction, inside concrete basement, double roof of paper and boards, band saws, planers, 175 h.p. engine and boilers, shaving blower and dry kiln required. Owners are supervising construction.

Toronto, Ont.

Work is in progress for restaurant and bakery to cost \$80,000, Yonge street E.S., for H. L. Bowles; architects, Harris & Merritt, 15 James street, N.Y.; builder, Geo. A. Fuller Company; concrete contractors, Jago & Harris, Confederation Life Bldg., Toronto. Concrete foundation, tile coping, reinforced concrete, tar and gravel roofing, skylights, enamelled brick, front with terra cotta window extension, expanded metal sills, caen stone, art glass, ceramic tile floor, vacuum steam heating, refrigerating and baking machinery.

Plans have been drawn for laundry, cost \$3,000, n.e. cor. McCaul and Renfrew, for John Gardner, McCaul street. Architect, H. Simpson, 82-88 King st. east, Toronto; builders, Smallwood Bros., 97 Clinton street. One storey, brick, gas lighting.

Work is in progress for pair stores and dwelling to cost \$4,600, west side Dundas street, for H. M. Grills, 134 Hepburne street, Toronto; architect, W. E. Hunter; 2-storey, semi-detached, brick.

Work is in progress for store and dwelling to cost \$6,000 on Dundas st., for J. Casselman, 2235 Dundas street; 2-storey, stone and brick. Owner is builder.

Factory for Central Business Properties; architects, Dennison & Stephenson, 20 King street west, Toronto; contractors, plumbing, heating and electric wiring, Bennett & Wright, 72 Queen st. east, Toronto. Two storeys, brick, 55 x 100.

Factory, cost \$18,000, for Cooper Cap Company, Spadina ave., Toronto; architect, I. Feldman, 199 Yonge street, Toronto; masonry and concrete, John E. Webb; marble, Hoidge & Sons, 34 Price street, Toronto; carpentry, Frank Armstrong, 89 Oak street; roofing, A. B. Ormsby, Queen and George streets; plastering, Hoidge & Son; paint and glass, Summer & Wiggins, 471 Spadina cres.; plumbing and heating, Fiddes & Hogarth, 123 King street east.

I. X. L. Laundry, cost \$3,000, McCaul and Renfrew Place, for John Gardner; architect, Henry Simpson, 82 King st. east, Toronto; builder, Smallwood Bros. 97 Clinton street, Toronto; two storeys, brick, tar and gravel roofing, skylights, cut stone, fireproof, galvanized iron cornice. Laundry machinery.

Vancouver, B.C.

A permit has been granted for addition to garage, cost \$6,500, for H. A. Bowers, 1233 Georgia street, Vancouver. Contractor, Burrard Construction Company, Pacific Bldg., Vancouver. Addition, 66 x 20, concrete and galvanized iron, also reconstruction of garage burned last spring.

Victoria, B.C.

Work is in progress for addition to hotel, 70 rooms, for Canadian Pacific Railway. Supervising architects, Honcymann & Curtis, 821 Pender street w.; contractors, Skene & Christie. Seven storeys, 48 x 138, fireproof, steel and slate roof, Heddington Island stone, caps and facings, telephone and bath in each room.

Power Plants, Electricity and Telephones

Bridgeburg, Ont.

Negotiations are being carried on by Canadian Niagara Power Co. for electric lighting system. Address Robert A. Land, clerk.

Forest, Ont.

By-law to purchase the electric light plant will be submitted shortly. The waterworks and sewerage by-laws will not be submitted at present.

Hamilton, Ont.

Wood poles for Hamilton Hydro Electric Department; consulting engin-

eer, E. I. Sifton; mayor, G. H. Lees. Contract divided between Construction Supply Co., Cont. Life Bldg., Toronto, and Lindsay Bros., Buffalo, N.Y.

Kamloops, B.C.

Superintendent C. L. Wain reports as follows on enlargement and additions to power plants: A new pump is required, capacity 2,000,000 gals. a day. Purchase recommended of a motor-driven turbine pump at 200 h.p. or 4-500 kw., and a steam turbine generator of 500 kw., the steam to be supplied by two Wilcox-Babcock boilers of 800 h.p. Recommendation was made for a 2,000,000 gallon reservoir with a 14-inch supply pipe. Total cost of installation was estimated as follows: Turbines, pumps, boilers, etc., \$53,150; pipe line, gates and valves, \$23,701; reservoir (1,000,000 gals.) \$19,132.92; reservoir (2,000,000 gallons) \$31,276.17. Total cost with reservoir of one million gallons, \$95,983.92. Total cost with reservoir of two million gallons, \$108,227.47.

London, Ont.

Supt. Glaubitz will recommend that the Commissioners equip a chemical works in connection with hydro-power plant to cost \$10,000.

Quebec, Que.

Municipal lighting, erection of a steam plant, etc., will be rushed in Quebec and probably new machinery installed necessary for extra power at their dam at Dorchester, 15 miles from here. Contractor, The Dorchester Electric Co. of Quebec; president, J. de S. Bosse, Que.

Sault Ste. Marie, Ont.

The Lake Superior Power Company have awarded the contract to Chapman & Walker, Limited, Toronto, for the supply of electric motors, approximately 3,000 h.p., \$30,000.

Tavistock, Ont.

Important improvements are contemplated by the Bell Telephone Company. The office will be moved and a more complete system installed.

Vancouver, B.C.

City Electrician McCrossan has recommended that arc lamps be installed at the following points: Westminster road and Valentine, 19th and Main, 12th and Laurel, Trinity and Nanaimo, Trinity and Kamloops, Kalso and McGill.

Winnipeg, Man.

Tenders are called for supply of copper wire and overhead telephone materials. Specifications at office of Smith, Kerry & Chace, engineers, Carnegie Library Bldg., Winnipeg. Received by Chairman, Board of Control, until 11 a.m., Dec. 22nd. Secretary Board of Control, M. Peterson.

Gas experts are to report early next year on the feasibility of construction of municipal gas plant to compete with the Winnipeg Electric Company.

Business Notes

Longue Pointe, Que.

Landerville & Huard's 2-storey sash and door factory destroyed by fire; estimated loss, \$5,000.

Montreal, Que.

Building at 33 Bleury street, used as factory by National Spinning Company,

damaged by fire. Damage, \$5,000.

Saraguay Electric Company's power house, capacity 30,000 h.p. and electric supply plant, in Ahuntsic Ward, recently purchased by The Canadian Light & Power Co. destroyed by fire. Plant may not be re-built.

Owen Sound, Ont.

The Canadian Pacific Railway Co's two elevators, engine-house, number or railway cars, &c., destroyed by fire. Loss, \$1,000,000.

Quebec, Que.

J. N. Landry's garage on St. Paul street with three automobiles destroyed. Estimated lost \$15,000.

Underwood, Ont.

I. H. Brill's store and stables near Paisley, occupied by W. T. Richardson burned. Loss about \$10,000.

Miscellaneous

Castor, Alta.

The ratepayers passed a by-law to raise \$6,000 for fire equipment.

Hamilton, Ont.

Tenders are called until Dec. 20th for supply of weatherproof insulated copper and aluminum wire. Specifications with Consulting Engineer. Mayor, G. H. Lees; consulting engineer, E. I. Sifton.

Toronto, Ont.

The Lake Superior Power Co. have awarded to Chapman & Walker, Limited, Toronto, a contract for the supply of electric motors approximating 3,000 h.p., the contract price being in the neighborhood of \$30,000.

New Companies

Dominion Mahogany and Veneer Co., Ltd., Montreal, Que., incorporated with a capital of \$500,000 to deal in all classes of timber, lumber, wood veneer preparations, etc. Incorporators, John Thomas Hackett, Thomas B. Gould and Thomas J. Coonan, all of Montreal.

Montreal (Lachine Canal) Land Syndicate, Limited, incorporated, with a capital of \$400,000, to carry on a land and building business, to dispose of electric, hydraulic or other power, etc. Incorporators, Gordon W. MacDougall, Lawrence Macfarlane and Robert Edwin Moyse, all of Montreal, Que.

The Gatineau Spar Milling Co., Ltd., Hull, Que., incorporated, with a capital of \$150,000, to build, maintain and operate telegraph and telephone lines, water powers, etc., to construct tramways, wharves, bridges, roadways, etc. Incorporators, Pierre M. Cote, Joseph M. Cote and Aime Leblanc, all of Ottawa.

Winnipeg Electric Water Heating Co., Ltd., Winnipeg, Man., incorporated with a capital of \$50,000. Incorporators, Geo. A. Clines, Victor George Williams, M.D., and Wm. E. Wright, all of Winnipeg.

The Lombard Investment Co., Ltd., Winnipeg, Man., incorporated, with a capital of \$100,000, to buy, sell and deal in timber and timber limits, and carry on business as a general land, mining and lumbering company. Incorporators, Frederick W. Louthood, Rpy. B. S.

Jenkins, Geo. A. H. Dysart, of Winnipeg.

Theo. A. Burrows Lumber Company, Winnipeg, Man., incorporated with a capital of \$500,000, to carry on a pulpwood, lumber and timber business in all its branches, to erect mills, etc. Incorporators, Frank Carlisle, Wm. J. Chalk and Marshall Anderson, all of Winnipeg.

The Bishop Construction Co., Ltd., Winnipeg, Man. Incorporated with a capital of \$10,000, to buy, sell and deal in lumber and other building materials, and carry on business as building contractors and general lumber dealers in all its branches. Incorporators, John Bishop, Henry Bristow, Arthur Edward Holmes and Maurice E. Bishop, all of Winnipeg.

Anglo-Canadian Agencies, Limited, Montreal, Que., incorporated, with a capital of \$10,000, to carry on business as railway and general contractors. Incorporators, Geo. Alex. Grant, Richard H. Simmonds and Geo. Hugh Park, all of Montreal.

Vancouver Equipment Company, Ltd., Vancouver, B.C., has been incorporated with a capital of \$10,000, to carry on business as railway builders, mechanical engineers, etc.

National Home-Builders, Limited, Vancouver, B. C., incorporated with a capital of \$100,000, to carry on business as general builders and contractors.

British North American Construction Co., Ltd., Vancouver, B. C., incorporated with a capital of \$100,000, to construct wharves, docks, elevators, bridges, hotels, public buildings, etc.

Electrical Construction Co., Ltd., Vancouver, B. C., incorporated with a capital of \$75,000, to buy, sell and deal in light, heat, power or other electrical machinery and supplies.

South Vancouver Lumber Co., Ltd., 103-6 Crown Building, 615 Pender st. west, Vancouver, B. C., incorporated with a capital of \$50,000, to carry on business as timber merchants, sawmill owners and lumbermen in all its branches.

Fraser Lake Water and Power Co., Ltd., Victoria, B. C., incorporated with a capital of \$25,000, to construct and operate telephone and telegraph systems and carry on a general water power business.

Building Permits

Vancouver, B. C.

Alterations to building for office, \$5,000, Pender street; owner, News-Advertiser Co., Pender street; contractor, Passage & Tomlin, 201 Dominion Trust Building. Addition to power house building, \$12,000, Union street; owner, B. C. Electric Railway Company. Two-sty. frame stores and apartment, \$3,500, 755 Broadway east; owner, D. Cooper, Broadway east; contractors, Carlyon & Fleming, South Vancouver P.O. Brick and concrete warehouse, \$10,000, 898 Beach ave.; owner, R. Hamilton & Co., 615 Hastings street; contractors, Armstrong, Morrison & Co., Ltd. Two-sty. frame residence, \$3,000, 1316 12th ave. west; owner, H. Rindal, care C.P.R. Depot; contractors, Davies & Sanders, 66 Davis Chambers. Hwo-sty. frame apartment, \$4,100, 1024 Clark drive; owner, H. Lovegrove; contractor, Arthur Blair, Fraser ave. P.O.

Contract Record

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Vol. 25

December 27, 1911

No. 52



The Call of 1912

"And what is writ, is writ—
Would that it were worthier!"

—Byron.

1911-1912

In every phase of life, parting is one of man's hardest ordeals. It is so in all fields of endeavor and business as it is in society and pleasure. The last stage, the last hour, the last line, pass with a certain, if indefinable, regret. The satisfaction which comes from a work well and honorably done, a duty faithfully discharged, does not always compensate. It is human nature to cling to old associations, especially when the ties which bind us to those associations are linked with gratitude and encouragement. So, in a measure, we think of the passing of 1911.

To most of us at this period there comes the reflection that we are a year older and that Time, as well as Opportunity, is making rapid strides. But the passing of 1911 has a special significance. The year has been in every respect a "banner year" for Canada and its close finds the country's trade established on a higher level than at any previous time in her history. Canada has grown during 1911,—has grown in a manner that has awakened world-wide interest,—interest worth millions of dollars to us, directly or indirectly. Nineteen hundred and eleven has seen Canada's fiscal independence established. Thanks to a succession of favorable events during the year, our country's national future is assured. Nineteen hundred and eleven has given us greater confidence in ourselves and the world greater confidence in us. Nineteen hundred and eleven has brought general prosperity and great development. Nineteen hundred and eleven has brought unprecedented activity to the constructional interests; and it is leaving no legacy of labor or other trouble to its successor. Yes, 1911 has treated us well and we shall continue to think kindly of it.

Thanks to the general co-operation of the reader and advertiser we have made progress in the Contract Record during 1911. We might have made more; we hope to make more; we shall make more. It is impossible to remain where we are, and we cannot go back; we are impelled forward.

We are confident that we are serving the most progressive community in the country and we are determined not to fail of the opportunity to render the best possible service. That service will be effected in presenting expert articles on the engineering and constructional problems of the day; series of articles by well known authorities; carefully detailed and illustrated descriptions of important contracts; editorials dealing with current topics and calculated to advance the interests of the engineer and contractor; live market and trade news; accurate and timely information on projected work.

So now to the future, and to the higher standard and new ideal of 1912! Reader, your prosperity and ours are one,—and the union is indissoluble. Let us, then, cement the tie in mutual good-will, and in co-operation,—that most potent of human forces. Let us together bid farewell to the Old Year,—reluctantly perhaps—and face the New with the assurance that there never yet dawned a brighter horizon upon this modern Canaan of ours.

Reader, prosperity!

City Engineers and Civic Mismanagement

Is Our Present System of Municipal Administration Adequate to Canada's Growing Needs?—Why not Government by Commission?

Each year at this time, prior to the municipal elections, the prevailing topic appears to be the Mismanagement of Civic Affairs.

It would seem that if the citizens of Canada are going to rise to the occasion they must obtain through the government some change in the existing methods of municipal administration. The present system is totally inadequate for a country like ours, which is developing so rapidly. Great Britain, and Europe generally, have, by years of experience, brought their civic government down to a business-like basis. Why cannot we follow their example?

The friction existing between so many city engineers and their various councils is attributable in no small measure to a defective system of government. The procedure of electing an entirely new council every year is held by many to be wrong. The incoming council, unaccustomed to public affairs, attempt to rush through more work during their short term of office than it is possible for their engineer to carry out efficiently. Again, frequently they hold up works started by the previous council. These conditions give the engineer no reasonable time to reflect, or to give due consideration to his designs. Work often started late in the year remains unfinished during the winter months, thus creating discomfort for the public. Who gets the blame? The engineer.

This frequent changing of councils leads to jealousy and heated discussion among the aldermen, into which the officials are naturally drawn. Sides are taken and the battle commences for the year, the engineer frequently being made the scapegoat of party and personal feelings. The newspaper of the party opposing the engineer invariably joins in the fray, further harassing a sensitive or nervous official to such an extent that it is physically impossible for him to concentrate his mind upon the important work he is undertaking.

Such cases might be quoted: where the engineer has finally been requested to resign, or has been compelled to tender his own resignation, a slandered, libelled man, with a ruined reputation,—for what?—a paltry salary and no thanks for what he has done. Another engineer must be appointed, probably new to the district and unaccustomed to local conditions. Sooner or later he, too, is overtaken by the same fate. The picture is not by any means lurid in its coloring: vide Victoria, Vancouver, South Vancouver, Moose Jaw, and the large eastern cities.

All this means that in time no engineer with ability and self-respect will apply for the appointments offered. Did not the Vancouver aldermen have to travel across the continent to Montreal, holding out, en route, a tempting bait of \$8,000 a year, to secure a man? We wonder how far this sort of thing will eventually be carried.

Should the choice of an engineer be left entirely to the council? It is true that they represent the people who have elected them, and that they are responsible for the spending of the ratepayers' money, but this does not give them the necessary qualifica-

tions to enable them to judge, or select, a well qualified, experienced engineer. They fix salaries which are entirely inadequate to attract men with brains. They are influenced oft-times to vote for this man or the other, and sometimes the man least entitled to the appointment is accepted; and his fate is often justified.

It has already been urged editorially in these columns that the Canadian Society of Civil Engineers take a more active interest in this question. It would obviate a lot of trouble if, when appointments were offered, the applications therefor were perused by a special board of civil engineers appointed by the Society. This board could recommend two or more candidates to the council for selection. Such a course would at least eliminate the possibility of an incompetent man being appointed. It would also be well if the extent of the authority of any civic official, as well as his duties, were defined clearly in a by-law, drawn up for the purpose by the council, their solicitor and the Canadian Society of Civil Engineers.

Government by Commission

An argument in favor of the commission form of government is presented in a letter relating to municipal procedure at Winnipeg, printed in another column.

We are firmly convinced that far better results would be obtained in our Canadian cities if the commission form of government were established; with, however, the power of recall and referendum and other conditions to be approved by the government.

In this connection it is of interest to note that Mr. Planta, Mayor of Nanaimo, B.C., and this year's President of the Union of B. C. Municipalities, came out strongly in favor of government by commission at the convention of the above body held at Victoria, B.C., last month. (Incidentally, he came in for a storm of criticism from his council upon his return to Nanaimo).

Mr. Planta acknowledged certain disadvantages of the commission system, but contended that it was justified if only on the ground that it would prevent the harassing of competent officials by mayors and councils who did not possess that technical knowledge and experience which alone could justify criticism.

"At present," he said, "our councils are constituted largely of men inexperienced in municipal work and entirely deficient in technical knowledge. They, nevertheless, undertake to direct their engineers and other expert officials in work with which they, themselves, are not conversant. As a consequence, there is constant waste of public money. In Nanaimo, for instance, I am open to confess, that on more than one occasion, results have shown that our expenditure has not always been judicious. To every municipality, cases will recur where money could have been saved and better work done had the council acted on the advice of officials, instead of opposing it. The mayor and council often handicap the engineer and

other men in charge of public work by insisting on the work being done in a manner contrary to that which a practical man would advise. Further confusion is caused by one council cancelling work which the preceding council has undertaken."

Government by Experts

"I believe that government by commission would mean government by experts. At present, most of our councillors realize that they are handicapped by lack of technical knowledge. I think that the commission form of municipal administration would attract a more independent and better qualified type of man, who would be specially equipped for his responsibilities and work. The people would elect the commissioners, who would be paid good salaries for their services. As paid officers, they would be liable to recall by the people. It would be for the electors to choose the men best equipped for such administrative responsibilities: men of known probity, and independent position; and men of repute, as engineers, lawyers, architects, or other experts with experience that would qualify them to act as supervisors and directors of public works.

"It would not be so bad if members of the council would be advised by their executive officers, and follow that advice. Instead of this, they often tie their officials' hands, and then blame them for their own mistakes."

Mayor Planta said that he claimed no expert knowledge himself, but he knew that in his own city of Nanaimo they had recently made a serious mistake involving heavy additional expenditure, by insisting on a uniform street grading, which in one place alone had meant cutting through four feet of solid rock unnecessarily.

Another suggestion in regard to the election of councils is that two or more of their number retire annually so that an entire change may take place every three years. This does not appeal to us as strongly as government by commission, but it is not without its merits in that it would permit of the carrying out of a continuous policy and result in the engineer's obtaining a better opportunity for showing his professional and executive ability.

At this time of the year a word to prospective aldermen may not perhaps be amiss:

The engineer is the head of the spending department and has a great responsibility. With this responsibility he should have some freedom of thought and action.

There is no particular reason why all the skill possessed by the alderman should be concentrated in directing shafts at the head of the engineer. The latter does not carry an imaginary apple on his head and the alderman has no right to constitute himself a modern William Tell. The City Engineer should be regarded as a City Engineer and not as a figure-head.

Interference with the city engineer's department is not the hereditary duty of the aldermanic office and no "divine right" has been given to the alderman whereby he may slander the engineer at will.

Upon his appointment the alderman need not necessarily think that he is at once miraculously

endowed with engineering ability; moreover, the public do not expect it.

The only way in which satisfactory results will be obtained under the present system of administration is by:

(1) Raising the status of the engineer, by examining more carefully into his qualifications, and paying higher salaries.

(2) The partial control of appointments by some professional body, presumably the Canadian Society of Civil Engineers.

(3) Educating the public to discern the needed qualifications in their would-be representatives.

(4) A firm, unwavering policy on the part of the engineer.

Certain it is that unless some change is made, it will not be many years before the city councils throughout Canada will have to offer fabulous salaries to get their work done. In any case, the development will be interesting,—if not to the profession, to the looker-on.

Municipal Mal-Administration—Winnipeg in the Honor List

Editor, Contract Record:

You are certainly to be commended for taking up the question of the treatment of city engineers and other officials by city councils. Your articles exposing the cities of Victoria and Moose Jaw were timely and to the point.

I am enclosing two clippings* from a Winnipeg paper of recent date. These exemplify the manner in which aldermen and controllers, who are running for office, go after city officials unjustly and in defiance of the best interests of the work.

The city engineer to whom reference is made is one of the most capable engineers in Canada and certainly he knows as much about the engineering possibilities of Winnipeg and Manitoba as any other man in the country. The controller mentioned has been after a visible supply of water for the city of Winnipeg ever since he has had anything to say in the affairs of the city. His antagonism to the City Engineer is attributable to the fact that the latter has convinced the majority of the council that the scheme favored by the Controller is not the best for the city—at any rate, for the present.

The City Engineer cannot compel the city council to follow his recommendations. He is an employee whose duty is to give advice to the best of his ability and then—carry out the instructions of the council whether or no they are in accordance with his advice.

The Controller in question may say that the Winnipeg City Council have followed their engineer's advice and that it has not proved satisfactory, but if he looks through the Engineer's reports he will see that in not one instance have the council acted upon the advice given. The Winnipeg City Council have the common fault of all councils: they are dilatory,—and this is an expensive trait. They were late in starting their extension wells: compare the date of the City Engineer's recommendations with the date of the instructions to commence work on the extensions. The City Engineer has made numerous recommendations in connection with the proposal to increase the

*We are unable to reproduce the clippings as it is against our practice to permit personal accusations to be made in letters written under a nom de plume. Editor.

water supply but the council have only acted upon that portion of his advice which has suited them; now they blame him because their ideas, not his, have been unsatisfactory. Now that the elections are at hand, there come two men, one a lawyer, looking for political notoriety, and the other with a grievance of a more or less personal nature, saying that the City Engineer has not done his duty, their object being to create the impression among the electorate that they are "big" men, and men who should be given the opportunity to spout for a two-year term.

In the case I have cited it is singular that these complaints are always made in the Engineer's absence, and it is interesting to note that the employees of the city have been instructed not to write for the press any letters in connection with city works.

A short time ago the Controller to whom I have referred horrified the people of the city by publishing in one of the local papers a photograph of five or six dead frogs in a quart jar of water, asserting that such was the condition of the city reservoir, and claiming that if a visible supply were obtained these horrors would cease. An analysis of the water containing the dead frogs followed. Presumably the Controller was not aware that few, if any, large reservoirs are without frogs and other life. By getting a number of them together in a small jar he was making conditions a million times worse than they really were.

One might suggest that the number of frogs would be increased rather than decreased by a visible supply from some lake or river. If the Controller does not know these things, he is an ignoramus; if he does, and makes his assertion in spite of his better knowledge, he is something worse for trying to fool the people into the belief that they are being slowly poisoned.

In my opinion, when a man makes such remarks about city employees at a public meeting—statements which are likely to injure his name and reputation—he should be made to prove them and the facts should be published, whether he is right or wrong. If he is right, the course is open to the city; if he is wrong, he should be debarred from resuming his seat or from taking any other civic position.

This letter is not written in defence of the City Engineer of Winnipeg, and the writer mentions him only in the way of providing an instance of the treatment engineers receive from those who are elected to places of authority. In Toronto, Winnipeg and other big cities, the engineer has had to put up a struggle from time to time to hold his own against the ignorance and opposition of factions in the council.

In Winnipeg, not a few have boasted upon their election that they were going to have the engineer removed, but after being associated with him for two or three months they evidently realized that they had better take a course at a night school before prosecuting their ambitious schemes any further.

Yours very truly,

"ONE WHO KNOWS."

The Danger of a Little Knowledge to the Alderman

A prominent Western engineer writes us as follows:

"On the council here my worst bug-bears have been the so-called practical men who, by virtue of their connection with some small contracting busi-

ness, or by the practice of an architectural fraud, founded on the failure to make good on the practical side of the work, constitute themselves experts in all constructional lines. One man can tell the quality of cement at once by squeezing it in his hand. Another will send in a plan of a building with the girders shown about 1/3 of the necessary strength. The latter is very forceful until he is asked to explain the ground of his calculations, and then he subsides. Then there are those with friends to serve,—an all too common type.

"Municipal work has many attractive problems for the engineer, but the many disadvantages and the unsatisfactory conditions under which he has to work are beginning to cause a dearth of good men in the profession."

C. N. A. B. Convention

Tuesday, February 20th, 1912, has been fixed for the opening day of the Convention of the Canadian National Association of Builders.

Mr. E. T. Nesbitt, of Quebec, is President of the Association, and Mr. J. H. Lauer, of Montreal, Secretary. Every effort is being made to make the meeting the most successful in the history of the institution. A large delegation is expected from Winnipeg and other Western points. Further announcements will be made in these columns from time to time.

Success is Built on Failure

People in all walks of life and in all vocations suffer setbacks. No one is immune from occasional reverses and discouragements. Few men, however, are so weighed down by adversity that they cannot rise superior to it and again go forward, and failures are more often than otherwise but steps to success. Fortunes are often built on the misfortunes of others, but the man who can make his own mistakes the guides to ultimate success has accomplished greater results.

The navigator on unknown and uncharted seas must pick his way carefully. He will strike shoals, encounter head winds and currents, and be obliged to back out and choose a new course; but if he has the persistency worth while, he will finally reach the desired port.

Every man must believe in the work he is doing and in his ability to get results. No honest end is so insignificant as to be unworthy of best effort, and none too great to be attained by industry and application. The slighting of small things will lead to inefficiency in great ones, and failure frequently results from neglect of details. Men learn these things from experience, and unless they have poor memories, such experiences are most valuable.

Thorough belief in the work at hand must be accompanied by confidence in the ability to carry it to a conclusion. Temporary setbacks must not obscure the desired end. The mental eye must see through and beyond obstacles. If the main purpose is always in mind, details of accomplishment will prove only steps to the ultimate goal.

Above all, never surrender to reverses. The thing worth while is worth fighting for, and desire thrives on opposition, just as hunger whets the appetite. Results that come too easily are valued too lightly. Resistance increases the desire for success, and reward that has cost effort gives greatest satisfaction. The man who has faith in what he has undertaken and confidence in his ability to accomplish it, is never "down and out."

Engineers and Contractors on Road Work

Responsibilities Defined—Contract Work Under Direction of Engineer as Successful in this Field as in Any Other—General Observations

By Onward Bates, Past-President American Society of Civil Engineers

In the first place, road work should be under the direction of an engineer; because the kind of work to be done, the quality of the work, the amount of it, and the method of doing it, should be determined by an expert. But suppose the engineer is not an expert, what then? Do not be influenced by any such supposition. Work from knowledge, and employ an engineer who is a road expert. There are engineers who are road experts, and there will be many such engineers developed as correct methods are adopted for road work. As the demand arises, the supply will arise to meet it. In any case, whether the work is performed under contract, or otherwise, the road engineer is necessary.

The road engineer should know just what is needed. He should be able to plan and describe these needs so that they are clearly interpreted to those who do the work. He must make his plans to conform to the funds provided to pay for the work. He should possess exceptional executive ability, for in his occupation there is an unusual spread of responsibility for the work itself, and for the number of interests which must be considered. Technical knowledge, good judgment, and tactfulness are all essential qualities which he is expected to possess. His field of action is most attractive, for the reason that half of his problems are already solved. Experience is principally gained by the study of failures, and a knowledge of what has been so poorly done in the past will teach him what must be avoided in the future.

To improve the roads in any specified locality requires first of all a head to plan and to supervise the work to be done. This head, whom I designate as the road engineer, must be responsible for all the work in his district, and since responsibility cannot be dissociated from authority, he should have full authority over the conduct of all the work for which he is responsible to the power that appoints him. The engineer must not be hampered in his work by any other consideration than the performance of his duty as engineer. He should have no affiliations and should eschew politics, knowing all men only as citizens with a common interest to be served by him.

A word of warning here for those who have the power of appointing the engineer—scarcely anything can be more subversive to the public good than to make a political appointment of such an office. The engineer should be chosen as an expert in his line of work, which leads to the conclusion that his office should be an appointive rather than an elective one. His appointment should be after careful examination of his qualifications for the office, and this can only be made by an appointing power, which is capable of determining his fitness and which is responsible for the performance of his duties.

The Road Contractor.—In the second place, road work should be done by contract, because if we are expected to improve our roads, we must make a business of road work, and since the contractor is in that business, we need to engage his services. No better argument can be made in support of this statement than to call attention to road work which was not

conducted as a business, and which was performed by men whose business was not that of road making. A road contractor should know his business. He should know what constitutes a good road, and how to build it. He should be provided with tools and implements required for road construction and maintenance. If the road contractor follows road building as an occupation, it is expected that he will have such plant as will enable him to execute work of the best character, with economy of cost in money and time, and that he will have a following of workmen familiar with road making. We may reasonably expect that road work will be done by a competent road contractor with greater economy and despatch than can be attained under a system where a local government undertakes to buy plant and employ men with which it do its own road work.

The engineer plans and supervises the work, gives instructions to the contractor, inspects material and workmanship, and makes the contractor's estimates for payment. Contracts should be awarded by the engineer, or upon his recommendation. In general, the engineer directs the work and is responsible to the power which appointed him for the performance of all of the contractor's obligations. The contractor, on his part, must comply with all the requirements of the contract, and to this end should be directly responsible to the engineer.

The Contract.—Thus it rests with the engineer and contractor to get the best roads possible with the expenditure of the people's money. It is obvious that they must pull together or the people will be losers. Their relations are defined in the contract for the work. In the ordinary forms of contract for work to be performed, the engineer is vested with full power of directing the operations of the contractor. The engineer makes the estimates of quantities and of values, upon which the contractor receives payment. It is his duty to fix the standards for material and workmanship, to inspect the quality of materials and of work, to accept such as conform to the contract and to reject such as do not meet the contract requirements.

Nearly all contracts give the engineer arbitrary power to decide all questions arising in the performance of the contractor's obligations, and most contracts state that the decision of the engineer shall be final and binding on the contractor. These powers conferred on the engineer appear to be the outgrowth of experience and are perhaps warranted by expediency. For so long as the engineer is competent and fair, the system works very well, but engineers have the qualities common to humanity and it would be fairer to them if the provisions of a contract confined their decisions within the limits of justice. Experienced contractors sometimes find that contracts which they must accept, or go without the work, give the engineer such an advantage over them, that they attach more importance to the personality of the engineer than to the terms of the contract.

Speaking from experience both as an engineer and as a contractor, I do not favor vesting the engineer

with arbitrary power over the contractor's interests. We live under a constitutional government, and contracts between its citizens should preserve the constitutional rights of both parties. A contract which enables one party to work an injustice upon the other is contrary to public policy, and whether it be legal or not, it conflicts with the principles which all of us claim as citizens. I believe it is possible to draw contracts which will secure the faithful performance of the obligations of both parties, and will at the same time protect the interest of the party at whose expense the work is carried on.

Under a general system of road improvement throughout the country, equitable forms of contract will be developed which will supersede forms that are found in practice to be objectionable. Bring together the expert engineer and the competent contractor, and it will be found that they can work together in harmony and obtain the best results for the community which employs them. In most cases of trouble between the engineer and the contractor the fault lies with one or the other, or with both of them. It would seem almost superfluous to make the statement that the best form of contract is that which covers the obligations of both parties in the simplest and plainest terms, leaving out all unnecessary language. And yet it is well to be reminded of this, for many contracts for performance of work are so unintelligible that both engineer and contractor find it difficult to decide what are their respective obligations.

The Specifications.—Specifications for material and workmanship are usually attached to and form a part of the contract. The preceding remarks favoring brevity and simplicity in the wording of contracts apply with equal force to the specifications. Instead of trying to include in the specifications everything under the sun, it will be better to omit from the contract all items of uncertain and indeterminate character, and this will avoid the necessity of describing and specifying their value and extent.

In the interest of economy and efficiency the work should be classified and grouped in the most convenient manner for letting it by contract. The work should be of such character and volume as will enable the contractor to make favorable prices. The engineer should also try to arrange the work so that a contractor may work continuously through the working season. The expenses of organizing and starting work are understood, and should not be repeated any oftener than is necessary. Changing contractors or employing them at intervals of time involve what may be called "contractor's terminal expenses," and if these can be avoided there will be a considerable saving in cost which should be recognized in the contract prices and the saving divided between the parties. Better prices for work and better service will be obtained from an established local contractor who, in looking to the work as a means of livelihood, desires to retain in his service experienced workmen and to keep his plant employed, both of which are necessary for economical operations, and he will thus be in a position to make more favorable proposals for the work than when making ventures with scattering bids in various localities and with unfamiliar conditions.

Contract and Day Labor.—In advocating the contract method of doing road work, I recognize that some work can be more effectively handled by day labor or by special arrangement. There is a dis-

inction between road-making and road-maintenance. The former may be classified as intermittent work, and the latter as continuous work. Maintenance and repair work will frequently be of such a nature that it cannot be advantageously contracted for, and the engineer must provide for this class of work by day labor, or by some method which is suggested by his experience.

In general, it is better to contract for all work which is adaptable to that method. The engineer's operations may cover an extended field and cause him to be unable to supervise the work personally, in which case his inspectors or other assistants must act for him, and they can be better employed in controlling results of work done at the contractor's cost than in becoming responsible for the value of work done by the engineer's employees who may be so scattered that the cost of supervision will equal the wages paid to the workmen.

Another reason for avoiding the direct employment of workmen is that it means the purchase of tools and implements for the workmen, and this will always be unprofitable unless there is sufficient work to wear them out. There is scarcely a worse investment than a contractor's outfit which is not employed.

Guarantees.—It is not uncommon for a contract to specify that the contractor shall guarantee his work for a certain period of time, sometimes reaching into years. There may be cases where a contractor's guaranty is justified, but it is a questionable practice. Competent engineering will require and secure good work. When a contract is completed, the engineer should know that the contractor has given the full value of work specified in the contract, and he should be in a position to pay that value in full. The engineer's employment should be continuous. He should be a permanent officer of the local government, responsible to his superiors for construction and maintenance of the roads. This responsibility, as has been stated, should clothe him with the authority necessary to secure the ends he is employed to attain.

Since the engineer is the official who makes the plans and controls the execution of them, while the contractor works under his instructions, subject to the terms of the contract, any suggestions as to road making should be addressed to the engineer, who will communicate to the contractor as much of them as is necessary in carrying out the work. I purposely avoid mentioning details of contracts, plans and specifications, all of which the engineer must fit to the particular problems he is called on to solve, but in a general way, I venture to suggest some of the elements of road engineering necessary to be observed in his practice.

Financial Considerations.—He must always maintain an equilibrium between the amount of work he plans to carry out, and the funds available to pay for this work. The kind and amount of work will be limited by the sum appropriated for its cost. He must decide whether the limitation shall be placed on the kind or the volume of the work. As a general proposition the character of the work should be uniform. To secure this he may have to sacrifice his ideals and fit the character to the circumstances controlling the case. The efficiency of a road is determined by the tonnage hauled. For a given distance of haul, unless the road is of uniform quality, the haul will be limited by the worst portion of the road. There is therefore such a thing as making the road, or at least a portion of it, too good, if the funds are not within

sight to bring the whole distance to the same good quality.

In a rich and populous state where the people have awakened to the necessity for good roads and contemplate the expenditure of many millions of dollars to secure that end, it is very well to say, "we will build no cheap roads," and to fix a standard of \$5,000 or \$6,000 per mile for construction. On the other hand, in the case of a state with a population of less density and with a much smaller provision of funds, and yet with, say, 80,000 miles of highway within its territory, it would be folly to adopt such expensive construction. This wonderfully prosperous country owes this prosperity more to its development through the construction of cheap railways than to all other causes combined. The economic results obtained by cheap first construction in order to provide intercommunication through a great area have been demonstrated beyond question in the case of railways, and the principle has equal application in the matter of highways. The improvement of highways is not to be accomplished by spending all the available money in spots. These highways are for the whole people and all of them are entitled to benefit by the expenditures. Improve the conditions of communities by giving them the best roads they can afford at the present time and the resulting increased prosperity will provide the means for bringing them to the desired standard. The kind and amount of road construction depend upon conditions, and should be determined by the exercise of good judgment on the part of the engineer.

Maintenance.—He must also arrange to maintain the standard of quality planned for its construction. This means constant attention and repairs to meet the deterioration resulting from wear and weather effects. The old adage of "a stitch in time saves nine" is nowhere more applicable than to road maintenance. This is a most important consideration, and it emphasizes the requirement that the office of road engineer should be a permanent one. The maintenance of roads requires a knowledge of all the conditions affecting them. The engineer stands toward a road in his care as a doctor does toward his patient, and to diagnose the case of a road, the engineer must feel its pulse, take its temperature, and learn all about it. A helpful and satisfactory way of doing this is to keep statistics of work done, of cost of repairs, and of the times and seasons of treatment. These statistics can be diagrammed so that the engineer may, with a hasty glance, read the record, and learn both what has been done and what is needed to be done.

The road engineer will in the future be judged by his performance, as compared with what is accomplished elsewhere. If a system of good roads is promoted throughout the country, there will be precedents and new records established for road work, in kind, quality, and cost, which will, from time to time, fix new standards in these respects.

The Field of Road Improvements.—It may appear that my remarks about the duties of engineers are out of place, but I have made the digression advisedly. A fair consideration of the work and duties of the road engineer will bring many of us, who have practised the profession in other lines, to the realization of the great field of employment opening to us in this particular class of work. The practice of the road engineer will require knowledge, skill, experience, judgment, and business qualities, of high grade, which will lead many of us to engage in this special line of work. This will benefit the profession and also the country.

For the contractor there will be provided a steady and profitable business, which from its nature can be conducted in a moderate way with small capital, a most desirable condition in these days when there is so great complaint about the monopolization of business by combinations of capital, which closes doors of opportunity to men of small means with capacity to work for themselves.

Unfair Criticism

There is a class of perfectly true criticism which is doing a lot of harm in the world of engineering affairs, and no good whatever. It is the criticism which is absolutely and sweepingly damning when anything goes wrong with a piece of machinery. If the unfortunate thing fails to operate perfectly through some trivial defect, easily remedied at trifling expense and with little delay, such criticism condemns it as completely as though it fell into bits fit only for the scrap heap, says the Engineering Record. It is exasperating to have new apparatus fail to work well when it is urgently needed, but if the trouble is due to some unimportant detail quickly set right, there is no good end gained by saying the appliance won't work. The development of the machine may have called for the careful thought of the best specialists, its manufacture may have been marked at every step by the use of the best materials and workmanship, but something wrong may have passed the inspector's eye. If that machine gets into the hands of one of these critics, and the flaw comes to his attention, it stands little chance of fair play. He condemns it to his acquaintances and ridicules it to his friends. Now this is not only unfair but is extremely prejudicial to progress. Machinery plays such an important part in engineering work that every user of it should help the manufacturers to produce better apparatus by telling them about any improvements that are possible in it. In this way the users will be the gainers. Few engineers engage in work requiring a large investment of their own money in manufacturing plants and they do not appreciate the serious financial harm that may be done to manufacturers by criticisms of their products which are unwarranted by the actual facts.

Reinforced concrete parapet walls for a factory in Brooklyn, N.Y., are 8 feet high from the lowest point to the roof and are anchored by $\frac{3}{4}$ -in. square rods, 12 in. on centres, cast in the cornice; these bars extend $1\frac{1}{2}$ feet above the roof and lap the vertical reinforcement rods of the wall. Reinforcement for the wall consists of $\frac{3}{8}$ -in. square rods 7 feet 10 inches long. An overhanging coping ornamented with fascia, moulding and fillets, surmounts the 8-in. parapet wall. Reinforcement for this coping consists of short $\frac{3}{8}$ -in. square rods run from the vertical wall rods near the face of the lower fillet, to the upper part of the fascia, and also three longitudinal rods placed at equal distances on centres along the outside of the short rods. Longitudinal rods are laid at regular intervals in the parapet wall as it is cast. The factory was designed and erected by the Moyer Engineering & Construction Company, of Brooklyn.

The Imperial Bank are putting the finishing touches on a new two-storey building at Port Colborne, Ont. The structure is faced with terra cotta and is an excellent piece of work.

Modern Methods of Foundation Work

Reinforced Concrete Raft Foundations for Tall Buildings— System of Plate Girders in a Loft Building in New York

Reinforced concrete-raft foundations were used in the construction of the factories for Herman Behr & Company and the W. H. Sweeney Manufacturing Company, in Brooklyn, N. Y. Both buildings are located only a few hundred feet from East River on made land with their basement floors below high-water mark. It was decided in each design to build the entire basement floor, 10½ ft. and 9 ft. below grade, respectively, as a raft which serves as a support for columns and walls besides taking the upward pressure of the earth and water. No waterproofing was applied, but the concrete of a 1:2½:5 mixture was carefully proportioned and, it is said, no signs of leaking have occurred.

The first-named structure is built entirely of reinforced concrete, 9 storeys in height above grade, and is 58 ft. by 168 ft. 7 in. in size. The column spacing is 16 feet 10 inches longitudinally and approximately 19½ feet laterally; the columns are carried up in a vertical line from the basement to the upper floor and pilasters are located in all four walls at the same distance on centres. The walls extend down to the raft footing on all sides and are tied securely by bending the reinforcement over into the footing. The columns for the basement and first floors are 30 x 30 in. in size, decreasing to 16 x 16 in. in the upper floor, with reinforcement varying from 4 to 8 vertical bars, 1½ feet long are cast in the foundations, as shown in Fig. 1, and coupled to the column rods by means of eight 1-ft. pipe sleeves, placed before the column is poured. Reinforcement for the pilasters is wired to similar tie rods left in the footings.

The raft foundation is 12 in. in thickness, which is increased to 3 feet by a continuous line of footings under the outer walls and along the centre line of the columns lengthwise of the building. These footings are 5 feet wide under the walls and 6 feet wide under the columns; the intervening space is brought up nearly to their surface level by a dirt fill and the finished concrete floor laid over the entire area. Reinforcement for the 12-in. floor consists of transverse bars 1 in. square, spaced 5 in. on centres. It required 1,144 bars, 19½ feet long, for the entire floor, and because of the reverse bending moments they were placed about 3 inches from the top of the slab. Laps

were made for continuity under the centre line of the column in all cases. Under the columns, in the top of the footing course, ¼-in. square bars were used longitudinally with the centre bars, 16 feet 10 inches long, carried through straight, while the outside bars, 19½ feet long, are bent down to the bottom of the slab to provide for shear.

In the W. H. Sweeney Manufacturing Company's factory, which is also a reinforced concrete structure, 115 ft. 7 in. by 130 ft. 11 in. in size, with 10 storeys and basement, the raft foundation is 1 ft. 9 in. thick over the entire area, with the exception of the engine and boiler rooms, about 39 x 66 ft. in size, located in one corner of the building; this floor is 3 ft. 3 in. thick, having a 3-in. mortar finish. Square column footings are used under each column in this structure and raised 2 ft. 6 in. above the top of the raft or within 3 inches of the basement-floor level. The columns are spaced approximately 16 feet on centres in both directions and are 28 inches square in the basement, decreasing as they approach the upper floors. Reinforcement for all columns consists of vertical rods and hoops with the rods tied to the anchor bars, which are cast in the footings and projecting about 1½ ft.

The raft, outside of the engine room, is reinforced by six lines of rods about 1½ feet on centres in the top of the slab, laid in both directions along the centre line of the columns. These bars lap about 2 ft. at all joints, providing a continuous reinforcement. Six rods are run diagonally from the corners of the building to the nearest columns to further strengthen the construction. In the bottom of the slab under each column 24 rods in two layers at right angles to each other are used to provide for shear from the pressure of the columns. The floor in the engine room is heavily reinforced laterally because of the enormous weights and large amount of vibration; ¾-in. and 1-in. square rods are placed near the upper and lower surfaces, with extra rods used under all columns at right angles to this reinforcement and bent down into the bottom of the floor to provide for shear under the columns.

The reinforcement in both buildings was designed in accordance with the building laws of the Borough of Brooklyn; its value for compression and transverse bending must not exceed 500 lb. per square inch, and the value of steel in tension must not exceed 16,000 lb. per square inch. The bending moment for the design of the slab was computed as W1/8. Edison Portland cement was used in the construction. Both factories were designed and erected by the Moyer Engineering & Construction Company, of Brooklyn, N. Y.

Long Foundation Girders for a Loft Building

A 50 x 90-ft. steel-frame, 12-storey loft building at 71-73 Murray street, New York, has in the basement twenty main columns seated on a system of plate girders which transmit their loads varying from 126 tons to 602 tons to footings of reinforced concrete on the fine wet sand about 20 ft. below the curb. The columns are arranged in three rows, one in each

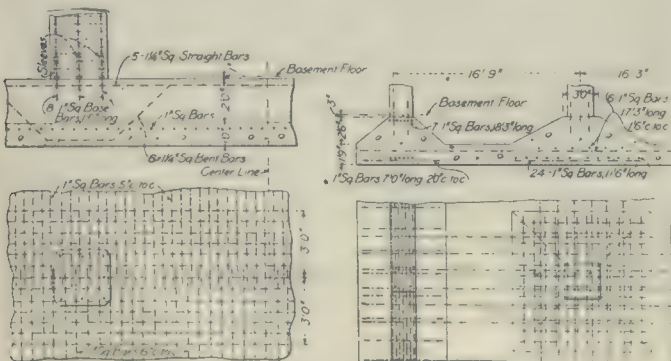
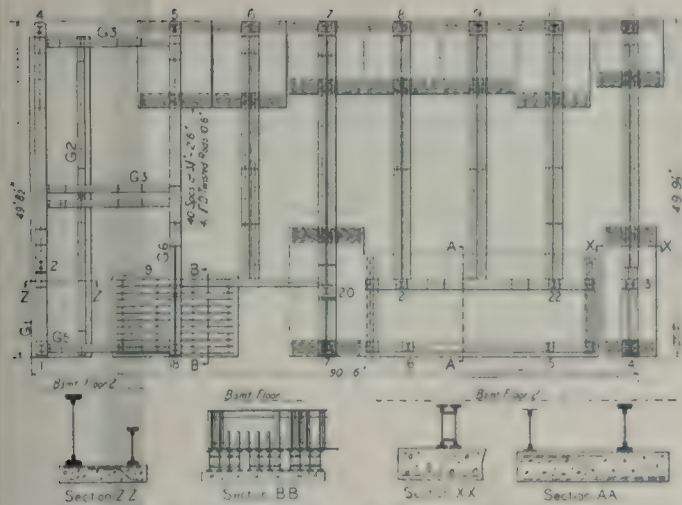


Fig. 1.

Details of Raft Foundations.



Fig. 2.



Plan of Foundation Girders and Footings,—
Murray Street Building.

of the longitudinal walls and a third row about 9 ft. from one wall and 38 feet from the other wall.

The footings which cover nearly half the surface of the lot occupy nearly continuous rectangular areas adjacent to the lot lines, leaving a considerable space between them unoccupied.

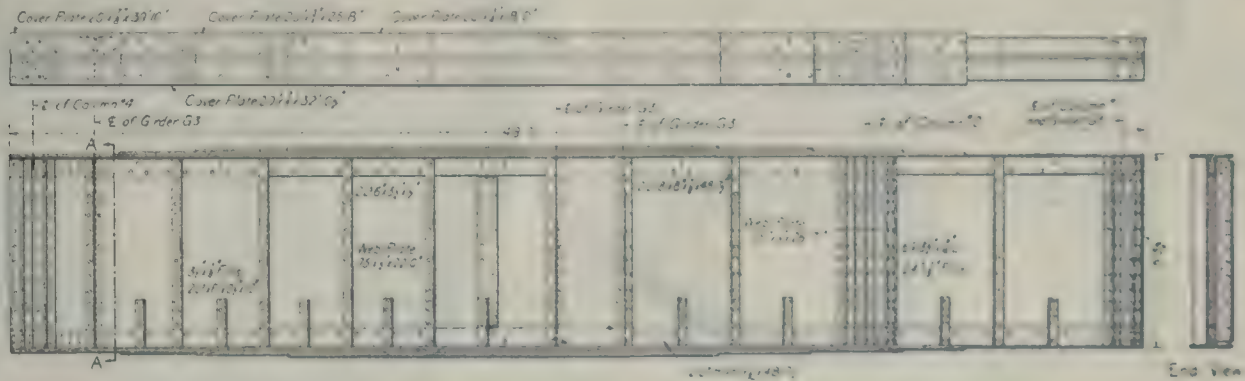
As the centres of the wall columns are within a few inches of the lot line it was necessary to transfer their loads horizontally, in order to apply them to the centres of gravity of the footings; this was accomplished by the customary device of using canti-

loading girder, so that in order to symmetrically apply the load to it a smaller auxiliary girder is provided parallel to the wall girder and serves as a fulcrum for longitudinal girders connecting the wall girders with the next main transverse girder.

All of the girders are single or double plate girders with 6 x 6 or 8 x 8-in. flange angles, 14-in. flange-cover plates and web plates from 48 to 75 in. deep. Some of them are single girders and some are double girders, set about 16-in. apart on centres, and connected by two tiers of tie bolts and gas-pipe separators just clear of the flange angles.

Columns 18 and 19 have a steel grillage of 24-in. I-beams bolted together in three sections and seated on a concrete footing 8 inches thick. All other footings are of reinforced concrete from about 2 to 3 feet thick. All of them have single tiers of transverse reinforcement bars near the lower surface and some of them have a second tier of transverse bars near the upper surface with bent bars joining the two tiers.

The largest girder is G1 in the end wall. It has groups of vertical web stiffener angles spaced close together at the column bearings and pairs of vertical angles farther apart dividing it into intermediate panels. On one side of the web pairs of 6 x 6-in. vertical hitch angles are provided for the field-riveted connections to the longitudinal girders framed to it to transfer part of the load to the fulcrum girder G2. The flanges are heavily reinforced near one end of the girder to correspond with the unsymmetrical bending moment and all of the rivets have button heads, those in the lower flange being allowed for in the 1½ in.



Plan and Elevation of the Grillage Girder G1.—Murray Street Building.

lever and distributing girders which combined the loads and effected their symmetrical distribution over the different footings.

All of the columns were therefore seated on the top flanges of long transverse girders, several of which extend across the full width of the building, each carrying two wall columns and one intermediate column. In four cases where two wall columns and an intermediate column were not on the same transverse line, the cantilever girders supporting the wall columns are anchored at the opposite ends to longitudinal girders at right angles to them and nearly or quite in the planes of the intermediate columns.

At one end of the building the three wall columns are seated on a long girder concentric with two footings which project considerably beyond the building line. At the opposite end of the building the three corresponding wall columns are seated on a similar long girder bearing close to one edge on a footing running the full width of the building. The footing has a width of 9 feet and is thus eccentric from the

of grouted bearing on the footings. In the intermediate panels the bottom flange angles are reinforced by short vertical angles riveted to the girder webs and having their lower ends ground to bearing against the flange angles so as to prevent the latter from being distorted by the upward pressure. The foundation girders have a total weight of about 200 tons and were all riveted up complete at the shops where they were fabricated.

Carrere & Hastings were the architects; Mr. Owen Brainard, chief engineer. Post & McCord were the contractors.—Engineering Record.

The effect of lightning on concrete, which has long been a matter of dispute, has been observed by a leading member of the American Society of Civil Engineers, who has a reinforced concrete water tank on his country place. This was struck by lightning, which caused no injury, but changed the texture of the concrete in places from granular to vitreous. The tank was heavily reinforced.

Sewage Disposal Plants for Residences

Principles underlying Success in Design and Operation—Disposal by Open Filters and Broad Irrigation—The Sub-Surface System—Cost Data

By Winthrop Pratt, Chief Engineer, State Board of Health of Ohio

The two chief principles upon which depends the successful operation of a house sewage disposal plant are:

1. The clarification of the sewage by causing the solid matter to settle to the bottom of a tank and there become partially liquefied, and by causing the grease and light suspended matter to rise to the top in the form of scum; and

2. The disposal of the clarified liquid either (a) in

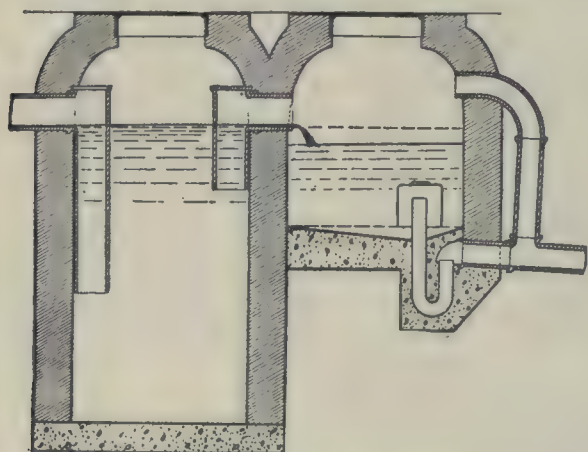


Fig. 1—Sectional Elevation showing Settling or Septic Tank and Dosing Chamber

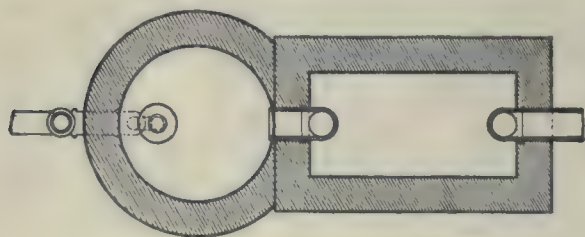


Fig. 2—Sectional Plan showing Settling or Septic Tank and Dosing Chamber

a specially prepared filter; (b) over the surface of the ground; or (c) into the soil beneath the surface.

The process depends, aside from its mechanical workings, upon bacterial action; and, without attempting to enter into a bacteriological discussion, it may be of interest to mention that the essential bacteria are of two general classes.

The first class of bacteria inhabit the tank and perform the function of partially changing the solid matter into liquid and gases. They are known as anaerobic (those working without oxygen), and facultative (those working either with or without oxygen). The bacteria are assisted in their work by worms and other animal organisms.

The second, or the aerobic, class of bacteria inhabit the filter or the ground used for the final purification of the clarified sewage. The function of this class is to transform the organic matter of the sewage into harmless and odorless mineral matter, thus caus-

ing or tending to cause the disappearance of the dangerous germs of the original sewage.

A plant designed according to the above-mentioned principles may be described somewhat as follows: The outflowing sewage from the house is delivered into a settling basin of sufficient size and of suitable design to afford opportunity for the sedimentation of the solid matter and the rise of the grease. This basin or tank contains a constant volume which approximately should equal one or two days' flow of sewage. The inlets and outlets should be so arranged that neither the scum at the top nor the sludge at the bottom is distributed as the sewage passes through it. The matter deposited in the bottom of the tank becomes partially reduced and passes away in the form of liquid or gas. There will be, however, a certain accumulation which must be cleaned out occasionally, probably not oftener than once a year. The tank should be ventilated through the main soil pipe of the house in the same way in which modern sanitary sewer systems are ventilated.

The clarified liquid overflowing from this tank passes into a second one adjacent thereto, called the dosing tank. Herein is placed an automatic siphon or other controlling device which holds back the flow until the sewage has reached a certain depth, at which time the entire contents of the dosing tank are discharged very rapidly. The discharge completed, the apparatus automatically prevents further outflow until the tank becomes full again. This tank serves to apply the sewage to the filter, sub-surface disposal system, or other means for final purification, to which the capacity or "dose" must bear a certain relation in order that the sewage be properly distributed.

Such distribution is essential for the reason that, if the sewage is allowed to pass on to the filter or into the "absorption system" in the same irregular way that it leaves the house, the filtering material will be constantly saturated in places and hence become clogged and foul. In other words, the filtering materi-

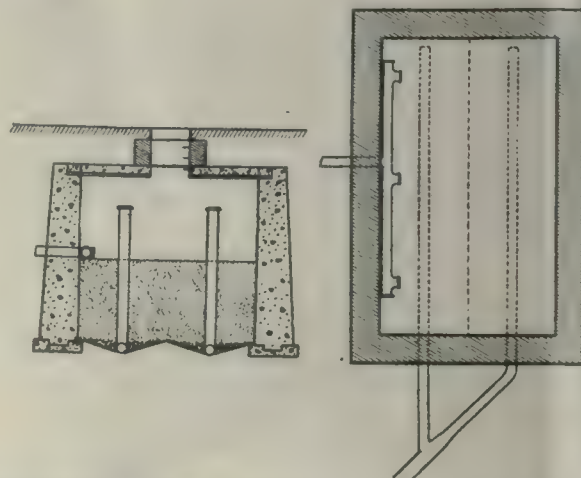


Fig. 3—Section and Plan of Underground Intermittent Sand Filter

al must be kept clean by allowing the air to frequently penetrate it.

The disposal of the clarified sewage by open filters and by broad irrigation is identical, in principle, with the corresponding methods for city plants and need not be described here. Of course, these can be used only where ample land is available; and they are not suitable for built-up districts, but rather for isolated houses. In any case, these methods involve exposing unpurified sewage to the air and are, therefore, less desirable than a sub-surface system. If, however, one wishes to construct a filter bed in a concrete chamber beneath the ground this can be satisfactorily done, though somewhat expensive, in close proximity to residences. (See Fig. 3).

The sub-surface disposal system is composed of lines of three, four or six-inch agricultural drain tile or vitrified pipe with open joints, laid level or nearly so, within one or two feet of the surface of the ground. These are called absorption or distribution pipes. Their total length is determined primarily by the porosity of the soil in which they are placed and varies for a family of five or six from 100 to 600 feet. In clayey soils it is necessary to thoroughly underdrain the land at a depth of 3 or 4 feet in order to render the soil dry enough to absorb the sewage, and in addition it is desirable to surround the tile with gravel, cinders, or porous material. There should be, of course, no opportunity for sewage to pass directly

ations in the rate of flow in the case of a single house, as compared to the more regular discharge from a municipality.

The small actual size of a house sewage tank, although it may be large from the standpoint of "hours of storage," may permit a sudden inrush of sewage to stir up the entire contents, thus carrying out some solid matter and causing the filters or the sub-surface system to clog. The above-mentioned facts show the necessity of designing both tanks and finishing treatment on a more liberal per capita basis than is required with municipal plants.

Finally, residential plants are intended to be more automatic than municipal plants, and rarely receive regular attention, and they must, of necessity, be located much nearer to dwellings than city plants. It is necessary, therefore, to exercise much more care in design in order that no work need be done on the plant oftener than once a year, although it should be inspected every few months.

Relative to the cost of building an efficient residential sewage disposal plant for a family of five or six, this will vary greatly according to the local cost of material and labor and the character of the ground in which it is to be placed. The usual tanks with sub-surface absorption system should be built in porous ground for \$100 to \$150; and in clay soil for \$250 to \$300. A plant including a covered sand filter may cost \$500.

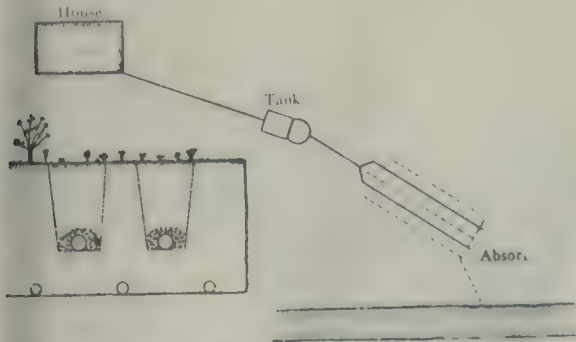


Fig. 4—Section and Plan showing Sub-Soil Absorption System and Under Drains for removing ground water.

from the absorption pipe into any of the underdrains. As mentioned above, the cubical contents of the absorption system should have a certain relation to the closing tank in order that the sewage may be properly distributed. It is often convenient, furthermore, to divide the system into two or three portions in order that the flow may be changed from one to the other every few weeks.

There will doubtless be a certain accumulation of finely divided solid matter in the tile, which may make necessary their relaying after a period of years. This, however, is a matter of small importance. The system can be placed at any convenient point and is often installed under the lawn or vegetable garden without in any way showing evidence, except by assisting in the growth of vegetation. (See Fig. 4).

While the general principles of the design of municipal sewage purification plants apply to residential plants, there are several practical differences which should be borne in mind.

In the first place the sewage from individual houses is extremely fresh and there is no opportunity for the mechanical breaking up of the larger suspended particles as is the case when sewage flows for miles in a city sewer. Then there are extreme fluctu-

Pneumatic Caissons for Tall Buildings

Mr. Alexander Allaire, M.E., manager of the Foundation Company, Limited, Montreal, recently read a paper on "Pneumatic Caisson Foundations for Tall Buildings," before the members of the Canadian Society of Civil Engineers, Montreal. After a description of a caisson Mr. Allaire spoke of improvements made by his company whereby the roof of the working chamber, cofferdam, and timber walls were eliminated and the shafting recovered, resulting in the cost being lessened and the speed of the work increased.

Practically all sky-scrapers in the lower part of New York are on pneumatic caisson foundations. Naturally, almost every building has its own peculiar needs, so that the actual methods vary greatly. The lecturer gave a short description of the installation of the foundations of the Dominion Express building, Montreal, and went on to say that the increasing value of properties in New York is resulting in not only increased height to buildings, but also to the ground below the surface, this adds to the difficulty of installing a foundation. Mr. Allaire gave details of this type of construction in the Trust Company of America Building, and followed it by a description of the foundations for the Chicago and Northwestern depot, Chicago—a departure from either of the types previously referred to.

To illustrate how large a factor is constituted by plant, two different buildings—the Singer Building and the new Municipal Building, New York—were described. The question of confined space naturally led to the adjacent property factor. On fully ninety per cent. of the New York City jobs it is found necessary to shore and maintain the adjoining buildings. Each of these is usually a new problem and has to be handled in a special manner. Mr. Allaire gave details of methods of dealing with various buildings, and illustrated his description by means of slides.

History and Progress of Sand-Lime Brick

**Manufacture dates back only One Decade on this Continent
— Rapid Strides in Canada — An Industry with a Future**

Specially contributed by W. E. Plummer, Jr.

AS a commercial proposition the manufacture of sand-lime brick has been in operation in Germany for upwards of fifty years. The product of these early operations, while a serviceable material, was far from being equal to the brick made to-day. These early brick were a mixture of sand and lime pressed in crude presses and placed under sheds to dry, and then exposed to the weather for a long period, it usually being estimated that a year was required to harden properly for use.

About twenty years ago Dr. William Michaelis, Sr., an eminent German chemist, discovered that a mixture of sand and lime, with a small percentage of water, if subjected to high mechanical pressure and then placed (while fresh from the press) in a closed cylinder and subjected to several hours of high steam pressure, would give an excellent sandstone. This discovery entitles Dr. Michaelis to be known as the Father of Sand-Lime Products, for, following this discovery, the business of manufacturing real sand-stone brick began. This discovery enables the manufacturer

to take his raw material and in twelve hours produce a perfect sand-stone brick ready for use.

About ten years ago the first sand-lime brick were made in the United States, and soon after in Canada, following the plans then in use in Germany. It was but a short time, however, before the American sand-lime brick manufacturers and the machinery men found that better brick were required for our market, and they immediately began improving machinery and methods; to-day the average output of American factories is unequalled anywhere.

In 1904 a few of the manufacturers of sand-lime brick met in Cincinnati and organized The National Association of Manufacturers of Sand-Lime Products; in 1909, many Canadian manufacturers having been taken into membership, the name was changed to The American Association of Manufacturers of Sand-Lime Products. This association to-day includes in its membership most, if not all of the successful operators in this line, as well as the leading machinery men, and it is largely due to the work of this association that



The Wellington School, Winnipeg, in which 550,000 sand lime brick, furnished by the Manitoba Pressed Brick Co. of Winnipeg, were used. The building is trimmed with Brownstone and presents an excellent appearance.



Gordon-McKay & Co.'s building at Toronto, which required 1,250,000 sand lime brick (furnished by the Indestructible Brick Co.).



The Morgan & Wright Rubber Co.'s building at Detroit, Mich., in which over 6,000,000 sand-lime brick were used.



Bird's-eye view of the Buick factories, Flint, Mich. These buildings cover 60 square acres and their construction required 25,000,000 sand lime brick. They are the largest sand-lime brick buildings in the world.

the sand-lime industry is to-day in such a flourishing condition. It is established on a firm basis and has grown with rapid strides. In the United States, Michigan has produced more sand-lime brick than any other State, this being due perhaps to the fact that the brick were first introduced there. But Canada has been developing rapidly of late and present indications are that Toronto will lead all other cities in 1912, as there will be an output of about 160,000 brick a day in that city alone. This looks large, but Germany has several factories producing upward of 100,000 brick a day, and the demand is so great that new factories are being built all the time.

It is satisfactorily established that sand-lime brick has come to stay and that it will be a valuable addition to the building materials, for the shape and character of the brick place them in line for ornamental and face work as well as for all ordinary purposes.

Brittleness in Brick

The following, by a prominent engineer in "Brick and Clay Record," answers an oft-repeated query from brick makers and contains some useful and valuable information on clays in general.

True brittleness is a fault inherent in the clay, and it may be either physical or chemical. Alluvial clays as a rule are fine grained and the grains are rounded—water worn—and the bond in such material is naturally weak. The bond in a brick is due to the fusion or partial fusion of a portion of the material which surrounds and cements together the coarser particles. If the coarse material is fragmental, other things being equal, the bond will be stronger than with rounded material. Thus the physical character affects the burned product. We may illustrate by citing various rock formations. Flints, cherts, obsidian, etc., are very hard but brittle because of the uniformity of the body, and such materials are easily chipped into arrow heads by pressure with a piece of bone.

Basalts may be brittle because the quick cooling has not given time for the development of crystals of any size to lace the mass together. Older plutonic rocks with their angular masses of quartz, lath shaped feldspar, plates of mica, etc., are tough because of the interlacing of the various crystals. A weak alluvial clay brick shows on the fracture a fine grained mealy structure while a shale brick is conglomeratic.

There is also a chemical side which has influence for we know that some glass mixtures give stronger glass than other mixtures, and also that the addition of certain fluxes to paving brick material increases the toughness of the burned product. We cannot control the chemical factor, at least not in common brick product, but we can greatly improve the physical character by the addition of sharp porous grog, such as crushed bats, furnace clinkers, etc., provided the clay is not already overloaded with sand so that it will not stand the addition of any more dead material. The addition of fine sand, or silt, or even coarse sand when water worn, does not give the results that we get from sharp coarse porous material. Not only will such material increase the toughness of the brick but it helps to overcome laminations, and improves the drying possibilities. We have seen strong, sound, clear ringing brick made from clays which alone would give a weak, badly shattered brick.

We find that the loss from kilns is due frequently

to cracks in the brick rather than brittleness or weakness of the bond. The brick crack during the drying and if examined when partially dry, the cracks are plainly evident, but when fully dry, the cracks close up and are not visible. Such cracked brick, unless they break before being put into the kiln, result in considerable loss. The cracks do not heal during the burning but instead become deeper through the shrinkage strains of burning and the cooling strains, and the lightest touch in removing them from the kiln will cause them to break.

Brittleness may be lessened in many wares by proper cooling, giving the fused material, whether much or little, time to anneal. The annealing stage should be from low red heat to blackness rather than when the kiln is first closed. Many are very careful at first, but rush the cooling just at the time when the annealing really begins.

A heavy lift bridge with two decks, the lower one of which can be raised 46 ft. so as to give a clearance of 65 ft. between it and the water, has been built across the Missouri River at Kansas City from the plans of Messrs. Waddell & Harrington. This movable deck carries railroad tracks and is raised by 1¼-in. steel cables from each panel point, which run over 5-ft. sheaves on the top chord of the fixed span and then to motor-operated drums at each end of this chord, thence descending to heavy concrete counterweights. The drums at the two ends of the bridge are connected by a rope drive so as to insure the uniform operation of all moving parts. The total weight of the movable span is about 780 tons. The bridge has a span of 425 feet and is said to be the longest riveted span in this country; it forms part of a steel structure 4,150 feet long. The upper deck carries two electric railways, a roadway and two sidewalks. When the movable deck is in its normal lower position it rests on seats where it is held by 28 latches, all operated simultaneously through rods and bell cranks by a 15-h.p. motor. The end locks are designed for braking thrusts.

Demolishing a bridge with explosives was carried out successfully on the five-span structure at the Bridlington station of the North Eastern Railway Company, Yorkshire, England. Each arch had a span of 18 feet, a width of 37½ feet, and consisted of four courses of brick set in cement mortar. In the five arches 139 holes, each 10 inches deep, were bored in parallel lines and each was charged with either a 4 or 6-oz. cartridge of Ammonal, the explosive employed. The total quantity of explosive, Engineering reports, was only 39½ lb. Heavy ship's cables were placed over the arches to prevent flying fragments.

Economical sewer sections have been the subject of study by Mr. Alberto Schreiner, assistant engineer in charge of design for the Bureau of Sewers, Borough of Queens, New York City. The experience in that office has led to the general conclusion that it is desirable, from the standpoint of low cost and ease of construction, to use vitrified pipe on all lines up to 24 in. in diameter. For sewers having diameters between 24 in. and 4 ft. plain concrete is believed to be the most economical type of construction, but for diameters greater than 4 ft. it has been found that reinforced concrete may be used to best advantage.



Courtesy of "Stone."

A SYMBOLICAL DOORWAY IN VERONA. - ERECTED IN THE THIRTEENTH CENTURY.

An Excellent Example of the Lasting Qualities of Brick and Stone. It will be noted that all the carving is symbolical of the military art, the columns being cannon; the bases, drums; the brackets of the balcony, bombards; etc.

Town Planning and Housing in Canada

The Unsightly and Unhealthy Growth of our Cities—Problems of the Present and Responsibilities of the Future*

By Chas. A. Hodgetts, M.D., L.R.C.P., Lond.

Medical Adviser to the Public Health Committee, The Commission of Conservation of Canada

After a careful survey of the work which is being carried on in Great Britain and Germany, one must acknowledge that we are behind the times, and that Canadians have made and continue to make serious mistakes in the laying out of our cities and towns and in not planning for their development. Acknowledging this fact, it is our duty as citizens to learn by the mistakes of the older countries of Europe and set ourselves to work in a united effort to correct the evils which can be seen in every city, town and village in the Dominion.

It will not do to say the future must take care of itself. Our forefathers in their ignorance repeated the mistakes which they brought with them from the old land whither they emigrated to this great western country. We know now of their mistakes and the responsibility rests upon us of to-day to set to work to right those mistakes, which to-day are evils, prejudicial to the health, morality and financial well-being of our cities.

Canadian Cities Nothing but Overgrown Towns

We need go back only a few decades in the history of Canada to judge of the rapid development of our urban population. What were Montreal and Toronto, Ottawa and Winnipeg in 1867—the year of Confederation? A study of the census returns shows how villages have grown by leaps and bounds into cities and how great has been the growth of many of the older cities—all of these are from the town-planning and indeed from the housing standpoint—monstrosities. All along the line there has been a growth. The lumber town of forty years ago is still a lumber town,—overgrown. It has not risen to a realization of its importance or to the dignity of its position as the Federal Capital of a great and growing nation. Nor does the great seaport of Canada, its commercial capital, present any outstanding features to lead one to eulogize the foresight of its wealthy and intellectual citizenship in regard to the manner in which they have permitted their metropolis to grow—or the system adapted of converting a once fine family residence into an apartment house or tenements of the worst type.

The town which was once the seat of Government of Upper Canada would be a finer, more dignified, and healthier and wealthier city to-day if in Governor Simcoe's time some system of townplanning had been applied to Muddy York—if there had been a planning of more Yonge streets which would have been highways to the outlying country districts.

Of the Prairie city which forty years ago, had a population of some 250 people, it can be said there has been more good judgment shown in its planning, but even here mistakes have been made. The growth has been marvellous, but how much wealthier the municipality would have been had large portions of land been acquired by the corporation when the prices were low.

It is to be hoped in the re-planning of these great cities that some at least of the natural beauties and advantages will be conserved and the indiscretions of their youthful days, at least, atoned for. It is too late to correct some of them.

In Canada we have simply been repeating and accentuating the mistakes of European cities. Here we find the errors of Great Britain, Germany, France and the United States, each error being in proportion to the preponderance of this or that particular nationality in the district—and to these errors have been added those of our own creation.

From various and obvious causes—chiefly the price of land and high rentals—there have sprung up in close proximity to all of our larger cities, hamlets where the mechanic, the clerk and others have purchased land and erected thereon either shacks or unpretentious homes. Gradually these have grown into either villages or towns and finally have been taken into the larger corporation. In a similar manner factories have located in the outskirts of our cities and around these have been built the homes of the employees, until ultimately they too have become a part of the greater municipality—another example of a misfit in town extension. All along the line there has been no working to a common and well thought-out scheme, having for its object the greater city. The result of this want of organization has brought us, thus early in our history, up against problems which they in Europe have been dealing with for some time. Cannot we, therefore, take a few leaves out of their books of town development and housing, and properly apply them, that they may be to our advantage, not only as individuals but as municipalities?

Cities, like men, have their birth, growth and development, and it is as true of the body corporate as it is of the child, that trained up in the way it should go, when it is old it will not depart therefrom. In this country, during the past forty years, hundreds of towns have been born and scores of them have grown into cities, but rank and disorderly has been their growth, detrimental to the health of the inhabitants and expensive to the ratepayers. Indeed, it may safely be stated, there is not a city in Canada but has been made to pay heavily in the way of increased expenditure, by reason of the fact that estates within the immediate environs have been cut up into building lots and built thereon irrespective of the fact that they are ultimately to become a part of the greater body,—the object of the owner being simply to produce the greatest financial returns—irrespective of the health, the economic, the social or commercial interests of the people.

The "Land Speculator" Evil

Gross errors have been made and continue to be made in every Canadian city in respect to town planning and construction of buildings. Corporations are helpless and must look on with complacency at the opening up by land speculators of estate after estate. Buildings may cover these properties and yet the corporation has no power to ordain that provision be made for the future by requiring that adequate provision be made for open space, school sites, main roads or other public needs. When such estates are taken into the municipal limits it is too late to make the changes in roads, driveways, open spaces or parks, or even to lay water pipes or construct sewers without incurring expenditures vastly greater than would have been

*Extracted from an address delivered at the First Annual Congress of the Canadian Public Health Association, Montreal, Dec. 13-15, 1911.

the case if the municipal authorities had an oversight on the first instance of the planning of the property.

And notwithstanding all these evils, there does not exist to-day any adequate statutory provision which insists upon the environs of a city being planned as parts of the greater metropolis in such a manner as to be component parts of a harmonious whole and detrimental to each other. The primary cause for this movement in the older countries has been the markedly evil effects which housing and bad planning has had upon the health of the people. The neglect to provide sufficient sunlight and fresh air and the means of obtaining such.

It took nearly a century of unsanitary housing in England and over forty years in Germany to produce the present movement, looking not only to the construction of good healthy homes but to the way in which these units shall be set up in the city plan. Surely then it is high time we took a more earnest and active interest in all that concerns the development, growth and extension of our cities and towns.

First Legislate and then Plan

No material work can be done or good accomplished without adequate statutory provision being made in each province in the Dominion.

To attempt to work the remodelling of our cities and the planning for the future without first securing proper legislation would, in my opinion, be mis-spent time, labor and money. Let us be wise and learn from the difficulties and mistakes of others; work for the legislation first and plan in the meantime; then material progress is assured.

The following are some of the advantages of town planning:

- (1) The improvement in the general health and morals of the people.
- (2) The reduction of the death rate.
- (3) The provision of cheaper and more healthy homes.
- (4) The setting apart of an adequate number of suitably located open spaces.
- (5) The absolute prevention of slums with all their accompanying evils.
- (6) It prevents undue expensive road-making.
- (7) It obviates the present method whereby open spaces are required after the land has gone up in building value.
- (8) It prevents sudden large increases in land values which would otherwise result in land speculation.
- (9) It gives to the municipality that which belongs to the community its portion of the unearned increment which now goes to the speculator, and which is not his. This is estimated in England at one-fifth of the selling value.

It is to be hoped that these advantages, and many others which will suggest themselves to one who makes even a casual study of the subject, will result in organization for earnest work for the preservation of the natural and scenic beauties of which this country is so prolific; for the remodelling of our cities upon most approved town planning lines and the fixing upon a wise and firm foundation of the laws whereby their growth will not be thwarted, hampered or restricted; for the conservation of the lives of our people and their social and moral welfare.

The Province of Quebec Association of Architects have had under consideration the question of men who are practising as architects without being duly qualified. In Quebec, and in other provinces where there are close associations of architects, men who are not members of the association are unable to call themselves architects, although there is no law to prevent their drawing plans and receiving pay for their work. The result is that many men, particularly in Montreal, are competing with fully qualified architects, and

are receiving a smaller percentage than is customary. They pass no examinations, and the association is therefore unable to guarantee the quality of the work. Those who are unwary enough to represent themselves as architects are liable to be prosecuted, and the association has protected its members by taking action in some instances, but there are many who, by adopting such titles as construction engineers and the like, are not amenable to the law. How to prevent these men doing architects' work is a problem which the association has not yet solved, but apparently the only way is to get fresh powers from the Provincial Legislature.

Prince Rupert's Proposed Dry Dock

Messrs. Wm. T. Donnelly and Frank E. Kirby, the United States engineers appointed by the Grand Trunk Pacific Company to prepare plans for the construction of the terminals and floating dock and building yards at Prince Rupert read a paper a few days ago before the United States Society of Naval Architects and Engineers at New York, in which they told of their plans.

The first work to be undertaken under their plan will be a pier, 520 feet long and 60 feet wide, with a shore platform 80 feet wide and 930 feet long, with an area of 74,400 square feet. At the western end of this platform there will be an extension off shore 350 feet long by about 100 feet wide, and at right angles to this an extension 560 feet long by 80 feet for the attachment of a floating dock. Owing to the excessive rise and fall of tide, about 25 feet, a double line of diagonal bracing will be used in the pile work. The total area of the platform and pier work will be 181,400 square feet. In front of the main platform, east of the pier, there will be built a launching platform for side launching, 80 feet wide by 440 feet long.

The engineers say: "One of the controlling features in the general plan of development was the fact that the city of Prince Rupert will be 600 miles from the nearest base of supply or point where any considerable assistance, mechanical or otherwise, can be obtained. It was, therefore, determined at the outset that the mechanical equipment, large tools, etc., must be of the very best. On account of the high price of labor on the Pacific coast, ample provision for the use of power in every way possible must be made. This has resulted in the design of an electric power generating station with ample capacity for all present needs and with a large possibility of extension."

The plans provide for a complete ship building and repair plant with large machine, boiler, blacksmith, carpenter, and other shops. In the machine shop machinery will be provided to handle all the heaviest crank and other shifting for large steamers and boring, drilling, turning machinery, etc. The large tools being driven by individual motors. A 15-ton overhead crane will be provided for both boiler and machine shops.

The drydock will be a pontoon floating deck with capacity of 20,000 tons. It is proposed to construct this dock with the plant to be built at Prince Rupert. The dock will have an overall length of 604.4 feet, and clear width of 100 feet, width overall of 130 feet. Timber will be used largely in the construction. The lifting power is the aggregate of 12 pontoons of timber construction, united by steel side walls or wings. The construction will be arranged so that part or the whole of the dock may be used. The machinery for pumping the dock will consist of centrifugal pumps operated by electric motors, with capacity sufficient to pump the entire lifting power in two hours.

The Federal Government is to build a new highway between the towns of St. Lambert and Longueuil, on the south side of the St. Lawrence, opposite Montreal.

Concerning Road Costs and Maintenance

Improved Highways of Various Types and their Annual Cost—Qualifications of the Ideal Road—Various Methods of Cost Analysis

By A. H. Blanchard, Professor of Highway Engineering, Columbia University, N.Y.

The determination of the most economical and efficacious method of construction and maintenance to be employed on roads of various classes constitutes one of the most interesting subjects which the highway engineer has to consider. The solution of the problem depends upon many variable factors, all of which must be given due consideration and the proper value attached to each. The great variety of materials and methods of construction and maintenance used, together with the absence of such essential information as traffic censuses, cost data, etc., makes it a difficult matter sometimes to reduce all of the different types of roads to a comparable basis for a given location. It is only within the past few years that anything has been done relative to a scientific method of taking traffic censuses on trunk highways. At this time, however, there is considerable valuable information relative to the construction or maintenance of roads to meet modern traffic conditions. Another source of confusion is the conflicting reports as to the results obtained by the use of a certain method or material. In many localities where engineers have adopted some one general method for construction or maintenance it may be found that such methods, although they may be successful as far as use is concerned, are not the most economical types which are equally efficacious. The cost data covering construction furnished by many highway officials unfortunately is so brief that it is practically worthless. Many times in otherwise elaborate reports a total cost per mile is the only information furnished under the heading cost data. It is self-evident that in order that cost data should be of value to the public and the engineering profession, besides a complete description of construction, characteristics of materials employed and local conditions, there should be given figures relative to rates of labor, cost of equipment and detail data covering construction.

Improved Highways of Various Types

The topic "Road Costs and Maintenance" will be considered from the viewpoint of the annual cost to a community of improved highways of various types. Annual cost is a combination of the following variables: interest on the initial cost of the road, the annual maintenance charge, and an annuity which will in n years, the so-called life of the road, provide a fund equal to the cost of reconstruction. In the case of types of roads permitting partial reconstruction every m years, a second annuity should be included. As an illustration of the second case will be cited the practice of Parisian engineers in the reconstruction of wood block pavements. The surface of this type of pavement is maintained by the substitution of good blocks in such places as depressions have been formed usually attributable to excessive wear of blocks of poor quality. After a certain period the entire wood block surface is taken up, the blocks planed off and relaid. Again in the case of many types of roads having as a characteristic a broken stone surface a partial reconstruction of from 1 to 2 inches in depth is required every m years.

The other factors enumerated under annual cost need no explanation with the exception of maintenance charge. Unfortunately in maintenance we have a much abused word, as the standard upon which the definition of maintenance rests varies widely throughout this country. Hence reports relative to the cost of this item as a factor of annual cost

are of little value except in those cases where it is known what the highway officials mean by the statement that a road is well maintained. The ideal maintenance, which should be striven for in every case, is a method by which the surface of the highway is kept in as good condition as when accepted on the completion of construction. It is self-evident that it is only possible to conform to this ideal by the adoption of the principle of continuous maintenance. It is certainly deplorable that in the case of some of our public work the idea of maintenance possessed by certain lay boards will permit the surface of a macadam road to remain covered with loose broken stone caused by disintegration due to motor car traffic for a period of over two months. This practice in cases where funds are available for the improvement of the conditions noted is obviously absurd to designate as maintenance. Rather it should be characterized as criminal negligence. This Association has an admirable opportunity to emphasize the absurdity of the popular idea that an appropriation for the construction of a highway will provide a surface which, once constructed, will endure until eternity.

Unfortunately first cost in many cases is the only element which is considered in the selection of the type of road, while in other cases the number of years which a pavement will last or will remain dustless is the only factor given due weight. The interest charge, maintenance required and the annuity item seldom receive the attention deserved. Although it is self-evident that the problem cannot be solved exactly, nevertheless it is practicable to analyze the problem presented in a manner that will give as satisfactory results as are characteristic of the results obtained in many engineering problems of a similar type and thus approach within reasonable limits the ideal of economy and efficiency.

An ideal road or pavement should be durable, noiseless, sanitary, efficacious for road users, easily cleaned and made dustless, provide good foothold for horses and be non-slippery for all classes of vehicles under varying climatic conditions, yield neither dust nor mud, have a low tractive resistance, low annual cost, low first cost, low maintenance charge, and an aesthetic and impervious surface.

It should not be considered, therefore, that the idea of annual cost is paramount in every instance. For example, in Monaco, the winter home of the father of superficial tarring, Dr. Guglielminetti, ordinary macadam made absolutely dustless by ideal watering has been adopted because the primary requisite in that case was of an aesthetic character. In this instance it was necessary to select a dustless surface which would harmonize with the tropical gardens and yellow limestone palatial cafes, hotels, shops and villas clustered about the Casino of Monte Carlo. Again, although the annual cost is greater, many engineers favor the use of a bituminous filler for brick pavements rather than a cement grout filler because the pavement constructed with the former is not as noisy as with the latter.

Analysing Annual Cost

As illustrative of the method of analysis which should be employed in consideration of annual cost, a few examples will be given of cases which have come under the writer's observation.

The first illustration cited refers to a road built of water bound macadam located in an isolated and exposed district subjected to a traffic of five horse drawn vehicles and thirty motor cars per foot of width of a 14 ft. roadway during the period from 8.00 a.m. to midnight in the summer season. A large percentage of the motor traffic consisted of heavy touring cars, limousines and landaulets traveling at speeds between 40 and 55 miles per hour. The kind of treatment adopted consisted of the periodic application of light oil which, under the traffic and other local conditions, was efficacious from the standpoint of dustlessness for a period of one month. The annual cost of a superficial treatment with a bituminous material will be investigated for comparison. The interest on first cost and the annuity will be considered the same in both cases, although it is self-evident that the bituminous surface road will have a much longer life. The light oil was used during the maximum period for this locality, that is from May to November, inclusive. The cost of oiling, at 1c. per square yard per treatment was 7 cents, while it was found that the cost of repairs to the macadam surface was 3 cents. It should be said in this connection that, although the surface was maintained dustless throughout the above period, disintegration by high speed motor car traffic took place. The total maintenance charge was 10 cents per square yard per year. On the other hand if an annual superficial treatment had been employed, thus providing a bituminous surface which would have been efficacious throughout practically the entire year, the average cost of the superficial treatment would have been 5 cents per square yard, while the repair item would not have exceeded 0.5 cents, thus giving a total maintenance charge of 5.5 cents as compared with 10 cents with the light oil.

In another case coming under the writer's observation, it was decided to first construct a water bound macadam and afterwards provide a bituminous surface by superficial treatment. The annual cost of a bituminous concrete pavement, finished with a flush coat which, under the traffic to which this road was subjected, would last five years, will be investigated for comparison. Granted that it will be necessary to reconstruct both roads by replacing the wearing surface of 2 ins. every twenty years, the annual cost may be compared as follows, For the annual superficially treated road, the first cost was 67 cents, the interest charge at 4 per cent., 2.7 cents, the maintenance charge 7 cents, composed of a 5 cent charge for annual bituminous treatment and 2 cents for repairs, the annuity, 0.9 cents, based upon the cost of reconstruction. Hence the annual cost will be 10.6 cents. In the case of the bituminous pavement the first cost would, under the existing local conditions, be 90 cents, the interest charge 3.6 cents, the maintenance 2.5 cents, made up of a repair charge of 0.5 cents, and the cost of the flush coat, having a life of five years distributed throughout this period of 2 cents and an annuity of 1.7 cents, thus making the annual cost 7.8 cents as compared with the annual cost of the superficial treatment of 10.6 cents per square yard. It will be noted that the annuity covering total reconstruction is not considered in this case. In the opinion of the writer the advantage would be with the bituminous pavement.

Relationship Between Road Costs and Maintenance

The lack of appreciation of the intimate relationship existing between road costs and maintenance is attributable to many causes, among which may be noted the following:

- (1) Political interference in the selection of the men placed in control of highway work, and with the work of design, construction and maintenance of roads and streets.
- (2) The interference by controlling bodies of laymen in the legitimate work of the highway engineer.

(3) Division of responsibility in the supervision of highway work, particularly in municipalities, but also applicable in some states, as for instance, those in which the state department supervises the design and construction, while the responsibility for maintenance is placed upon the county or town.

(4) The comparatively small number of well-trained highway engineers who have devoted the requisite time and energy to the new problems which have arisen during the last decade.

(5) The comparatively infinitesimal amount of investigation which has been considered necessary as preliminary to the design of a road or street or a system of highways.

(6) The general meagerness of detail knowledge of the many different materials on the market and the varied methods in connection with which they may be used.

(7) A confusion of ideas on the part of many as to the reasons for the success or failure of various methods considered, both from the standpoint of road preservation and dust prevention.

(8) Non-observance of the relationship between the adaptability of various methods and the accessibility of new bituminous materials and machines.

(9) The search by many officials for a panacea for the treatment of all classes of roads and streets.

By an analysis of this brief outline of the relationship existing between road costs and maintenance it is apparent that the principles enunciated heretofore must have the enthusiastic support of all interested in highway improvement if economical highway construction and maintenance is to be characteristic of the future development of American highways.

A Visit to the Montreal Water and Power Company's Filtration Plant

After the close of the Congress of the Canadian Public Health Association, reported in our last issue, a number of delegates visited the filtration plant of the Montreal Water and Power Company, Verdun, now nearing completion. Mr. H. G. Hunter, the construction engineer of the New York Jewell Construction Co., who has acted as the expert superintendent of the erection of the plant since April, conducted the visitors over the plant. Among those present were: Messrs. Edwin Hanson, president of the company; F. H. Pitcher, manager and chief engineer; Albert Carvell, secretary-treasurer; and Jno. McFarlane, all directors of the Water and Power Co.; also Messrs. J. C. Meadows, engineer-in-charge, who will take full supervision of the plant from January 1; J. S. Lesage, superintendent of waterworks; Dr. H. St. George, city bacteriologist; Dr. Pelletier, secretary of the provincial board of health, and G. Janin, chief engineer of the city, and the following members of the Canadian Public Health Association: Col. Jones of Ottawa; Dr. R. St. J. Macdonald, of the department of hygiene, McGill University; Drs. J. J. Hagarty, McGill, and J. J. McCarrey, chief inspector of the city, Hon. J. G. Smith, M.L.A. Short speeches were made by Dr. Pelletier, Mr. Janin, and Mr. S. Carmichael, solicitor to the company.

The plant is the type known as the rapid gravity sand filter, and depends for its efficiency largely on the use of a coagulant. The rate of filtration will be in the neighborhood of 125,000,000 gallons per acre in 24 hours and the normal aggregate capacity of the units being installed at present is 25,000,000 gallons per day. Provision is made for extension to about twice that capacity by the addition of new filtration beds and more coagulating basin volume. The water is first to be drawn from the intake-well by low-

lift centrifugal pumps receiving, just before entering the pumps, the necessary coagulating solution. In this case it will be basic aluminum sulphate. On passing through these pumps the coagulant and water will become thoroughly mixed, after which it passes through the coagulating basin when, by means of suitable baffles, sufficient time will be afforded before filtration to render the coagulation of the water complete. From the coagulating basin the water flows by gravity through the filter beds to the clear water basin beneath.

The rate of filtration is governed by automatic controllers placed between the clear water basin and filters. From the clear water basin the filtered water flows by gravity to the high service pumps and thence is forced into the mains. When the sand in any one or all of the beds becomes clogged to such an extent as to interfere with the proper rate of filtration the unit or units in question are cut out from the remainder of the plant and the sand bed washed by a reverse current of filtered water and air. The effluent immediately after washing is wasted until a satisfactory condition is reached; the unit or units are then again turned in with the others.

The plant at present is provided with 15 separate filter beds or units, which, with the capacity provided in the clear water basin will afford sufficient flexibility to accomplish the necessary washing of the sand beds, without interruption to the supply of filtered water. Provision is being made for the use of calcium hypochlorite in the effluent in case this treatment is found desirable. The plant is guaranteed to remove 28 per cent. of all bacteria without the hypochlorite and practically all color, sediment and turbidity.

The walls and floor of the filter units, clear water basins, coagulating basins, and lower parts of the machinery room, the floor of operating room, etc., are all reinforced concrete and the superstructures are of brick with slate roofs; the buildings throughout are lined with buff pressed brick. The plant has been designed by, and is being erected under the supervision of Mr. F. H. Pitcher, the general manager and chief engineer of the Montreal Water and Power Company.

The contractors are Messrs. Laurin & Leitch, of Montreal, with the New York Continental Jewell Filtration Co., of New York, as sub-contractors for the equipment.

The plant is to be in charge of Mr. J. O. Meadows, at present sanitary engineer of the Provincial Board of Health, who will be responsible to the company for its operation.

The John S. Metcalf Company, Limited, Montreal and Chicago, have received a contract from the Grand Trunk Pacific Railway Company for the design and construction of a 2,500,000 bushel concrete elevator at their Mission Island terminal, Fort William, Ont. This is the second storage unit of the Grand Trunk Pacific terminal at Mission Island, and will bring the storage capacity up to a total of 5,750,000 bushels. The ultimate capacity of the grain terminals, as laid out by the Metcalf Company, contemplates a total storage capacity of 40,000,000 bushels. The cost of the structure just awarded is \$500,000.

Chief Engineer Janin, Montreal, has suspended all work on new pavements and sidewalks for the season. The city has been unable to carry out its complete programme, \$200,000 worth of pavement work having to be held over. This is due to a late start, lack of cement, and scarcity of labor. The city surveyor, Mr. Barlow, states that owing to the demand it was absolutely impossible to get men, and that if 100 were advertised for five or six would apply. The feature of the season has been the increase in day work, the aldermen favoring this form rather than contract work. A considerable amount of time was lost owing to a new paving law, but when a start was made the work was pushed through as quickly as possible.

Winnipeg Technical High Schools

The school board of the city of Winnipeg is just completing the construction of two technical high schools for elaborating and extending the work of the manual training departments of the various public schools of the city. This work was begun a little over a year ago, after a strenuous campaign of several months which at times showed a tendency to become somewhat bitter. The trouble was not that the board did not realize the efficacy of the technical school, but rather that they could not decide upon a location. In the central district of the city there would have been trouble in securing an adequate site at a reasonable figure, and when it was suggested that the collegiate be placed in either North or South Winnipeg a storm of protest was raised that blocked progress. Finally an Irish compromise was effected, the decision being to place a collegiate in both districts. The North Winnipeg high school is only a few blocks from the present northern boundary of the city, and a couple of blocks west of Main street, while the other is near the present south-westerly limit of the developed residential section. The idea is that as the city expands the schools will quickly be placed more nearly in the centre of the districts to be served.

Described briefly these buildings have three floors and a basement, with a total area of 40,040 square feet of floor. They are built in the form of a letter "E," with ample space between the wings for light and ventilation. Each contains 36 class rooms. There is a gymnasium in one of the wings with a floor area of 40 by 80 feet, an auditorium in the central wing, and a large hall above it which may be utilized for a variety of purposes. Baths and dressing rooms are provided, and are connected with the gymnasiums by spiral stairways, separate sections being provided for boys and girls.

Only a small portion of the basement is devoted to the baths and heating system, the balance being fitted up for the special classes in the mechanical trades. These include the electrical, plumbing, pattern making, wood turning, machine and forge shops, each of which it is proposed to equip with adequate plant to give the boys experience in setting up and finishing work.

The front of the building is 220 feet in length and the wings are 182 feet long (from corner to corner). The front of the building is 66 feet in depth, with the class-rooms on the front and wide corridors behind. The wings are 45 feet deep, with splendid lighting on three sides. The central wing is 116 feet long and 56 feet wide. In the basement considerable additional floor space has been gained by utilizing the sections between the wings. In one of these is located the forge shop. This arrangement is especially favorable, as it brings this shop with its noise and smoke entirely apart from the rest of the building. The roof is carried on trusses of angle iron, with skylights for lighting and many ventilators for carrying off the gases. Solid walls at either side separate this shop from the baths and the boiler room, and entry is gained by a flight of half a dozen steps down from the basement corridor. Double doors are an added protection.

Roughly speaking, four million brick have been used in the building. The face brick, a deep red, was brought from Ontario, and the balance is of local manufacture. Some difficulty was experienced in getting facing brick of the same tint throughout, and there was also a difference in dimensions between two lots delivered. The entries and trim are in native limestone. The mechanical difficulty was readily overcome and it is hoped that the weather will balance out the colors. Practically all of the floors and pillars are of reinforced concrete, the exceptions being the floors over the gymnasium and auditorium, which are carried by heavy I-beams. In all there were 100 tons of re-

inforcing steel used, and floor slabs 6 inches in thickness are planned to carry 300 pounds to the square foot. One slab, 10 by 12 feet, was loaded with 18 tons and after 12 hours showed a deflection of $1/32$ of an inch.

The I-beams over the gymnasium, which have a clear span of 40 feet, are 2 feet 8 inches in depth and rest on bearing beams 8 feet in length. While the tables of reinforcement for beams and girders cover a great variety of lengths and dimensions a description of a typical one may be of interest. This particular style is 28 feet in length, and is used in the class-room floors. All rods but two are of $3/4$ inches. It has 2 rods 31 ft. 2 ins. long; 2 rods 30 ft. 8 ins. long; 1 rod 30 ft. 4 ins. long; 2 rods $7/8$ ins., 29 ft. long, and 2 rods of the standard $3/4$, of the same length. To each girder there are 24 stirrups.

An interesting feature is in the planning of the fire escapes. Recently the school board adopted the "cork-screw slide" type of escape, but these were of necessity erected alongside the older schools, the spiral being within a steel tube. In the technical school a sort of pocket has been built on the sides of the building and the spiral is inside it. As shown in the illustration these are outside

Fraser is making a tour of the various municipalities, giving directions as to the points at which the stone for macadamizing is to be placed. Fourteen or fifteen full sets of crushing and macadamizing machines will be distributed along the route as early as possible in the spring so that work may be started as soon as the snow has left the ground. The plans provide for a roadbed of water-bound macadam, 16 feet wide, while all bridges and culverts must be of concrete.

A model garden city is to form a big feature in the scheme of the Canadian Northern Railway for entering Montreal. Mr. Frederick G. Todd, who has made a study of town planning, has been engaged to prepare plans for this new suburb, and proposes to make it the model city of Canada. The city will be within ten minutes' ride of the heart of Montreal, and will be reached by means of the proposed tunnel line through Mount Royal. The line, it is stated, will come over the Back River, by bridging at The Bizard, will run along the shore to Bois Franc, and then strike through the new suburb to the tunnel, and so into Montreal. The plans provide for the electrification of the



Front Elevation of Kelvin Technical High School, Winnipeg.

the building and at the ends of the corridors. Doors open outward on an open balcony and the entries to the pair of chutes are from these. It is effective and still does not mar the structure.

Hardwood floors are used, except in the lavatories, baths and some of the shops. The latter are of asphalt and tile is used for the baths. These also have tile wainscoting and slate partitions. The walls and ceiling are in white plaster, with green burlap below. The stair treads, raisers, and walls are of marble, the contract for which has only recently been let. Each of the main stairways may be cut off, if desired, by fireproof doors, in case of emergency, and above the railing on each, heavy netting is carried to a height of seven feet to prevent accidents to children. Three entries are provided.

The plans were prepared by J. B. Mitchell, Superintendent of Construction for the School Board. The contract price for erection is \$300,000 each, with the heating and plumbing about \$65,000 additional.

Plans have been completed for the international highway to connect Montreal with New York. The Canadian section will be constructed under the Provincial Government, which will bear the greater part of the cost. Mr.

line at the point where it enters the tunnel. It is proposed to elevate the tracks over the garden city, and to erect shops for the construction and repair of cars and motors and for a plant to generate electricity on a site near the entrance to the tunnel.

F. W. W. Doane, C.E., of Halifax, has been engaged to design a sewerage system for the town of Springhill, N. S. He is at present engaged making plans and estimate of cost which must be submitted to a meeting of the rate-payers for their approval before the local legislature meets in February.

Dr. T. A. Starkey, Professor of Hygiene, McGill University, read a paper on "Ventilation of Public Buildings" before the Province of Quebec Association of Architects, Montreal, on December 19. In the first place, Dr. Starkey dealt with the question from the standpoint of physics, and then considered the methods of ventilation by natural mechanical means. He also alluded to the system of propelling fresh air and extracting foul air from opposite ends of a building, and advocated natural means of ventilation as compared with mechanical means. A short discussion ensued, in which Professor Nobbs and Messrs. Miller and Burgess took part.

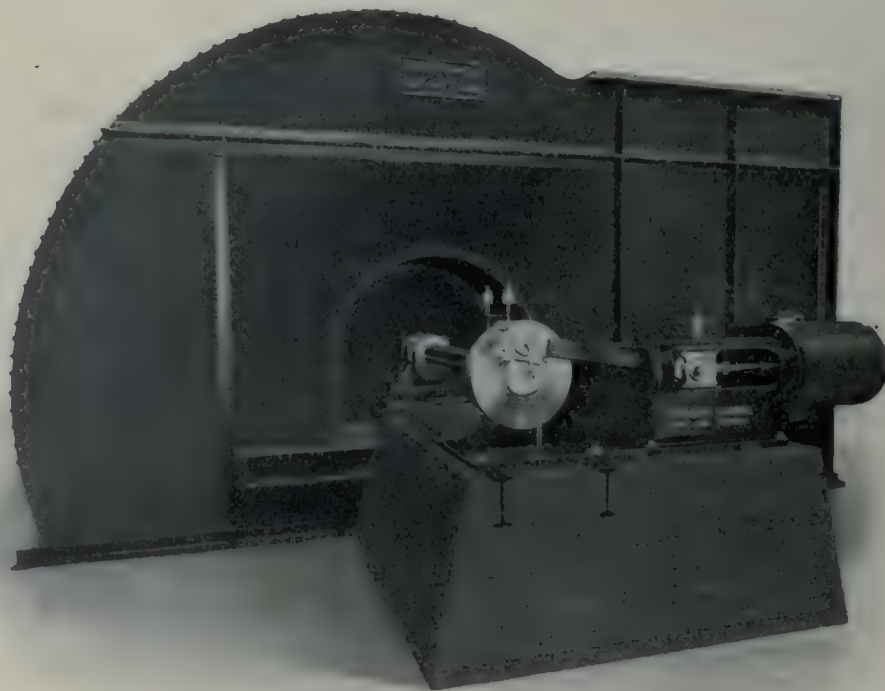
The Process of Drying Brick

Contributed by S. R. Sheldon

In order that the plasticity of clay may be utilized in the forming of bricks and other clay products, it must contain or have mixed with it a certain amount of water. This water must be retained in the pores of the clay until the bricks have been properly formed. The quantity of water required to insure the desired degree of plasticity depends largely upon the process of manufacture. The dry press process requires from six to twelve per cent. of water to form a good brick; the stiff mud or wire cut process requires from twenty to twenty-five per cent. of water, and the soft mud process requires in some cases as high as thirty and thirty-five per cent. of water. The exact amount of water required in any of the above processes varies considerably, according to the nature of the clay and also the design and strength of the machinery used. A certain amount of moist-

set of steam coils is also provided to utilize the exhaust steam from the main engine for heating the air supplied to the tunnels, but in such cases where electrical energy is used for driving the machinery, the waste heat from the cooling kiln is used to dry the brick. In this waste heat drying system a fan is used for drawing the heat from the cooling kiln and this fan, after mixing a certain amount of fresh air with the waste heat, discharges the heated air throughout the tunnels.

Other drying systems in use are the hot floor dryer, which consists of a concrete floor through which steam pipes are run to keep the floor hot, and the brick are dried by being hacked up on this hot floor; the pipe rack dryer in which the brick are placed on steel pallets set in racks made up of steam pipe, the brick being taken to and from the drying rooms by means of special conveyors. There are so many different types of dryers, of which lack of space will not permit a description.



Three-quarter housed, up discharge, waste heat fan, with direct connected horizontal side crank engine.

ure remains in the brick after they are dried, usually about four to five per cent. This moisture is removed by evaporation in the water smoking process in the burning kiln.

It is the removal of the mechanical water that has been added to the clay to develop its plasticity for manufacture that constitutes the operation of drying brick. This water is removed by evaporation, either at the temperature of the atmosphere in the open air, or at higher temperatures produced artificially in closed rooms provided with the requisite ventilating devices.

The rapidity with which brick can be dried without damage must be determined for every clay, and depends chiefly upon the ratio between the clay substance and the sand which is mixed therewith, and also upon the size and density of the brick.

There are several designs of dryers in use in the brick yards of Canada. The one most commonly used is the fan dryer, consisting of a fan of the steel plate type used to distribute the heated air through the dryer tunnels. A

It will be readily seen that the best and most economical dryer is the type using the waste heat from the cooling kilns. For the waste heat dryer the progressive principle or the continuous car system is almost universally adopted as the most practical method of handling bricks during the drying period. The dryer consists of long tunnels or compartments into which the cars of wet bricks enter at one end, and when dried are removed at the other end. The heat is introduced at the end at which the cars are removed and the air, saturated with moisture, escapes at the end at which the cars enter. These tunnels are always kept full of cars by immediately replacing those removed dry at the hot end, by wet bricks at the opposite end. In this manner the system of drying becomes truly progressive and continuous. The heat required to evaporate the moisture from the wet brick is drawn from kilns in which the burning process has been completed and which are being allowed to cool before they can be removed. Any temperature that may be particularly suited to the brick being dried can be

maintained, ranging from the temperature of the outside air to as high a degree of heat as 500 degrees Fahr., should such a temperature be necessary. By means of the waste heat fan, the circulation through the dryer is constant and positive, a uniform distribution of the heated air is maintained and the quantity of air desired can be changed by altering the speed of the fan to suit the conditions.

The length of time required to dry bricks in a waste heat dryer varies from ten to forty-eight hours, and even to seventy-two hours in some cases. Bricks made from clay which runs high in alumina must be dried slowly, or the loss from cracked bricks will be excessive. Then again, the size of brick has to be considered, and in drying fireproofing material, architectural blocks and other clay wares, the size must always be given careful consideration. It will therefore be seen that careful judgment must be exercised in designing a drying plant in order to obtain the highest possible efficiency.

The actual process of drying brick is not complete when the so-called dry brick are taken from the dryer and set

waste heat from any available source, must form an important part of the equipment of a modern brick or clay working plant.

Trade Inquiries

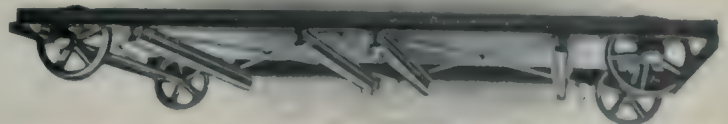
The Dominion Government Trade and Commerce reports contain the following enquiries. Readers of the Contract Record may obtain the names of enquirers by writing to the Department of Trade and Commerce, Ottawa:—

1406. Heating installations.—A firm of mechanical engineers in Buenos Aires desires to be placed in touch with Canadian manufacturers of heating installations. They would be glad to receive correspondence on this subject, with all the information possible. All quotations must be either c.i.f. Buenos Aires, or f.o.b. steamer, and shipping weights, freight rates, etc., must be stated.

1407. Constructional steel.—A firm of mechanical engineers in Buenos Ayres, desires to be placed in touch with Canadian manufacturers of constructional steel. They



Up discharge, full housed, waste heat fan, with direct connected horizontal side crank engine.



Double transfer car for brick yard, often used as single cars to transfer one car at a time.



Stiff mud car without decks. Decks are usually furnished of either wood or channel iron, as desired.

in the burning kiln. The brick have then to be water smoked, which is the name given to the process of removing the hygroscopic water in the clay, which is generally about four or five per cent. This water smoking process must be carefully carried out, as in this operation may be produced damage to the brick that no subsequent operation can remedy and that may lessen or destroy their market value. Some of the results of improper water smoking are "scumming," which is the appearance of a sort of white wash on the surface of the brick; others are checking and softening, which break and destroy the shape of the brick. Scumming and checking are frequently produced in the drying process, as well as in the water smoking or kiln drying process.

There are a number of patent brick dryers on the market, and, any number of men, engaged in designing and selling brick dryers; and considerable progress is being made; although much yet remains to be done. More must be known about those clays that give trouble in drying, and just what peculiarities of the clay cause the trouble, and the remedy for that trouble; but great progress is being made and it is generally conceded that artificial dryers, utilizing

would be glad to receive correspondence on this subject with all the information possible. All quotations must be either c.i.f. Buenos Aires or f.o.b. steamer, and shipping weights, freight rates, etc., must be stated.

1409. Metallic ceilings and concrete reinforcement.—A firm of engineers and commission merchants in Buenos Aires, desires to be placed in touch with a manufacturer of metallic ceilings and concrete reinforcement. All quotations must be either c.i.f. Buenos Aires or f.o.b. steamer, and shipping weights, freight rates, etc., must be stated.

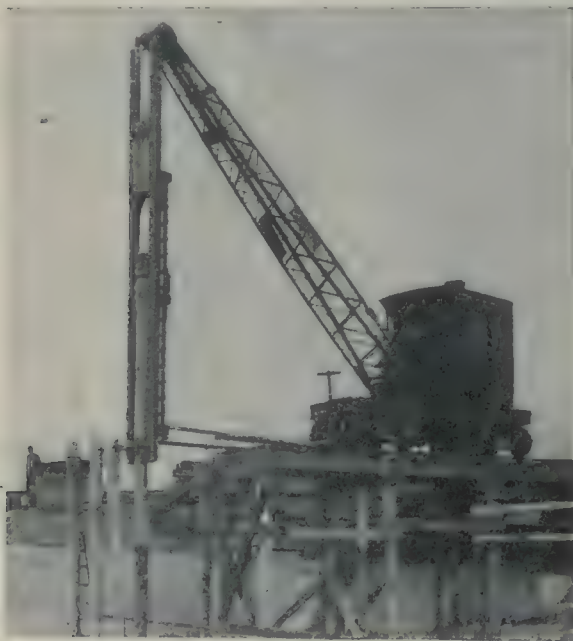
1416. Constructional timber.—A firm of contractors in Montevideo desires to be placed in touch with exporters of timber for building purposes, including doors and windows with their frames, flooring and ceiling, rafters, beams, etc. of spruce. Prices should be c.i.f. Montevideo or f.o.b. steamer, and freight rates, with all possible particulars, should be stated.

Voting upon the nominations for the officers of the Builders' Exchange, Montreal, will take place at the annual meeting on January 22nd. The nomination committee in its

report recommends the following nominations: President, James Ballantyne, re-election; vice-president, Joseph Brunet, re-election; J. H. Lauer, secretary, and W. A. Stanley, secretary and assistant secretary, respectively, re-election; master carpenters' section, Frank Pauze; concrete, K. D. Church; general contractors, Z. Beauchamp, of J. B. Pauze & Company, Limited; lumber and mill work, William Ruth-erford; masons and brick contractors, John Allan; painters, W. E. Potter; plumbers, J. R. Meadowcroft; roofers, J. K. McNutt, of George W. Reed; brick and quarry supplies, T. A. Morrison; and cement and builders' supplies, Alex. Bremner.

A Home Made Device for Driving Piles

A novel device for driving piles has been used by the Nickel Plate R. R. in its grade crossing elimination work in Cleveland. The road has used in this work, a Brownhoist locomotive crane, furnished by the Brown Hoisting Machinery Co., of Cleveland. Among the other duties of the crane, the contractor on this job has fitted the crane with



Fifteen-ton Locomotive Crane equipped with leads for driving piles.

a simple and inexpensive attachment for driving the piles. The accompanying cut shows the crane with this special attachment driving the piles for an elevated switch.

This attachment is the regular drop hammer method of driving piles, but is operated entirely by the locomotive crane. The two 25-ft. guides are hung from the end of the crane boom, being held by a bolt, and they are free to swing back and forth. When driving the piling, the guides are held rigid by a brace fastened to the completed portion of the trestle. The piling is held securely in the guides by several cross braces on the back side, and on the front side by an iron bar placed across the two hooks at the bottom of the guides. The hammer is operated with a single hoisting rope, and hook, controlled by the operator of the crane. The trigger for releasing the hammer at the top is a bolt, inserted in one of the guides. The crane hoists the piling up into the guides for driving, with the same hoisting rope that operates the hammer. While this is being done, the hammer is held at the top of the guides with a bolt, placed through the guides by one of the workmen. The guides are equipped with a

ladder as shown in the cut so that the workman can reach the top.

The railroad has used 40 ft. piles and has driven them 20 ft. into the ground, which consists of practically all shale. The contractor claims that he can drive four of these piles in less than an hour. He formerly used a regular pile-driver, and he says that he can drive more piles a day with this simple "home-made" attachment, than with the regular pile-driver, and at less cost. The attachment is easily and quickly attached to, or removed from, the locomotive crane.

Personal News and Notes

Mr. R. J. McClelland has been appointed City Engineer of Kingston, Ont., at a salary of \$1,200 a year.

According to the final report made to the Toronto Board of Works by City Engineer Rust, the total expenditure on public improvements during the past year was \$5,267,711.

Mr. Philip J. Turner, F.R.I.B.A., architect, 121 Board of Trade Building, Montreal, has gone to England for the Christmas season. He will return to Canada about the latter part of January.

Messrs. John Millen & Son, Limited, 321 St. James street, Montreal, have been appointed Canadian agents for the R. D. Nuttall Company, Pittsburg, Pa., manufacturers of gears, pinions and United States Standard trolley bases.

The directors of the Builders' Exchange, Montreal, have passed a resolution strongly opposing the proposed tax of \$25 per head on any men working along the wharves of the port who are not residents of the city. The tax is suggested by a committee of the council.

The public will be asked, shortly after the new year, to subscribe to an issue of bonds, with a common stock bonus, in the P. Lyall & Sons' Construction Company, Limited. The board of directors comprise Peter Lyall, William Lyall, Trail Lyall, H. N. Greenshields, and H. W. Beauclerk.

The new Winnipeg plant of the Canada Cement Company, Limited, will be ready in June next, and will give an output of 2000 barrels a day, making with the other plants at Calgary and Exshaw an output west of the lakes of 140,000 barrels per month. Mr. F. P. Jones, the general manager, estimates the year's business will show an increase of 30 per cent. over that of 1910.

The City of Montreal will ask the Provincial Government for additional powers for the commission which has under consideration the laying of overhead wires in conduits. By these the commissioners will be able to prepare separate parts of their scheme and put them into operation when approved by the Public Utilities Commission. All compensation is to be fixed by the conduit commission, subject to appeal to a court of law.

In future, Mr. Janin, the city engineer of Montreal, will be officially known as chief engineer and city surveyor, while Mr. Barlow, now city surveyor, will be designated general superintendent of the roads department. Mr. Charles Arnoldi has been appointed city treasurer, in succession to Mr. Robb. In the budget, provision is made for \$696,012 for roads, but in May it is proposed to add \$348,000. Inspection of buildings is estimated to cost \$30,265.

The annual meeting of the American Association of Manufacturers of Sand-Lime Products was held in Grand Rapids, Mich., December 5-6. The 1912 meeting will be held in Toronto.

Contracts Department

News of Special Interest to Contractors, Engineers, Manufacturers and Dealers in Building Supplies.

Information for insertion in these columns is invited from Architects, Contractors, Engineers, etc.

Waterworks, Sewerage and Roadways

Fort William, Ont.

A by-law will be submitted to the ratepayers on January 1st to raise \$11,200 for construction of good roads.

Hamilton, Ont.

Stewart & Witton, 2 Hughson street, are interested in the contemplated purchase of road machinery, near Bartonville. 400 acres of land have been purchased, half of which will be divided into building lots, early in the spring. New road materials, machinery, cement walks and pumps will be required.

Chairman Wallace, Works Committee, states that an additional \$60,000 or more will be needed for roads in east end (Barton street, Kensington, etc.), which are impassable as conditions exist.

Merritton, Ont.

Tenders were called for construction of 1000 ft. of 10-in. sewers. Received by clerk Dec. 22nd. Clerk, R. Clark.

Montreal, Que.

City Controllers have recommended the appropriation of \$650,000 for street improvements; \$300,000 for waterworks department, and \$483,000 for fire department for the coming year's budget.

St. Catharines, Ont.

Extensions will be made to bitulithic pavement, concrete curb, to cost \$21,778. City engineer, Mr. D. Brown.

St. Lambert, Que.

Tenders are called for sewers on Hickson street. Tenders received on 18th were irregular; new tenders called at once by J. R. Beatty, town clerk, to close Jan. 2nd. Town Engineer, A. D. Dickson.

South Vancouver, B. C.

Civic Improvement League representatives have requested the Board of Works to recommend to incoming City Council the permanent paving of Main street from 16th ave. to Eburne line and ultimately similar work on all trunk roads. This would necessitate the laying of trunk sewers, gas and water mains first.

Toronto, Ont.

Following local improvements are planned: 36-in. concrete, brick on concrete sewers; 24-in. and 18-in. tile pipe sewer, and 44,077; pavements, asphalt, 24 ft. width, 4-in. concrete foundation, \$7,595; concrete pavement, \$872; brick block pavement, \$4,966; concrete curbing, \$902. City Clerk, W. A. Littlejohn.

Tenders are called until Jan. 26th for sewers, Barton avenue, East Toronto outlet. Large concrete sewer, Sec. No. 3. Chairman Board of Control, G. R. Geary.

Vancouver, B.C.

Construction of sewers in streets and lanes to the amount of \$34,970 was recommended by City Engineer Fellowses.

Recommendations of City Engineer Fellowses: block pavement, \$122,443; asphalt, \$116,551; asphalt and vitrified brick, \$301,460; creosoted block, \$110,608; bitulithic, \$67,176; vitrified brick, \$96,536.

Victoria, B. C. (Sooke Lake)

The lowest total bids of the various tenderers for a waterworks system were as follows: Dietrich Co., Seattle, \$1,788,776; Victoria Machinery Depot and Porter Bros., Victoria, \$1,705,461.25; Patrick McHugh, Seattle, \$1,745,245; Sound Lumber and Construction Co., Seattle, \$1,795,931; Naylor Bros., Vancouver, \$1,427,170; Norton Griffiths Co., Victoria, \$1,595,851; Cummings and Kieth (part), Seattle, \$600,650; Jeffery and Holt, Seattle, \$1,540,060; John Haggerty and Co. (part only), Victoria, \$146,141; Westholm Lumber Co., Victoria, \$1,169,720; Graff Construction Co., Seattle, \$1,384,652. Contract provisionally awarded by council to be approved by vote of ratepayers and then officially awarded. Consulting engineer, Wynn Meredith; Water Commissioner, J. L. Raymur.

Weston, Ont.

The ratepayers at a meeting voted unanimously in favor of sewage system. E. A. James, Engineer Good Roads Commission, roughly estimated a trunk sewer on Main street and a large septic tank to cost \$20,000.

Woodstock, Ont.

The Oxford County Council has decided to spend \$60,000 for the construction of good roads in the county, and debentures will be issued at once. Work will be commenced as soon as possible.

CONTRACTS AWARDED

Windsor, Ont.

Thomas Chick has been awarded contracts for the construction of new sewers on Tuscarora street and Gladstone avenue.

Railways, Bridges and Wharves

Anse Aux Canards Gaspe Co. Que.

Tenders are called for construction of wharf. Plans, etc., at office of district engineers, Quebec, Montreal, and on application to postmaster at New-Port, Que. Received by secretary until 4 p.m., January 15th. Secretary, R. C. Desrochers, Dept. of Public Works, Ottawa.

Bridgeburg, Ont.

Plans are accepted for viaduct, cost \$20,000, over railway tracks, for Village of Bridgeburg, Grand Trunk and N. Y. Central Railways. Reeve, J. Atwood.

Chairman of Committee to secure Railway Commission's consent. Plans were prepared by Engineer Anderson.

Brandon, Man.

B. C. Donham & Co., 52 Broadway, New York City have made application to council for franchise to build and operate water supply, electric and power and electric railway systems.

Eburne, B.C.

Builders, E. E. Higgins & W. H. Fisher are interested in company which is incorporated at \$100,000, who propose to build a wharf and warehouse on the North Arm of Fraser.

Goderich, Ont.

The Huron County Council at its next meeting will take up the matter of arranging for new bridges to be built in Hallet and McKillop Townships and also repairs to the Maitland bridge.

Grand Forks, B.C.

Tenders will be called for bridge (steel and concrete), \$100,000, for Canadian Pacific Railway; engineer in charge, C. S. Moss, Nelson, B.C. 350 ft. long, supported by three large concrete pillars. It is stated that it will take a year to complete.

Haliburton, Ont.

The ratepayers will vote on a by-law on January 1st entailing the expenditure of \$11,000 for bridge purposes.

New Liskeard, Ont.

Tenders are called for construction of public wharf. Plans, etc., at Dept. and at office of J. G. Sing, district engineer, Confederation Life Building, Toronto, and on application to local postmaster. Tenders received by secretary until 4 p.m. Jan. 10th. Secretary, R. C. Desrochers, Dept. Public Works, Ottawa.

Ottawa, Ont.

The Board of Control recommends approval of plans which call for steel bridge, on Bronson avenue, to cost \$82,000. Land damages, \$50,000 extra. City engineer, N. J. Ker, Ottawa.

Tenders called for steel rails and fastenings for Commissioners Transcontinental Ry., Ottawa; Secretary, P. E. Ryan. About 14,468 gross tons of 80 lb. steel rails and fastenings. Received until noon Jan. 10th by secretary.

Port Colborne, Ont.

The route is surveyed for electric railroad to cost \$400,000 Pt. Colborne & Bridgeburg), for Niagara, St. Catharines & Toronto Railway. (Controlling interest Canadian Northern Railway; vice-president, D. B. Hanna). Eight stations, standard gauge track, 65-lb. steel rails, up-to-date rolling stock and equipment. Necessary charter and franchise secured and route surveyed. It is officially stated that work will commence in the spring.

Sandon, B.C.

Surveys are completed for mine tramway and mill site, for The Rambler—Cariboo Mines Limited. Machinery for mine and tramway to be shipped in before breaking up of roads in the spring.

Thorold, Ont.

Mr. Munro, town clerk, has received official notification that a new G. T. R. station is included in the estimates of 1912. H. G. Kelly, vice-president.

Vancouver, B. C.

Plans are approved for bridge, cost \$2,100,000, across 2nd Narrows, for Burrard Inlet Tunnel & Bridge Co. Dominion subsidy \$550,000; Provincial subsidy \$250,000. Plans prepared by Res. Engineer Crutwell approved by directors and forwarded to London.

Windsor, Ont.

By a recent court decision bridge 56 feet wide on London street, and one 45 feet wide on Sandwich street, will be built. Type of bridge to be decided later at a conference between City Engineer Brian, City Solicitor, and the company. Owner, Michigan Central Railway.

Winnipeg, Man.

Tenders are called for pipe covering for Comms. Transcontinental Railway; secretary, P. E. Ryan. Supply of all coverings for piping, etc.; smoke breeching in connection with equipment of locomotive plant of the Winnipeg shops, Sec. 6, Tp. 11, Range 42. Plans at office of W. J. Press. Mechanical Engineer, Ottawa; of P. A. Evans, assist. engineer, Transcona, Man. Received by secretary until Jan. 3, 1912.

CONTRACTS AWARDED**Calgary, Alta.**

C. P. R. car shops to cost \$2,247,787. City clerk, W. D. Spence; general supt., C. P. R., A. Price. Calgary, asst. vice-president, F. W. Peters; general contractor, Westinghouse-Church-Kerr Co., New York, U.S.A. Vice-president, S. E. Junkins.

Quebec, Que.

Electrical installation for bridge to cost \$6,000, over St. Charles River. General contractor, Laurin & Leitch, 5 Beaver Hall Square, Montreal. Contractor, General Electric Co., Montreal; motors and wiring.

St. John, N.B.

Railway (to Grand Falls) for Provincial Government. Contractors, St. John & Quebec Railway (A. R. Gould) Sub-contractor, William J. Scott, Fredericton, supply of 50,000 railway ties; also posts, etc., for 50-mile section.

Public Buildings, Churches, Schools, etc.**Barrie, Ont.**

On January 1st the ratepayers will vote on two by-laws, \$50,000 for school purposes, and \$21,100 for a sewerage system.

Brantford, Ont.

Grace Church plan to construct a parish hall and tower. Chime of bells to be installed. Total estimated cost, \$60,000. \$23,000 has been subscribed towards Parish Hall.

Camlachie, Ont.

Public Library Board are contemplating the erection of new public library. Matter to be taken up soon.

Hamilton, Ont.

Interior fittings are required for St. Anthony's Italian Church, Clinton St. Rector, Rev. Father Bonomie, St. Mary's Cathedral. Roof on, interior fittings to the amount of \$600 required.

Interior fittings are required for St. Ann's Polish Church, St. Ann & Barton streets. Rector, Rev. Father Bagnosic. In the spring a larger church will be built; probably by day labor.

Christ's Church Cathedral are contemplating additions to cost \$30,000; architect not employed yet. Rector, Rev. Canon Abbot, 218 McNab N. Stone. Work will probably start in spring.

London, Ont.

The Executive Council of Huron (Bishop Mills) are planning the erection of new parsonages at Tillsonburg, Hyde Park and Waterloo. Plans will be prepared soon.

The Royal Bank of Canada will take over the city hall building on January 1, and extensive improvements are planned.

Plans will be prepared soon for new city hall. The council will go into the matter fully in the New Year; estimated cost, \$200,000. Old city hall was purchased by Royal Bank.

Medicine Hat, Alta.

Tenders are called for church to cost \$75,000 for Methodist Church of Canada. Secretary Building Committee, H. T. W. Forster; architect, W. T. Williams; 80 x 120, brick and stone, concrete foundation, steam heating, electric lighting, ventilating system, shingle roofing. Plans, etc., at office of architect or secretary. Received by secretary until 6 p.m., Jan. 20, 1912.

Montreal, Que.

Plans are being prepared for boys' school. Mt. Royal Ward, for Roman Catholic School Commissioners; architect, G. A. Monette, St. John st., Montreal. Concrete and brick construction.

North Battleford, Sask.

Competitive plans called by Board of Education about middle of February for a new collegiate. Cost \$50,000.

North Vancouver, B.C.

Tenders are called for church for St. Andrew's Presbyterian Congregation. Architects, Alexander & Brown, Fairfield Bldg., Vancouver; frame, 106 x 45. Specifications with architect or from chairman of board, 64 Lonsdale avenue. Tenders called by architects on general contract until December 26. General contract will include everything but heating and stone work, for which tenders will be called later.

S. McDonald is excavating for theatre and office building to cost \$35,000, First street. 2-storey (foundation for more). Theatre behind store, offices above. Work will be rushed by owner.

Pelee Island, Ont.

John Close has been appointed by the council to superintend the construction of a new town hall. Work has commenced but all interior furnishings, heating and lighting equipment will be purchased.

Port Arthur, Ont.

Plans are being prepared for theatre block to cost \$75,000, Arthur street, for Alberta Land Company, H. D'Arcy Hut-ton, manager. Architects, Hood & Scott, Port Arthur. It is stated that work will commence next year.

Prince Rupert, B.C.

Competitive plans are called for extensions to general hospital. Government grant of \$10,000 in addition to \$10,000 voted by city, augmented by several thousand from other sources.

Sarnia, Ont.

A committee is appointed by County of Lambton as follows: F. Brock, Dawn; Dr. C. O. Fairbank, Petrolia, and Dr. Morrison, Sarnia, to secure a site and have plans prepared for a county hospital.

Plans will be submitted for church to cost \$50,000 for Congregation of St. Mary the Virgin. Brick construction, cut stone, art glass, steam heating, electric lighting, slate roofing, art glass, marble front. Plans received by Building Committee.

Toronto, Ont.

Tenders are open for picture theatre to cost \$7,000, Roncesvalles avenue near Fern avenue, for J. Kyle, 41 Adelaide west; 1-storey and basement, brick, structural steel, fireproof, plate and art glass, ornamental iron, tile coping, turned columns, electric lighting, steam heating, tar and gravel roofing.

Plans are approved for erection of a library, Bloor and Gladstone. Architect, Chapman & McGiffin, 59 Yonge street; vitrified red brick, terra cotta trimmings, green tile roofing.

Plans are prepared for Sunday School to cost \$20,000 (1st avenue), for First avenue Baptist Church; architect, J. F. Brown, Board of Trade Bldg., Toronto. Brick, slate roof, steam heating, electric lighting, hardwood finish.

Vancouver, B.C.

Tenders have been received for St. Paul's Hospital as follows: Norton-Griffiths Co., \$323,000; Megrath & Dennis, Dom. Trust Bldg., \$323,000; Sutherland & Avery Co., Portland, \$341,000; Sound Construction Co., Seattle, \$347,800; Booker, Campbell & Whipple, Williams Bldg., \$350,000; Purdy & Henderson, Vancouver, \$369,200; S. J. Lund, Empire Bldg., \$399,600. It is understood here that contract will go to Norton-Griffiths Steel Construction Co. Architect, R. F. Tegan, Metropolitan Bldg., Vancouver.

Plans are being prepared for church to cost \$50,000 for Methodist Church of Canada. Architect, G. A. Horel, 25th and Main streets, 84 x 112, Gothic style, stone. The building will contain club rooms as well as auditorium, etc. Further details later.

Victoria, B.C.

Plans are being prepared for convent to cost \$6,000, Hamilton street, for The Poor Clare Nuns; 2-storey, frame, containing public chapel.

Walpole Island, Ont.

A grant has been obtained by the Executive Committee of the Diocese of Huron, for the purpose of building and equipping a new parsonage on the Island.

Welland, Ont.

Plans are called for extension to Poor House for Welland County Council; clerk, R. Cooper. Clerk instructed to secure plans for extension.

Winnipeg, Man.

Competitive plans are called for Parliament Buildings to cost \$2,000,000, for Department of Public Works. Minister, Colin H. Campbell. Copies of regulations governing competition obtained from Jas. Hartney, 77 York street. Toronto, Ont.

Plans are being prepared for three new schools for Winnipeg School Bd. Supt. of Buildings, J. B. Mitchell. 25 class rooms in each building; addition to offices. Plans being prepared under supervision of Mr. Mitchell. Buildings to be erected in 1912.

CONTRACTS AWARDED**Burnaby, B. C.**

Prison farm building, cost \$5,000,000, for Public Works Department, Victoria. General contractors, Smith & Sherbourne, 615 Hastings street west, Vancouver. Four storeys, 346 x 200, main buildings; steel and concrete with brick facings. General contractors erecting offices on site, will handle all minor contracts except heating, wiring and plumbing.

Hamilton, Ont.

School, cost \$87,500, Trolley street. Architects, Stewart & Witton, 2 Hughson street south, Hamilton. General contractor, W. H. Yeates, 21 Leeming street, Hamilton. Sixteen rooms. Architects may let contract for seating without calling for tenders; general contractor has letting of contract for tile flooring, the only other contract not let. Tenders may not be called for flooring. Building to be roofed in two months.

Montreal, Que.

Police and fire station, \$62,000, Marchal street. Architect, Theo. Daoust, 90 St. James street, Montreal. General contractor, Jos. Marcotte, 565 St. Antoine street. Two storeys, 70 x 109, terra cotta, cut stone and brick on steel frame, concrete foundation, low pressure steam heating, electric lighting. "Security" gravel roofing. Sub-contracts will be let later.

St. Thomas, Ont.

The following contracts have been let in connection with the new kindergarten: Carpentering, Alfred Morris; plumbing, Hamilton & Scott; plastering, Charles Lee; painting, Fred Clarke; heating, George T. Stewart. Building being fitted up for use as school.

Sandwich, Ont.

Town hall to cost \$10,000. Architect, Crane & Pennington. Excavating, Geo. Shaw; mason work, Thomas Bros. Windsor; carpentry, Major & McLean. Sandwich; plumbing and heating, James Purser; painting and glazing, T. W. Brooke; electric wiring, Clarke Electric Co.

Toronto, Ont.

Church, Roncesvalles avenue, for Congregation of St. Jude's. Painting and glazing, H. W. Johnson, 209 Church street.

Residences**Calgary, Alta.**

Permit has been granted for residence to cost \$4,500, Elbow Park, for Collins Bros., 1235 12th avenue west; 2 storey, 25 x 36, frame, concrete foundation, steam heating, electric lighting, hardwood interior finish. Owner is builder.

Plans are being prepared for apartment block to cost \$50,000 14th, avenue and 4th street west. Architect, A. Pirie.

Chatham, Ont.

James R. Palmer will build a new residence to cost \$3,000, Pattison ave. Two storeys, brick. Contracts to be let at a later date.

Kitsilano, B.C.

McTavish Bros., 421 Pender street west, will build an apartment house on 3rd avenue. Architect, W. D. O'Rochfort, Victoria. 3 storey, brick, 100 x 120. steam heating, modern fittings.

Montreal, Que.

Excavation is done for six flats to cost \$7,600, Des Erables, for Felix Brien, 351 Garnier street; 3 storey, 50 x 50, brick encased, stone foundation, gas and electric light, gravel roof. Owner is builder.

Foundations are in for five flats to cost \$3,500, Fabre street, for Joseph Legare, 470 Gilford street; 3 storey, 30 x 70, pressed brick, gravel roofing, hot water heating, gas and electric light.

Foundations are under way for apartment house to cost \$65,000, Dorchester street, for A. MacKay, St. Antoine and St. Martin streets; architect, J. E. Adamson, 525 St. Catherine street west. Electric wiring, C. R. Jerry, Electrical Co., 18 Drummond street. Marble and tiling not awarded yet. 4-storey, 55 x 163.

Ottawa, Ont.

Tenders will be called for residence to cost \$3,000, Bell street, for Jacob Polovin, 250 Bell street; 30 x 40, double brick veneer, concrete foundation, electric light.

Toronto, Ont.

Tenders will be let shortly for pair residences, \$4,500, 94-96 Fern avenue, for Abraham Mundy, 745 Euclid ave. Semi-det., brick, tar and gravel roofing.

A permit has been granted to erect two pair residences, cost \$9,200, e.s. Sunnyside ave., for Lorne McAfee, 4 Star ave., Toronto. 2½ storeys, brick.

Excavation is done for pair residences, \$3,500, Empire ave. near Queen, for J. Lutz, 544 King street west. Two storeys, brick front and roughcast sides.

A permit has been granted for residence, cost \$2,500, Kenneth ave., for A. Stephens, 278 Wright ave. Two-sty., brick.

Excavation is done for residence, cost \$2,500, 69 Mavety street, for A. McGill, 564 Clendenan ave. Two storeys and attic, brick.

Tenders will be called shortly for apartment house, cost \$16,000, Queen & Beatty ave., for D. Lavine, 183 Beverley street. Architect, S. A. Wagett. Two storeys, brick.

Plans have been re-drawn for residence to cost \$20,000, Forest Hill road, for Wm. Caldwell. Architect, E. Bird, Traders Bank Bldg., Toronto; 2½-sty., stone construction, electric light, hot

water heating, tile, mantles, electric work.

Excavation is done for 3 attached residences, \$9,000, Harcourt avenue, for F. C. Pearson, 174 Wolfrey avenue; 2-storey, brick.

R. Nuttall, Stephenson avenue is excavating for 3 detached residences to cost \$7,800 (Pickering street); 2-storey, brick.

Tenders are open for 7 attached residences and stores to cost \$24,000, S. W. Roncesvalles and Bostead, for R. C. Bustard, Heath street; architect, J. H. Stanford, Yonge street Arcade. Excavating.

McMillan & Costain, Main street, are excavating for 1 pair residences to cost \$6,000, Gerrard street; 2-storey and attic, solid brick, tar and gravel roofing.

G. E. Pearson, 2 Division street, is excavating for 2 pair residences to cost \$10,000, Fermanagh avenue. 2½-storey, brick, semi-detached, slate, tar and gravel roof.

Tweedy & Co., 460 Bathurst street, are excavating for 2 pair dwellings, \$12,000, Indian road and Central avenue 2½-storey, semi-detached, brick.

Waters & Elliott, 24 Vermont street, are excavating for 3 pair residences to cost \$10,500, S. E. corner Paton road and Campbell avenue.

Excavation is done for residences to cost \$6,000, 148-50 Bedford road, for Urquhart & Sharpe, 1425½ Bloor west; 2-storey, semi-detached, brick.

Tenders are open for residence to cost \$3,000, Heath street east, for Mrs. E. D. G. Cohen, 141 Farnham avenue; architect, Langley & Howland, Continental Life Bldg. 2½-storeys, brick and stucco, cut stone, shingle roofing, hardwood flooring, mantles, No. 4 hot water heater, 475 ft. radiation, gas and electric lighting.

Excavation is completed for residence to cost \$3,000, 59½ Constance street, for H. E. Markey, 469 Bathurst street. 2½-storeys, brick.

Excavation is done for residence to cost \$2,500, Medland Crescent, for Noble Johnston & J. Lewis, 128 Medland 2½ storeys, brick.

Excavation is done for pair residences to cost \$3,000, 1-3 Sydenham street, for P. H. Harrison, 40 Bently avenue; 2-storey, semi-detached, shingle roofing.

Excavation is done for residence to cost \$2,500, Medland avenue near Humberside, for Jas. Fuller, 10 Robert St. 2½ storeys, brick, shingle roofing.

Geo. E. Pearson, 2 Division street, will build one pair 2½-storey, semi-detached residences on N. S. of Fermanagh avenue, to cost \$5,000.

A. T. Stewart, High Park Gardens, will build one pair 2-storey, semi-detached brick residences on Howard Park avenue near Indian road, to cost \$6,000.

Excavation is done for pair residences to cost \$4,000, Woodbine avenue, for J. G. and A. C. Churchill, 415 Clinton St. Owner is builder.

Tenders are called for erection of residence, St. Andrew's Gardens, for Mr. Good. Architect, C. J. Gibson, 75 Yonge street, Toronto. 2½ storeys, brick, cut stone, tiles, mantles, deadening felt, hot water heating, electric light, hardwood interior finish.

Plans are drawn for apartments (43 suites), 160 Huron street, for Home-Suite Homes. Manager, W. E. Dyer, 114 King street west; 4 storeys and basement, 40 x 120, pressed brick, steel and concrete. Roman stone, hardwood, interior finish.

Excavation is done for 1 pair residences to cost \$4,400, Brock avenue, near Maple Grove, for Webb & Pearl, 10 Beaconsfield avenue. 2 storeys and attic, semi-detached, brick.

W. J. Grant, 29 Callendar avenue, is excavating for 2 pair residences to cost \$8,000, Cheltenham avenue. 2 storeys, semi-detached, brick.

A permit has been granted for residences to cost \$3,000, near Conduit St., for R. Graham, 57 Clara avenue; 2-styl., brick.

A permit has been granted for 1 pair residences to cost \$3,800, E. S. Emerson avenue, near Lappin, for Jas. Crapper, Emerson avenue; 2-storey, semi-detached, brick.

Mrs. E. Cohen, 141 Farnham avenue, will build a residence to cost \$3,000, S. S. Heath street. Architect, Langley & Howland, Bay and Richmond. 1½-storeys, brick.

A permit has been issued for three attached dwellings to cost \$6,500, Ossington avenue, for R. B. Burkell, 180 Rusholme road; architect, W. L. Mason. 2½ storeys, brick.

A permit is granted to erect 2 detached dwellings to cost \$7,000, Medland Crescent and Oakmont road, for Jas Pengelly, 762 Keele street east. Toronto. 2½ storeys, brick.

CONTRACTS AWARDED

Bridgeburg, Ont.

Two residences to cost \$2,500 each, for F. Henry Emrick. Builder, Chester W. Taylor. Brick veneer, shingle roof, hardwood floors, modern plumbing, oak finish. Samuel House of Stevensville intends erecting two houses in the spring.

Montreal, Que.

Nine tenements to cost \$6,000 for J. P. Dixon, 329 St. Martin street, Montreal. General contractor, J. P. Gravel, 3354 Etang street, Montreal. Three storeys, 72 x 54, brick, masonry foundation, stove heating, electric and gas lighting, gravel roofing, tile and enamel baths, hot and cold water fixtures, hardwood finish.

Senneville, Que.

Residence to cost \$40,000, near Montreal, for Dr. J. L. Todd, 261 Peel St., Montreal. Architect, Nobbs, & Hyde, Beaver Hall Hill, Montreal. General contractors, Byers & Anglin, 65 Victoria street, Montreal. Two and one-half storeys, 30 x 40, stone and fireproof material, masonry foundation, hot water heating, electric lighting, slate roofing.

Toronto, Ont.

Residence, cost \$6,000, Castle Frank Crescent, for Mr. Smith, 19 Wellington street west; architect, Bond & Smith, 19 Wellington street west; masonry, Elgie & Page, 21 Havelock street; carpentry, E. A. Bradshaw, 52 Lynwood ave.; plastering, Mr. Goulding, Balliol street; two storeys, brick and stone, cut stone, hot water heating, electric work, mantles, plate glass.

Residence for Dr. E. M. Walker, Architect, W. A. Langton, 82 King west;

Masonry, Orr Bros., 39 Queen east; carpentry, Wilson & Robinson; plastering, Jno. Royce; plumbing, J. R. Seager, 799 College; electrical, Chapman & Walker, 69 Victoria.

Residence to cost \$2,600, for Chas. Collard, 98 Brooklyn avenue. Builder, Jos. Anderson, 568 Jones avenue. 2 storeys and attic.

Verdun, Que.

Residence to cost \$3,000, for R. Dawe, Lasalle road. General contractor, Wilfrid Julien, 270 Ethel street; 2-storey, 18 x 41, wood and brick, stone foundation, gravel roofing, electric lighting.

Vancouver, B.C.

Bungalow to cost \$3,000, Wellington avenue, for R. Tulford, Collingwood W. Architect, J. H. Bowncan, Crown Bldg., Vancouver. General contractor, E. Grubb, South Vancouver; 1½ storeys, 6-room, frame, furnace, electric wiring.

Westmount, Que.

Foundation is started for residence to cost \$11,000 for J. H. Hand, 609 Belmont street; architects, Wright & Sons, 204 St. James street; 2 storeys, 34 x 60, brick, concrete foundation, hot water heating, electric lighting, felt and gravel roofing. Owner is builder.

Foundations are under way for two semi-detached residences to cost \$12,000. Clerk avenue, for C. N. Blakely, 46 Aberdeen avenue; architect, Wright & Son; 2 storeys, 52 x 55, concrete and brick hot water heating, electric and gas lighting, slate and galvanized iron roof.

Work is in progress for 2 semi-detached residences to cost \$7,500, Fairmont ave., for D. Martel, 573 Frontenac st. Gen. contr., A. Lamay, 1113 Cowan st., Montreal; 2-storey, 51 x 37, brick, stone foundation, electric light and gas, gravel and tar roofing, hot water heating.

Business Buildings and Industrial Plants

Brussels, Ont.

W. H. Pyrne is contemplating the erection of a three-storey addition to mill. It is stated new machinery will be installed.

Calgary, Alta.

A permit has been granted for cold storage building to cost \$3,000, for Standard Fisheries Ltd., Vancouver. Architect, Lang & Major, Calgary. General contractor, G. J. Davis, 2422 Cedar ave., Calgary. 2-storey, 25 x 50, frame, concrete foundation, electric lighting.

British Canada Agricultural Tractors, Ltd., E. A. Wild, representative, are contemplating the location of a large factory here to manufacture agricultural machinery. Nothing definite done as yet.

Chatham, Ont.

Canadian Wolverine Co., manufacturers of plumbing, sunlies, are planning to build an addition to plant, increase of power and additional machinery. Matter will be decided at once.

Fort William, Ont.

The ratepayers will vote on the by-law to raise \$102,000 to enable city to carry out its agreement with F. V. Samuel, of Guelph, who has been negotiat-

ing re location of plant to manufacture wrought iron and steel pipe.

Seaman, Kent & Co., headquarters Meaford, plan to build an addition to their factory to cost \$10,000. Wood-working machinery will be required.

Hamilton, Ont.

Plans are being prepared for cream separator factory to cost \$35,000, for Magnet Cream Separator Company; president, A. B. Petrie. Two storeys, 110 x 40, reinforced concrete, fireproof, stone foundation, reinforced concrete roof, steam heating, plaster on walls, electric lighting, electric work, steel working machinery, dynamos, switch-board.

Plans are completed for an ice factory to cost \$4,000, Strachan street, for Inksetter & Myers, Limited, Bank of Hamilton Bldg.; Geo. A. Inksetter. Architects, Donaldson & Patterson, 229 Bay street, Hamilton. One storey, 60 x 75, frame and corrugated iron, stone foundation, electric lighting, corrugated iron roofing, concrete floors. Ice making machinery will be required.

The United Coke & Gas Company, 17 Battery Place, New York, are contemplating Canadian branch and plant to be established here at a cost of \$100,000.

Kentville, N.S.

A co-operative company being organized, and an apple storage building 40 x 200 feet is planned; cost \$7,500.

Kitsilano, B.C.

Plans are ready for store and apartment building, for J. E. McLean. Architect, Helyer & Archer, Dominion Trust Building, Vancouver. Two storeys, brick, four suites of apartments and three stores.

London, Ont.

A branch to be opened for gas producer factory for the Davies Acetylene Co., Elkhart, Indiana. Canadian manager, J. H. Baker, temporary quarters secured on Richmond street and manufacture of generators will be commenced soon. A large factory will be built later.

Biscuit factory, Dundas street, of D. S. Perrin Co., Ltd., burned. Loss estimated at \$150,000. New machinery costing about \$80,000 to be purchased; new factory to be erected to cost about \$200,000. Work will commence soon.

Midland, Ont.

On January 1st the ratepayers will vote on a by-law to grant a fixed assessment to J. A. Benson and M. J. Bray to assist in the establishment of a wood-working plant here; also a by-law to provide \$8,000 for cement sidewalks.

Montreal, Que.

Friedman Bros., wholesale and manuf. clothiers, 322 Notre Dame west, are contemplating the erection of a clothing factory, 7 storeys, on St. Urbain street. Site of 10,000 sq. feet purchased.

Tenders called for offices and stores, Notre Dame and St. Sulpice, for J. O. Gravel, 59 Mansfield street, Montreal; architects, Hutchison, Wood & Miller. Royal Insurance Building, Montreal. 10 storeys, 50 x 75, stone, brick, steel, concrete, concrete and stone foundation, Ohio sandstone, grey canyon or limestone facing, steam heating, electric lighting, gravel roofing, birch floors, marble halls, two elevators and modern appointments. Tenders closed Decem-

ber 22nd. Contemplated for spring work.

Alex. Nelson, 380 St. Catherine st., has just purchased property at 192 Peel street and plans to erect four stores to cost \$90,000.

Napancee, Ont.

Factory additions for Dominion Rock Drill Co., Ltd., manufacturers of drilling machinery. Three storey buildings, each 150 x 45, of cement and brick. On Jan. 1st the ratepayers will vote on fixed assessment of above company.

Sherbrooke, Que.

City is about to purchase a site from T. M. Craig for Cosmopolitan Clothing Co., \$3,000 will be spent in repairs and building equipped with 75 machines for manufacture of overalls, jumpers, etc.; 100 hands employed.

The Jenckes Machine Co. are about to make arrangements to double capacity of shops. New buildings and machinery will have to be provided.

St. Catharines, Ont.

Tenders were received until Dec. 22 for storage building, for the city. Building to be metal covered.

St. John, N.B.

P. M. Block, Portland, Maine, has practically closed negotiations for the purchase of 5 acres from Harry Gilbert as a site for the erection of a factory for the manufacture of explosives.

Thorold, Ont.

The Montrose Paper Mills, Limited, propose making extensions to paper mills. President, T. A. Welldon; secretary, D. J. Albertson, Kalamazoo. Plans prepared for machine room. Tenders not yet called for. Machinery to be installed: 1 paper machine, 6 beaters and washers with necessary screens, tanks, etc.; 2 rotary boilers, necessary finishing machinery, cutters and calendars, as far as can be learned above have not been purchased.

Toronto, Ont.

Foundation has started for private garage, cost \$3,000, on e.s. Kendal ave., for Dundas Building Co., West Toronto. One storey, brick and stone.

Victoria, B.C.

Plans will be prepared for factory (Mosaic tile) to cost \$15,000, for The Canadian Mosaic Tile Co. (George Ager 516 Trutch street, and R. W. Marsh, are interested); capital, \$100,000. Architect, Jesse M. Warren, Sayward Bldg., Victoria. 1 storey, 100 x 100, frame, corrugated iron. To manufacture 1000 ft. per day.

Vancouver, B.C.

Storey & Campbell, Beatty street, are contemplating the erection of a business building, Pender street. Architect, W. T. Whiteway, Molsons Bank, Vancouver. Four storeys.

Plans are filed for store and apartment building to cost \$12,000, Union st., for L. & J. Trasolini, 462 Barnard St. Architect, L. Schuller. Three storeys, 50 x 50, three stores, four suites.

Store and office building, Homer and Georgia, for Mahon, McFarland & Proctor. Architect, W. Frederick Gardiner, 347 Pender street west, Vancouver. 4-storey (designed for 10) steel and concrete, 75 x 120, Heddington Island stone, Risco face brick, fire escapes,

veneer mahogany doors, tar and gravel roofing, Pyrobar plaster brick partitions, electric work, Raecolith floors, iron balusters and steps, hard wall plaster, fire hose, gravity steam heating (oil furnaces). Tenders received until Dec. 30th from selected contractors. Heating not included.

Welland, Ont.

Plans are prepared for alterations to hotel to cost \$15,000, for S. Beattie, proprietor. Architect, A. E. Nicholson, St. Catharines. Alterations and extensions.

The Township of Crowland will vote on a fixed assessment by-law for Canadian Automatic Transportation Company, Welland. If it carries, company will build a factory. Township Clerk, H. L. Pratt, Welland.

Winnipeg, Man.

Office building on Lombard street for John D. Atcheson, Bank of Toronto Bldg., Winnipeg. Ten storeys, terra cotta, fireproof, steel and concrete, steam heating, electric lighting, interior finish, marble and hardwood. Excavation done. Geo. A. Fuller Company, 1001 Union Bank, intend bidding and invite figures on different trades, viz.: carpentry, passenger elevator, plumbing, heating, electric lighting, vacuum cleaning, and ornamental iron. Tenders on general contract will be called by architects after new year.

Mrs. N. J. MacIntyre, 83 Smith St., is contemplating additions to business block; 3 extra storeys may be added next summer.

Waterloo, Ont.

Work is in progress for addition to furniture factory, \$15,000, on King st., for Messrs. Snyder Bros. Three storeys, 158 x 55, white brick; upholstered goods will be manufactured exclusively. Site being cleared.

CONTRACTS AWARDED

Brantford, Ont.

Factory to cost \$10,000, for Brantford Oven & Rack Company, Ltd., Campbell street. Architect, G. W. Hall, 321 Colborne street, Brantford. General contractors, Bennett & Bowden, Brantford. Two storeys, 60 x 100, brick, concrete foundation, shingle on asbestos roofing, interior finish pine. Contract awarded December 15th. No sub-contracts awarded. Gas engines will probably be installed for power.

Hamilton, Ont.

Glass factory, to cost \$40,000, James north, for Diamond Flint Glass Co., James street N., Hamilton. Architect, Stewart, Wilton, 2 Hughson street, E., Hamilton. General contractor, H. L. Dickinson Construction Co., Pittsburg, Pa., U.S.A. Machinery will be required shortly.

Montreal, Que.

Plans are re-drawn for store and 3 flats to cost \$35,000, St. Jerome and Bordeaux, for Mrs. Fabien Vanasse, 99 Rachel street E. General contractor, D. Peloquin, Sorel, Que. 2-storey, 25 x 60, brick and wood, gas light, gravel roofing, stove heating.

Offices to cost \$40,000, Longue Pointe Ward, for The Montreal Locomotive Works, Limited, 41 Bank of Ottawa Building, Montreal. Excavation, Shearer, Brown & Wells, 225

St. Patrick street, Montreal. Plastering, R. D. Clark & Sons, 26 Lincoln avenue, Montreal. Plumbing and heating, Conroy Bros., 291 Centre street Montreal. Roofing, Sidley & Hunt, 77 Duke street, Montreal. Electric lighting, H. H. Willetts, 177a Canning street. Two storeys, 40 x 80, concrete faced with brick, slate roofing, oak trimmings.

Factory to cost \$8,000, 206 Chatham street, for R. Miller, 168 St. Maurice street; manufacture of aerated waters. General contractor, Adolph Gibeau, 126 Boyer street, Montreal; plumbing, W. Atcheson, 1163 Galt avenue, Montreal. Two storeys and basement, 50 x 130, solid brick, concrete foundation, hot water heating, electric lighting, gravel roofing, interior, slow burning timber, electric power and new machinery required.

Light manufacturing building, Billiard Parlor, 701 St. Lawrence, for S. Berland, 462 Elm ave., Westmount; architect, C. Dufort, La Patrie Bldg., Montreal; general contractor, G. Bail, 365 Plessis st., Montreal. Four storeys and basement, 40 x 150, brick front and mill construction, concrete foundation, electric lighting, hot water heating, gravel roofing, fire escapes. Basement to be used as billiard parlor. Work not started.

New Westminster, B.C.

Permit has been granted for hotel to cost \$25,000, Carnarvon and 8th Sts., for A. G. Peters; 3 storeys, brick. Plans completed, general contract let.

Match factory, Sapperton, Pitt River road, for Dominion Match Company, Limited, 328 Hastings street west, Vancouver. Secretary, R. Thompson. Architect, Gamble & Knapp, 615 Hastings street west, Vancouver. Contractors, Beer & McLellan. Two storeys, 75 x 200, concrete or wood blocks over concrete, walls of either brick or gypsum blocks; mill construction throughout; electricity motive power for machinery. It is probable several houses will be erected by the company. Tenders received by Mr. Thompson. Work will begin at once.

Orillia, Ont.

Bank and 3 stores to cost \$25,000 for Cavana & Watson. Architect, J. H. Robertson. General contractor, J. D. Haywood. Roofing, J. D. Haywood, carpentry, N. Pless. 4-storey, 45 x 75, steel and brick, electric lighting, steam heating, composition roofing, hardwood interior finish, elevator shaft provided, no elevator to be installed at present. Fire escapes and vaults required. Heating, plumbing and painting not let yet.

Ottawa, Ont.

Hotel to cost \$8,000 for Estate of Margret Cowan. Architect, C. J. Burnett, Sparks street Chambers, Ottawa. General contractor, T. J. E. Ferguson, Ottawa. Solid brick, 33 x 40, concrete foundation, electric lighting.

Auto sales room to cost \$19,500, for Russell Motor Car Co. Architect, J. A. Ewart, Sparks street, Ottawa. General contractor, Jas. C. Low, 262 Catherine street, 66 x 90, solid brick, concrete foundation, electric light.

Addition and alteration to garage, Sparks street, for Pink, McVeity & Blackburn, Sparks street. Architect, J. P. McLaren, 104 Sparks street, Ottawa.

(Continued on page 68)

Tenders and For Sale Department

To Engineers

Every man who puts in a tender on your jobs has got to see your plans and specifications first. If you are in Montreal and he is in Vancouver the inspection of your plans is a problem. Let us solve that for you. Place on file copies of your plans and specifications in any or all of the "Contract Record" offices.

More contractors and manufacturers read the "Contract Record" than any other Canadian publication. It is the logical place to look for tenders called, and where all important works are advertised.

Send along your plans for your next job and put a line in your ad. to that effect.

Contract Record

Montreal—B34 Board of Trade.
Toronto—220 King Street West.
Winnipeg—Commercial Travellers' Bldg.
Vancouver—441 Seymour Street.

Sewer Excavator

For sale for immediate use, a Vulcan "Little Giant" Steam Shovel with extra long dipper handle for excavating to 16 feet below surface, mounted on traction wheels, dipper 1½ yd. capacity. Machine just overhauled; new chain, and extra large new boiler; weighs 32 tons; low price. Address

WILLIS SHAW MACHINERY Co.,
39 South LaSalle Street,
Chicago, Ill.

42-t.f.

Lighting Contract Wanted

I have a complete lighting and power outfit and want to get in touch with towns in the market for electric lighting and power. Am willing to sell the outfit or operate it under a franchise. Would require investment of \$10,000 or \$20,000. If interested write to Box 379, Contract Record, Toronto, Ont. 49-52

CITY OF WESTMOUNT City Surveyor's Department

Tenders are invited for:—

1. Supply of one steam road roller.
2. Supply and erection of bituminous macadam mixer plant.

General conditions, form of tender and all particulars can be obtained at the office of the City Surveyor.

Tenders in sealed envelopes marked either "Tender for Steam Road Roller" or "Tender for Bituminous Macadam Mixer Plant" will be received by the City Clerk, Westmount, up to twelve noon, 3rd January, 1912.

Tenders will be opened by the Mayor sitting in public in the City Hall, at 5 p.m., 3rd January, 1912.

The City Council does not bind itself to accept the lowest or any tender.

ARCH. CURRIE,
City Surveyor.

City Hall, Westmount,
8th December, 1911. 50-52

Debentures For Sale

The Corporation of the Town of Steelton will receive tenders up to 8 o'clock p.m., January 16th, 1912, for the purchase of: \$82,000 Sewer Debentures, running 30 years, and \$32,000 Cement Walk Debentures, running 20 years.

Full particulars on application to
52-2 J. ROBINSON, Clerk.

Tenders Wanted

For the several trades required in the erection and completion of a proposed Church of England Building at Sudbury, Ont., will be received up to noon, Thursday, February 1, 1912.

Plans and specifications may be seen at Secretary's office, Bank of Montreal, Sudbury, Ont. The lowest or any tender not necessarily accepted.

All tenders to be on forms provided, to be sealed, marked "Tender" and addressed to

W. J. MONTGOMERY,
Sec. Building Committee,
Church of Epiphany,
Sudbury, Ont. 51-1

Sudbury, Dec. 12, 1911.

Tenders for Steel Bridge

Sealed tenders will be received till 4 p.m., Wednesday, January 23rd, 1912, for the erection of a steel bridge over the Saugeen River, 10th Concession, Township of Brant. Bridge to consist of two spans of 125 feet each and one span of 90 feet, or two spans of 165 feet, 16-ft. roadway and with concrete floor.

Also tenders for two abutments and two piers for same to be built of concrete. A separate tender is required for bridge and abutments, and enclosing a marked cheque for \$200 for each tender.

The lowest or any tender not necessarily accepted.

Specifications may be seen with the undersigned.

JAMES WARREN,
Engineer in Charge.
Walkerton, Dec. 26th, 1911. 52-52

Positions Vacant

Advertisements under this heading two cents a word per insertion. Box No. ten cents extra. Minimum charge 25 cents

WANTED—Experienced station operators for high tension voltage work; permanent position. Applicants must be proficient in some mechanical trade. Give full particulars of experience, age and salary. Box 396, Contract Record, Toronto, Ont. 52-52

WANTED—A qualified builders' hardware salesman with good connection in Western Canada and accustomed to figuring from Architects' plans, to travel for large United States manufacturer. Address replies, stating experience, salary required and copies of references immediately, to Box 389, Contract Record, 220 King Street West, Toronto, Ont. 50-52

Positions Wanted

Advertisements under this heading one cent a word per insertion. Box No. ten cents extra. Minimum charge 25 cents

Position wanted by building superintendent and engineer with general building experience, including reinforced concrete. Also had experience in deep foundation work, mass concrete and dam construction. Box 390, Contract Record, Toronto, Ont. 52-52

Advertising Manager—Of a large manufacturing concern of Cleveland, Ohio, desires to connect with a going house, who are looking for results in advertising. Is competent of writing own copy, compiling of catalogues, folders, circulars, etc. For further information address Box 385, Contract Record, Toronto, Ont. 50-51F

Miscellaneous

Advertisements under this heading one cent a word per insertion. Minimum charge 50 cents

Sales Agents Wanted

Large British firm with plants in England, Bohemia and France, manufacturing Carborundum and Electric goods and high class grinding machinery wants to secure either first class salesmen or firms with established trade connections to represent them in Canada. Apply Box 393, Contract Record, Toronto, Ont. 52-1

Large United States firm manufacturing transits, levels, and complete line of engineering and architectural instruments, wants Canadian representatives. Apply Box 398, Contract Record, Toronto, Ont. 52-2

New Companies

The D'Auteuil Lumber Co., Ltd., Quebec, Que., incorporated with a capital of \$50,000 to buy, sell and deal in lumber, pulp and timber of all kinds, operate power plants, sawmills, etc. Incorporators, Chas. Edmond Taschereau, Joseph Phileas Cantin and Ulric Gelly, all of Quebec.

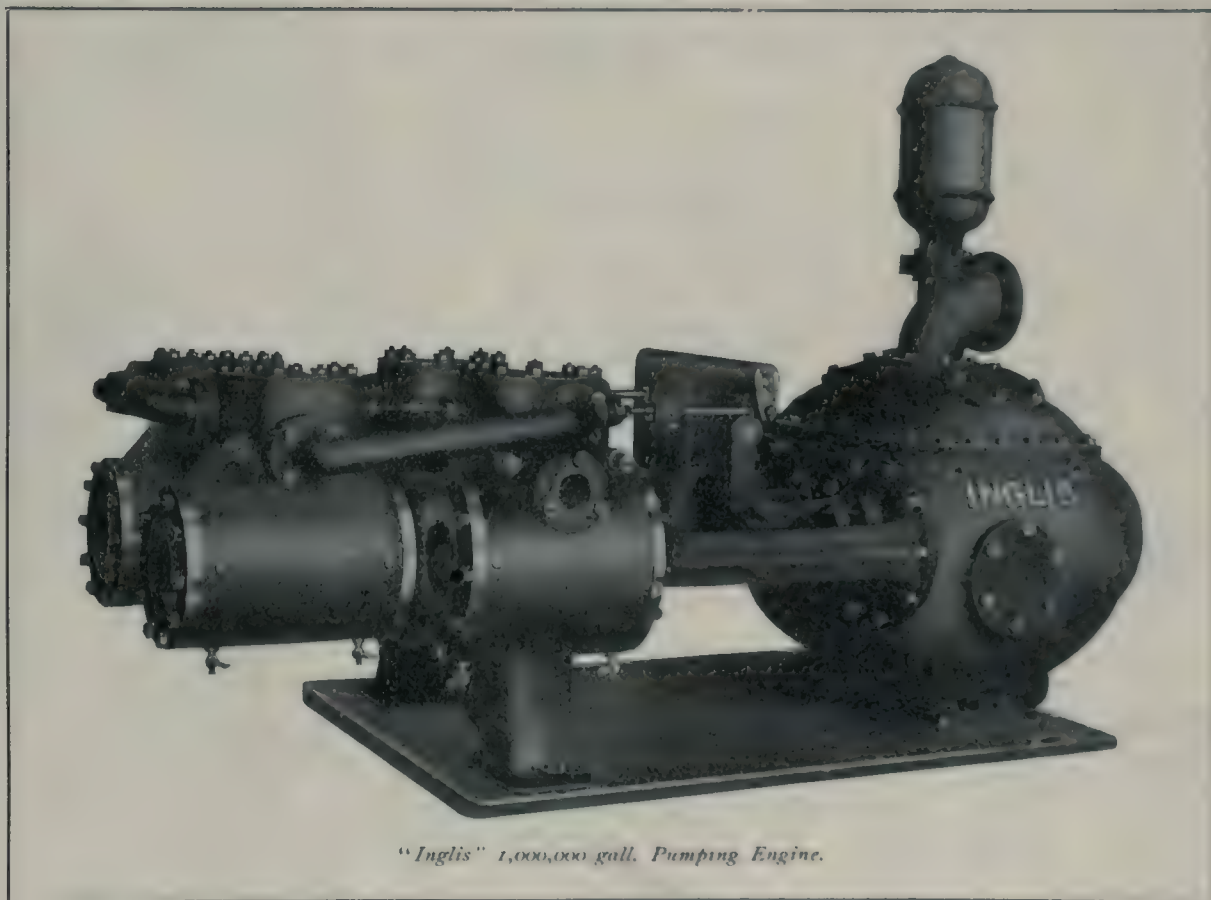
Roper, Clarke & Co., Ltd., Montreal, Que., incorporated with a capital of \$40,000, to sell and deal in machinery, tools, electrical, mining and contractors' supplies. Incorporators, Francis Geo. Bush, Herbert Wm. Jackson and Michael J. O'Brien, all of Montreal, Que. ...

P. Lyall & Sons Construction Company, Ltd., Montreal, Que., incorporated with a capital of \$3,250,000, to carry on business as builders, contractors, general engineers, dealers in timber, stone and other supplies. Incorporators, S. G. Dixon, E. Langueduc, E. R. Parkins, and A. C. Calder, all of Montreal.

Saguenay Mills, Limited, Montreal, Que., incorporated with a capital of \$20,000, to own and operate sawmills, timber limits and deal in lumber, wood pulp and timber of all kinds. Incorporators, J. S. P. Morgan, Wm. G. M. Morgan, of Sorel, Que., and E. Maurault, of Montreal, Que.

Water-Works Plants

for Towns and Cities



"Inglis" 1,000,000 gall. Pumping Engine.

Our long and successful experience in the building and installation of Pumping Engines and Water Works Machinery should be a strong argument in favour of "Inglis" products. During the fifty-two years (52) our plant has been in operation, we have built many Pumping Engines, all of which have given entire satisfaction.

Capacities from one to thirty million gallons per 24 hours.

Send us your inquiries.

The John Inglis Company

Engineers and Boilermakers

Limited

14 Strachan Ave., TORONTO, Canada

Business Buildings and Industrial Plants

(Continued from page 65)

General contractor, G. Grain, Clemow avenue, Ottawa. 3-storey, reinforced concrete, steam heating, reinforced concrete roofing, lighting, electric hoist. Re-building of garage gutted by fire four weeks ago.

Alteration and addition to shop and residence to cost \$3,500, Somerset St., for D. A. F. Shillington. Architect, Horwood, Taylor & Horwood, Sparks street. General contractor, A. Richards and Jas. Robertson, Ottawa.

Toronto, Ont.

Brick addition to cost \$18,500, W.S. Booth avenue, for Dunlop Tire Co., Ltd, Booth avenue. Architect, J. L. Havill, Mail Bldg. Masonry, Henry Lucas & Son, 141 Havelock street; carpentry, Brown & Cooper, 297 Carleton street; plumbing, Fiddes & Hogarth, 122 King street E., all of Toronto. 2-storey, brick addition. Roofing, painting and glazing, sprinkler system not yet awarded.

Factory (manufacture of check books) Wellington street, for F. N. Burt & Co. Architect, J. F. Brown, Board of Trade Bldg., Toronto. Painting and glazing, J. R. Robinson, 138 Amelia street; 3-storey, 140 x 90, brick.

Vancouver, B.C.

Office building to cost \$80,000, 509-15 Richard street, for North West Canada Trust Company. Architect, J. P. Mathieson & Co., 1242 Comox, Vancouver. General contractors, Dominion Construction Company; T. J. Madlen, manager, 433 Homer street, Vancouver. Excavation contractor, Paschal & Schegel. Plans changed to include eight storeys instead of seven. Minor contracts let on completion of plans.

Store and apartment building, cost \$25,000, Heatley and Hawkes. Architect, Hugh Branton; general contractor, Egdell & Dixon, 115 Carter Cotton Building. Four storeys and basement, concrete foundation.

Warehouse (Cold Storage), cost \$300,000, Water street, for Swift & Co., 125 Water street, Vancouver; company's architect, A. E. Shank; general contractor, J. McDiarmid & Co., 138 Portage ave., Winnipeg. Six to ten-storey warehouse and cold storage plant. Work will start shortly after first of year.

Victoria, B. C.

Hotel, cost \$100,000, Johnson street, for St. James Limited, Chas. Hayward and F. S. Barnard. Architects, Breseman & Durfee, Sayward Building; excavation contractor, Wegner & Harney; six storeys, 60 x 105, 90 rooms, pressed brick and terra cotta, ten private baths, ten public baths, telephone system, hot and cold water in each room. interior finish mahogany and fir. Tenders called on general contract soon; plumbing,

heating and wiring and elevator contracts let separately.

Westmount, Que.

Garage to cost \$10,000, Lansdowne avenue, for James Baillie, B14 Board of Trade Building. Architects, Hutchison, Wood & Miller, Royal Insurance Building, Montreal. General contractors, John Stewart & Company, Bethune St., Montreal. Two storeys, 20 x 36, concrete and brick, hot water heating, electric lighting, hopper gravel roofing. Tenders not in yet for superstructure.

Power Plants, Electricity and Telephones

Essex, Ont.

Robert S. Stewart of Detroit who has recently purchased electric plants in Sandwich, Essex, Leamington, Kingsville, Harrow, and Amherstburg, contemplates very extensive improvements including the putting in of high tension wires and additional equipment to give a 24-hour service.

London, Ont.

The Fire and Light Committee has recommended that \$20,000 be expended for placing additional electric lights on the streets. The matter will be taken up at once.

Orillia, Ont.

Contemplated new telephone exchange on Peter street, for Bell Telephone Company of Canada. Local manager, H. M. Black. Central energy system. Specifications are awaiting approval.

Quebec, Que.

Rights have been secured for Hydro-electric power development on Saguenay River, for The Quebec Railway, Light, Heat and Power Co., Ltd., Head Office, Quebec. General manager, C. E. A. Carr. Water power rights for first thirty miles on Saguenay from Lake St. John. Erection of 50,000 h.p. hydro-electric plant will be started in the spring.

Richmond Hill, Ont.

On January 1st the ratepayers will vote on a by-law to raise \$5,000 to provide electric power for lighting purposes.

Renfrew, Ont.

A by-law will be submitted for power development to cost \$60,000 (converting steam plant to Hydro-electric) and removal of old boilers, filters and generators. Power house, dam, generators, turbines, etc. Owner, A. T. Lawson. Consulting engineer, J. B. McRae, Citizen Bldg., Ottawa.

Vancouver, B. C.

The C. C. Telephone Co. are ready for tendering, Highlands Exchange Building to cost \$45,000, Turner street. Superintendent of Construction, C. F. Bollscheweller, Seymour street office. 4-

storey, 43 x 60, steel and concrete, pressed brick facing, steam heating, plumbing, tar and gravel roofing, rest room. General contract will include heating, plumbing and wiring for lighting; installation of telephone system, wiring, etc., to be done by company.

Business Notes

Aylmer, Ont.

J. Thody's cold storage building and ice house completely destroyed by fire. A larger plant will be built later.

Hawarden, Sask.

The following buildings were destroyed by fire on the 12th inst.: Milburn's hardware store, Manderson & Torgeson's implement and garage building, Canadian Bank of Commerce, Thos. Nuttall's drug store, etc. Loss, \$50,000.

Moncton, N. B.

Elliot's hardware store, H. L. Bass's shoe store, M. J. Steeve's confectionery, Moncton Fuel Company, Foster Keith's barber shop and Boston 5c. and 10c. store burned. Estimated loss \$30,000.

Montreal, Que.

Cigar factory on 29 St. Peter street, occupied by Harris, Harkness & Co., Youville Square, owned by Sisters of the Congregation of Notre Dame, burned. Damages estimated at \$15,000. Repairs are being made.

Chemical plant of Standard Chemical Iron and Lumber Co., 524 Ambroise St.; 2-storey, brick building, damaged by explosion to the extent of \$10,000.

Moose Jaw, Sask.

The Robin Hood Flour and Oatmeal mills, cooperage plant, elevator—burned. Loss estimated at \$500,000.

Pingston Creek, B.C.

The Gibbons Lumber Company's mills are reported totally destroyed by fire. Loss, \$100,000, covered by insurance.

Rosthern, Sask.

Flour mill of Union Supply Co., Ltd., burned. President, John Hamm. Loss, \$17,000 of building and machinery. Meeting of shareholders to be held soon to decide about re-building on larger scale.

St. John, N.B.

The McLaughlin Bldg. on Germaine street damaged to the extent of \$20,000. Climo's photo studio, Breck & Patterson's millinery included.

Miscellaneous

Winnipeg, Man.

Tenders are called for supply of 300 lin. feet of wrought iron well casing, 20-in. outside diameter, 3/8-in. metal, f.o.b. city yards. Specifications with City Engineer. Received by Chairman Board of Control, until 11 a.m., December 28th.

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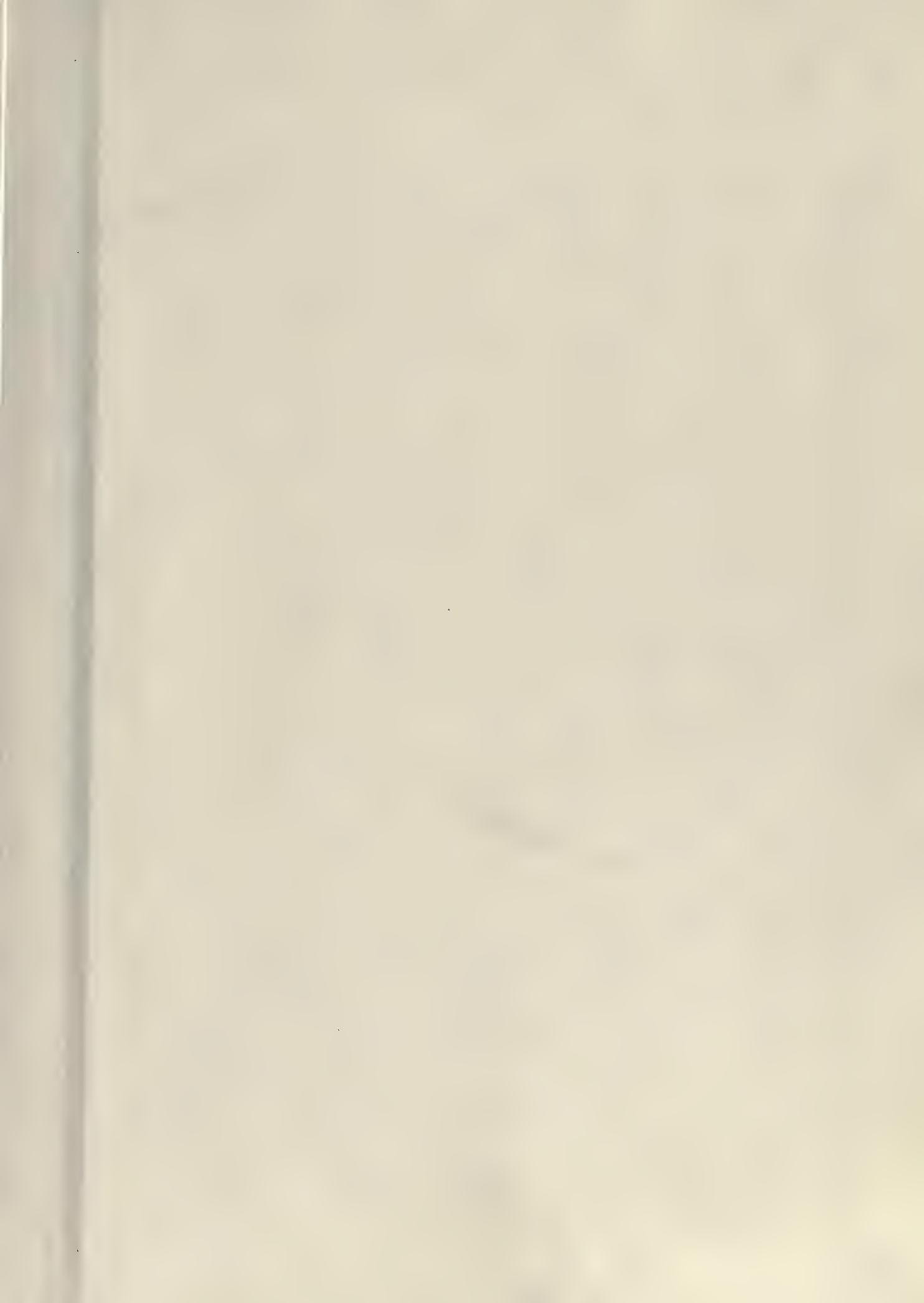
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